MEMORIAS
SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS

PROCEEDINGS
SYMPOSIUM ON CHEMICAL EMERGENCY PREPAREDNESS

23-27 julio, 1984
July 23-27, 1984
Metepec, Edo. de México
MEXICO

Centro Panamericano de Ecología Humana y Salud
OPS/OMS

Gobierno del Estado de México
Secretaría de Educación, Cultura y Bienestar Social
Dirección de Promoción Social

Los documentos contenidos en estas memorias se han impreso directamente de los textos entregados por los autores a la secretaria del Simposio sobre Emergencias Producidas por Agentes Químicos.

The papers presented in these proceedings have been printed directly from the papers given by the authors to the secretary of the Symposium on Chemical Emergency Preparedness.

Fernando Rulfo V.
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CONTENIDO/CONTENT

SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS

PREFACIO

Conforme se ha ido elevando el grado de industrialización de los países o las regiones, se ha ido también elevando el número de accidentes en los cuales están involucrados agentes químicos de diversa naturaleza, tanto dentro de los procesos de producción como durante el transporte de materiales. Durante las recientes décadas, en los países desarrollados, se han creado sistemas para la prevención y control de dichos accidentes. En algunos de estos países se ha llegado a un alto grado de eficiencia para controlar los efectos de los accidentes y estudiar los riesgos que implica el manejo de agentes químicos.

En las Américas, la importancia y magnitud de las industrias químicas se han incrementado rápidamente y en muchos países estas industrias constituyen ahora uno de los principales factores de desarrollo económico. Con frecuencia, este desarrollo ha sido más rápido que el establecimiento de los sistemas correspondientes, necesarios para la prevención y el control de los desastres producidos por agentes químicos.

Es por lo anterior, que se ha organizado este evento, a fin de que los representantes de diferentes países tanto desarrollados como en desarrollo intercambien conocimientos y experiencias referentes a la prevención y control de accidentes producidos por agentes químicos.

El Simposio se llevó a cabo en el Centro Panamericano de Ecología Humana y Salud (ECO) de la Organización Panamericana de la Salud (OPS) y la Organización Mundial de la Salud (OMS), en Metepec, México, del 23 al 27 de julio de 1984, bajo el patrocinio de las entidades siguientes: Agencia para el Desarrollo Internacional de Estados Unidos (USAID), a través de la donación (grant) número OTR-0000-IN-3280-00, la OPS y la OMS. La impresión de las Memorias ha sido financiada por la Dirección del Patrimonio Cultural del Gobierno del Estado de México, México.

La sesión inaugural fue presidida por el Señor Secretario de Salubridad y Asistencia, Doctor Guillermo Soberón Acevedo, y el Señor Gobernador Constitucional del Estado de México, Licenciado Alfredo del Mazo G.

Participaron 29 representantes y 37 observadores procedentes de los siguientes países: Argentina, Brasil, Canadá, Colombia, Costa Rica, Cuba, Chile, Estados Unidos de América, Jamaica, México, Nicaragua, Panamá, Paraguay, Perú y Uruguay, así como representantes de organizaciones internacionales.

Durante los tres primeros días fueron tratados los siguientes temas: evaluación de riesgos, prevención de accidentes y atención a emergencias producidas por agentes químicos. En cada una de estas tres ocasiones actuaron como coordinador y como relator respectivamente los siguientes participantes: Ing. Mauricio Athié (México)e Ing. Oscar Cáceres (Perú); Dra. Elizabeth Anderson (EE.UU.) y Dra. Cristina Cortinas de Nava (México); Dr. Carlos Celso de Amaral e Silva (Brasil) y Dr. Hernán Venturino (Chile); Sr. T.D. Ellison (Canadá) y Dra. Eva Fogel (Uruguay).

El cuarto día se integraron tres grupos de trabajo con cerca de 20 participantes cada uno y durante el quinto y último día, se discutieron conjuntamente las conclusiones a que llegó cada uno de los grupos, actuando como presidente de la sesión plenaria la Dra. Eva Fogel (Uruguay) y se obtuvieron las conclusiones que se citan a continuación.

Este Simposio fue organizado y coordinado por la Dra. Nilda A.G.G. de Fernícola, Toxicóloga del Centro Panamericano de Ecología Humana y Salud.

SYMPOSIUM ON CHEMICAL EMERGENCY PREPAREDNESS

PREFACE

While the industrialization level of countries and regions has been increased, also has been increased the number of accidents in which different chemicals are involved either within the production processes or during transportation of materials. During the past decades, the developed countries have created systems for preventing and controlling the forementioned accidents. In some of these countries the accident control and prevention systems are extremely efficient and the risks related to chemicals management can be thoroughly studied.

In the region of the Americas the importance and magnitude of the chemical industries have increased rapidly and they have become a major component of economic development. Often such development has proceeded at a faster rate than the establishment of the required corresponding networks to prevent and control potential disasters.

For this reasons this symposium was organized for representatives of developed and developing countries interchange knowledge and experience referring to prevention and control of accidents produced by chemicals.

The Symposium was held at the headquarters of the Pan American Center for Human Ecology and Health (ECO) of the Pan American Health Organization (PAHO) and the World Health Organization (WHO), in Metepec, State of Mexico, Mexico, from July 23 to 27, 1984. The following organizations sponsored the event: The United States Agency for the International Development (USAID) through the grant number OTR-0000-IN-3280-00, PAHO and WHO. The publications of the Proceedings was financed by the Direction of Cultural Heritage of the Government of the State of Mexico, Mexico.

Doctor Guillermo Soberon Acevedo, Minister of Health and Welfare of Mexico, and Dr. Alfredo del Mazo G., Governor of the State of Mexico presided at the inaugural session.

Twenty nine representatives and 37 observers from the following countries, as well as representatives of international organizations, were present: Argentina, Brazil, Canada, Colombia, Costa Rica, Chile, Cuba, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, United States of America, and Uruguay.

During the first three days the following topics were dealt with: risk evaluation, accident prevention and considerations in emergencies produced by chemicals. Acting as coordinator and narrator respectively for the three days were: Mr. Mauricio Athie, M. Sc. (Mexico) and Mr. Oscar Cáceres, B.Sc. (Peru); Dr. Elizabeth Anderson (USA) and Dr. Cristina Cortinas de Nava (Mexico); Dr. Carlos Celso de Amaral e Silva (Brazil) and Dr. Hernan Venturino (Chile); Mr. T.D. Ellison (Canada) and Dr. Eva Fogel (Uruguay).

On the fourth day work groups were set up with an average of 20 participants in each one. During the last day the conclusions, which were a joint formulation of the three groups, were discussed. Dr. Eva Fogel acted as president and the following are the recommendations which were the outcome of the general discussion.

This Symposium was organized and coordinated by Dr. Nilda A.G.G. de Fernicola, Toxicologist of the Pan American Center for Human Ecology and Health.

" SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS "

CENTRO PANAMERICANO DE ECOLOGIA HUMANA Y SALUD - ECO/OPS/OMS

23 AL 27 DE JULIO DE 1984

METEPEC, EDO. DE MEXICO, MEXICO

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SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS

P R O G R A M A

LUNES 23 DE JULIO

07:30	Salida hoteles, ciudad de México.
09:00-10:15	Registro en el Hotel Paseo, Metepec, Edo. de México.
10:15	Salida Hotel Paseo a ECO, Sede del Simposio.
11:00-11:30	SESION INAUGURAL
11:30-11:45	Receso café
11:45-12:00	Elección del Presidente y Relator del Simposio.

TEMA: EVALUACION DE RIESGOS

12:00-12:30	"El Programa de Preparativos ante Casos de Emergencia de la OPS/OMS". Dr. Claude de Ville, OPS/Washington.
12:30-14:00	Receso comida
14:00-14:45	"Perfil Industrial de América Latina y el Caribe". Dr. Melville A. Gajraj, PNUMA/Ginebra.
14:45-15:30	"Evaluación de Riesgos para la Salud Pública Asociados con Accidentes Causados por Agentes Químicos". Dr. Vittorio Silano, STC/OMS/EURO.
15:30-16:00	"Red de Detección, Planeación y Atención de Emergencias Toxicológicas Ambientales" Ing. Gerardo Arrambide, Ministerio de Salud ARGENTINA
16:00	BRINDIS DE BIENVENIDA A LOS PARTICIPANTES (ECO). Traslado al Hotel Paseo.

NOTA: Subtituya la primer página de su Programa por esta.

MARTES 24 DE JULIO TEMA: PREVENCION DE ACCIDENTES

09:00-9:30	"Contaminación de la Bahía de Cartagena" Dr. Luis Jorge Pérez Calderón, Plan Desastres Sector Salud, COLOMBIA.
09:30-10:00	"Substancias Tóxicas: Una aproximación para Evaluar los Efectos de la Salud de Carcinógenicos y otros tóxicos". Dra. Elizabeth Anderson, Directora Salud y Evaluación Ambiental, Agencia de Protección del Medio Ambiente (EPA), Washington, D.C., E.U.
10:00-10:30	"Desarrollo y Responsabilidad en la Manipulación de Productos Agroquímicos". Sr. William Hollis, Asociación Nacional de Productos Químicos. Washington, D.C., E.U.
10:30-11:00	Receso café
11:00-12:00	"El Programa de Atención de Emergencias en el Transporte de Monsanto' Sr. Stanley H. Brand, Operación de Respuesta en Casos de Emergencia, Monsanto Company, St. Louis, Missouri, E.U.
12:00-12:30	"Principales Daños Producidos por Agentes Químicos en Costa Rica" Ing. Andrés Incer Arias, Ministerio de Salud, COSTA RICA.
12:30-14:00	Receso comida
14:00-14:30	"Desarrollo del Sistema de Información para el Transporte de Substancias Peligrosas en los Estados Unidos". Sr. Albert B. Rosenbaum, Transportes Nacionales de Camiones-Tanque, Washington, D.C., E.U.
14:30-15:00	"El Sistema de Atención de Emergencias en el Transporte en los Estados Unidos" Sr. Robert Messler, Asociación de Fabricantes de Productos Químicos, Washington, D. C., U.S.A.
15:00-15:30	Receso café
15:30-16:00	"Atención en Casos de Derrames de Productos Químicos durante el Transporte" Sr. J. Larry Payne/Sr. Clyde Strong, Complejo Universitario A&M de Texas, College Station, Texas, E.U.
16:00-16:30	"La Producción y Transporte de Acido Sulfúrico Proveniente de la Planta de Zinc de Cajamarquilla-Lima". Ing. Oscar Cáceres, Protección Medio Ambiente, Ministerio de Salud, PERU.
16:30	Recorrido turístico incluyendo Cosmovitral y Casa de las Artesanías.
20:00	Traslado Hotel Paseo.

MIERCOLES 25 DE JULIO TEMA: ATENCION DE EMERGENCIAS

09:00-09:30	"Plan de Acción Emergencia contra Contaminantes Peligrosos en el Estado de Sao Paulo" Dr. Carlos Celso do Amaral e Silva, Coordinador Cooperación Externa, Compañía de Tecnología de Saneamiento Básico del Estado de Sao Paulo, BRASIL.
09:30-10:00	"Accidente Químico por Escape de Amoníaco en Uruguay" Dra. Eva Fogel, Directora, Cátedra de Toxicología, URUGUAY.
10:00-10:30	"Investigación a Mediano y Largo Plazo de la Población Expuesta a Radiaciones Emitidas por Cobalto 60, Barrio Alto, Ciudad Juárez" Dr. Alfredo Carboney, Dirección General Investigación Efectos Ambiente y Salud, Secretaría de Salubridad y Asistencia, MEXICO.
10:30-11:00	Receso café
11:00-11:30	"Procedimientos para Aplicar en Caso de una Emergencia en una Planta de Productos Químicos" Dr. Daniel Alonso, Representante del Gobierno para Desastres Nacionales, CUBA
11:30-12:00	"Reglamentación para la Planificación de Emergencias Producidas por Productos peligrosos: Accidente en Mississauga" Sr. T. D. Ellison, Director General, Ministerio de Transportes de Canadá, CANADA.
12:00-12:30	"Planificación y Preparación para Respuesta ante Emergencias Producidas por Material Peligroso" Tte.Jane Ditto, Guardia Costera de los Estados Unidos, Washington, D.C., E.U.
12:30-14:00	Receso comida
14:00-14:30	"El Plan de la Agencia Federal de Control de Emergencias para Reducir las Consecuencias en el Uso de Materiales Peligrosos" Sr. Andrew C. Casper, Director de la División de Programas de Control, Asociación Federal del Control de Emergencias, (FEMA), Washington, D.C., E.U.
14:30-15:00	"Resultados de Investigaciones sobre Preparativos y Respuestas a Nivel Comunitario ante Emergencias Químicas Agudas" Sra. Jane Gray/Prof. E. L. Quarantelli, Centro de Investigaciones frente a Desastres, Universidad del Estado de Ohio, E.U. presentada por el Dr. Thomas S. Schorr, ECO.
15:00-15:30	Receso café
15:30-16:00	"Contaminación Cursos de Agua, Fuente de Abastecimiento para Consumo Humano por Relaves de Empresa Minera". Dr. Hernán Venturino, Asesor Problemas Ambiente, Ministerio de Salud, CHILE.

MIERCOLES 25 DE JULIO — TEMA: ATENCION DE EMERGENCIAS

16:00-16:30	"Atención de Casos de Emergencias Producidas por Agentes Químicos en México" M. en C. Porfirio Aldana/Ing. Rafael López Ruíz, Dirección General de Prevención y Control de Contaminación Ambiental, Secretaría de Desarrollo Urbano y Ecología, MEXICO.
16:30	Proyección de audiovisuales
18:00	Traslado al Hotel Paseo.

JUEVES 26 DE JULIO

09:00-09:30	"Planes en el Area de Salud para Desastres" Dr. F. Lorraine Davies, Director de Servicios de Emergencia, Salud y Bienestar, Canadá, CANADA.	
09:30-10:00	"La Experiencia en Jamaica ante Emergencias de Origen Químico" Sr. Henry Robinson, Oficina de Preparativos ante Desastres. JAMAICA.	
10:00-10:30	Receso café	
11:00-12:30	Mesa Redonda:	Evaluación de Riesgos para la Salud Pública Asociados con Accidentes de Origen Químico. Elaboración de Protocolo para ser Usado en Estudios Prospectivos y Retrospectivos.
12:30-14:00	Receso comida	
14:00-16:00	Mesa Redonda:	Recomendaciones para la Organización de la Atención de Emergencias Químicas: 1. a nivel gubernamental 2. a nivel internacional
16:00	Recorrido turístico por zona arqueológica de Tenango del Valle y visita al Museo Arqueológico Regional, (si el estado del tiempo lo permite).	
20:00	Traslado al Hotel Paseo.	

VIERNES 27 DE JULIO

09:00-12:30	Aprobación documento final
	Recomendaciones
12:30-14:00	Comida
14:30	Traslado al Hotel Bristol, Cd. de México.

PAN AMERICAN CENTER FOR HUMAN ECOLOGY AND HEALTH

PAN AMERICAN HEALTH ORGANIZATION

SYMPOSIUM ON CHEMICAL EMERGENCY PREPAREDNESS

P R O G R A M

MONDAY JULY 23

07:30	Departure from hotels, Mexico City
09:00-10:15	Registration at El Paseo Hotel, Metepec, State of Mexico
10:15	Departure from El Paseo Hotel to ECO, Symposium's headquarters
11:00-11:30	INAUGURATION
11:30-11:45	Coffee Break
11:45-12:00	Election of Symposium Chairman and Secretary

THEME: HAZARD EVALUATION

12:00-12:30	"PAHO/WHO Emergency Preparedness Programme" Dr. Claude de Ville, PAHO Washington, D.C., U.S.A.
12:30-14:00	Lunch
14:00-14:45	"Industrial Profile of Latin America and the Caribbean" Dr. Melville A. Gajraj, UNEP/Geneva, Switzerland.
14:45-15:30	"Evaluation of Public Health Hazards Associated with Chemical Accidents" Dr. Vittorio Silano, STC/EURO/WHO.
15:30-16:00	'Network for Control, Planning and Attention Environmental Toxic Emergencies". Eng. Gerardo Arrambide, Ministry of Health, ARGENTINA
16:00	PARTICIPANTS WELCOME COCKTAIL
	Departure to El Paseo Hotel

NOTE: Please replace the first page of youi "Program".

TUESDAY JULY 24	THEME: ACCIDENT PREVENTION
09:00-09:30	"Pollution of the Cartagena Bay" Dr. Luis Jorge Pérez Calderón, Planning for Disasters, Health Sector, COLOMBIA.
9:30-10:00	"Toxic Substances: an Approach for Rating the Health Effects for Carcinogens and other Toxicants" Dr. Elizabeth Anderson, Director Health & Environmental Assessment, Environmental Protection Agency (EPA), Washington, D.C., U.S.A.
10:00-10:30	Product Stewardship and Coshared Responsibility in Agrochemical Safety. Mr. William Hollis, National Agricultural Chemicals Association, Washington, D.C., U.S.A.
10:30-11:00	Coffee Break
11:00-12:00	"Program for Emergency Attention during the Transportation of Monsanto" Mr. Stanley H. Brand, Monsanto, Operations Emergency Response, St. Louis, Missouri, U.S.A.
12:00-12:30	"Main Damages Produced by Chemical Substances in Costa Rica Mr. Andrés Incer Arias, B.Sc., Ministry of Health, COSTA RICA.
12:30-14:00	Lunch
14:00-14:30	"The Development of the Transportation Hazard Information System in the United States". Mr. Albert B. Rosenbaum, National Tank Truck Carriers, Washington, D.C., U.S.A.
14:30-15:00	"U.S. Emergency Attention during Transport Progam" Mr. Robert Messler, Chemical Manufacturers Association, Washington, D.C., U.S.A.
15:00-15:30	Coffee Break
15:30-16:00	"Handling Chemical Spills Resulting from Transportation Incidents" Mr. J. Larry Payne/Mr. Clyde Strong, The Texas A&M University System, College Station, Texas, U.S.A.
16:00-16:30	"Production and Transport of Sulphuric Acid from the Cajamarquilla, Lima Zinc Plant" Mr. Oscar Cáceres, B. Sc., Environmetal Protection Health Ministry PERU.
16:30	Sightseeing tour: Botanic garden, Cosmo-Stained glass windows and Handicraft Shop in Toluca.
	Return to El Paseo Hotel.

WEDNESDAY JULY 25 THEME: EMERGENCY RESPONSES

09:00-09:30	"Emergency Action Plan against Dangerous Pollutants, State of Sao Paulo". Dr. Carlos Celso do Amaral e Silva, Coordinator of Basic Environmental Sanitation Technology Company of the State of Sao Paulo, BRAZIL.
09:30-10:00	"Chemical Accident caused by Ammonia Spill in Uruguay" Dr. Eva Fogel, Director of the Toxicology Faculty, URUGUAY
10:00-10:30	"Short and Medium Term Research among the Population Exposed to Cobalt 60 Radiations,Barrio Alto, Ciudad Juárez" Dr. Alfredo Carboney, Director General of Effects on the Environment Research, Ministry of Health and Welfare, MEXICO
10:30-11:00	Coffee Break
11:00-11:30	"Procedures to follow in an emergency in a chemical plant" Dr. Daniel Alonso, Government Representative for National Disasters, CUBA
11:30-12:00	"Regulatory Requirements for Dangerous Goods Emergency Planning Resulting from the Mississauga Accident" Mr. T. D. Ellison, Director General, Transport Canada, CANADA
12:00-12:30	"Planning and Preparing for Response to Hazardous Material Emergencies" Lt. Jane Ditto, United States Coast Guard, Washington, D.C., U.S.A.
12:30-14:00	Lunch
14:00-14:30	'The Federal Emergency Management Agency's Plans for Reducing the Consequences of Hazardous Materials Emergencies" Mr. Andrew C. Casper, Director Division Comprehensive Management Programs, Federal Emergency Management Association (FEMA), Washington, D.C., U.S.A.
14:30-15:00	"Research Findings on Community Preparation for, and Responses to Acute Chemical Emergencies" Ms. Jane Gray/ Profr. E.L. Quarantelli, Disaster Research Center, Ohio State University, U.S.A. Presented by Dr. Thomas S. Schorr, ECO.
15:00-15:30	Lunch
15:30-16:00	"Pollution of Water Courses, Sources for Human Consumption for Relaves Mining Enterprise" Dr. Hernán Venturino, Environmental Problems Consultant, Ministry of Health, CHILE
16:00-16:30	"Emergency Responses produced by Chemical Substances in Mexico" Mr. Porfirio Aldana M. Sc./Mr. Rafael Lopez Ruiz B.S./ General Direction for Environmental Pollution Prevention and Control, Ministry of Ecology and Urban Development, MEXICO.

WEDNESDAY JULY 25

16:30	Audiovisual Aids Projection
18:00	Departure to El Paseo Hotel

THURSDAY JULY 26 THEME: EMERGENCY RESPONSES

09:00-09:30	"Emergency Health Planning for Chemical Disasters" Dr. F. Lorraine Davies, Director Emergency Services, Health & Welfare, Canada, CANADA.	
09:30-10:00	"Chemical Emergencies-The Jamaican Experience" Mr. Henry Robinson, Office of Disaster Preparedness,	
10:00-10:30	Coffe break	
10:30-11:00		
11:00-12:30	Discussion Panel:	Evaluation of Public Health Hazards Associated with Chemical Accidents. Elaboration of a Protocol to be Used in Prospective and Retrospective Studies.
12:30-14:00	Lunch	
14:00-16:00	Discussion Panel:	Recomendations for the organization for emergency responses produced by chemical substances. 1. at the governmental level 2. at the international level
16:00	Tourist tour to archeological zone of Tenango del Valle and Regional Archeological Museum, (if weather permits)	
20:00	Departure to El Paseo Hotel	

FRIDAY JULY 27

09:00-12:30	Final document approval
	Recommendations
12:30-14:00	Lunch
14:30	Departure to the Bristol Hotel, Mexico City.

CONCLUSIONES DEL SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS

A. EVALUACION DE LOS RIESGOS

La mayor parte de los países indica tener información parcial sobre la distribución geográfica de las plantas productoras de sustancias química. La gama va desde algunos países en los cuales aún no se recolecta ninguna información hasta otros en los cuales se tiene un proceso de información avanzado. En cuanto a las rutas terrestres y de transportación, ningún país cuenta con una reglamentación o información apropiada.

En general no se dispone de una información actualizada sobre el tipo de volumen de sustancias químicas producidas, como tampoco existe un sistema adecuado que registre las sustancias químicas que son importadas, distribuidas, transportadas y almacenadas. Es así como los conocimientos sobre los riesgos a la salud pública son estrictamente aquellos que se obtienen a través de la literatura especializada que, en algunos casos, no es lo suficientemente amplia.

En algunos países se mantiene un registro de accidentes químicos ocurridos, sin embargo, estos registros son de tipo sectorial con el problema de que no siempre existe una entidad responsable de coordinarlos y/o analizarlos. Más aún, el seguimiento a corto y mediano plazo de los accidentes y sus consecuencias no se realiza.

En la mayor parte de los países no se llevan a cabo estudios de riesgos en forma sistemática, debido a las siguientes causas:

- La información acumulada sobre emergencias producidas por los agentes químicos no se obtiene fácilmente y es poco difundida.

- Existe un déficit de profesionales especializados en contingencias por agentes químicos.

- Existe en general una falta de conciencia respecto al problema producido por los agentes químicos.

- Los recursos económicos y materiales son insuficientes.

- La reglamentación respecto a la obligación de efectuar los estudios de riesgo no se aplican en forma adecuada.

- Las autoridades nacionales incluyendo los ministerios de salud dan poca importancia al asunto.

Entre los asistentes hubo consenso en que es importante dirigir el programa de análisis de riesgo, inicialmente en las plantas industriales de aquellos países en los cuales esta actividad es importante; sin embargo, se enfatizó el papel predominante que representa el transporte de productos químicos en relación al elevado número de accidentes.

En cuanto a los riesgos de almacenamiento, éstos son considerados como un problema vinculado con la producción y/o los volúmenes de importancia generados en los países.

Se concedió especial importancia a la realización de estudios a nivel nacional sobre evaluación de riesgos, partiendo de la premisa de que las áreas de mayor industrialización, por lo general, están cercanas a zonas de alta densidad poblacional.

En uno de los grupos de trabajo se consideró la posibilidad de usar el tipo de sustancia como uno de los parámetros para establecer prioridades.

Algunos participantes señalaron su preocupación por la falta de objetivos y definiciones de los accidentes químicos y, en consecuencia, la dificultad de clasificar apropiadamente los accidentes asociados con las sustancias químicas.

Se señaló además que el papel del sector salud debe ser de carácter normativo, regulador y de vigilancia para la evaluación de los efectos sobre la salud colectiva.

En cuanto al mandato sobre la realización de evaluación de riesgos como una responsabilidad gubernamental, la gama de respuesta obtenida va desde los países en los que no existe institución gubernamental con disposición central hasta aquéllos donde existen convenios para llevar a cabo los estudios sobre riesgos. Sin embargo, se acepta que en todos los casos existen fallas de coordinación tanto a nivel horizontal, como de los elementos centrales y periféricos, así como una falta de experiencia en ese campo.

En la mayoría de los países existe una legislación con diferente grado de complejidad, reconociéndose, sin embargo, que el nivel de aplicación de las leyes y reglamentos requiere ajustes y actualización para su aplicación.

Se reconoce la importancia de la coordinación en los sectores público y privado cuyo énfasis dependerá de las características políticas y económicas de los diversos países.

No se estableció con claridad el papel de las agencias gubernamentales y de los organismos privados, sin embargo, es deseable la creación de comités conjuntos entre industrias, según la rama de actividades.

Se reconoce la importancia de establecer mecanismos de coordinación en los cuales el organismo líder dependerá del tipo del problema a tratar. Sin embargo, se hizo notar que en la mayor parte de los accidentes existen daños a la salud, por lo que requiere la contribución del sector salud en cada uno de los casos .

De igual manera, se identificó claramente que es necesaria una contribución de la industria paraestatal o privada como uno de los integrantes del proceso de coordinación y como un posible aportador de mayor información especializada para el manejo de catástrofes ocasionadas por agentes químicos.

Se propone la preparación de una lista de organismos de apoyo y cooperación, así como la creación de centros y programas para la atención de accidentes producidos por agentes químicos, fundamentalmente en las áreas de toxicología y epidemiología.

Se reconoció la importancia de realizar eventos a nivel internacional en donde los países puedan intercambiar experiencias sobre accidentes de naturaleza química.

Se dio particular énfasis al acceso de información respecto a los efectos agudos, crónicos y tóxicos resultantes de la exposición a agentes químicos.

Se hizo notar la conveniencia de elaborar manuales, así como de establecer criterios que permitan fijar estrategias para el análisis y evaluación de riesgos, incluyendo perfiles de riesgos a la salud para el sector que trabaja con sustancias químicas.

Se sugirió tener acceso, a través de organismos internacionales, a los registros de información tales como el TRPTC, CHEM-TRUCK, etc.

Se reconoció el valor de las agencias internacionales para obtener apoyo político y hacer tomar conciencia del tema a los niveles de toma de decisión en cada país. La OPS debería elaborar esquemas para estructurar paulatinamente programas que faciliten la evaluación de riesgos e incluir ésto como parte del informe conjunto OPS/PISQ.

B. PLANIFICACION ANTE CONTINGENCIA Y ATENCION DE ACCIDENTES

En lo referente a planificación de contingencia y atención de emergencias producidas por agentes químicos, se reconoció que ninguno de los países de América Latina y el Caribe representados en el Simposio, poseen planes de contingencia general. En algunos casos, ciertos países manifestaron contar con planes parciales para el manejo de accidentes (derrames de hidrocarburos en mares y costas territoriales, así como en ciertos productos químicos). También informaron algunos representantes que ciertas industrias asentadas en su país cuentan con planes propios de emergencia que son el resultado de compromisos y/o convenios internacionales establecidos.

Existe un consenso entre los participantes que en aquellos países donde existan estructuras administrativas de planificación y coordinación para dar respuesta a emergencias de desastres naturales, se originen grupos de trabajo coordinados para la atención de emergencias químicas.

En algunos países donde existen comités de defensa civil o comités de coordinación para la atención de emergencias, hay una capacidad técnica muy limitada; sin embargo, algunos países indicaron que tienen algunos recursos programados para este objeto en el sector público, universidades y en el sector privado.

Finalmente, algunos países manifestaron contar con centros que proporcionan información sobre tratamiento de intoxicaciones como un servicio contínuo las 24 horas durante los 365 días del año. Estos centros son insuficientes y no cuentan con toda la información requerida sobre los agentes químicos. Se sugirió que, de acuerdo a las características de los países, estos centros sean establecidos, ya sea como operación a nivel nacional o como centros que proporcionen servicio de tipo subregional e internacional. La disponibilidad de laboratorios, tanto a nivel gubernamental como privado, en los diversos países, es limitada,

aunque ciertos miembros mencionaron que cuentan con una infraestructura de análisis de laboratorio restringida para identificar sustancias químicas que afectan la salud pública.

Cabe hacer notar que la mayor parte de los países indicó que no se utiliza el rotulado internacional para identificar sustancias químicas peligrosas convenido internacionalmente, enfatizando la conveniencia de su uso y la importancia de adoptar un sistema único internacional para evitar futuros caos o confusiones.

Algunos países de América Latina y el Caribe han establecido programas parciales para la formulación de planes de emergencia, usando la experiencia de los países desarrollados, estos planes de emergencia, sin embargo, son limitados y están restringidos de forma que no incluyen los riesgos asociados con el transporte y manejo de sustancias peligrosas. Se sugirió la implementación de programas de preparación para accidentes químicos.

Apoyo de la comunidad internacional para realizar programas de emergencia química en la Región:

Se sugiere un intercambio de experiencias entre los países a través de la realización de talleres sobre temas específicos, así como la movilización de recursos (TCDC) que faciliten el manejo de emergencias químicas.

Se sugiere la conveniencia de utilizar el Boletín de ECO como un vehículo para dar a conocer la información a los usuarios de los diversos países y con ello participar en la realización de los programas nacionales sobre emergencias químicas, y facilitar también el intercambio de datos sobre eventos similares que pueden ocurrir en los diferentes países. Se solicitó a los participantes contribuir con información para el Boletín a fin de cumplir con este propósito.

Finalmente, se sugirió llevar a cabo reuniones de este tipo en períodos preestablecidos a fin de observar el grado de avance que se alcance en los programas para emergencias causadas por agentes químicos en toda la Región.

CONCLUSIONS OF THE SYMPOSIUM ON CHEMICAL EMERGENCY PREPAREDNESS

A. HAZARDS EVALUATION

1. a). A partial information on geographical distribution of chemical manufacturing plants is available in many countries. Major differences exist among countries in this respect; in some countries no information is available, whereas in other ones the data acquisition process is very well advanced. In general, no adequate regulations or information exist on transportation routes of hazardous chemicals.

b). In general no uptodate information is available as to nature and amount of manufactured chemicals. Furthermore, no adequate system is in operation to register chemicals imported, distributed, transported and stored. Under these conditions the only possible knowledge of health risks comes from a general literature data, which sometimes is incomplete.

c). Reporting systems for chemical accidents are in operation in some countries only. However, these systems have a sectorial character; no control unit for coordination and analysis exists. Furthermore, no short or long-term follow up of consequences of accidents is usually carried out.

2. In the countries, studies of risk are not carried out in a systematic manner, the main causes being that:

- the accumulated information on emergencies caused by chemical agents is not easily obtained and receives only limited diffusion;
- there is a lack of technical persons specialized in contingencies for chemical agents;
- there is a lack of awareness, in general, with respect to the problem;
- material and economic resources are insufficient;

- regulation with respect to the obligation to make risk assessments, have not been adequately applied;
- government authorities, including Ministries of Health, give little importance to the matter.

3 a). There was consensus that it is important to direct the analysis initially at production plants in those countries in which this activity is very important, however, the dominant role of terrestrial transport was emphasized given the high number of related accidents.

In relation to storage, this was considered to be a problem connected with production and/or imports into the countries.

b). Special importance was given to the undertaking of national studies of risk assessments particularly for the areas of highest industrial and population density, understanding that the two are frequently interposed.

One of the groups considered the possibility of using the type of substance as one of the parameters for establishing priorities.

Some countries indicated a concern with the lack of identification of definitive terms to facilitate the definition and consequently final classification of the accidents associated with chemical substances.

The role of the health sector ought to be normative, regulatory and one of vigilance and control, for the evaluation of the community health effects.

4. The replies from the countries in which there does not exist a governmental institution with a central mandate through those in which there exist conventions for co-ordination to carry out studies on risks. It was accepted nevertheless that in all cases there were failures in

coordination horizontally, in the central elements as well as periferally, and a lack of experience in the field.

a). In the majority of the countries, there exists a legislative process with varying levels of complexity, recognizing nevertheless that the level of applicability of the laws and regulations require adjustments and updating to facilitate their application. Everyone recognized the importance of coordination in the public and private sectors, the emphasis of which will depend on the political and economic characteristics of the individual countries. It was not clearly established, what ought to be the role of the government agencies vis-a-vis the private agencies. It was highlighted, however, that the creation of joint industry committees according to areas of activity would be desirable.

b). The importance of establishing co-ordinating mechanisms in which the lead agency would depend on the type of problem, was recognized. Nevertheless, it was also recognized that all accidents have an associated health component, which requires a contribution from the health sector in each case. It was clearly identified that a private or parastatal contribution as one of the integral processes of co-ordination and as a possible major contributor of specialized information in the management of the disaster, was necessary.

5. It is recommended that a list of supporting and cooperating institutions in case of chemical accidents be prepared. Centres and programmes specifically dealing with toxicology and epidemiology should be established.

It is the consensus of the groups that it is important to provide opportunities at an international level for exchange of information and experiences in relation to chemical accidents.

One of the three groups atributed a major importance to immediate access to information concerning acute and chronic effects resulting from

exposure to chemicals as well as toxicological properties of chemicals.

Criteria and guidelines to establish strategies for evaluation of hazards associated with chemical accidents should be developed; they should also provide guidance for the elaboration of health risks profiles for the chemical sector and main chemical substances.

It was suggested that international channels be established to get access to existing information sources (e.g. IRPTC).

International Agencies have a rolè to play in order to get political support to these activities and increase awareness at decision making levels of the countries on the importance of this subject.

PAHO should develop schemes to progressively structure programmes intended to facilitate evaluation of hazards and this component should be included in the Status Evaluation Report that will be prepared by PAHO in connection with IPCS.

B. CONTINGENCY PLANNING AND ACCIDENT ATTENTION

1. None of the Latin American or Caribbean countries represented, have developed general forms of contingency plans.

Some have partial plans for the management of oil spills at sea or coastal areas, as well as for certain chemical products.

Some countries indicated that their more important industries had their own emergency plans while in other the plans are the result of conventions of established international agreements.

2. There was a consensus in all working groups that the co-ordination of response to chemical emergencies ought to be included in the groups established to handle natural disasters.

3. In some countries where there exist civil defense committees or co-ordination committees for attention to emergencies, there is very limited technical capacity, however, some countries indicated that they have some resources programmed in the public sector, universities and private sector.

4. a). Some countries indicated they have anti-poison information centres working on a 24 h basis for 365 days per year. Most countries recognized that these centers are insufficient and that there are no centres capable of providing information on chemical substances.

It was suggested that such centres be established according to national characteristics either at a national or subregional (international) level.

b). The availability of laboratories both at a governmental and private level is limited. Even though some countries have an infrastructure of public health laboratories to identify chemical substances their capability is very limitea.

c). Most countries indicated that they do not use the international labelling system for hazardous chemicals. The importance of using only one international system to avoid chaos and confusion was stressed.

4. Some Latin American and Caribbean countries, have established partial programmes for the formulation of emergency plans, using the experience of the developed countries. These emergency plans, nevertheless are limited and are restricted so as not to include the risks associated with transport of dangerous substances. The generalized opinion was that these type of master plans are desirable.

5. The help of the international community would be very valuable in the following area:

to encourage an interchange of experiences between countries through the holding of workshops on specific themes, as well as in the horizontal mobilization of resources (TCDC) which facilitate the management of emergencies. It was noted that it would be convenient to use the ECO newsletter as a vehicle for transmiting information to the users in the countries. The participants were invited to contribute information so that the newsletter could comply with the proposal. It was suggested that management of the actions for controlling emergencies be linked to information centres that facilitate data exchange on similar events occurring in other countries.

Finally, it was proposed to carry out mettings of this kind in pre-established dates in order to acknowledge the advance of the programs for chemical emergency preparedness.

LA ORGANIZACION PANAMERICANA DE LA SALUD Y SU PROGRAMA SOBRE PREPARATIVOS PARA CASOS DE EMERGENCIAS Y DESASTRES

DR. CLAUDE DE VILLE DE GOYET

Dr. Claude de Ville de Goyet
OPS/OMS Washington.

LA ORGANIZACION PANAMERICANA DE LA SALUD Y SU PROGRAMA SOBRE PREPARATIVOS PARA CASOS DE EMERGENCIAS Y DESASTRES.

Tengo el placer y honor de dirigirme a usted como primer expositor y presentarles el programa sobre preparativos para casos de emergencias y desastres de la Organización Panamericana de la Salud.

La organización Panamericana de la Salud (OPS) fundada por los países de este hemisferio en el año de 1902 sirve desde el año 1948 como oficina Regional de la Organización Mundial de la Salud para las Américas. La OPS tiene como proposito asistir a los países miembros en el desarrollo de sus programas y actividades para la salud. A raíz del terremoto que afectó Guatemala en febrero de 1976, los Cuerpos Directivos de la OPS es decir los Gobiernos de los países miembros establecieron en 1977 el programa de preparativos para casos de desastres con el siguiente mandato:

- Formular planes de acción para todo tipo de catastrofes.
- Incentivar el inventario de los recursos disponibles.
- Capacitar el personal de Salud.
- Preparar y diseminar guías y manuales.
- Promover investigaciones operativas.
- Mantener enlace y coordinar con la Oficina de las Nacionaes Unidas para la coordinación de los socorros (UNDRO), la Cruz Roja, y otras agencias gubernamentales y no gubernamentales activas en este campo.

Dentro de la estructura de la OPS este programa coordina y apoya a todas las actividades de preparación o de socorro en casos de desastres de los demás programas especializados.

Por desastres entendemos toda situación de emergencia con efectos negativos sobre la salud pública que supera la capacidad de respuesta de la comunidad afectada y en consecuencia requiere un esuferzo coordinado multidisciplinario.

Además ,actividades relacionadas con catástrofes naturales

como son: terremotos, huracanes, tornados, inundaciones, deslizamiento de terreno etc, el programa incluye en su alcance los desastres tecnológicos como incendios, accidentes de aviones, explosiones y los accidentes químicos masivos que es el tema de este simposio.

La OPS en la atención a los problemas de salud causados por agentes químicos tanto a nivel de los países como a nivel internacional no limita sus acciones solamente a la preparacion de planes de emergencia y de socorros. Varios programas de la OPS se dedican a los aspectos mas importantes de prevención, analisis de riezgos, seguridad de la producción, transporte y almacenaje de éstos agentes químicos, dentro de estos programas cabe mencionar el Programa Regional de Seguridad Química con punto focal en el Centro Panamericano de Ecología Humana y Salud (ECO) anfitrión y organizador de este evento, el programa de salud de los trabajadores y el programa de enfermedades tropicales con respecto a los aspectos de uso de pesticidas etc.

No obstante de que la responsabilidad de la coordinación de los planes de emergencia y de las operaciones intersectoriales de socorro para todo tipo de desastres cae en un solo punto focal es decir el programa para casos de desastre, el conocimiento técnico, científico de la OPS en áreas tan especializadas como química, toxicología etc. y la responsabilidad práctica de su diseminación a los países se encuentra en este Centro.

ECO como centro especializado de la OPS dentro del programa regional de salud ambiental es el punto focal para todos los aspectos de salud relacionados con agentes químicos de la prevención a la evaluación retrospectiva de los accidentes, un enfoque mas integral y productivo a largo plazo que la simple preparación de planes en caso de emergencia.

Quisiera felicitar al personal de ECO por la organización de este simposio, como primera etapa hacia el desarrollo de un programa regional de seguridad química. También es necesario desta-

car la contribución y generoso apoyo financiero de la oficina de ayuda para desastres al extranjero de la Agencia Internacional de desarrollo de los E.U. que hizo posible la realización de esta reunión. Que encuentren aquí la manifestación del agradecimiento de la OPS y de los Países.

RED DE DETECCION, PREVENCION Y ATENCION DE EMERGENCIAS TOXICOLOGICAS AMBIENTALES: PROYECTO EN IMPLEMENTACION

GERARDO H. ARRAMBIDE

-RED DE DETECCION, PREVENCION Y ATENCION DE EMERGENCIAS TOXICOLOGICAS AMBIENTALES - PROYECTO EN IMPLEMENTACION

INTRODUCCION

El presente proyecto está pensado para comenzar a satisfacer una necesidad que muestra una tendencia creciente en nuestro país, y como es de suponer también, en el resto de la América Latina.
La toxicología ambiental, es un concepto relativamente moderno, por ser consecuencia directa de un proceso también moderno, como es la aparición de agentes orgánicos, inorgánicos y biológicos a jenos ó distintos a los que componen el medio ambiente natural
El concepto de tóxico ambiental con que se designa a estos agentes reconoce dos orígenes, uno cualitativo y otro cuantitativo, ó sea cuando es extraño al medio donde se encuentra ó cuando su concentración es distinta a la que normalmente se espera, no habiendo sufrido alteraciones previas.

La DIRECCION NACIONAL DE CALIDAD AMBIENTAL dependiente de la SUBSECRETARIA DE PROGRAMAS DE SALUD DEL MINISTERIO DE SALUD PUBLICA Y ACCION SOCIAL por intermedio de su DEPARTAMENTO DE SALUD AMBIENTAL Y PRODUCTOS RESIDUALES, está incorporando y asumiendo gradualmente la coordinación nacional del presente proyecto mediante el establecimiento de relaciones bilaterales con cada uno de los organismos **de Saneamiento Ambiental**, de los distintos ESTADOS PROVINCIALES, con los cuales existe una vinculación fluída, desde hace varios años, para la atención de la problemática ambiental en general, situación que se está extendiendo a este caso particular.

Este proyecto persigue dos objetivos claros y concretos : uno referente a la función que se le asigna y el otro referente al modo técnico de operación.

1°) Por ser fundamentalmente un proyecto de coordinación, trata de armonizar el funcionamiento colectivo de una serie de organismos ya existentes en todo el territorio nacional, y que cumplen individualmente una función, a nivel regional, vinculada con el tema en cuestión.

2°) Trabajar sobre la detección de los procesos crónicos para lograr lo siguiente :

a- prevenir el episodio agudo de tipo puntual, que generalmente se vincula a un hecho accidental.

b- En caso que se produzca una emergencia por un episodio agudo, estar preparado para afrontarlo con solvencia, la que se obtendrá fundamentalmente por estar trabajando sobre lo crónico ó sea no verse sorprendido por el hecho accidental no predecible a priori; y sin conocer el comportamiento del agente causante, en el medio ambiente ó sobre el ser humano.

Esta breve introducción pretende solamente exponer la filosofía del presente proyecto, el cual no está determinado por un principio y un final, sino que se lo comenzó a implementar y se lo va alimentando a medida que se le van incorporando, ya sea nuevos organismos ó nuevos elementos humanos, materiales, tecnológicos e intelectuales a los organismos ya incorporados.

También se quiere dejar en claro, en esta introducción, que se tiene plena conciencia que la verdadera solución al problema de los tóxicos ambientales, fundamentalmente los químicos ó derivados de productos químicos peligrosos, está en la existencia de normas

adecuadas que regulen su fabricación, fraccionamiento, transporte, uso ó aplicación, eliminación de residuos sólidos, líquidos y gaseosos, etc.

Asimismo que esas normas además de existir se cumplan ó se puedan hacer cumplir en todos los ámbitos. Lo que simplemente se quiere expresar es que la definitiva solución es actuar directamente sobre las causas, de manera que solamente la aparición de tóxicos en el ambiente, en niveles comprometidos, se deba a los casos accidentales puntuales, los cuales son tema de las reuniones organizadas en esta oportunidad.

Pero no obstante lo expuesto, también se tiene plena conciencia que, el control absoluto de los volcamientos regulares ó periódicos al medio ambiente, por el momento es sólo un planteo teórico, ya que materialmente se está lejos de concretarlo, aunque se debe tender a ello como fin último.

Entonces este proyecto encuentra su justificación ó punto de apoyo en una realidad ambiental que todavía no hemos terminado de conocer y de la cual se trata de proteger a la salud de la población; responsabilidad ineludible para los organismos ambientales que funcionan en los Sectores de la Salud Pública.

Como casos atípicos que escapan al planteo presentado en esta introducción, nuestro país cuenta con dos peligros de intoxicaciones ambientales particulares; uno natural, como es la presencia de elevadas concentraciones de arsénico en gran parte de las fuentes subterráneas de abastecimiento de agua para consumo, y el otro es la presencia de nitratos acumulados también en las napas subterráneas, estos de antiguo origen antrópico. Ambos casos presentan situaciones críticas, cuando por variadas razones sus ya elevadas concentraciones , aumentan aún más, provocando importantes cuadros, sobre todo en el caso de nitratos.

Otro tema de gran interés para este proyecto, es la compleja problemática de los plaguicidas y agroquímicos que se presenta en nuestro país, la cual lo motivó principalmente, dado que son los productos químicos que generan cuadros de todo tipo (agudo, subagudo y crónico) y en todos los ámbitos (higiene laboral - salud pública - medio ambiente).

Seguido a esta introducción, se adjuntará un resumen de los principales puntos desarrollados en el proyecto.

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DESARROLLO

OBJETIVOS BUSCADOS Y METODOLOGIA ELEGIDA

DESCRIPCION

Como se plantea en la introducción, los objetivos particulares de este proyecto son, la coordinación intersectorial y extrasectorial, promover la detección de los problemas crónicos en forma precoz, proceder a efectuar la prevención y finalmente fomentar y participar en los aprestamientos para atender las emergencias cuando estas se produzcan.

Estos objetivos parciales no excluyen ni se oponen al objetivo último del proyecto que no es otro que "disminuir la incidencia del medio ambiente en el deterioro de la salud, causado por agentes tóxicos presentes en este".

La DIRECCION NACIONAL DE CALIDAD AMBIENTAL efectúa la coordinación con los organismos homólogos de los distintos Estados Provinciales, coordinación que depende de acuerdos ó convenios bilaterales dado el carácter FEDERAL de nuestro país, lo que determina una total soberanía en las decisiones que toman dichos Estados.

Es importante aclarar sobre lo dicho, que todos los organismos provinciales de Saneamiento, dependen del Sector Salud, al igual que el nivel Central Nacional, lo que genera una mayor afinidad en los temas y metodologías de trabajo (excepción hecha de la Provincia de Entre Ríos donde el organismo se lo elevó al rango de Subsecretaría y pasó al ámbito de Obras Públicas).

Estos Organismos Provinciales relacionados con la DIRECCION NACIONAL DE CALIDAD AMBIENTAL, técnicamente, politicamente y administrativamente; y a si vez también relacionados entre sí, fundamentalmente los que pertenecen a una misma región, forman el esqueleto ó trama principal del sistema. Para este caso se agrupa a los estados provinciales en 6 Regiones a saber :

Noroeste - Noreste - Central - Cuyana - Pampeana y Patagónica; agrupación susceptible de ser modificada si fuera necesario para mejorar la eficiencia del sistema.

La trama secundaria la forman estos Organismos Provinciales conectados con Organismos ó Instituciones relacionados con el tema y que funcionen dentro de la misma provincia (Institutos, Hospitales Públicos, Clínicas ó Sanatorios Privados, Universidades, Cooperativas de Productores Agropecuarios, Cámaras de Industrias, Agrupaciones para la Defensa Civil, Bomberos, Policías, Fuerzas Armadas, Empresas de Servicios, etc.).
Esta situación se repite a Nivel Central Nacional, con un complemento muy importante y vital para el funcionamiento de este sistema, como es la vinculación directa y permanente de la DIRECCION NACIONAL DE CALIDAD AMBIENTAL - DEPARTAMENTO DE SALUD AMBIENTAL Y PRODUCTOS RESIDUALES con el CENTRO DE INVESTIGACIONES TOXICOLOGICAS (CEITOX) que funciona dentro del INSTITUTO DE INVESTIGACIONES CIENTIFICAS Y TECNICAS de las FUERZAS ARMADAS (CITEFA) y dependiente del CONSEJO NACIONAL DE INVESTIGACIONES CIENTIFICAS Y TECNICAS (CONICET). Este organismo dedicado a las investigaciones toxicológicas, funciona como de consulta permanente, el que a su vez está tratando de terminar de instalar una terminal, para la obtención de información computarizada, marca HEWLET PACKARD modelo 86 B con MODEM de comunicación, conectado a distintos Bancos de Datos, por línea telefónica internacional.
Las comunicaciones del sistema, dentro del país, reconoce distintas vías : personales, por correspondencia, telegráficas, telefónicas, además de por radio, aprovechando la infraestructura que posee en todo el país la Dirección Nacional de Emergencias Sanitarias y sus Delegaciones Provinciales, dependientes también del MINISTERIO DE SALUD PUBLICA.

En lo que respecta al modo técnico de operación el planteo es el siguiente : si se tiene en cuenta que el modo óptimo de detectar alteraciones ambientales que afecten ó incidan sobre la salud, es el monitoreo total del medio ambiente, en el espacio y en el tiempo. Esta situación ideal es casi imposible de concretar en la práctica en las actuales circunstancias, para la Argentina, y suponemos que para el resto de América Latina.

Entonces a los efectos de no ver muy disminuídas las posibilidades de prevención y detección, se elaboró este proyecto de características mixtas, ó sea, se monitorea el medio ambiente dentro de las posibilidades actuales, y además se busca obtener el diagnóstico toxicológico precoz, sobre todo en procesos de intoxicaciones crónicas. Esta información temprana permitirá actuar en forma inmediata y evitar el aumento de la importancia de un episodio potencialmente peligroso.

Este es el principal aspecto en lo que respecta al funcionamiento del sistema, ó sea fomentar la agilidad de la comunicación de los casos detectados, utilizando todos los canales disponibles, en forma orgánica y necesariamente centralizada para evitar superposiciones en las posteriores acciones a ejecutar.

Esta detección es indistintamente referida a la obtenida por monitoreo ambiental, ó la obtenida por diagnóstico toxicológico sobre seres vivos en general y sobre seres humanos en particular, tratando de que esta última en lo posible no sea necesario utilizarla.

La comunicación manejada de este modo, permite recavar la información técnica necesaria de manera más ó menos rápida, para decidir en base a ésta, las posteriores decisiones a tomar.

Estas decisiones, involucran una serie de acciones a ejecutar que van desde, la atención de un intoxicado a la neutralización ó desactivación de un residuo tóxico y desde intensificar los estudios y muestreos en un área determinada, a la creación y aplicación de normas para el control de la contaminación del medio ó para el manejo de un determinado agente.

ORGANISMOS, ENTIDADES E INDIVIDUOS COMPONENTES DEL SISTEMA O QUE ESTA PREVISTO INCORPORAR, PARA LAS DISTINTAS FUNCIONES.

En esta parte del presente proyecto, se están agrupando los distintos integrantes del sistema, de acuerdo al tipo de función que cumplen dentro del mismo. (detección - prevención - atención).

En caso de ser más de una las funciones, se hace prevalecer la principal, sin obviar la ó las secundarias.

También se agrupan los organismos, entidades ó individuos que de acuerdo a lo proyectado, sería conveniente ir incorporando, ó que de una u otra forma deberían pertenecer al sistema.

Durante el transcurso de las reuniones se proporcionarán listas actualizadas, dejando un juego a disposición de ECO.

PAUTAS PREVISTAS PARA LA AMPLIACION O CRECIMIENTO DEL SISTEMA.

Se expondrá en esta parte del presente proyecto las pautas previstas para ampliar el sistema, ya sea con programas de equipamiento, entrenamiento de profesionales ó de apoyo financiero, fundamentalmente para lograr el desarrollo de los centros regionales, como se explicará durante la exposición.

ALGUNOS EJEMPLOS DE INTERES NACIONAL Y PRIMEROS TEMAS QUE SE ESTAN DESARROLLANDO

Como ya se comentó en la introducción, se señalan como temas de interés nacional :

- Plaguicidas
- Nitratos
- Arsénico
- PCB'S
- Plomo
- Cromo
- Metales pesados en general

Habiéndose empezado a trabajar en principio con Nitratos y Plaguicidas. Además con Arsénico, por ser un contaminante químico natural, se está recopilando toda la información existente (química - toxicológica y patológica) a los efectos de realizar un diagnóstico acertado de la situación y posteriormente encarar un programa de desarsenicación de aguas de consumo.

- Con respecto a PCB'S, se está preparando una norma específica para su tratamiento como Residuo Industrial Peligroso.

ANEXOS Y LISTADOS

Se llevarán copias de las listas a las que se hace referencia en el punto sobre componentes del sistema.

Además se adjuntarán anexos con el curriculum y los antecedentes de los principales componentes del sistema, tratando de cuantificar, según la función, la capacidad operativa de cada uno.

CONTAMINACION DE LA BAHIA DE CARTAGENA

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La Bahía de Cartagena está situada sobre la Costa Atlántica de la República de Colombia. Geograficamente se localiza de los 10 16' a 25 Latitud Norte y - desde los 75 30' a 35 Longitud Oeste, con una área aproximada de 70 kilómetros cuadrados. Tiene dos entradas por las cuales se comunica con el Mar Caribe; - una al norte o Bocagrande, con una extensión de casi dos kilometros (1 milla naútica), y otra al sur o Bocachica con una extensión de 400 metros.

Al norte y al fondo de la Bahía se encuentra Cartagena de Indias, una de las ciudades más bellas de América.

Es interesante conocer algo de la historia de la Ciudad, pues para su protección se llevaron a cabo algunas construcciones que hoy en día repercuten en - los estudios oceanográficos y ecológicos que allí se realizan, ade ás de jugar un papel muy importante en las repercusiones que la contaminación ha producido posteriormente. Fué Cartagena de Indias la Ciudad más importante de la Corona Española en las tierras Suramericanas, ya que era un puerto obligado para todos los que entraban al interior de esa parte del Continente, hacia lo que hoy en día es Colombia, Ecuador y Perú, y de los que retornaban a España de estos sitios.Tenía fama por las riquezas que albergaba y por lo tanto,numerosas veces fué asediada y saqueada por los piratas. Debido a esto los Españoles emprendieros la construcción de unas sólidas lefensas que aún se mantienen en buen estado y es así como la Ciudad antigua está practicamente encerrada por murallas y persisten los fuertes que las protegían.

Pero además de las construcciones en la ciudad, se realizaron en la Bahía dos obras relievantes y de gran significado ecológico. La primera fué realizada - en el sureste de la Bahía hacia 1580, que consistió en un canal hoy llamado Canal del Dique. Desde 1650 ya existía una ruta fluvial y con este canal, que mide 115 kilómetros de largo, se puso en comunicación la Bahía con el Rio Grande de la Magdalena. Este río es el más importante de la República de Colombia y hasta hace algunos años era la vía principal hacia el interior de ella.En consecuencia y debido al flujo de agua dulce, si no toda, gran parte de la Bahía posee características propias de un estuario tipo positivo. La segunda obra - fúe la construcción de una muralla submarina iniciada en 1771 y concluida siete (7) años más tarde. Esta muralla une a la Isla de Tierrabomba con el continente y se encuentra a menos de dos metros de la superficie y clausura por lo tanto la entrada a los barcos, los que deben obligatoriamente entrar a través de la entrada sur o Bocachica. Es así como esta edificación colonial limitó - el intercambio de las aguas. Vale la pena anotar que a cada lado de esta escollera se puede llegar a una profundidad de 18 metros.

El rápido desarrollo de Cartagena y la ausencia de una conciencia clara sobre los daños derivados del uso indebido de las aguas han producido, unos efectos indeseados en la Bahía de Cartagena, Bahía de Barbacoas, Ciénaga de la Virgen Islas del Rosario aguas marítimas aledañas y en los caños que comunican estos cuerpos de agua. Algunos estudios han permitido diagnosticar situaciones de emergencia en algunas zonas de los cuerpos mencionados, lo cual hizo concluir en la necesidad urgente de realizar un estudio integral aplicando las técnicas - disponibles usadas en casos similares, en la Bahía de Cartagena y sus áreas de

influencia. Con este estudio el Gobierno de Colombia tendría elementos de juicio que le permitiría adoptar medidas de vigilancia y contról que propicien un equilibrio entre el desarrollo económico y el grado de conservación del medio ambiente deseado.

A partir de los años cincuenta la ciudad ha tenido un fuerte desarrollo industrial en la parte oeste de la Bahía. Los desechos de las industrias, además de las aguas servidas de la ciudad se vierten directamente a la Bahía. Todo esto aunado a que la circulación se encuentra restringida por la escollera, hace que esta Bahía esté sometida a cierto grado de alteración o contaminación.

Los contaminantes más importantes que recibe la Bahía son: Treinta mil metros cúbicos de aguas negras sin tratar; derrames de hidrocarburos, mercurio, plaguicidas , insecticidas, matamalezas, desechos orgánicos provenientes de procesadoras de carne, leche, pescado, aceites vegetales, piladoras de maíz de arroz y aserrios ; lodos en suspensión del Canal del Dique y carbonato de calcio proveniente del Caño Casimiro; contaminación industrial, etc. setenta mil metros cúbicos de aguas industriales ricas en carbonatos de calcio y mercurio residual. La gran mayoría de los contaminantes llegan a la Bahía debido a fallas humanas o a fallas de los equipos.

Desde el año 1972 viene operando una compañía química que produce cloro-soda, la cual utiliza mercurio como sustancia catalítica. En el proceso de producción se encontró que no se llevaban unos controles muy rigurosos sobre el proceso y que el mercurio contenido en las aguas de desecho habían llegado a la Bahía.

Generalmente este tipo de industrias químicas entra a participar como contaminante debido al escape de mercurio durante dicho procesamiento. En general la Bahía se estudió en forma muy intensa y la mayoría de las investigaciones llegaron a la conclusión de que la Bahía sí se encontraba contaminada. De un total de 57 estudios de investigación realizados en esa área, el 55.81 % están basados total o parcialmente en la contaminación, 35.08 % están relacionados con lo referente a las contribuciones de tipo biológico, y el 12.11 % a estudios oceanográficos e hidrográficos de la Bahía.
En el año de 1976, el Comité de Producción Ambiental de la Bahía de Cartagena (COPAC) y otras entidades sospecharon la presencia de una posible contaminación con mercurio, y en Junio de ese mismo año el Ministerio de Salud confirmó la presencia de mercurio en las ostras, langostinos, langostas, y otros productos alimenticios de la clase de los mariscos extraídos de la Bahía de Cartagena - con niveles hasta de 103 ppm. En Agosto del mismo año, el Ministerio de Salud reportó el valor de 1.04 mg/litro, provenientes de una muestra tomada de los afluyentes de la fábrica, e indicó la presencia de valores positivos en 15 - muestras adicionales de agua.

Al mismo tiempo que se reiteró la solicitud para que se tomaran medidas tendientes a disminuir las descargas del metal, la empresa manifestó con tal motivo el deseo de contrarrestar la contaminación mediante un crédito del Fondo Nacional de Proyectos de Desarrollo (FONADE), y manifestaron que elaborarían un proyecto de circulación de las aguas de las cabeceras de las celdas y sal-

muera clorada, con el objeto de disminuir los eventuales vertimientos de mercu rio al Caño Casimiro. Posteriormente el Ministerio de Salud a través de la Di- rección de Saneamiento Ambiental, mediante un informe identificó los siguien- tes procesos como vías de contaminación: escapes de salmuera, escapes de agua de cabecera que contienen principalmente mercurio en solución, derrames de so da cáustica, lodos provenientes de la purificación de la solución de sal, aguas del lavado de las celdas y vapores de mercurio,haciendo énfasis que estas últimas que contienen mercurio en solución, no se recirculaban, si no que se - vertían a la Bahía. El informe resalta que las trampas no retienen el mercurio que se encuentra ni en solución ni en suspensión.

En el año de 1976 el Ministerio de Salud a través de la Dirección de Saneamien to Ambiental y en coordinación con la Universidad de Cartagena y con entidades nacionales, departamentales y municipales que de una y otra forma tienen que ver con el control del medio ambiente, llegó a un acuerdo con la Organización Panamericana de la Salud para que conjuntamente se recomendaran las acciones a seguir en el control de la contaminación de la Bahía de Cartagena y sus áreas de influencia.

A través de el Instituto Nacional de los Recursos Naturales Renovables y del Ambiente (INDERENA) y de la Comisión de Oceanografía se solicitó el acceso a la planta. Se nombró una comisión que estaba conformada por personal sueco para que se efectuara la investigación, y esta comisión determinó que existían entre 12 y 15 tns. de mercurio. Además la comisión conceptuó que la Bahía se recuperaría en una manera natural en un periodo que fluctuaría entre 7 y 8 años.

Se encontró una gran concentración de mercurio en el agua, por lo consiguiente fué necesario efectuar una serie de estudios a diferentes niveles de profundidad, encontrandose la mayor concentración de mercurio en los animales que vivían en los niveles más profundos.

Una vez efectuado el estudio anterior, se pasó a analizar el estado físico de las personas que derivaban su sustento de la pesca de los productos de la Bahía. Se tomó una muestra la cual brindó unos resultados negativos. Hasta la fecha no se ha tenido conocimiento de muertes de personas por este fenómeno. Los casos que han sido reportados no se saben si se deban al mercurio, ya que son extremadamente raros.

En la medida en que se encontraron peces y mariscos contaminados se sospechó que podían existir manifestaciones patológicas en los humanos, pero ninguno de los casos estudiados presentó el cuadro clínico de la enfermedad de Minamatas que se presentó en el año de 1950 en el Japón debido a la intoxicación con mercurio.

En marzo de 1982 la Organización Panamericana de la Salud llevó a cabo un análisis físico-químico de la calidad de las aguas de la Bahía de Cartagena. Se efectuaron varios análisis de la Demanda Bioquímica de Oxigeno (DBO) de muestras provenientes de la Bahía de Cartagena, Ciénaga de la Virgen y afluentes

sanitarios para comparar con los datos obtenidos anteriormente. En la Bahía todos los puntos sin excepción presentan una DBO directa muy baja en torno a 1 mg/l. (N: 1 a 10). Como las aguas de la cienaga de la Virgen están muy eutroficadas, la DBO directa no presentó residual de oxigeno después de cinco días de incubación. Analizando los datos de 1980 se verifica que la demanda - es muy baja, cerca de 1 mg/l, la cual aumenta a 2 y 3 mg/l en algunos puntos en los meses de lluvia.

Se definió, que los mayores problemas de calidad del agua en la Bahía de Cartagena eran de oxígeno disuelto, con sus bajos niveles medidos cerca del fondo, flotantes, grasas y aceites. Se descartan los problemas potenciales del mercurio y coliformes por sus bajos niveles medidos en la columna de agua y además, en el caso del mercurio, la eliminación de la descarga de este tóxico a la Bahía.

El modelo matemático hasta la fecha indica que el impacto directo al balance de oxígeno disuelto de la Bahía de las descargas industriales y domésticos utilizadas es poco.

Otros países que han sufrido problemas similares de control en Bahías y estuarios, adelantaron estudios tendientes al mejoramiento del medio ambiente y alcanzaron en un gran porcentaje las metas que se fijaron. No obstante los primeros sistemas de control utilizados en otros países no se pueden aplicar exactamente al caso de la Bahía de Cartagena, ya que todos los cuerpos de agua no responden en igual forma cuando reciben un contaminante, además del hecho de que los usos que cada país le dá a sus aguas son diferentes, de acuerdo a las costumbres y al desarrollo socio-económico.

Se recomienda elaborar una evaluación más profunda de la contaminación bacteriana i.e. coliformes fecales, de la Bahía de Cartagena para asegurar que el uso de la Bahía para recreación primaria y secundaria no se limite en el futuro por el aumento de las cargas contaminantes.

En base a los datos revisados, parece que los niveles de mercurio en la columna de agua están abajo de concentraciones consideradas como tóxicas directamente. Sin embargo se debe seguir con el programa de medir los niveles de este - tóxico en los organismos de fondo y peces, siendo estos mejores indicadores del problema, si es que existe. La conclusión de eliminar descargas de mercurio a la Bahía de Cartagena es clara.

La máxima concentración de oxígeno se presenta a la entrada de Bocagrande, disminuyendo en concentración a medida que se acerca a la Isla Manzanillo lo cual demuestra que estas aguas se mantienen más renovadas y más nuevas. Sobre el - fondo de la Bahía ocurre lo contrario, quizas a causa del encajonamiento de las aguas y la presencia de materia orgánica , las aguas de la Bahía presentan características de anóxicas por el bajo contenido gaseoso de O_2, y como es lógico la oxidación de materiales se presentará con mejores perspectivas que en superficie, eliminando los sulfatos y degradando el proceso de sedimentación del H_2S.

El estudio de la composición del plancton dentro y fuera de la Bahía permite deducir, que es la misma masa de agua la que penetra tanto por Bocagrande como por Bocachica, aportando una rica y variada fauna zooplactónica, que sufre una considerable reducción en el interior de la Bahía debido a varios factores, siendo posiblemente el más importante de ellos, la contaminación de las aguas y en un segundo lugar a un aumento de la temperatura y una disminución de la salinidad.

Existen dos industrias que producen fertilizantes, en cuyos afluentes las concentraciones de nitrógeno y fósforo son bastante elevadas.

Hay tres industrias que producen pesticidas organoclorados y organofosforados Estos últimos aunque tóxicos se degradan rápidamente en el medio acuático, no habiendose detectado su presencia en los análisis realizados. En cuanto a los pesticidas organoclorados, las concentraciones detectadas son superiores a las normas recomendadas por la EPA y adoptadas por el Estado de Rio de Janeiro para aguas destinadas a la preservación de la flora y fauna naturales y a la propagación de especies destinadas a la alimentación humana.

Antes de iniciar el control efectivo de los afluentes industriales lanzados a la Bahía de Cartagena, se sugiere que se proceda a un trabajo de concientización del personal de las industrias para que adopten medidas alternas de control que puedan lograr una reducción en el volumen de los afluentes y en la carga contaminadora. Siguiendo esta etapa de concientización es necesario que se establezcan las concentraciones máximas permisibles de cada sustancia en los afluentes, teniendo en cuenta la calidad de las aguas de la Bahía necesarias para atender usos benéficos a que se destinen . Por eso se sugiere que se fije un porcentaje de remoción a ser exigido por las industrias más contaminadoras. Cuando se inicien las medidas de control se deberá establecer un programa de monitoreo con uno o dos muestreos por año en cada una de las industrias controladas a fin de verificar la eficiencia de las medidas implantadas.

De acuerdo a lo que presenta este informe, la carga industrial vertida en la Bahía de Cartagena es muy grande principalmente si se compara con la descarga de alcantarillado de la Ciudad. A fin de mejorar la calidad de las aguas de la Bahía , es necesario desarrollar un programa de control que resulte en la reducción de estas cargas. Se recomienda que se dedique especial atención al vertimiento de los pesticidas organoclorados, que por su toxicidad, persistencia y posibilidad de acumulación en la cadena alimenticia, pueda causar daños irreparables a las aguas y a la fauna de la Bahía, arriesgando la salud de la población que se alimenta de peces de esas aguas. Se recomienda también que se amplien los equipos de muestreo y de análisis físico-químicos para que se puedan utilizar técnicas más precisas para la caracterización de afluentes tales como muestras compuestas de 24 horas durante 7 días seguidos.

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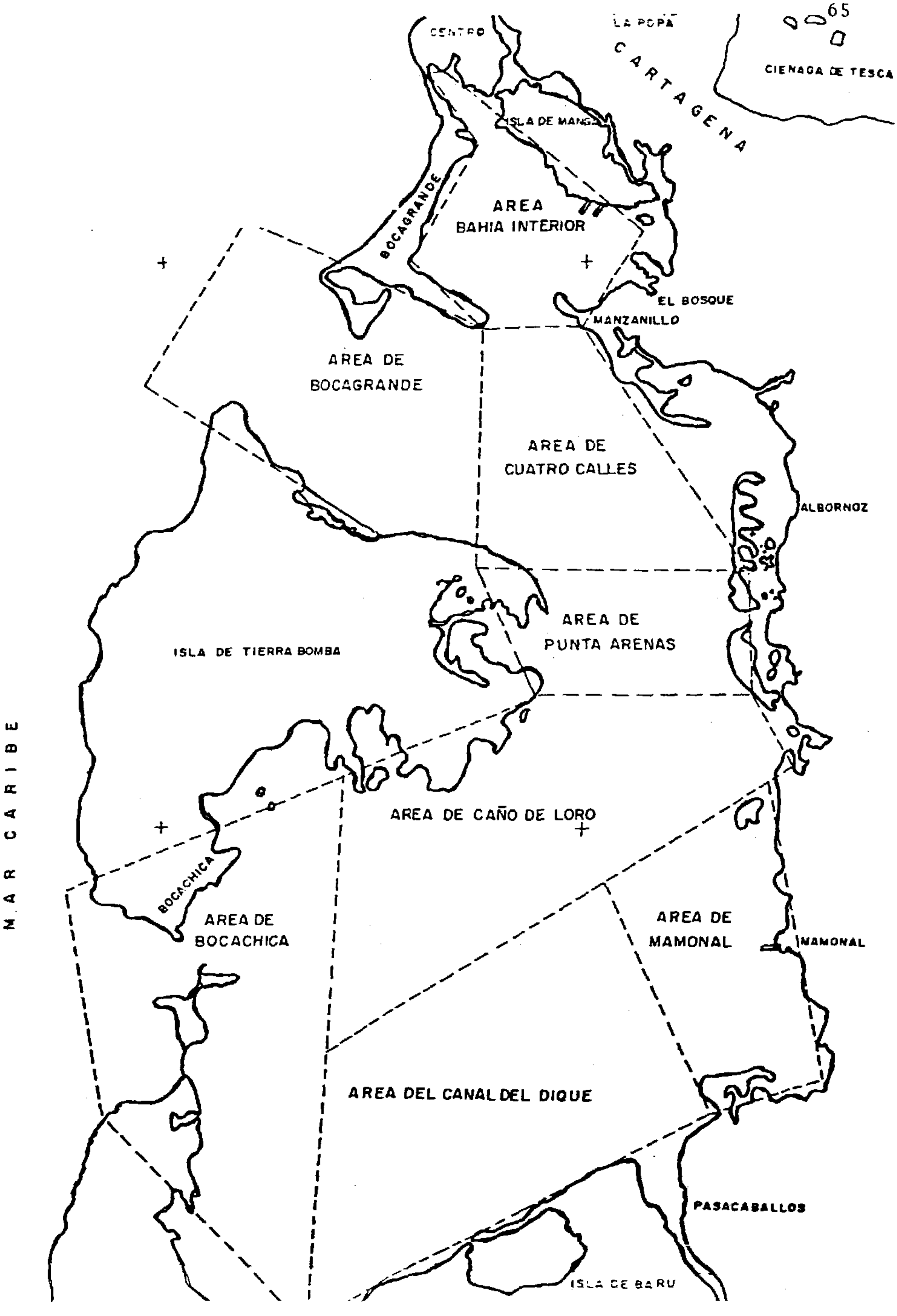
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AREA DE
BOCAGRANDE
AREA DE
CUATRO CALLES
ALBORNOZ
AREA DE
PUNTA ARENAS
ISLA DE TIERRA BOMBA
MAR CARIBE
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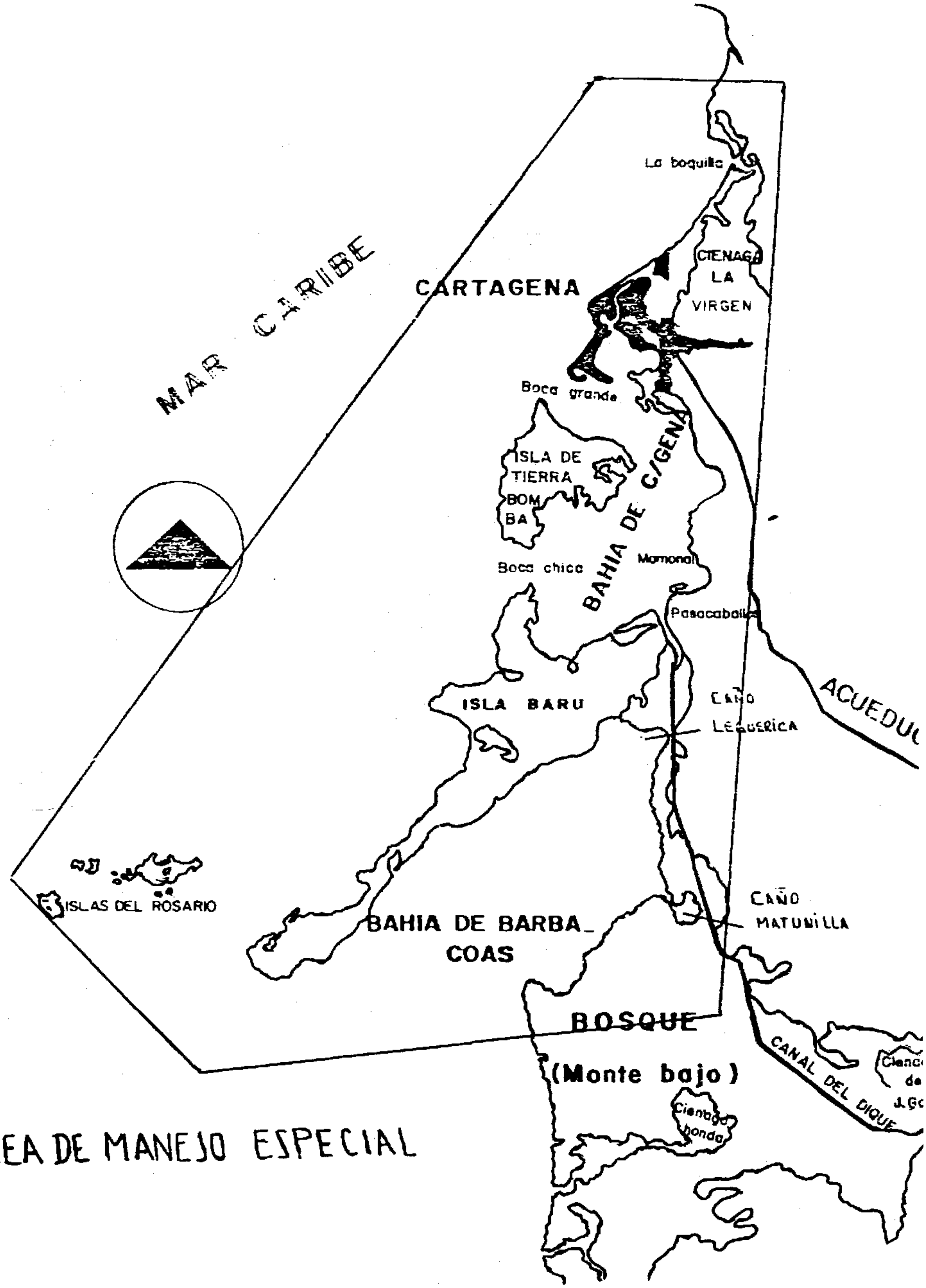

AREA DE MANEJO ESPECIAL

METHODOLOGY FOR RANKING THE DEGREE OF HAZARD ASSOCIATED WITH EXPOSURE TO CARCINOGENS AND OTHER TOXIC CHEMICALS[a]

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[a]This paper is adapted from two documents prepared by the Office of Health and Environmental Assessment, Office of Research and Development, United States Environmental Protection Agency: Technical Support Document and Summary Table for the Ranking of Hazardous Chemicals Based on Carcinogenicity (Carcinogen Assessment Group, External Review Draft, OHEA-C-073, July 1983); and Methodology and Guidelines for Reportable Quantity Determinations Based on Chronic Toxicity Data (External Review Draft, Environmental Criteria and Assessment Office, ECAO-CIN-R245, August 1983).

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I. INTRODUCTION

Inadvertent exposures of populations to hazardous chemicals make it necessary for public health officials to have immediate knowledge of the severity of potential effects and the doses that cause the effects observed. A hazard index has been developed in response to the need to establish a rating scheme to characterize hazardous chemicals according to the severity of disease and the associated hazards, and to prescribe quantities of hazardous chemicals which, when spilled, must be reported to the U.S. Environmental Protection Agency. About 200 potential carcinogens and 200 chemicals associated with other diseases have been evaluated. The hazard index for potential carcinogens couples the weight of evidence indicating potential carcinogenicity with the potency of the chemical to rate the relative cancer hazard. Similarly, the hazard index for chemicals that may cause other diseases couples rating factors for the severity of disease with the dose which causes the onset of disease to rate the relative hazards of these chemicals. These hazard indexes and the data for the chemicals thus far evaluated may have more general applications in assessing chemical risks to the public in response to accidental exposures.

Toxicity indexes, such as lethal dose for 50% of animals (LD_{50}) and no-observed-effect-level (NOEL) can be used in the setting of permissible levels of harmful substances in the environment or for setting priorities of concern of harm to human health or the environment. Hazard index can be defined as the overall indicator of potential harm of a hazardous substance to humans and the environment. Hazard indexes can be estimated by taking into consideration all parameters related to the fate, effects, and dose-response characteristics of the hazardous substances. Thus the chemical structure; physicochemical properties; mechanisms of action; chemical, biological and environmental transformation and

transport; and toxicity indexes are important parameters for estimating hazard indexes of chemicals in the environment.

Some of the above parameters can be estimated from experimental data, while others may have to be estimated using statistical techniques. The extent and the form of hazard indexes depends on the purposes for which they are used.

This paper describes the use of a systemic (chronic) toxicity index and a carcinogenicity index in setting reportable quantities (RQ) under Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") of 1980. Section 103 of CERCLA requires immediate notification from any person in charge of a vessel or an offshore or onshore facility who releases an amount of a hazardous substance equal to or greater than its RQ. Under CERCLA Section 102(b), the RQ of any hazardous substance designated in Section 101(14) is one pound unless a different RQ has been established pursuant to Section 311(b)(4) of the Federal Water Pollution Control Act. These are statutory RQs for the CERCLA Section 101(14) hazardous substance unless and until the Administrator of EPA promulgates regulations establishing different quantities to be reported when released. CERCLA also permits EPA to establish a single RQ for each hazardous substance, regardless of the environmental medium into which the substance is released.

The Emergency Response Division of the Office of Emergency and Remedial Response proposed to use "Selected Criteria Processing" (SCP) to adjust the statutory RQs. SCP includes ignitability, reactivity, carcinogenicity, aquatic toxicity, acute mammalian toxicity (oral, dermal, inhalation) and chronic toxicity as the six primary criteria for adjusting RQs. The RQ for each hazardous substance is the lowest numerical value of all applicable RQs derived from the primary criteria. The RQ is then readjusted using biodegradability, hydrolysis, and photolysis as secondary criteria.

II. TOXICITY INDEX OF POTENTIALLY CARCINOGENIC SUBSTANCES

Hazardous substances suspected of carcinogenic potential can be ranked using as toxicity index the level of evidence in support of their carcinogenicity and the strength (potency factor) they exhibit in inducing carcinogenic responses. Three types of evidence can be used to evaluate a substance's carcinogenic hazard potential. They are: (1) epidemiologic evidence; (2) experimental evidence derived from long-term animal bioassays; (3) supportive or suggestive evidence from short-term tests, metabolism and pharmacokinetics, and structure-activity correlations.

(1). The Weight-of-Evidence Approach to Evaluating the Evidence for Carcinogenicity

The weight-of-evidence can be defined as the strength of evidence indicating potential carcinogenicity, not relative carcinogenic activity or potency of the agent. Thus, an overall decision as to whether an agent may pose a carcinogenic hazard to humans should be based on a careful evaluation of all relevant scientific data, including the design and conduct of the study and the nature and type of responses. In the most complete form, a weight-of-evidence determination should be made from a consideration of the strengths and weaknesses of each piece of evidence, including epidemiological investigations, long-term animal studies, and supporting information.

A. Primary Sources of Information

1. Epidemiology Studies

Human information can provide direct evidence of the association of increases in tumor incidence or mortality in humans with exposure to chemicals. Well designed and conducted analytical epidemiology studies, especially case-control and cohort investigations, are of prime importance; descriptive studies and case reports provide ancillary information.

Important elements in interpreting the likely causality of epidemiological observations include the magnitude of the risk estimates (strength of the associations); the likelihood of their being due to chance (statistical significance); the rigor of the study design to avoid various kinds of bias, including those related to selection, confounding, classification, and measurement; the dose-response relationships; the temporal relationships between exposure and disease; the specificity of the associations; their biological plausibility; and the reproducibility of the findings.

2. Long-Term Animal Studies

Confidence in the results of animal experiments is gained when carcinogenic effects have been confirmed in repeated experiments, in different animal strains or species, or in different dose groups or sexes within a given study. Other measures include demonstration of a highly significant increase in tumors, the presence of tumors at multiple anatomical sites, the histological types of tumors present, and the shortening of tumor latency in treated groups as compared with controls. Dose-response relationships also support a conclusion of carcinogenicity.

In reaching an overall evaluation of the experimental animal evidence, each long-term study needs to be reviewed with regard to the following factors:

a) tumor incidence

b) tumor development

c) preneoplastic lesions

d) target-organ toxicity

e) other relevant biological and chemical information.

B. Supportive Information

1. Short-Term Testing

Appropriate *in vivo* and *in vitro* short-term tests provide ancillary empirical and potentially mechanistic information bearing on the carcinogenicity of an agent.

2. Biological Test Results

Many toxicological, physiological, and biochemical observations, such as comparative metabolism and pharmacokinetic studies and certain mechanistic investigations, can contribute to a determination of carcinogenicity.

3. Structure-Activity Relationships

General information bearing on the biological reactivity of compounds chemically related to the agent under investigation is useful in the evaluation of the carcinogenicity of the agent.

(2). Summarizing the Weight-of-Evidence for Carcinogenicity Using the International Agency for Research on Cancer (IARC) Criteria

After the data have been evaluated, the weight-of-evidence for carcinogenicity may be classified according to the IARC criteria (see Appendix I).

Weight-of-Evidence Statement Using the IARC Criteria

Level of evidence from experimental animal studies

Level of evidence from human studies

IARC grouping

(3). Potency Factor Estimates

After the decision has been made that a compound has the potential for causing cancer in humans, attempts will be made to estimate a potency factor F defined as $1/ED_{10}$. ED_{10} is the estimated dose associated with a lifetime cancer

risk of 10%. The potency factor F will be used together with the qualitative weight-of-evidence for carcinogenicity in the ranking of the carcinogenic hazard potential of the chemicals.

Dose-Response Data That Can Be Used For Potency Factor Estimates

Animal Data

Human Data

The potency factor F is used in place of the potency factor q_1^{*}†, which the Carcinogen Assessment Group (CAG) normally uses in the estimation of risk, because the objective here is to rank chemicals for their potential to cause carcinogenic harm and not to estimate risk associated with a particular level of exposure. Furthermore, it is advantageous to use the potency factor F because it can be estimated without the use of the many assumptions that are required for calculating and/or using q_1^{*}. This is possible because the dose associated with a lifetime cancer risk of 10% is usually within or close to the experimentally observable range.

Other advantages of the potency factor F are:

a. It is relatively insensitive to the choice of the dose-response extrapolation model.

b. The point estimation of ED_{10}, which has some optimal statistical properties, can be used to calculate F. Therefore, it is not necessary to use the upper-bound estimate, which is more stable for estimating risk at very low doses.

† q_1^{*} is the upper confidence limit for the linear coefficient in the multistage model. See Appendix II, Description of the Quantitative Risk Extrapolation Models Used by the U.S. Environmental Protection Agency.

(4). Potency Factor Grouping

The potency factor estimates are indicators of relative magnitude (potency) to cause carcinogenic harm. These numerical values are useful tools for setting toxicity indexes.

When the relative potency factors are estimated by the procedure outlined in (3) above, they can be aggregated into four groups. Those chemicals with the highest potency factor can be placed in group 1, intermediate potency factor chemicals can be placed in group 2, low potency factor chemicals can be placed in group 3, and the lowest potency factor chemicals can be placed in group 4. The method used for grouping 192 chemicals for the RQ project is to place chemicals with potency factors (F) above 100 into group 1; chemicals with potency factors from 10-100 into group 2; chemicals with potency factors from 1-10 into group 3; and chemicals with potency factors below 1 into group 4. The major disadvantage of this method is that the grouping of chemicals with borderline potencies between groups is arbitrary. While toxicologic information could be used to aid in placement, the process would still be somewhat subjective. Another method of grouping is analysis for clustering in addition to potency numerical value cut-off points.

(5). Cancer Hazard Ranking Based on Combined Qualitative and Quantitative Assessments

The culmination of the hazard ranking process described in this study is accomplished by combining the qualitative weight-of-evidence for carcinogenicity with the potency group placement to arrive at a final carcinogenicity index for each chemical. Substances are ranked as posing a high, medium, or low cancer hazard according to the following scheme:

Carcinogenicity Indexing for Reportable Quantities under CERCLA

IARC Group	Potency Group 1 F>100	2 F = 10-100	3 F = 1-10	4 F<1
1	HIGH	HIGH	MEDIUM	LOW
2A	HIGH	MEDIUM	MEDIUM	LOW
2B	HIGH	MEDIUM	LOW	LOW
3	Cannot Be Ranked in General*			

The hazard rankings for about 200 suspected carcinogens are presented in Table I (page 12).

III. TOXICITY INDEX FOR SUBSTANCES WITH SYSTEMIC (CHRONIC) TOXICITY POTENTIAL

The toxicity indexes on chronic toxicity reflect two primary attributes of each chemical:

1. The minimum effective dose (MED) levels for chronic exposures (mg/day for a 70-kg man) via alternative environmental media (air, water, etc.).
2. Type of effect (liver necrosis, teratogenicity, etc.).

(1) The Minimum Effective Dose (MED)

The dose rating for a given chemical is based upon the MED transformed to values ranging from 1-10 using the graph in Figure 1 (page 27). Substances having an effect at a low dose (i.e., those that are more highly toxic) will be given a high rating on this graph, while those requiring a high dose (less toxic) will

* The group 3 category includes chemicals for which the evidence from animal studies is limited or inadequate, and for which there is no human evidence. For those studies with reliable dose-related data, a potency estimate is determined and a hazard ranking is performed.

be given a low rating. The rating values range from 1 to 10.

(2) Rating Potentially Hazardous Chemicals According to the Severity of Disease

The effect rating for an individual chemical will range from 1 to 10 depending on severity (Table II, page 28), with 10 being the most severe. These values must be assigned on a chemical-by-chemical basis.

(3) Toxicity Hazard Ranking Based on the MED and the Severity of Disease

A final Composite Score (CS) which is the chronic toxicity index is determined by multiplying the dose rating by the effect rating. The possible range of CSs is thus 1 to 100. Using this scheme, only those compounds inducing what are judged to be the most severe effects at low levels of exposure would fall into the high toxicity index category.

The following step-by-step text gives additional details for this procedure:

1. Identify subchronic or chronic no observed adverse effect levels (NOAELs), lowest observable effect level (LOAELs) or frank effect level (FELs) based on animal or human data from the available literature. Note the dose/exposure and the effect.
2. Convert all NOAELs, LOAELs and FELs to units of mg/kg/day. Inhalation, dietary or drinking water exposure data will be converted to units of mg/kg/day doses based on the methods outlined previously (U.S. EPA, 1980).
3. If the NOAEL, LOAEL or FEL is based on subchronic exposure, a corresponding chronic value will be estimated by dividing the subchronic value by 10 or less.
4. The MEDs based on animal data will be converted to human MEDs using the cubed root of the body weight ratio approximation,

and the subsequent value will be multiplied by 70 kg to put the MED in units of mg/day for a 70 kg man.**

5. Assign a dose rating value (RV_d) to the dose associated with the MED as described in Figure 1.

6. Assign an effect rating value (RV_e) to the effect associated with the MED as described in Table II.

7. Calculate the SC as:

$$CS = RV_d \times RV_e$$

8. If more than one MED can be used to calculate a CS for a route of exposure (oral or inhalation), the MED for the route of exposure which will be considered in setting the RQ will be selected by the following criteria:

   o If adequate chronic data are available, disregard MEDs based on subchronic data.

   o If more than one MED remains, select the MED which is based on the "best" data.

   o If considerations of data quality do not lead to the selection of a single MED, the MED resulting in the highest CS for a given route will be used.

9. Having selected a single MED and derived a CS for each route of exposure, the MED used to determine the RQ will be the MED from the route of exposure with the highest CS.

**This is based on the assumption that metabolic rate is a function of body weight to the two-thirds power. Thus, the human dose, assuming a body weight of 70 kg, is equal to:

$$\text{animal dose} \times \frac{70\text{ kg}}{\text{animal weight}} \quad 2/3.$$

This equation can be rearranged so that the human dose in mg/day equals:

$$\text{animal dose} \times \frac{\text{animal weight}}{70\text{ kg}} \quad 1/3 \times 70\text{ kg}.$$

10. The reportable quantities (RQs) are then assigned based on the following relationship to CS:

Composite Score (or chronic toxicity index)	RQ (lbs)
81-100	1
41-80	10
21-40	100
6-20	1000
1-5	5000

The composite scores for about 200 potentially hazardous chemicals are presented in Table III (page 29).

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Acenaphthene	(83-32-9)	Inadequate	Inadequate	3	NA	NA	b
Acenaphthylene	(208-96-8)	Inadequate	Inadequate	3	NA	NA	b
2-Acetylaminofluorene	(53-96-3)	Inadequate	Sufficient	2B	32.00	2	Medium
Acrylonitrile	(107-13-1)	Limited	Sufficient	2A	0.06	4	Low
Aflatoxin B_1	(1162-65-8)	Limited	Sufficient	2A	10,000.00	1	High
Aldrin	(309-00-2)	Inadequate	Limited	2B	63.00	2	Medium
4-Aminobiphenyl	(92-67-1)	Sufficient	Sufficient	1	87.00	2	High
Amitrole	(61-82-5)	Inadequate	Sufficient	2B	9.20	3	Low
Ammonium bichromate	(7789-09-5)	Inadequate	Inadequate	1[g]	g	NA	Medium
Ammonium chromate	(7788-98-9)	Inadequate	Inadequate	1g	g	NA	Medium
Anthracene	(120-12-7)	Inadequate	Inadequate	3	NA	NA	b
Arsenic and Compounds	(7440-38-2)	Sufficient	Inadequate	1	130.00	NA	High
Arsenic acid	(7778-39-4)	Limited	Inadequate	2A[d]	d	NA	High
Arsenic disulfide	(1303-32-8)	Limited	Inadequate	2A[d]	d	NA	High
Arsenic trichloride	(7784-34-1)	Limited	Inadequate	2A[d]	d	NA	High

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Arsenic pentoxide	(1303-28-2)	Limited	Inadequate	2A[d]	d	NA	High
Arsenic trioxide	(1327-53-3)	Sufficient	Inadequate	1	130.00	1	High
Arsenic trisulfide	(1303-33-9)	Limited	Inadequate	2A[d]	d	NA	High
Asbestos	(1332-21-4)	Sufficient	Sufficient	1	p	p	p
Auramine	(2465-27-2)	Inadequate	Sufficient	2B	1 20	3	Low
Azaserine	(115-02-6)	Inadequate	Sufficient	2B	a	NA	c
Aziridine	(151-56-4)	Inadequate	Limited	2B	310.00	1	High
Benzene	(71-43-2)	Sufficient	Limited	1	0.26	4	Low
Benzidine and its salts	(92-87-5)	Sufficient	Sufficient	1	1.90	3	Medium
Benzo[a]pyrene	(50-32-8)	Inadequate	Sufficient	2B	500.00	1	High
Benzo[b]fluoranthene	(205-99-2)	Inadequate	Sufficient	2B	150.00[1]	1	High
Benzo[ghi]perylene	(191-24-2)	Inadequate	Inadequate	3	NA	NA	b
Benzo[k]fluoranthene	(207-08-9)	Inadequate	Limited	3[r]	NA	NA	c
Benzyl Chloride	(100-44-7)	Inadequate	Limited	3[r]	NA	NA	c
Benz[a]anthracene	(56-55-3)	Inadequate	Sufficient	2B	21.00	2	Medium

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Benz[c]acridine	(225-51-4)	Inadequate	Limited	3[r]	1500.00	1	Medium
Beryllium and Compounds	(7440-41-7)	Limited	Sufficient	2A[e]	17.00[j]	2	Medium
Bis(2-chloroethyl)ether	(111-44-4)	Inadequate	Sufficient	2B	13.00	2	Medium
Bis(chloromethyl)ether	(542-88-1)	Sufficient	Sufficient	1	1900.00	1	High
Cacodylic acid	(75-60-5)	Inadequate	Inadequate	3	NA	NA	b
Cadmium and Compounds	(7740-43-9)	Limited	Sufficient	2A[f]	60.00[k]	2	Medium
Cadmium acetate	(543-90-8)	Limited	Sufficient	2A[f]	k	NA	Medium
Cadmium bromide	(7789-42-6)	Limited	Sufficient	2A[f]	k	NA	Medium
Cadmium chloride	(10108-64-2)	Limited	Sufficient	2A[f]	k	NA	Medium
Cadmium sulfate	(10124-36-4)	Limited	Sufficient	2A[f]	k	NA	Medium
Calcium arsenate	(7778-44-1)	Limited	Inadequate	2A[d]	d	NA	High
Calcium arsenite	(52740-16-6)	Limited	Inadequate	2A[d]	d	NA	High
Calcium chromate	(13765-19-0)	Sufficient	Sufficient	1[g]	g	NA	Medium
Carbon tetrachloride	(56-23-5)	Inadequate	Sufficient	2B	39.00	2	Medium
Chlorambucil	(305-03-3)	Sufficient	Sufficient	1	a	NA	c

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Chlordane	(57-74-9)	Inadequate	Limited	3[r]	83.00	2	Low
Chlornaphazine	(494-03-1)	Sufficient	Limited	1	a	NA	c
Chlorobenzilate	(510-15-6)	Inadequate	Sufficient	2B	1.60	3	Low
Chloroform	(67-66-3)	Inadequate	Sufficient	2B	2.00	3	Low
Chloromethyl methyl ether (technical grade)[n]	(107-30-2)	Sufficient[n]	Sufficient[n]	1	n	n	High[n]
Chloromethyl methyl ether	(107-30-2)	Inadequate	Inadequate	3	NA	NA	b
4-Chloro-o-toluidine hydrochloride	(3165-93-3)	Inadequate	Sufficient	2B	0.07	4	Low
Chromium and Compounds	(7440-47-3)	Sufficient	Sufficient	1[g]	1.90[g]	3	Medium
Chromic acetate	(1066-30-4)	Inadequate	Inadequate	1[g]	g	NA	b
Chromic acid	(7738-94-5)	Limited	Inadequate	1[g]	g	NA	Medium
Chromic sulfate	(10101-53-8)	Inadequate	Inadequate	1[g]	g	NA	b
Chromous acid	(10049-05-5)	Inadequate	Inadequate	1[g]	g	NA	b
Chrysene	(218-01-9)	Inadequate	Sufficient	2B	5.00[i]	3	Low
Creosote	(8001-58-9)	Limited	Sufficient	2A	58.00	2	Medium
Cupric acetoarsenite	(12002-03-8)	Inadequate	Inadequate	2A[d]	d	NA	High

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Cyclophosphamide	(50-18-0)	Sufficient	Sufficient	1	18.00	2	High
Daunomycin	(20830-81-3)	Inadequate	Sufficient	2B	a	NA	c
DDD	(72-54-8)	Inadequate	Sufficient	2B	0.10	4	Low
DDE	(72-55-9)	Inadequate	Sufficient	2B	3.80	3	Low
DDT	(50-29-3)	Inadequate	Sufficient	2B	5.60	3	Low
Diallate	(2303-16-4)	Inadequate	Sufficient	2B	2.40	3	Low
2,4-Diaminotoluene	(95-80-7)	Inadequate	Sufficient	2B	3.00	3	Low
1,2,7,8-Dibenzopyrene	(189-55-9)	Inadequate	Sufficient	2B	a	NA	c
Dibenz[a,h]anthracene	(53-70-3)	Inadequate	Sufficient	2B	1000.00	1	High
1,2-Dibromo-3-chloropropane	(96-12-8)	Inadequate	Sufficient	2B	170.00	1	High
Dibutylnitrosamine	(924-16-3)	Inadequate	Sufficient	2B	34.00	2	Medium
3,3'-Dichlorobenzidine	(91-94-1)	Inadequate	Sufficient	2B	7.10	3	Low
1,2-Dichloroethane	(107-06-2)	Inadequate	Sufficient	2B	0.23	4	Low
1,1-Dichloroethylene	(75-35-4)	Inadequate	Limited	3[r]	4.60	3	Low
Dichlorophenylarsine	(696-28-6)	Inadequate	Inadequate	3	NA	NA	b

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence		Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
		Humans	Animals				
Dieldrin	(60-57-1)	Inadequate	Sufficient	2B	130.00	1	High
Diepoxybutane	(1464-53-5)	Inadequate	Sufficient	2B	8.50	3	Low
Diethanolnitrosamine	(1116-54-7)	Inadequate	Sufficient	2B	17.00	2	Medium
Diethyl Arsine	(692-42-2)	Inadequate	Inadequate	3	NA	NA	b
1,2-Diethylhydrazine	(1615-80-1)	Inadequate	Sufficient	2B	a	NA	a
Diethylnitrosamine	(55-18-5)	Inadequate	Sufficient	2B	1000.00	1	High
Diethylstilbestrol	(56-53-1)	Sufficient	Sufficient	1	7900.00	1	High
Dihydrosafrole	(94-58-6)	Inadequate	Sufficient	2B	1.10	3	Low
3,3'-Dimethoxybenzidine	(119-90-4)	Inadequate	Sufficient	2B	0.01	4	Low
Dimethyl sulfate	(77-78-1)	Inadequate	Sufficient	2B	a	NA	a
Dimethylaminoazobenzene	(60-11-7)	Inadequate	Sufficient	2B	280.00	1	High
7,12-Dimethylbenz[a] anthracene	(57-97-6)	Inadequate	Sufficient	2B	200,000.00	1	High
Dimethylcarbamoyl chloride	(79-44-7)	Inadequate	Sufficient	2B	510.00	1	High
1,1-Dimethylhydrazine	(57-14-4)	Inadequate	Sufficient	2B	13.00	2	Medium
1,2-Dimethylhydrazine	(540-73-8)	Inadequate	Sufficient	2B	870.00	1	High

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Dimethylnitrosamine	(62-75-9)	Inadequate	Sufficient	2B	29.00	2	Medium
2,3-Dinitrotoluene	(602-01-7)	Inadequate	Inadequate	3	NA	NA	b
2,4-Dinitrotoluene	(121-14-2)	Inadequate	Sufficient	2B	3.80	3	Low
2,5-Dinitrotoluene	(619-15-8)	Inadequate	Inadequate	3	NA	NA	b
2,6-Dinitrotoluene	(606-20-2)	Inadequate	Limited	3[r]	NA	NA	c
3,4-Dinitrotoluene	(610-39-9)	Inadequate	Inadequate	3	NA	NA	b
1,4-Dioxane	(123-91-1)	Inadequate	Sufficient	2B	0.03	4	Low
N,N-Diphenylamine	(122-39-4)	Inadequate	Inadequate	3	NA	NA	b
1,2-Diphenylhydrazine	(122-66-7)	Inadequate	Sufficient	2B	4.60	3	Medium
Dipropylnitrosamine	(621-64-7)	Inadequate	Sufficient	2B	a	NA	c
Epichlorohydrin	(106-89-8)	Inadequate	Sufficient	2B	0.16	4	Low
Ethyl Methanesulfonate	(62-50-0)	Inadequate	Sufficient	2B	140.00	1	High
Ethylene dibromide	(106-93-4)	Inadequate	Sufficient	2B	13.00	2	Medium
Ethylene Oxide	(75-21-8)	Limited	Limited	2A	6.00	3	Medium
Ethylenethiourea	(96-45-7)	Inadequate	Sufficient	2B	0.97	4	Low

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
1-Ethyl-1-nitrosourea	(759-73-9)	Inadequate	Sufficient	2B	8.70	3	Low
Ferric dextran	(9004-66-4)	Inadequate	Sufficient	2B	o	NA	b
Fluoranthene	(206-44-0)	Inadequate	Inadequate	3	NA	NA	b
Fluorene	(86-73-7)	Inadequate	Inadequate	3	NA	NA	b
Glycidaldehyde	(765-34-4)	Inadequate	Sufficient	2B	1.20	3	Medium
Heptachlor	(76-44-8)	Inadequate	Sufficient	2B	36.00	2	Medium
Heptachlor Epoxide	(1024-57-3)	Inadequate	Sufficient	2B	36.00[q]	2	Medium
Hexachlorobenzene	(118-74-1)	Inadequate	Sufficient	2B	12.00	2	Medium
Hexachlorobutadiene	(87-68-3)	Inadequate	Limited	3[r]	0.50	4	Low
α-Hexachlorocyclohexane	(319-84-6)	Inadequate	Sufficient	2B	211.00	1	High
β-Hexachlorocyclohexane	(319-85-7)	Inadequate	Limited	3[r]	1.70	3	Low
γ-Hexachlorocyclohexane	(58-89-9)	Inadequate	Limited	2B	1.70	3	Low
δ-Hexachlorocyclohexane	(319-86-8)	Inadequate	Inadequate	3	NA	NA	b
Hexachloroethane	(67-72-1)	Inadequate	Limited	3[r]	0.27	4	Low
Hydrazine	(302-01-1)	Inadequate	Sufficient	2B	100.00	1	High

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Indeno(1,2,3-cd)pyrene	(193-39-5)	Inadequate	Limited	2B	a	NA	c
Iodomethane	(77-88-4)	Inadequate	Limited	3[r]	NA	NA	c
Isosafrole	(120-58-1)	Inadequate	Limited	3[r]	0.54	4	Low
Kepone	(143-50-0)	Inadequate	Sufficient	2B	44.00	2	Medium
Lasiocarpine	(303-34-4)	Inadequate	Sufficient	2B	38.00	2	Medium
Lead acetate	(301-04-2)	Inadequate	Sufficient	2B	7.30	3	Low
Lead arsenate	(3687-31-8)	Limited	Inadequate	2A[d]	d	NA	High
Lead phosphate	(7446-27-7)	Inadequate	Limited	2B	a	NA	c
Lead subacetate	(1335-32-6)	Inadequate	Sufficient	2B	0.17	4	Low
Lithium chromate	(14307-35-8)	Inadequate	Inadequate	1[g]	g	NA	Medium
3-Methylcholanthrene	(56-49-3)	Inadequate	Sufficient	2B	12.00	3	Medium
4,4'-Methylene-bis-(2-chloroaniline)	(101-14-4)	Inadequate	Sufficient	2B	1.70	3	Low
Methylnitrosourea	(684-93-5)	Inadequate	Sufficient	2B	12,000.00	1	High
Methylthiouracil	(56-04-2)	Inadequate	Sufficient	2B	30.00	2	Medium
Methylvinylnitrosamine	(4549-40-0)	Inadequate	Sufficient	2B	a	NA	c

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
N-Methyl-N'-nitro-N-nitrosoguanidine	(70-25-7)	Inadequate	Sufficient	2B	58.00	2	Medium
Mitomycin C	(50-07-7)	Inadequate	Sufficient	2B	[a]	NA	[c]
Mustard gas	(505-60-2)	Sufficient	Limited	1	[a]	NA	[c]
1-Naphthylamine	(134-32-7)	Inadequate	Limited	3[r]	NA	NA	[c]
2-Naphthylamine	(91-59-8)	Sufficient	Sufficient	1	5.20	3	Medium
Nickel and Compounds	(7440-02-0)	Limited	Sufficient	2A[h]	1.10[1]	3	Medium
Nickel Ammonium Sulfate	(15699-18-0)	Limited	Limited	2A[h]	1	NA	Medium
Nickel carbonyl	(13463-39-3)	Limited	Sufficient	2A[h]	1	NA	Medium
Nickel chloride	(7718-54-9)	Limited	Limited	2A[h]	1	NA	Medium
Nickel cyanide	(557-19-7)	Limited	Limited	2A[h]	1	NA	Medium
Nickel hydroxide	(12054-48-7)	Limited	Limited	2A[h]	1	NA	Medium
Nickel nitrate	(13478-00-7)	Limited	Limited	2A[h]	1	NA	Medium
Nickel subsulfide	(12035-72-2)	Limited	Sufficient	2A[h]	1.10[1]	1	Medium
Nickel sulfate	(7786-81-4)	Limited	Limited	2A[h]	1	NA	Medium
Nitrosomethylurethane	(615-53-2)	Inadequate	Sufficient	2B	2400.00	1	High

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
N-Nitrosopiperidine	(100-75-4)	Inadequate	Sufficient	2B	170.00	1	High
N-Nitrosopyrrolidine	(930-55-2)	Inadequate	Sufficient	2B	290.00	1	High
5-Nitro-o-toluidine	(99-55-8)	Inadequate	Limited	3[r]	0.53	4	Low
Pentachloronitrobenzene	(82-68-8)	Inadequate	Limited	3[r]	1.50	3	Low
Phenacetin	(62-44-2)	Inadequate	Sufficient	2B	0.02	4	Low
Phenanthrene	(85-01-8)	Inadequate	Inadequate	3	NA	NA	b
Phenobarbital	(50-06-6)	Inadequate	Limited	3[r]	0.75	4	Low
Phenylalanine Mustard	(148-82-3)	Sufficient	Sufficient	1	1100.00	1	High
Polychlorinated biphenyls	(1336-36-3)	Inadequate	Sufficient	2B	37.00[m]	2	Medium
Potassium arsenate	(7784-41-0)	Limited	Inadequate	2A[d]	d	NA	High
Potassium arsenite	(10124-50-2)	Limited	Inadequate	2A[d]	d	NA	High
Potassium bichromate	(7778-50-9)	Limited	Inadequate	1[g]	g	NA	Medium
Potassium chromate	(7789-00-6)	Limited	Inadequate	1[g]	g	NA	Medium
Propane sultone	(1120-71-4)	Inadequate	Sufficient	2B	37.00	2	Medium
Propyleniminе	(75-55-8)	Inadequate	Sufficient	2B	15.00	2	Medium

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
Pyrene	(129-00-0)	Inadequate	Inadequate	3	NA	NA	[b]
Saccharin	(81-07-2)	Inadequate	Limited	3[r]	0.01	4	Low
Safrole	(94-59-7)	Inadequate	Sufficient	2B	0.20	4	Low
Sodium arsenate	(7631-89-2)	Limited	Inadequate	2A[d]	d	NA	High
Sodium arsenite	(7784-46-5)	Limited	Inadequate	2A[d]	d	NA	High
Sodium bichromate	(10588-01-9)	Limited	Inadequate	1[g]	g	NA	Medium
Sodium chromate	(7775-11-3)	Limited	Inadequate	1[g]	g	NA	Medium
Streptozotocin	(18883-66-4)	Inadequate	Sufficient	2B	110.00	1	High
Strontium chromate	(7789-06-2)	Inadequate	Inadequate	1[g]	g	NA	Medium
2,3,7,8-Tetrachloro-dibenzo-p-dioxin	(1746-01-6)	Inadequate	Sufficient	2B	120,000.00	1	High
1,1,1,2-Tetrachloroethane	(630-20-6)	Inadequate	Limited	3	0.13	4	Low
1,1,2,2-Tetrachloroethane	(79-34-5)	Inadequate	Limited	3[r]	1.70	4	Low
Tetrachloroethylene	(127-18-4)	Inadequate	Limited	3[r]	0.18	4	Low
Thioacetamide	(62-55-5)	Inadequate	Sufficient	2B	27.00	2	Medium
Thiourea	(62-56-6)	Inadequate	Sufficient	2B	80.00	2	Medium

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Degree of Evidence Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking
O-Tolidine	(119-93-7)	Inadequate	Sufficient	2B	27.00	2	Medium
O-Toluidine and its hydrochloride	(636-21-5)	Limited	Sufficient	2A	0.22	4	Low
Toxaphene	(8001-35-2)	Inadequate	Sufficient	2B	9.70	3	Low
1,1,2-Trichloroethane	(79-00-5)	Inadequate	Limited	3[r]	0.30	4	Low
Trichloroethylene	(79-01-6)	Inadequate	Limited	3[r]	0.18	4	Low
2,4,6-Trichlorophenol	(88-06-2)	Inadequate	Sufficient	2B	0.08	4	Low
Tris(2,3-dibromopropyl) phosphate	(126-72-7)	Inadequate	Sufficient	2B	9.80	3	Low
Trypan blue	(72-57-1)	Inadequate	Sufficient	2B	0.01	4	Low
Uracil Mustard	(66-75-1)	Inadequate	Sufficient	2B	a	NA	c
Urethane	(51-79-6)	Inadequate	Sufficient	2B	0.64	4	Low
Vinyl chloride	(75-01-4)	Sufficient	Sufficient	1	0.16	4	Low

Note: The data herein without additional analysis should not be used for risk assessment purposes.

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

Chemical Name	Chemical (CAS)	Degree of Evidence Humans	Animals	Grouping Based on IARC Criteria	Potency Factor Estimate	Potency Group	Hazard Ranking

[a]Data available are inadequate for calculation of potency factor using current methodology. An appropriate method of estimating a potency factor for these types of data is currently under development by CAG.

[b]Other toxicity endpoints must be used as a basis for hazard ranking.

[c]Carcinogen hazard ranking will be possible when methodology to calculate a reasonable potency factor is developed or new data becomes available.

[d]Grouping and potency factor estimate is based on weight of evidence for arsenic and arsenic compounds in the drinking water of humans (assumed to be predominantly the trioxide).

[e]Grouping is based on weight of evidence for beryllium sulfate.

[f]Grouping is based on weight of evidence for cadmium compounds as a class.

[g]Grouping is based on weight of evidence for chromate production and animal data which indicates that hexavalent chromium is carcinogenic. The potency estimate is based on epidemeology data for total chromium exposure of chromate workers..

[h]Grouping is based on weight of evidence for nickel compounds as a class.

[i]Calculated, using the potency factor estimate for benzo[a]pyrene as a reference.

[j]Potency estimate is based on data from beryllium sulfate exposure in rats.

[k]Potency estimate is based on epidemeology data for cadmium smelters. Please note that potency estimate based on animal data would be at least 100 times higher. Please refer to OHEA document "Addendum to the Health Assessment Document for Cadmium, 1983" for details.

[l]Potency estimate is based on data for nickel subsulfide.

[m]Potency estimate is based on data for Aroclor 1260.

[n]Technical grade chloromethyl methyl ether is contaminated with bis(chloromethyl)ether, and the hazard ranking is therefore based on the evidence for bis(chloromethyl)ether.

[o]Inappropriate to group or rank for environmental considerations because available evidence is based on subcutaneous and intramuscular injection experiments.

[p]A potency factor estimate for asbestos is inappropriate here because the carcinogenic potential of asbestos is related to specific fiber shapes, sizes, and atmospheric concentrations. Air concentrations are usually measured either as number of fibers or mass. However, no direct relationship exists between air fiber/mℓ (>5 microns) concentrations (by the phase contrast light microscope method) and mass concentrations in $\mu g/m^3$ (determined by electron microscopy). The relationship depends on the type of environment sampled, the type of asbestos in the air, and the size of the fibers.

[q]Potency factor estimate is based on data for heptachlor since heptachlor epoxide is a metabolite of heptachlor.

[r]The Group 3 category includes chemicals for which the evidence from animal studies is limited or inadequate and there is no human evidence. These are group 3 chemicals with limited animal evidence. For those with good dose-related data, a potency estimate is determined and a hazard ranking is performed.

Compounds with group 1 potency factor estimates (>100) are given "medium" hazard ranking. Compounds in potency group 2,3 or 4 are given "low" hazard rankings.

NA = Not applicable

TABLE I. SUMMARY OF HAZARD RANKING FOR POTENTIAL CARCINOGENS (Continued)

The substances identified for re-evaluation and profile revision are:

hexachlorocyclohexane
sodium arsenite
N-nitrosodiethanolamine
DDE
dibutylnitrosamine
dipropylnitrosamine
N,N-diphenylamine
cadmium choride
amitrole
thioacetamide
N-nitrosodiethanolamine
mustard gas
phenacetin
benzene

Note: The data herein without additional analysis should not be used for risk assessment purposes.

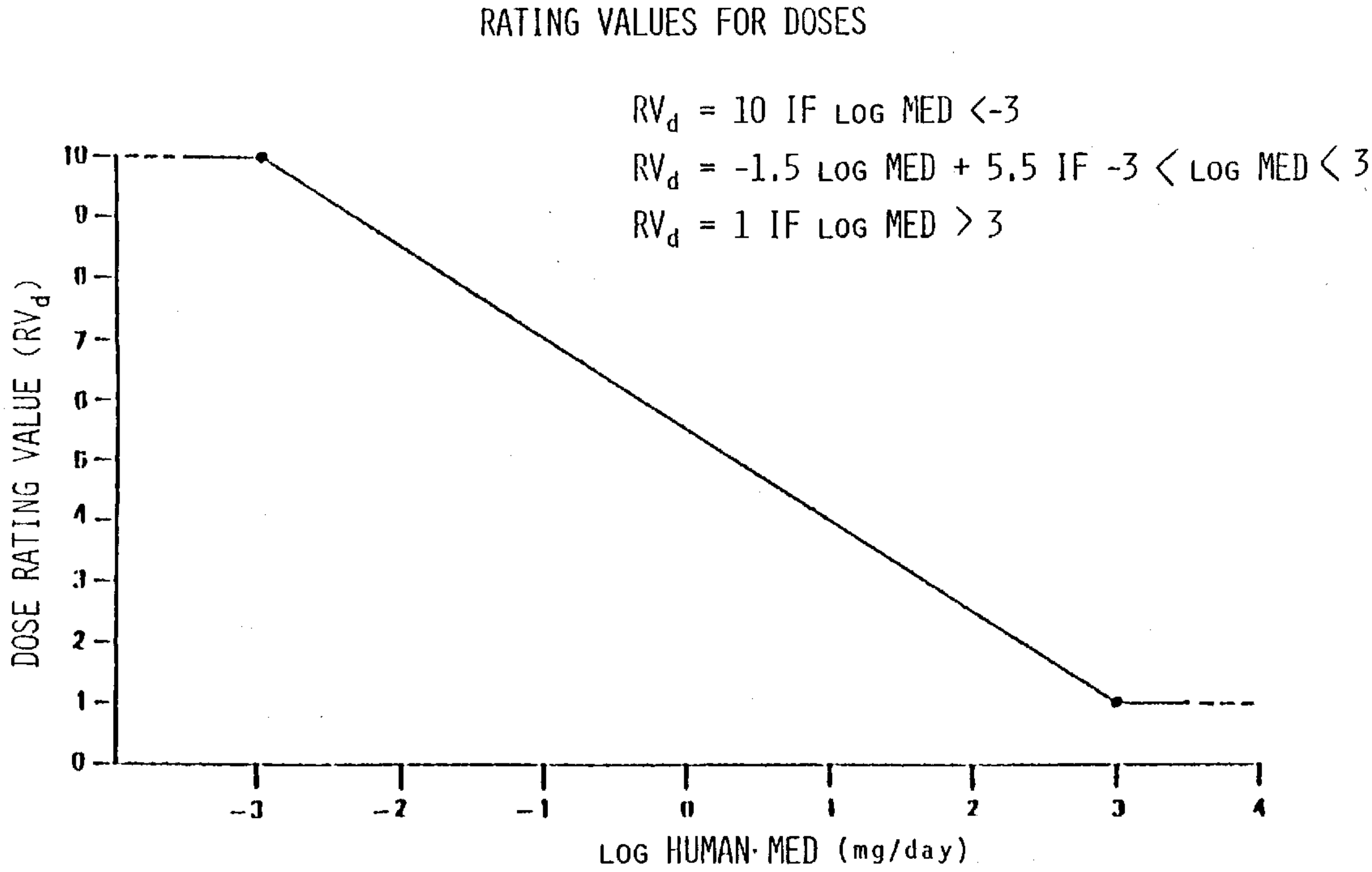

FIGURE 1. RATING VALUES FOR DOSES USED TO DERIVE REPORTABLE QUANTITIES BASED ON CHRONIC TOXICITY.

TABLE II.

Rating Values for NOAELs, LOAELs, and FELs used to Derive Reportable Quantities Based on Chronic Toxicity

RATING	EFFECT
1	ENZYME INDUCTION OR OTHER BIOCHEMICAL CHANGE WITH NO PATHOLOGIC CHANGES AND NO CHANGE IN ORGAN WEIGHTS
2	ENZYME INDUCTION AND SUBCELLULAR PROLIFERATION OR OTHER CHANGES IN ORGANELLES BUT NO OTHER APPARENT EFFECTS.
3	HYPERPLASIA, HYPERTROPHY, OR ATROPHY BUT NO CHANGE IN ORGAN WEIGHTS.
4	HYPERPLASIA, HYPERTROPHY, OR ATROPHY WITH CHANGES IN ORGAN WEIGHTS.
5	REVERSIBLE CELLULAR CHANGES: CLOUDY SWELLING, HYDROPIC CHANGE, OR FATTY CHANGES.
6	NECROSIS OR METAPLASIA WITH NO APPARENT DECREMENT OF ORGAN FUNCTION. ANY NEUROPATHY WITHOUT APPARENT BEHAVIORAL, SENSORY, OR PHYSIOLOGIC CHANGES.
7	NECROSIS, ATROPHY, HYPERTROPHY, OR METAPLASIA WITH A DETECTABLE DECREMENT OF ORGAN FUNCTIONS. ANY NEUROPATHY WITH A MEASURABLE CHANGE IN BEHAVIORAL, SENSORY, OR PHYSIOLOGIC ACTIVITY.
8	NECROSIS, ATROPHY, HYPERTROPHY, OR METAPLASIA WITH DEFINITIVE ORGAN DYSFUNCTION. ANY NEUROPATHY WITH GROSS CHANGES IN BEHAVIOR, SENSORY, OR MOTOR PERFORMANCE. ANY DECREASE IN REPRODUCTIVE CAPACITY. ANY EVIDENCE OF FETOTOXICITY.
9	PRONOUNCED PATHOLOGIC CHANGES WITH SEVERE ORGAN DYSFUNCTION. ANY NEUROPATHY WITH LOSS OF BEHAVIORAL OR MOTOR CONTROL OR LOSS OF SENSORY ABILITY. REPRODUCTIVE DYSFUNCTION. ANY TERATOGENIC EFFECT WITH MATERNAL TOXICITY.
10	DEATH OR PRONOUNCED LIFE SHORTENING. ANY TERATOGENIC EFFECT WITHOUT SIGNS OF MATERNAL TOXICITY.

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Acenaphthene							ID	
Acetic acid, lead salt (lead acetate)	oral	35.2	Decrease in survival of offspring	3.2	10	32	100	By analogy to lead (and compounds)
Acetic acid, thallium (I) salt [thallium (I) acetate]	oral	0.90	Alopecia, increased kidney weight	5.6	4	22	100	Downs et al., 1960
Acetonitrile	inhalation	115	Neurological disorders and hemorrhages in the brain	2.4	8	19	1000	Pozzani et al., 1959
Acrylonitrile	oral	29.9	Teratogenicity with maternal toxicity	3.3	9	30	100	Murray et al., 1976
Allyl alcohol	inhalation	3.54	Focal necrosis of liver and kidney	4.7	6	28	100	Torkelson et al., 1959
Ammonia	inhalation	42.5	Hydropic changes in adrenal glands, cloudy swelling in kidney tubules, increased splenic hemosiderin	3.1	5	15	1000	Weatherby, 1952
Ammonium bichromate							ID	
Ammonium bifluoride	oral	12	Mottled teeth resulting from fluoride moiety	3.9	5	19	1000	U.S. EPA, 1980
Ammonium silicofluoride							ID	
Antimony (metallic)							ID	
Antimony (and compounds)	inhalation (antimony trisulfide)	0.7 of Sb	Altered ECG patterns possibly indicating greater susceptibility to heart failure	5.7	8	46	10	Brieger et al., 1954
Antimony potassium tartrate	oral	12.8	Shortening of life span	3.8	10	38	100	Schroeder et al., 1970
Antimony pentachloride							ID	
Antimony tribromide							ID	

TABLE III. SUMMARY OF HAZARD KING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	References
Antimony trichloride							ID	
Antimony trifluoride							ID	
Antimony trioxide	inhalation	132	Histologic alterations of the lung producing greater suscepti-bility to pneumonia	2.3	8	18	1000	Gross et al., 1955
Arsenic (metallic)							ID	
Arsenic (and compounds)	oral	1.0	Hyperpigmentation and hyperkera-tosis of skin, arteriosclerotic gangrene of extremities	5.5	9	50	10	Tseng et al., 1968; Tseng, 1977
Arsenic acid	oral	297	Decreased survival; enlargement, fibrosis, and lesions of common bile duct	1.3	10	18	1000	By analogy to sodium arsenate
Arsenic disulfide							ID	
Arsenic (III) oxide	oral	0.114	Hepatic cloudy swelling and spotty necrosis, bile duct proliferation with angitis and fibrosis, slough-ing of renal tubular epithelium	6.9	6	41	10	Ishinishi et al., 1980
Arsenic (V) oxide	oral	238	Decreased survival; enlargement, fibrosis, and lesions of common bile duct	1.9	10	19	1000	By analogy to sodium arsenate
Arsenic trichloride	oral	0.216	Hepatic cloudy swelling and spotty necrosis, bile duct pro-liferation with angitis and fibrosis, sloughing of renal tubular epithelium	6.5	6	39	100	By analogy to arsenic (III) oxide
Arsenic trisulfide	oral	5.15	Polyneuropathy, hyperpigmentation and hyperkeratosis of skin	4.4	8	35	100	Tay and Seah, 1975
Arsine, diethyl-							ID	
Asbestos	inhalation	0.027	Asbestosis	7.9	10	79	10	Gillam et al., 1976
1,2-Benzanthracene							ID	

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite Score[b]	RQ	References
Benzene	inhalation	345	Decrease in survival, marked effects on hematopoietic system	1.7	10	17	1000	Green et al., 1981
Benzene, 1,3-dichloro-	inhalation	277	Increased liver and kidney weight, hepatocellular cloudy swelling	1.8	5	9	1000	By analogy to dichlorobenzene (a,4-)
Benzene, hexachloro-	oral	50	Increased mortality	3.0	10	30	100	Cam and Nigogosyan, 1963
Benzene, hydroxy- (phenol)	inhalation	20.8	Death	3.5	10	35	100	Deichmann et al., 1944
Benzene, 1-methyl-2,4-dinitro- (2,4-dinitrotoluene)	oral	46.7	Shortening of lifespan, anemia, aspermatogenesis	3.0	10	30	100	Lee et al., 1978
Benzene, 1-methyl-2,6-dinitro- (2,6-dinitrotoluene)	oral	29.9	Methemoglobinemia, anemia, incoordination, CNS demyleination, gliosis, testicular atrophy with aspermatogenesis	3.3	9	30	100	Ellis et al., 1976
Benzene, nitro-							ID	
Benzene, pentachloro-	oral	215	Tremors in pups	2.0	7	14	1000	Linder et al., 1980
Benzene, pentachloronitro-	oral	479	Kidney lesions	1.5	7	10	1000	Fytizas-Danielidou, 1975
1,2-Benzenedicarboxylic acid, dibutyl ester (dibutyl phthalate)	oral	420	Fetotoxicity (evidence of delayed ossification)	1.6	8	13	1000	Shiota et al., 1980
1,2-Benzenedicarboxylic acid, diethyl ester (diethyl phthalate)	oral	29,925	Weight loss	1.0	4	4	5000	Food Research Labs, Inc., 1955
Benzidine	oral	22.4	Hepatic foci of cellular alteration	3.5	8	28	100	Frith et al., 1980
Benzo(b[illegible])fluoranthene							ID	
3,4-Benzopyrene	oral	0.6	Fetotoxicity without maternal toxicity	5.8	8	46	10	Rigdon and Rennels, 1964

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	References
p-Benzoquinone							ID	
1,2-Benzphenanthrene							ID	
Beryllium (metallic)							ID	
Beryllium (and compounds)	inhalation	0.011	Chronic pneumonitis, epithelial hyperplasia	8.5	8	68	10	Vorwald and Reeves, 1959
Beryllium chloride	inhalation	0.594	Increased lung weight, pneumonitis, epithelial hyperplasia	5.8	8	47	10	By analogy to beryllium and compounds
Beryllium fluoride	inhalation	0.350	Increased lung weight, pneumonitis, epithelial hyperplasia	6.2	8	50	10	By analogy to beryllium and compounds
Beryllium nitrate	inhalation	0.983	Increased lung weight, pneumonitis, epithelial hyperplasia	5.5	8	44	10	By analogy to beryllium and compounds
(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dichloro-(dichlorobenzidine)							ID	
Bis(2-chloroisopropyl)ether	oral	743	Decreased survival	1.2	10	12	1000	NCI, 1979
Bis(chloromethyl)ether							ID	
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	diet	23.9	Increased urinary coproporphyrin and renal hyperplasia	3.4	3	10	1000	Kociba et al., 1977
2-Butanone (methyl ethyl ketone)	inhalation	860	Fetotoxicity	1.1	8	8	1000	Schwetz et al. 1974
Cadmium (metallic)							ID	
Cadmium (and compounds)	inhalation	0.075 as Cd	Pulmonary and renal dysfunction	7.2	8	58	10	Lauwerys et al., 1974
Cadmium acetate	oral	9.18	Decreased survival	4.1	10	41	10	Schroeder et al., 1964
Cadmium bromide	oral	0.65	Necrosis of renal tubular epithelium	5.8	7	41	10	By analogy to cadmium chloride

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Cadmium chloride	oral	0.44	Necrosis of renal tubular epithelium, decreased immunologic response	6.0	7	42	10	Koller et al., 1975
Calcium arsenate	oral	3.3	Polyneuropathy	4.7	7	33	100	Tay and Seah, 1975
Calcium arsenite	oral	10.8	Decreased survival	3.9	10	39	100	By analogy to sodium arsenite
Calcium chromate	inhalation	19.3	Epithelial necrosis, atrophy, and hyperplasia of the bronchial tree; emphysema-like changes and focal scarring in alveoli of some mice	3.6	8	29	100	Nettesheim et al., 1971
Captan	oral	251.3	Teratogenicity with maternal toxicity	1.9	9	17	1000	Robens, 1970
Carbamimidoselenoic acid (selenourea)							ID	
Carbon disulfide (carbon bisulfide)	inhalation	33	Decreased immunological reactivity, altered menstrual cycle	3.2	7	23	100	Kashin, 1965: Vasilyeva, 1973
Carbon tetrachloride	inhalation	17.9	Reduced corneal sensitivity	3.6	7	25	100	Moeller, 1973
Carbonic acid, dithallium (I) salt [thallium (I) carbonate]	oral	0.80	Alopecia, increased kidney weight	5.6	4	23	100	By analogy to thallim I acetate
Chloral (hydrate)							ID	
1-Chloro-2,3-epoxypropane	inhalation	16.9	Squamous metaplasia of nasal turbinates	3.7	7	26	100	Quast et al., 1979a,b
Chlorodibromomethane (dibromochloromethane)	oral	6.6	Suppression of hepatic and splenic phagocytosis	4.3	6	26	100	Munson et al., 1978
Chloroethane							ID	
Chloromethyl methyl ether	inhalation	5.9	Bronchial hyperplasia and squamous metaplasia	4.3	7	30	100	Laskin et al., 1975

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
2-Chlorophenol (2-monochlorophenol)							ID	
Chromic acetate							ID	
Chromic acid	inhalation	1.6	Perforation of the nasal septum	5.2	6	31	100	NIOSH, 1973
Chromic sulfate							ID	
Chromium (metallic)							ID	
Chromium (and compounds)	inhalation	6.4	Epithelial necrosis, atrophy, hyperplasia in bronchial tree; emphysema-like changes and focal scarring in alveoli of some mice	4.3	8	34	100	Nettesheim et al., 1971
Chromous chloride							ID	
Cobaltous bromide							ID	
Cobaltous formate							ID	
Cobaltous sulfamate							ID	
Copper (metallic)							ID	
Copper (and compounds)	oral	14	Elevated serum aspartate transaminase levels, jaundice	3.8	5	19	1000	Suttle and Mills, 1966b
Copper sulfate, ammoniated	oral	54	Elevated serum aspartate transaminase levels, jaundice	2.9	5	15	1000	By analogy to copper (and compounds)
Creosote	oral	1,496	Decreased food consumption	1.0	1	1	5000	Miyazato et al., 1981
Cresol	inhalation	1.34	Bone marrow depression of erythroid series	5.3	4	21	100	Uzhdavini et al., 1972
Cupric acetate	oral	44	Elevated serum aspartate transaminase levels, jaundice	3.0	5	15	1000	By analogy to copper (and compounds)
Cupric acetoarsenite							ID	
Cupric chloride	oral	30	Elevated serum aspartate transaminase levels, jaundice	3.3	5	16	1000	By analogy to copper (and compounds)

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Cupric nitrate	oral	65.2	Elevated serum aspartate transaminase levels, jaundice	2.8	5	14	1000	By analogy to copper (and compounds)
Cupric oxalate							ID	
Cupric sulfate	oral	35.6 CuS0t4?	Elevated serum aspartate transaminase levels, jaundice	3.2	5	16	1000	Suttle and Mills, 1966
Curpic tartrate	oral	47	Elevated serum aspartate transaminase levels, jaundice	3.0	5	15	1000	By analogy to copper (and compounds)
2,4-Dichlorophenoxyacetic acid and (2,4-D esters)	oral	129 (as 2,4-D)	Fetotoxicity	2.3	8	18	1000	Schwetz et al., 1971
Dibenz(a,h)anthracene							ID	
Dichlorobenzene (1,2-)	oral	154	Increased liver and kidney weight	2.2	4	8	1000	Hollingsworth et al., 1958
Dichlorobenzene (1,4-)	inhalation	277	Increased liver and kidney weight, hepatocellular cloudy swelling	1.8	5	9	1000	Hollingsworth et al., 1956
1,2-Dichloroethane	inhalation	145	Liver and gall bladder diseases	2.3	8	18	1000	Kozik, 1957
1,1-Dichloroethane	inhalation	542	Kidney injury evidenced by histological changes and increased blood urea	1.4	7	9	1000	Hofmann et al., 1971
1,1-Dichloroethylene (vinylidene chloride)	oral	37.7	Increased incidence of liver necrosis	3.1	6	19	1000	NTP, 1982
1,2-Dichloroethylene	inhalation	189	Fat accumulation in the liver and histologic changes in the lung	2.1	5	10	1000	Freundt et al., 1977
Dichloromethane	inhalation	21,750	Increased mortality	1.0	10	10	1000	Burek et al., 1980
2,4-Dichlorophenol	oral	121	Non-specific hepatic changest--swelling of hepatocytes with some differences in cell size and infiltration of round cells	2.4	5	12	1000	Kobayashi et al., 1972
2,6-Dichlorophenol							ID	
Dichlorophenylarsine							ID	

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Dichloropropane							ID	
1,2-Dichloropropane							ID	
Dichloropropane-Dichloropropene mixture	inhalation	43.8	Increased relative kidney and liver weight	3.0	4	12	1000	Parker et al., 1982
1,3-Dichloropropene	inhalation	3.24	Slight cloudy swelling of renal tubular epithelium	4.7	5	24	100	Torkelson and Oyen, 1977
Dichloropropene(s)	inhalation	3.24	Slight cloudy swelling of renal tubular epithelium	4.7	5	24	100	Torkelson and Oyen, 1977
Diethylamine	inhalation	30.2	Pulmonary irritation, multiple punctate corneal erosions and edema, and histological changes in liver	3.3	8	26	100	Brieger and Hodes, 1951
O,O-Dimethyl-O-p-nitrophenyl phosphorothioate (methyl parathion)	oral	10.7	Decreased survival	4.0	10	40	100	NCI, 1979
Dimethylamine	inhalation	37	Necrosis of liver parenchymal cells, hepatic fatty degeneration, tubular degeneration of testes, corneal injury	3.1	6	19	1000	Dow Chemical Co., 1964
Dinitrobenzenes	oral	3.0	Testicular atrophy with indications of possible loss of function	4.8	7	34	100	Cody et al., 1981
4,6-Dinitro-o-cresol	oral	2.45	Cataracts	4.9	8	39	100	U.S. EPA, 1980; NIOSH, 1978; Horner, 1942
Dinitrophenols	oral	14	Cataracts	3.8	8	30	100	U.S. EPA, 1980; Horner, 1942; Tainter et al., 1935
2,4-Dinitrophenol	oral	14	Cataracts	3.8	8	30	100	U.S. EPA, 1980; Horner, 1942; Tainter et al., 1935
Diphenylhydrazine	oral	59.8	Increased mortality, decreased growth	2.8	10	28	100	NCI, 1978

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Ethane, hexachloro-	inhalation	449	Increased mortality	1.5	10	15	1000	Weeks et al., 1979
Ethane, 1,1,1,2-tetrachloro-							ID	
Ethane, 1,1,2,2-tetrachloro-	inhalation	22	Fatty liver, elevated ACTH in the hypophysis	3.5	5	17	1000	Schmidt et al., 1972
Ethane, 1,1,2-trichloro-							ID	
Ethene, 1,1,2,2-tetrachloro-	inhalation	7266	Increased mortality due to renal disease	1.0	10	10	1000	Rampy et al., 1978
Ethion							ID	
Ethylbenzene	inhalation	724	Slight change in kidney and liver weight	1.2	4	4	5000	Wolf et al., 1956
Fluoranthene							ID	
Formaldehyde	inhalation	12.3	Increased mortality, mucopurulent rhinitis, epithelial dysplasia and squamous metaplasia of nasal cavity	3.9	10	39	100	Swenberg et al., 1980
Hexachlorophene	oral	29.9	Nervousness, paralysis, status spongiosus	3.3	9	30	100	Kimbrough and Gaines, 1971
Hydrogen sulfide							ID	
Indeno(1,2,3-cd)pyrene							ID	
Isoprene	inhalation	550	Decreased Ot2? consumption (rat), increased number of leukocytes, slightly decreased number of erythrocytes (rabbits), and increase in some organ weights, bronchial vascular lesions and focal liver dystrophy (all)	1.4	4	5	1000	Gostinskii, 1965
Lead (metallic)							ID	
Lead (and compounds)	oral	22.4 Pb	Decrease in survival of offspring	3.5	10	35	100	Schroeder and Mitchener, 1971

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Lead arsenate	oral	598	Decreased survival	1.3	10	13	1000	Fairhill and Miller, 1941
Lead chloride	oral	30.8	Decrease in survival of offspring	3.3	10	33	100	By analogy to lead (and compounds)
Lead fluoborate	oral	41.2	Decrease in survival of offspring	3.1	10	31	100	By analogy to lead (and compounds)
Lead fluoride	oral	26.5	Decrease in survival of offspring	3.4	10	34	100	By analogy to lead (and compounds)
Lead iodide	oral	49.9	Decrease in survival of offspring	3.0	10	30	100	By analogy to lead (and compounds)
Lead nitrate	oral	37.3	Decrease in survival and longevity	3.1	10	31	100	Schroeder et al., 1965
Lead phosphate	oral	29.3	Decrease in survival of offspring	3.3	10	33	100	By analogy to lead (and compounds)
Lead stearate							ID	
Lead subacetate	oral	29.1	Decrease in survival of offspring	3.3	10	33	100	By analogy to lead (and compounds)
Lead sulfate	oral	32.8	Decrease in survival of offspring	3.2	10	32	100	By analogy to lead (and compounds)
Lead sulfide	oral	25.9	Decrease in survival of offspring	3.4	10	34	100	By analogy to lead (and compounds)
Lead thiocyanate	oral	35	Decrease in survival of offspring	3.2	10	32	100	By analogy to lead (and compounds)
Lithium chromate							ID	
Mercuric nitrate	inhalation	1.39	Tremor	5.3	8	42	10	Neal et al., 1937, 1941
Mercuric sulfate							ID	
Mercuric thiocyanate							ID	
Mercurous nitrate							ID	

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Mercury, (acetato-O) phenyl- (phenyl-mercuric acetate)	oral	1.26	Moderate renal damage	5.3	7	37	100	Fitzhugh et al., 1950
Mercury fulminate							ID	
Methyl chloride	inhalation	221.3	Neuromuscular damage and death	2.0	10	20	1000	Smith and Von Oettingen, 1947a,b
Methyl methacrylate	inhalation	121.5	Tracheal and suggestive liver histopathologic damage, serum biochemical changes, impaired gastrointestinal motor performance	2.4	7	17	1000	Tansy et al., 1976, 1980a,b
Monochlorobenzene	oral	56	Increased liver and kidney weight	2.9	4	12	1000	Knapp et al., 1971
Monoethylamine							ID	
Naphthalene							ID	
Nickel (metallic)	inhalation	1.79	Pneumonia	5.1	5	26	100	Johansson et al., 1981
Nickel (and compounds)	inhalation	1.27	Increased mortality, pneumo-coniosis	5.3	10	53	10	Ottolenghi et al., 1974
Nickel ammonium sulfate	oral	22.8	Decreased mortality of offspring	3.5	10	35	100	By analogy to nickel (and compounds) (soluble salt)
Nickel carbonyl	inhalation	2.7	Increased mortality	4.9	10	49	10	Sunderman et al., 1957
Nickel chloride	oral	10.3	Increased mortality of offspring	4.0	10	40	100	By analogy to nickel (and compounds) (soluble salt)
Nickel (II) cyanide	inhalation	2.39	Increased mortality, pneumo-coniosis	4.9	10	49	10	By analoty to nickel (and compounds) (nickel sulfide)
Nickel hydroxide	inhalation	2.0	Increased mortality, pneumo-coniosis	5.0	10	50	10	By analogy to nickel (and compounds) (nickel sulfide)

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Nickel nitrate	oral	14.5	Increased mortality of offspring	3.8	10	38	100	By analogy to nickel (and compounds) (soluble salt)
Nickel sulfate	oral	12.3	Increased mortality of offspring	3.9	10	39	100	By analogy to nickel (and compounds) (soluble salt)
Nitric acid							ID	
p-Nitrophenol							ID	
2-Nitrophenol							ID	
Nitrophenol (mixed)							ID	
Paraldehyde							ID	
Pentachloroethane							ID	
Phorate							ID	
2-Picoline							ID	
Plumbane, tetraethyl- (tetraethyl lead)	oral	0.0014	Swollen, friable livers, peripancreatic inflammation, cardiac hypertrophy, slight neuronal damage	9.8	5	49	10	Schepers, 1964
Potassium arsenate	oral	372	Decreased survival; enlargement, fibrosis, and lesions of common bile duct	1.6	10	16	1000	By analogy to sodium arsenate
Potassium arsenite	oral	8.36	Decreased survival	4.1	10	41	10	By analogy to sodium arsenite
Potassium bichromate							ID	
Potassium chromate							ID	
Pyridine	oral	177	Mortality	2.1	10	21	100	Pollack et al., 1943
Selenious acid	oral	7.33	Decreased body weight, increased mortality	4.2	10	42	10	By analogy to sodium selenite
Selenium (metallic)							ID	

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_b[d]	RV_e	Composite[b] Score	RQ	Reference
Selenium (and compounds)	oral	2.69 (selenium)	Increased mortality among neonates	4.9	10	49	10	Schroeder and Mitchener, 1971b
Selenium dioxide (selenium oxide)	oral	6.28	Decreased body weight, increased mortality	4.3	10	43	10	By analogy to sodim selenite
Selenium disulfide							ID	
Silver (and compounds)	oral	0.10	Argyria (development of blue/gray skin pigmentation)	7.0	1	7	1000	U.S. DHEW, 1962
Sodium arsenate	oral	385	Decreased survival, enlargement and lesions of bile duct	1.6	10	16	1000	Byron et al., 1967
Sodium arsenite	oral	8.54	Decreased survival	4.1	10	41	10	Schroeder and Balassa, 1967
Sodium bichromate							ID	
Sodium bifluoride	oral	13	Mottled teeth resulting from fluoride moiety	3.8	5	19	1000	U.S. EPA, 1980
Sodium chromate							ID	
Sodium nitrite	oral	1,409	Marked hepatic atrophy and hemosiderosis	1.0	7	7	1000	Inai et al., 1979
Sodium selenite	oral	9.8	Decreased body weight, increased mortality	4.0	10	40	100	Schrauzer et al., 1976
Sulfuric acid, thallium (I) salt (thallium sulfate)	oral	0.86	Alopecia, increased kidney weight	5.6	4	22	100	By analogy to thallim I acetate
1,2,4,5-Tetrachlorobenzene	oral	20.5	Elevated alkaline phosphatase and bilirubin levels	3.5	1	3	5000	Braun et al., 1978
2,3,4,6-Tetrachlorophenol	oral	10.7	Fetotoxicity	4.0	8	32	100	Schwetz et al., 1974a
Tetraethyl pyrophosphate							ID	
Thallic oxide [thallium (III) oxide]	oral	1.2	Alopecia, increased kidney weight	5.4	4	22	100	Downs et al., 1960

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Thallium (metallic)							ID	
Thallium (and compounds)	oral	0.70 (thallium)	Alopecia, increased kidney weight	5.7	4	23	100	Downs et al., 1960
Thallium (I) chloride	oral	0.82	Alopecia, increased kidney weight	5.6	4	22	100	By analogy to thallium I acetate
Thallium (I) nitrate	oral	0.91	Alopecia, increased kidney weight	5.6	4	22	100	By analogy to thallium I acetate
Thallium (I) selenide							ID	
Toluene	inhalation	4,036	CNS dysfunction	1.0	7	7	1000	SRC, 1981
Tribromomethane (bromoform)	oral	6.6	Suppression of hepatic phagocytosis	4.3	6	26	100	Munson et al., 1978
Trichlorfon (trichlorofon)	oral	45	Decreased survival	3.0	10	30	100	Teichmann and Hauschild, 1978
1,2,4-Trichlorobenzene	oral	37.3	Increased adrenal weight	3.1	4	13	1000	Robinson et al., 1981
1,1,1-Trichloroethane	inhalation	54,592	Histologic changes in hepatocytes	1.0	6	6	1000	McNatt et al., 1975
Trichloroethene	oral	9.5	Decreased immune response	4.0	5	20	1000	Tucker et al., 1980; Sanders et al., 1980
2,4,5-Trichlorophenol	oral	179.6	Mild diuresis; slight degenerative changes in the liver and kidneys	2.1	6	13	1000	McCollister et al., 1961
2,4,6-Trichlorophenol							ID	
Triethylamine							ID	
Trimethylamine							ID	
1,3,5-Trinitrobenzene							ID	
Arsenic D004	oral	4.94	Decreased survival	4.5	10	45	10	Schroeder and Balassa, 1967
Cadmium D006	oral	4.49 as Cd	Decreased survival	4.5	10	45	10	Schroeder et al., 1964

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Chromium (VI) D007	inhalation	6.4	Epithelial necrosis, atrophy, hyperplasia of the bronchial tree; emphysema-like changes and focal scarring in alveoli of some mice	4.3	8	34	100	Nettesheim et al., 1971
Lead D008	oral	22.4 Pb	Decrease in survival of offspring	3.5	10	35	100	Schroeder and Mitchener, 1971
Selenium D010	oral	2.69 selenium	Increased mortality among neonates	4.9	10	49	10	Schroeder and Mitchener, 1971a
Uranyl acetate	oral	1.68	Kidney injury	5.2	6	31	100	By analogy to uranyl nitrate
Uranyl nitrate	oral	2.1	Degeneration of renal tubular epithelium	5.0	6	30	100	Anghelova, 1966
Vanadium (V) oxide (vanadium pentoxide)	oral	4,277	Mortality	1.0	10	10	1000	Stokinger et al., 1953
Vanadyl sulfate	oral	14	Reduced serum cholesterol and elevated serum fasting glucose levels	3.8	1	3	5000	Schroeder et al., 1970
Vinyl chloride	inhalation	228	Slight increase in mortality and moribundity	2.0	10	20	1000	Hong et al., 1981
Zinc (metallic)	oral	150	Hypochromic, microcytic anemia	2.2	8	18	1000	By analogy to zinc (and compounds)
Zinc (and compounds)	oral	150 (zinc)	Hypochromic, microcytic anemia	2.2	8	18	1000	Porter et al., 1977; Prasad et al., 1978
Zinc acetate	oral	421	Hypochromic, microcytic anemia	1.6	8	13	1000	By analogy to zinc (and compounds)
Zinc ammonium chloride	oral	558	Hypochromic, microcytic anemia	1.4	8	11	1000	By analogy to zinc (and compounds)
Zinc borate	oral	285	Hypochromic, microcytic anemia	1.8	8	14	1000	By analogy to zinc (and compounds)
Zinc bromide	oral	517	Hypochromic, microcytic anemia	1.4	8	11	1000	By analogy to zinc (and compounds)

TABLE III. SUMMARY OF HAZARD RANKING BASED ON CHRONIC TOXICITY (Continued)

Chemical	Route	Dose[a] (mg/day)	Effect	RV_d[b]	RV_e	Composite[b] Score	RQ	Reference
Zinc carbonate	oral	2,869	Cessation of reproduction, anemia	1.0	9	9	1000	Sutton and Nelson, 1937
Zinc chloride	oral	313	Hypochromic, microcytic anemia	1.8	8	14	1000	By analogy to zinc (and compounds)
Zinc cyanide							ID	
Zinc fluoride	oral	12.6	Mottled teeth resulting from fluoride moiety	3.8	5	19	1000	U.S. EPA, 1980a
Zinc formate	oral	357	Hypochromic, microcytic anemia	1.7	8	14	1000	By analogy to zinc (and compounds)
Zinc hydrosulfite							ID	
Zinc nitrate	oral	435	Hypochromic, microcytic anemia	1.5	8	12	1000	By analogy to zinc (and compounds)
Zinc phenolsulfonate							ID	
Zinc phosphide							ID	
Zinc silicofluoride							ID	
Zinc sulfate	oral	370	Hypochromic, microcytic anemia	1.6	8	13	1000	Porter et al., 1977; Prasad et al., 1978
Zirconium potassium fluoride							ID	

[a]Equivalent human dose

[b]All values have been rounded to two significant digits.

ID = Insufficient data

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APPENDIX I

IARC CRITERIA AND SCHEME FOR EVALUATION OF CARCINOGENS

METHODS

The data on each chemical were reviewed in detail before the meeting by selected members of the group: the animal studies and short-term test results were evaluated by experimentalists and the human studies by an epidemiologist. During the meeting of the Working Group these assessments were debated and adopted, and overall evaluations of carcinogenicity for humans were made on the basis of the combined evidence from humans and experimental systems (Table 1). Brief descriptions of the data on which the assessments and evaluations were based are given in the section on Results, together with references to the Monographs volumes in which they were evaluated previously and, when applicable, to papers published subsequently.

ASSESSMENT OF EVIDENCE FOR CARCINOGENICITY FROM STUDIES IN HUMANS

Evidence of carcinogenicity from human studies comes from three main sources:

1. Case reports of individual cancer patients who were exposed to the chemical or process.
2. Descriptive epidemiological studies in which the incidence of cancer in human populations was found to vary in space or time with exposure to the agents.
3. Analytical epidemiological (case-control and cohort) studies in which individual exposure to the chemical or group of chemicals was found to be associated with an increased risk of cancer.

Three criteria must be met before a causal association can be inferred between exposure and cancer in humans:

1. There is no identified bias which could explain the association.

2. The possibility of confounding has been considered and ruled out as explaining the association.

3. The association is unlikely to be due to chance.

In general, although a single study may be indicative of a cause-effect relationship, confidence in inferring a causal association is increased when several independent studies are concordant in showing the association, when the association is strong, when there is a dose-response relationship, or when a reduction in exposure is followed by a reduction in the incidence of cancer.

The degrees of evidence for carcinogenicity from studies in humans were categorized as:

1. Sufficient evidence of carcinogenicity, which indicates that there is a causal relationship between the agent and human cancer.

2. Limited evidence of carcinogenicity, which indicates that a causal interpretation is credible, but that alternative explanations, such as chance, bias or confounding, could not adequately be excluded.

3. Inadequate evidence, which indicates that one of three conditions prevailed: (a) there were few pertinent data; (b) the available studies, while showing evidence of association, did not exclude chance, bias or confounding; (c) studies were available which do not show evidence of carcinogenicity.

ASSESSMENT OF EVIDENCE FOR CARCINOGENICITY FROM STUDIES IN EXPERIMENTAL ANIMALS

These assessments were classified into four groups:

1. Sufficient evidence of carcinogenicity, which indicates that there is an increased incidence of malignant tumours: (a) in multiple species or strains; or (b) in multiple experiments (preferably with different routes of administration or using different dose levels); or (c) to an unusual degree with regard to incidence, site or type of tumour, or age at onset. Additional evidence may be provided by data on dose-response effects, as well as information from short-term tests or on chemical structure.

2. Limited evidence of carcinogenicity, which means that the data suggest a carcinogenic effect but are limited because: (a) the studies involve a single species, strain, or experiment; or (b) the experiments are restricted by inadequate dosage levels inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, too few animals, or inadequate reporting; or (c) the neoplasms produced often occur spontaneously and, in the past, have been difficult to classify as malignant by histological criteria alone (e.g., lung and liver tumours in mice).

3. Inadequate evidence, which indicates that because of major qualitative or quantitative limitations, the studies cannot be interpreted as showing either the presence or absence of a carcinogenic effect; or that within the limits of the tests used, the chemical is not carcinogenic. The number of negative studies is small, since, in general, studies that show no effect are less likely to be published than those suggesting carcinogenicity.

4. No data indicates that data are not available to the Working Group.

The categories sufficient evidence and limited evidence refer only to the strength of the experimental evidence that these chemicals are carcinogenic

and not to the extent of their carcinogenic activity nor to the mechanism involved. The classification of any chemical may change as new information becomes available.

ASSESSMENT OF DATA FROM SHORT-TERM TESTS

Because of the large number and wide variety of short-term tests that may be relevant for the prediction of potential carcinogens, the data relative to each compound have been summarized in the form of tables. These indicate both the type of test used and the biological complexity of the test system. "DNA damage" includes evidence for covalent binding to DNA, induction of DNA breakage or repair, induction of prophage in bacteria and a positive response in tests of comparative survival in DNA repair-proficient and DNA repair-deficient bacteria. "Mutagenicity" refers to induction of mutations in cultured cells or in organisms (e.g., heritable alterations in phenotype, including forward or reverse point mutations, recombination, gene conversion, and specific-locus mutation). "Chromosomal anomalies" refers to the induction of chromosomal aberrations, including breaks, gaps, rearrangements and micronuclei, sister chromatid exchange and aneuploidy. "Other" refers to various additional endpoints, including cell transformation (T), i.e., morphological transformation and colony formation in agar; dominant lethal (DL) tests; morphological abnormalities in sperm (SA); and mitochondrial mutation (Mt). The biological systems include: "Prokaryotes," i.e., bacteria, in the presence of absence of an exogenous metabolic activation system, and cellular systems; "Fungi and green plants;" "Insects," usually Drosophila melanogaster; "Mammalian cells (in vitro)," studies in which the test compound was administered to intact experimental animals; and "Humans (in vivo),"

studies of cells from groups of individuals drawn from a population exposed to the substance in question.

METHODS

In these tables, a "+" indicates that the result was judged by the Working Group to be significantly in one or more assays; "-" indicates that it was judged to be negative from an evaluation of one or more assays; and "?" indicates that contradictory results were obtained in assays from different laboratories or in different biological systems, or that the result was judged to be equivocal. The individual tables for each compound are summarized, for purposes of comparison, in Appendix 3.

The overall evidence summarized in the table was adjudged to fall into one of three categories, sufficient, limited and inadequate:

1. Sufficient evidence, when there were at least three positive results in at least two of three test systems measuring DNA damage, mutagenicity or chromosomal effects. When two of the positive results were for the same genetic effect, they had to be derived from systems of different biological complexity.

2. Limited evidence, when there were at least two positive results, either for different endpoints or in systems representing two levels of biological complexity.

3. Inadequate evidence, when there were generally negative or only one positive test results. Up to two positive test results were considered inadequate if they accompanied by two or more negative test results.

The Working Group was unable to define criteria for "negative" evidence.

In establishing these categories, the Working Group gave greater weight to the three primary endpoints - DNA damage, mutagenicity and chromosomal effects - and judgments were made on the quality as well as on the quantity of the evidence. In a minority of cases, strict interpretation of these criteria was tempered by consideration of a variety of other factors (such as the purity of the test compound, problems of metabolic activation, appropriateness of the test system) which, in the judgment of the Working Group, would place a compound in a category above or below that indicated by the summary table.

EVALUATION OF CARCINOGENIC RISK TO HUMANS

At present, no objective exist to interpret data from studies in experimental animals or from short-term tests directly in terms of human risk. Thus, in the absence of sufficient evidence from human studies, evaluation of the carcinogenic risk to humans was based on consideration of both the epidemiological and experimental evidence. The breadth of the categories of evidence defined above allows substantial variation within each. The decisions reached by the Group regarding overall risk incorporated these differences, even though the could not always be reflected adequately in the placement of an exposure into a particular category, as listed in Table 1.

The chemicals, groups of chemicals, industrial processes or occupational exposures were thus put into one of three groups:

<u>Group 1</u>

The chemical, group of chemicals, industrial process or occupational exposure is carcinogenic to humans. This category was used only when there

was sufficient evidence from epidemiological studies to support a causal association between the exposure and cancer.

Group 2

The chemical, group of chemicals, industrial process or occupational exposure is probably carcinogenic to humans. This category includes exposures for which, at one extreme, the evidence of human carcinogenicity is almost "sufficient," as well as exposures for which, at the other extreme, it is inadequate. To reflect this range, the category was divided into higher (Group A) and lower (Group B) degrees of evidence. Usually, category 2A was reserved for exposures for which there was at least limited evidence of carcinogenicity to humans. The data from studies in experimental animals played an important role in assigning studies to category 2, and particularly those in Group B; thus, the combination of sufficient evidence in animals and inadequate data in humans usually resulted in a classification of 2B.

In some cases, the Working Group considered that the known chemical properties of a compound and the results from short-term tests allowed its transfer from Group 3 to 2B or from Group 2B to 2A.

Group 3

The chemical, group of chemicals, industrial process or occupational exposure cannot be classified as to its carcinogenicity to humans.

APPENDIX II

DESCRIPTION OF THE QUANTITATIVE RISK EXTRAPOLATION MODELS USED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY*

1.0 INTRODUCTION/CHOICE OF MODEL

There is no really solid scientific basis for any mathematical extrapolation model relating carcinogen exposure to cancer risks at the extremely low levels of concentration that must be dealt with in evaluating environmental hazards. For practical reasons, such low levels of risk cannot be measured directly using either animal experiments or epidemiologic studies. We must, therefore, depend on our current understanding of the mechanisms of carcinogenesis for guidance as to which risk model to use. At the present time, the dominant view of the carcinogenic process involves the concept that most agents that cause cancer also cause irreversible damage to DNA. This position is reflected by the fact that a very large proportion of agents that cause cancer are also mutagenic. There is reason to expect that the quantal type of biological response characteristic of mutagenesis is associated with a linear nonthreshold dose-response relationship. Indeed, there is substantial evidence (from mutagenesis studies with both ionizing radiation and a wide variety of chemicals) that this type of dose-response model is the appropriate one to use. This is particularly true at the lower end of the dose-response curve; at higher doses, there can be an upward curvature, probably reflecting the effects of multistage processes on the mutagenic response. The linear nonthreshold dose-response relationship

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*Adapted from "Water Quality Criteria Documents; Availability," Federal Register, Vol. 45, No. 231, Friday, November 28, 1980, pp. 79350-79353.

is also consistent with the relatively few epidemiologic studies of cancer responses to specific agents that contain enough information to make the evaluation possible [e.g., radiation-induced leukemia, breast and thyroid cancer (Lewis 1957, Court-Brown et al., 1957, Hempelman, et al., 1975 and Myrden et al., 1974); skin cancer induced by arsenic in drinking water (Tseng,1968) and liver cancer induced by aflatoxin in the diet (Linsell et al., 1977)]. There is also some evidence from animal experiments that is consistent with the linear nonthreshold hypothesis (e.g., the initiation stage of the two-stage carcinogenesis model in rat liver and mouse skin).

Because its scientific basis, although limited, is the best of any of the current mathematical extrapolation models, the linear nonthreshold model has been adopted as the primary basis for risk extrapolation to low levels of the dose-response relationship. The risk assessments made with this model should be regarded as conservative, representing the most plausible upper limit for the risk; i.e., the true risk is not likely to be higher than the estimate, but it could be smaller.

2.0 THE MULTISTAGE MODEL

The mathematical formulation chosen to describe the linear nonthreshold dose-response relationship at low doses is the modified multistage model developed by Crump (1980). This model employs enough arbitrary constants to be able to fit almost any monotonically increasing dose-response data, and it incorporates a procedure for estimating the largest possible linear slope (in the 95 percent confidence limit sense) at low extrapolated doses that is consistent with the data at all dose levels of the experiment. For this reason, it may be called a "linearized" multistage model.

2.1 Procedure for Low-Dose Extrapolation Based on Animal Carcinogenicity Data

2.1.1 Description of the Extrapolation Model

Let P(d) represent the lifetime risk (probability) of cancer at dose d. The multistage model has the form

$$P(d) = 1 - \exp\left[-(q_0 + q_1 d + q_2 d^2 + \ldots + q_k d^k)\right]$$

where

$$q_i > 0, \text{ and } i = 0, 1, 2, \ldots, k$$

Equivalently,

$$A(d) = 1 - \exp\left[-(q_1 d + q_2 d^2 + \ldots + q_k d^k)\right]$$

where

$$A(d) = \frac{P(d) - P(0)}{1 - P(0)}$$

is the extra risk over background rate at dose d.

The point estimate of the coefficients q_i; i = 0, 1, 2, ..., k; and consequently the extra risk function A(d); at any given dose, d, is calculated by maximizing the likelihood function of the data.

The point estimate and the 95 percent upper confidence limit of the extra risk A(d) are calculated by using the computer program GLOBAL79 developed by Crump and Watson (1979). Upper 95 percent confidence limits on the extra risk and lower 95 percent confidence limits on the dose producing a given risk are determined from a 95 percent upper confidence limit, q_1^*, on a parameter q_1. Whenever $q_1 \neq 0$, at low doses the extra risk A(d) has approximately the form $A(d) = q_1^* \times d$. Therefore, $q_1^* \times d$ is a 95 percent upper confidence limit on the extra risk and R/q_1^* is an approximate 95 percent lower confidence limit on the dose producing an extra risk of R. Let L_0 be the maximum value of the log-likelihood function. The upper limit, q_1^*, is calculated by increasing q_1 to a value q_1^*, such that when the log-likelihood is remaximized subject to

this fixed value, q*, for the linear coefficient, the resulting maximum value of the log-likelihood L_1 satisfies the equation

$$2(L_0 - L_1) = 2.70554$$

where 2.70554 is the cumulative 90 percent point of the chi-square distribution with one degree of freedom, which corresponds to a 95 percent upper limit (one-sided). This approach of computing the upper confidence limit for the extra risk A(d) is a modification of the Crump et al. (1977) model. The upper confidence limit for the extra risk calculated at low doses is always linear. This is conceptually consistent with the linear nonthreshold concept discussed earlier. The slope, q_1^*, is taken an an upper bound of the potency of the chemical in inducing cancer at low doses.

In fitting the dose-response model, the number of terms in the polynomial, g(d), is chosen equal to (h-1), where h is the number of dose groups in the experiment including the control group.

Whenever the multistage model does not fit the data sufficiently, data at the highest dose are deleted and the model is refitted to the rest of the data. This is continued until an acceptable fit to the data is obtained. To determine whether or not a fit is acceptable, the chi-square

$$X^2 = \sum_{i=1}^{h} \frac{(X_i - N_i P_i)^2}{N_i P_i (1 - P_i)}$$

is calculated, where N_i is the number of animals in the i^{th} dose group, x_i is the number of animals in the i^{th} dose group with a tumor response, P_i is the probility of a response in the i^{th} dose group estimated by fitting the multistage model to the data, and h is the number of remaining groups. The fit is determined to be unacceptable whenever chi-square (X^2) is larger than the cumulative 99 percent point of the chi-square distribution

with f degrees of freedom, where f equals the number of dose groups minus the number of non-zero multistage coefficients.

2.1.2 Selection and Form of Data used to Estimate Parameters in the Extrapolation Model

For some chemicals, several studies in different animal species, strains, and sexes, each conducted at several doses and different routes of exposure, are available. A choice must be made as to which of the data sets from several studies are to be used in the model. It is also necessary to correct for metabolism differences between species and for differences in absorption via different routes of administration. The procedures listed below, used in evaluating these data, are consistent with the estimate of a maximum likely risk.

a. The tumor incidence data are separated according to organ sites or tumor types. The set of data (i.e., dose and tumor incidence) used in the model is the set where the incidence is statistically significantly higher than the control for at least one test dose level and/or where the tumor incidence rate shows a statistically significant trend with respect to dose level. The data set that gives the highest estimate of lifetime carcinogenic risk, q_1^*, is selected in most cases. However, efforts are made to exclude data sets that produce spuriously high risk estimates because of a small number of animals; that is, if two sets of data show a similar dose-response relationship and one has a very small sample size, the set of data which has the larger sample size is selected for calculating the carcinogenic potency.

b. If there are two or more data sets of comparable size that are identical with respect to species, strain, sex, and tumor sites, the geometric mean of q_1^*, estimated from each of these data sets, is used for risk

assessment. The geometric mean of numbers $A_1, A_2, \ldots, A_m$ is defined as $(A_1 \times A_2 \times \ldots \times A_m)^{1/m}$.

c. If sufficient data exist for two or more significant tumor sites in the same study, the number of animals with at least one of the specific tumor sites under consideration is used as incidence data in the model.

d. Following the suggestion of Mantel and Schneiderman (1975), we assume that mg/surface area/day is an equivalent dose between species. Since, to a close approximation, the surface area is proportional to the 2/3 power of the weight, as would be the case for a perfect sphere, the exposure in mg/2/3 power of the body weight/day is similarly considered to be an equivalent exposure. In an animal experiment, this equivalent dose is computed in the following manner. Let:

L_e = duration of experiment

l_e = duration of exposure

m = average dose per day in mg during administration of the agent (i.e., during l_e)

W = average weight of the experimental animal.

Then, the lifetime average exposure is

$$d = \frac{l_e \times m}{L_e \times W^{2/3}}$$

Often exposures are not given in units of mg/day, and it becomes necessary to convert the given exposures into mg/day. For example, in most feeding studies, exposure is expressed as ppm in the diet. In this case the exposure (mg/day) is derived by

$$m = ppm \times F \times r$$

where ppm is parts per million of the carcinogenic agent in the diet, F is the

weight of the food consumed per day in kg, and r is the absorption fraction.

In the absence of any data to the contrary, r is assumed to be one. For a uniform diet, the weight of the food consumed is proportional to the calories required, which in turn is proportional to the surface area of the 2/3 power of the weight, so that

$$m \propto ppm \times W^{2/3} \times r$$

or

$$\frac{m}{rW^{2/3}} \propto ppm$$

As a result, ppm in the diet is often assumed to be an equivalent exposure between species. However, we feel that this is not justified, since the calories/kg of food are significantly different in the diet of man as contrasted with that of laboratory animals, primarily due to differences in the moisture content of the foods eaten. Instead, we use an empirically derived food factor, f = F/W, which is the fraction of a species body weight that is consumed per day as food. We use the rates given as follows:

Species	W	f
Man	70	0.028
Rat	0.35	0.05
Mouse	0.03	0.13

Thus, when the exposure is given as a certain dietary concentration in ppm, the exposure in mg/$W^{2/3}$ is

$$\frac{m}{r \times W^{2/3}} = \frac{ppm \times F}{W^{2/3}} = \frac{ppm \times f \times W}{W^{2/3}} = ppm \times f \times W^{1/3}$$

When exposure is given in terms of mg/kg/day = m/Wr = s, the conversion is simply

$$\frac{m}{rW^{2/3}} = s \times W^{1/3}$$

When exposure is via inhalation, the calculation of dose can be considered for two cases where (1) the carcinogenic agent is either a completely water-soluble gas or an aerosol and is absorbed proportionally to the amount of air breathed in, and (2) where the carcinogen is a poorly water-soluble gas which reaches an equilibrium between the air breathed and the body compartments. After equilibrium is reached, the rate of absorption of these agents is expected to be proportional to metabolic rate, which in turn is proportional to the rate of oxygen consumption, which in turn is a function of surface area.

Case 1

Agents that are in the form of particulate matter or virtually completely absorbed gases, such as SO_2, can reasonably be expected to be absorbed proportionally to the breathing rate. In this case the exposure in mg/day may be expressed as

$$m = I \times v \times r$$

where I is inhalation rate per day in m^3, v is mg/m^3 of the agent in air, and r is the absorption fraction.

The inhalation rates, I, for various species can be calculated from the observation that 25 g mice breathe 34.5 liters/day and 113 g rats breathe 105 liters/day (Federation of American Societies for Experimental Biology, 1974)

For mice and rats of other weights W (expressed in kg), the surface area proportionality can be used to determine breathing rates (in m^3/day) as follows:

$$\text{For mice, } I = 0.0345\ (W/0.025)^{2/3}\ m^3/\text{day}$$

$$\text{For rats, } I = 0.105\ (W/0.113)^{2/3}\ m^3/\text{day}$$

For humans, the value of 20 m^3/day is adopted as a standard breathing rate (International Commission on Radiological Protection, 1977).

The equivalent exposure in mg/$W^{2/3}$ for these agents can be derived from the air intake data in a way analogous to the food intake data. The empirical factors for the air intake per kg per day, i = I/W, based upon the previously stated relationships, are as follows.

Species	W	i = I/W
Man	70	0.29
Rat	0.35	0.64
Mouse	0.03	1.3

Therefore, for particulates or completely absorbed gases, the equivalent exposure in mg/$W^{2/3}$ is

$$\frac{m}{W^{2/3}} = \frac{Ivr}{W^{2/3}} = \frac{iWvr}{W^{2/3}} = iW^{1/3}\ vr$$

In the absence of experimental information or a sound theoretical argument to the contrary, the fraction absorbed, r, is assumed to be the same for all species.

Case 2

The dose in mg/day of partially soluble vapors is proportional to O_2 consumption, which in turn is proportional to $W^{2/3}$ and to the solubility of gas in body fluids, which can be expressed as an absorption coefficient, r, for the gas. Therefore, when expressing O_2 consumption as $O_2 = k\ W^{2/3}$, where k is a constant independent of species, it follows that

$$m = k\ W^{2/3} \times v \times r$$

$$d = \frac{m}{W^{2/3}} = kvr$$

As with Case 1, in the absence of experimental information or a sound theoretical argument to the contrary, the absorption fraction, r, is assumed to be the same for all species. Therefore, for these substances a certain concentration in ppm or ug/m^3 in experimental animals is equivalent to the same concentration in humans. This is supported by the observation that the minimum alveolar concentration necessary to produce a given stage of anesthesia is similar in man and animals (Dripps, et al., 1977). When the animals were exposed via the oral route, and human exposure is via inhalation (or vice versa), the assumption is made, unless there is pharmacokinetic evidence to the contrary, that absorption is equal by either exposure route.

e. If the duration of the experiment, L_e, is less than the natural life-span of the test animal, L, the slope, q_1^*, or more generally the exponent, g(d), is increased by multiplying a factor $(L/L_e)^3$. We assume that if the average dose, d, is continued, the age-specific rate of cancer will continue to increase as a constant function of the background rate. The age-specific rates for humans increase at least by the 2nd power of the age and often by a considerably higher power, as demonstrated by Doll (1971). Thus, we would expect the cumulative tumor

rate to increase by at least the 3rd power of age. Using this fact, we assume that the slope, q_1^*, or more generally the exponent, g(d), would also increase by at least the 3rd power of age. As a result, if the slope, q_1^* [or g(d)], is calculated at age L_e, we would expect that if the experiment had been continued for the full life span, L, at the given average exposure, the slope, q_1^* [or g(d)], would have been increased by at least $(L/L_e)^3$.

This adjustment is conceptually consistent with the proportional hazard model proposed by Cox (1972) and the time-to-tumor model considered by Crump and Watson (1979), in which the probability of cancer by age t and at dose d is given by

$$P(d,t) = 1 - \exp[-f(t) \times g(d)]$$

3.0 CALCULATION OF CARCINOGENIC POTENCY BASED ON HUMAN DATA

If human epidemiologic studies and sufficiently valid exposure information are available for the compound, they are always used in some way. If they show a carcinogenic effect, the data are analyzed to give an estimate of the linear dependence of cancer rates on lifetime average dose, which is equivalent to the factor q_1^*. If they show no carcinogenic effect when positive animal evidence is available, then it is assumed that a risk does exist but it is smaller than could have been observed in the epidemiologic study, and an upper limit of cancer incidence is calculated assuming hypothetically that the true incidence is just below the level of detection in the cohort studied, which is determined largely by the cohort size. Whenever possible, human data are used in preference to animal bioassay data.

In human studies, the response is measured in terms of the relative risk of the exposed cohort of individuals compared to the control group. In the analysis of this data, it is assumed that the excess risk, or relative risk minus one, $R(X) - 1$, is proportional to the lifetime average exposure, X, and that it is the same for all ages. It follows that the carcinogenic potency is equal to $[R(X) - 1]/X$ multiplied by the lifetime risk at that site in the general population. Except for an unusually well-documented human study, the confidence limit for the excess risk is not calculated, due to the difficulty in accounting for the uncertainty inherent in the data (exposure and cancer response).

THE ROLE OF PRODUCT STEWARDSHIP AND CO-SHARED RESPONSIBILITY IN THE AGROCHEMICAL INDUSTRY

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THE ROLE OF PRODUCT STEWARDSHIP AND CO-SHARED RESPONSIBILITY IN THE AGROCHEMICAL INDUSTRY

EXECUTIVE SUMMARY

Product stewardship concerns industry's conduct as it carries out its activities relative to human and environmental consideration.

The activities carried out in this respect find their substance in the product stewardship philosophy which encompasses the fundamental concern of the established industry for the safety and health of all people who make, distribute, and use its products, and for the integrity of the environment.

It is to be known that the established agrochemical industry does practice product stewardship in numerous ways, but as such it is poorly recognized outside the industry and must be clarified.

The practice of product stewardship by multinational agrochemical companies is not always recognized or appreciated because the companies may not have explicitly defined their activities in product stewardship terms. Corporations take it for granted that the product stewardship activities they carry out are understood, but unfortunately, they are not. In this same vein, their many individual product stewardship activities in less developed countries, and the health and environmental benefits derived from them, are not adequately recorded and are seldom reported or made known. Since little, if anything, is ever known about these commitments and accomplishments, the industry is vulnerable to criticism as being indifferent or uncaring about conditions in the less developed countries.

To ensure the degree of human and environmental protection that society expects, without denying it the benefits of plant protection, is a matter of

co-shared responsibility which must include government, manufacturers, distributors/retailers, and users.

Responsibility for environmental management should not be strictly confined to industry. Environmental management, as a practice, should consider all dimensions of an environmental management situation and therein identify all the parties associated with it. The roles and responsibilities of all the involved parties should be defined and then joined in an overall management program based on carrying out co-shared responsibilities.

Some of the many fundamental product stewardship practices that are carried out by multinational companies as they do business in less developed countries, and areas where co-shared responsibilities are necessary in order that the principles and objectives of product stewardship can be fully realized are:

- provide sufficient information on toxicological and environmental properties of agrochemicals before marketing;
- provide information on physical and chemical properties;
- provide biological evaluation data on efficacy and crop safety;
- encourage governments to provide legal means for ensuring proper registration of agrochemicals;
- encourage governments to act on matters promoting safety throughout the entire system and cooperate in these efforts;
- proper labeling is a joint government/industry responsibility;
- provide for proper packaging materials and encourage proper storage, handling, and disposal; and,
- provide for worker health and environmental safety in carrying out the manufacturing and formulation of agrochemicals.

THE ROLE OF PRODUCT STEWARDSHIP AND CO-SHARED RESPONSIBILITY IN THE AGROCHEMICAL INDUSTRY

Product stewardship is a subject that concerns industry's conduct in carrying out its activities and is the substance on which credibility is based. It does require cooperative action with governments and other involved parties and it does have mechanisms of responsibility. Meanwhile, the established agrochemical industry does practice product stewardship, but it is poorly recognized as such and must be clarified.

The product stewardship philosophy encompasses the fundamental concern of the established industry for the safety and health of all people who make, distribute, and use its products, and for the integrity of the environment.

There are certain features of industry that are relevant to this philosophy and its employment that should first be explained:

1. In implementing the product stewardship philosophy, different companies give different titles to this function. Product stewardship is just one of several titles for the subject. Since it is the function, not the title, that is important, we have chosen the title "Product Stewardship" for this paper. The term does have some history in industry and it fits the subject comfortably.

2. There are considerable differences among corporations as to their organization, structure, and management, as well as products produced. Because of this, the approaches to implementing the Product Stewardship philosophy may be quite different.

3. The continuing practice of product stewardship by multinational agrochemical companies is not clearly recognized because the companies have not explicitly defined their activities in product stewardship

terms. There are a few exceptions. Corporations take it for granted that the product stewardship activities they carry out are understood; unfortunately, they are not. In this same vein, their many product stewardship activities in less developed countries, and the health and environmental benefits derived from them, are not adequately recorded and are seldom reported or made known. Since little, if anything, is ever known about these commitments and accomplishments, the industry is vulnerable to criticism as being indifferent or uncaring about conditions in the less developed countries.

The purpose of this paper is to identify certain fundamental product stewardship practices that are carried out by multinational companies as they do business in less developed countries. Included are those matters wherein government and third party cooperation is necessary in order that the principles and objectives of product stewardship can be carried out.

° Sufficient information on the toxicological and environmental properties of pesticide chemicals and products should be available before they are marketed to ensure that a meaningful assessment of hazard to man and the environment can be carried out.

° Information also should be obtained on the physical and chemical properties and purity of the technical grade material used in the formulations, as well as of the formulated product itself. Analytical methods for such determinations are essential. Therefrom, certain criteria of identity, quality and reasonable performance should be identified.

° Biological evaluation data should be available in order to assess the efficacy and crop safety of pesticides. These data may be obtained in the country or region of use, or in other countries or regions with

similar climatic and agricultural conditions.

- The multinational agrochemical industry, as represented by GIFAP member associations, encourages governments to provide a legal means for ensuring that pesticide products are registered, adequate data are supplied by the applicant, only registered products are offered for sale, and that products are used in a manner consistent with the labeling. Such a registration scheme also should provide for adequate control of the registered pesticide products in respect to their quality, their labels, packages and manner of distribution. Even in those countries where a registration processes is not entirely formalized, GIFAP encourages the governments to provide a primary infra-structure with appropriate training and motivation.
- Pesticides are needed and necessary in developing countries for the production of essential food crops. Therefore, governments and industry must share responsibility for judging competence of users, and making pesticides available to those capable and instructed in proper use, or to those able to read, understand, and follow a label. A responsible multinational agrochemical industry and governments can cooperate in many ways in order to accomplish such objectives. For example:

    1) Provide adequate labeling for products in a language appropriate for the importing country;
    2) Cooperate in national and regional programs to inform farmers and their technical advisors on the proper and safe handling of pesticide products. A copy of GIFAP's, "Guidelines for the Safe and Effective Use of Pesticides," in keeping with this product stewardship activity, is appended as Attachment 1.

3) Cooperate in training programs, e.g., for aerial and ground applicators on proper mixing, handling and use;

4) Provide instructions for drivers of vehicles, or other carriers, transporting pesticide products as to proper loading principles and how to proceed in case of an accident; and,

5) Cooperate in providing on-site audits, technical information, safe handling data, labeling advice, quality control monitoring and education for distributors, formulators and customers (where appropriate).

° Labeling is the main method of identifying the pesticide product and communicating instructions and advice to all concerned with its handling during transport, storage, use, or disposal. The development of a satisfactory label is considered to be the joint responsibility of industry and government.

° Packaging material should be impervious to and must not affect the contents under a range of conditions. Adequate storage of pesticides is important both for safety and for maintaining the efficacy of a product. Storage conditions should keep containers and contents in good condition.

° Information on methods of safe disposal of surplus products and empty containers should be provided. Disposal methods and necessary precautions will vary depending upon the products, the container and facilities available.

Product stewardship practices for worker safety and environmental controls in the manufacturing and formulating of agrochemicals are conducted by the established industry in their facilities in developed and developing countries. However, there are health, environmental, and economic risks to

less developed countries who may themselves engage in these activities unless they observe the same product stewardship practices employed by the established industries. It requires a high level of expertise and considerable investment if the proper product stewardship practices are to be instituted.

The International Group of National Associations of Agrochemical Manufacturers (GIFAP) addressed this matter in a presentation on, "Key Issues on Establishing Plants in Developing Countries for the Formulation of Agrochemicals." The paper was presented at a United Nations Interagency Conference, including UNIDO, UNEP, FAO, WHO, in June 1983, and is appended as Attachment 2. In describing the required infra-structure of a formulating plant, several product stewardship considerations are included, but are not so identified in the following quotation from the report. Asterisks have been added to identify the product stewardship considerations.

> The (formulating) infra-structure required should include a *quality control laboratory, *a waste disposal unit (incinerator), *an effluent treatment unit (if necessary), *medical facilities, *washing and changing facilities, *a canteen (if necessary) warehousing, a workshop, administration offices, utilities (electricity, steam and air), *a catchment system for contaminated rain and fire water, firm access roads, *firm and impermeable areas for the storage and loading of products, and a building for the formulation and filling units. If this infra-structure is already available then the investment required can be of the order of US$0.5-5 million, depending on the complexity of the process. If only a "green site" is available, then the investment required will be significantly higher.

Product stewardship standards and practices have been published by GIFAP and distributed worldwide. A copy of the GIFAP booklet entitled "Guidelines for the Safe Handling of Pesticides During their Formulation, Packing, Storage and Transport," is appended as Attachment 3.

The effective implementation of the Product Stewardship philosophy in an agrochemical business is embodied in at least two principles: (1) product stewardship should be appropriately carried out by all employees around the world, and (2) when applying product stewardship standards do not attempt to

differentiate between societies in which a company operates, but apply constant standards.

The perceptions that arise when the agrochemical industry is viewed from a distance can indeed be biased in uncertainty. A closer view of the established industry would better reveal that the necessary and appropriate considerations for human and environmental safety are in effect.

Meanwhile, there are other parties that are essential to the process of ensuring safety and maximizing benefits to society that must be recognized and their role identified. The manufacturer's product stewardship practices are not, in and of themselves, the total means to ensuring environmental integrity and human safety. An exception may be in the controlled processes of manufacturing and formulating, and even here government plays a role.

To ensure the degree of human and environmental protection that society expects, without denying it the benefits of plant protection, is a matter of co-shared responsibility which must include government, manufacturers, distributors/retailers, and users.

The nature of these responsibilities, which should be considered universal, are described in part as follows in Section 5.2.1 of a Research Report on Labeling, Application and Formulation, copy appended as Attachment 4.

> A. Manufacturer - The prime responsibility rests with the manufacturer who first must be satisfied that the product fulfills the many requirements demanded by the public, and the government authorities charged to watch the public interest. The manufacturer must ensure that there is adequate scientific evidence to support all claims for efficacy and safety.
>
> B. Government - Basically, the responsibility of the government is to protect the unwary from the unscrupulous: prevent unsubstantiated claims; ensure adequate directions for use; highlight precautions and limitations in use; protect the uninitiated from his own ignorance; safeguard reputable manufacturers from spurious claims by disgruntled users; and engender confidence in the system by the general public.
>
> C. Vendor - The responsibility of the sellers and distributors of pesticide products is to make certain that they do not offer products for sale which are not registered and that they do not

promote uses which are not recommended on approved labels.

D. User - The user is responsible for following the directions on the registered label.

Recognition that co-shared responsibility for agrochemical safety among the principals, in this case government and distributors, is essential was demonstrated by the Economic and Social Commission for Asia and the Pacific, Committee on Agricultural Development. A report, dated November 5, 1981, E/ESCAP/AD4/10 (copy appended as Attachment 5), includes a program exemplifying the sharing of responsibility for promoting safety by governments and subsequently distributors. The program includes:

> 3.(a) A pesticide management training programme aimed at retail level agro-pesticides distributors within the ESCAP region. The long-term objective of this training programme is to professionalize the retail-level agro-pesticides distributors with special reference to the safe handling and effective use of agro-pesticides. These distributors are recognized by ARSAP as being an important communication channel to pass on information about proper handling of agro-pesticides to the farmers.

The report further notes that the program was undertaken on a regional basis to include eight nations, thereby indicating the appreciation for and the acceptance of these important co-shared responsibilities.

The fact that achieving human and environmental safety in the use of agrochemicals and maximizing their benefits to society is a co-shared responsibility was also recognized by the FAO in its Report, "Second Government Consultation on International Harmonization of Pesticide Registration Requirements," October 1982. The report, in recommending a Code of Conduct in the distribution and use of pesticides aimed at countries lacking an effective pesticide registration process, states that, "In developing such a Code, the Consultation expressed the view that the Director-General should consider the responsibilities of all people involved in the safe and effective use of pesticides including governments, manufacturers, distributors and users ..."

It is to be realized that, from a practical standpoint, whatever benefits can be derived from such a Code can only be realized by employing the concept of co-shared responsibility among all the parties -- manufacturers, government, distributors, and users.

In summary, responsibility for environmental management should not be strictly confined to industry. Environmental management, as a practice, should also consider all dimensions of an environmental management situation and therein identify all the parties associated with it. The roles and responsibilities of all the involved parties should be defined and then joined in an overall management program based on carrying out co-shared responsibilities.

CONTRIBUTOR

This invited paper is offered as a contribution to the objectives of the November 1984 UNEP World Industry Conference on Environmental Management by the International Group of National Associations of Agrochemical Manufacturers (GIFAP).

June 1984

ATTACHMENT 1

GUIDELINES

for the safe and effective use of pesticides

ATTACHMENT 2

Guidelines

for the safe handling of **pesticides** during their formulation. packing, storage and transport.

GIFAP

GROUPEMENT INTERNATIONAL DES ASSOCIATIONS
NATIONALES DE FABRICANTS DE PRODUITS AGROCHIMIQUES

INTERNATIONAL GROUPOP NATIONAL ASSOCIATIONS
DE MANUFACTURERS OF AGROCHEMICAL PRODUITS

ATTACHMENT 3

(GIFAP paper for presentation at the UN interagency meeting to be held in Geneva from 6-10 June 1983)

KEY ISSUES ON ESTABLISHING PLANTS IN DEVELOPING COUNTRIES FOR THE FORMULATION OF AGROCHEMICALS

INTRODUCTION

The issues involved in the local formulation and packaging* of both chemical and biological pesticides are more complex than might be apparent at first sight.
Developing countries have a special interest because they foresee local production leading to:

- lower foreign currency requirements (for imports)
- possible foreign currency generation (from exports)
- lower prices to farmers
- increased local employment opportunities

However, having a local formulation plant does not necessarily mean that all of the abovementioned aims can be achieved.
This paper has been written to give a better appreciation of the subject of pesticide formulation production. It first details how formulation fits into the overall agrochemical business scene and against this perspective it then details the key issues relating to the establishment of formulation plants in developing countries. Finally it discusses how the Agrochemical Industry has assisted, and can further assist developing countries wishing to set up their own local agrochemical formulation facilities, and some suggestions are made on the role of the UN agencies in this matter.

BACKGROUND

Agrochemical formulation is the stage between the manufacture of the active ingredient (which can be of either a chemical or biological nature) and the marketing of the ready-to-use product. Formulation is the process whereby the active ingredient is put into a form that can be both conveniently and safely applied by the farmer. In essence it involves the physical modifying and/or mixing of the active ingredient with inert ingredients, such as solvents, mineral carriers and surface active agents. It ranges from the production of emulsifiable concentrates by the dissolution of an active ingredient and emulsifier(s) in a solvent, to the production of suspension concentrates by the wet grinding of a suspension of active ingredient and surface active agents in either water or oil.
Active ingredient manufacture is a natural sequential operation for a company that undertakes its own research and development (R & D). It is during the development stage that the manufacturing know-how is generated.

* throughout this paper the word formulation is used to cover both formulation and packaging activities

Formulation know-how is developed at the same time and hence formulation is a natural sequential undertaking for companies that manufacture their own active ingredients.

Investment by industry in agrochemical R & D has the same objective as any other investment, namely, to generate a reasonable return within a reasonable period. Failure to do this would oblige the companies concerned to seek an alternative use for their shareholder's capital.
The size of investment required for an agrochemical R & D programme is now-a-days so large (on average US$30 million per year) that only the major chemical companies can afford it, and even then only if they are successful at discovering, developing, manufacturing and marketing profitable new products. This explains why only some 40 companies worldwide have an innovative agrochemical capability. It is these companies who develop the necessary manufacturing and formulation know-how and who are the prime investors in production plants for new products.
The first plant that a chemical company builds to produce a new active ingredient is the primary plant. Subsequent plants are called secondary plants. Primary plants are virtually always located:

- in one of the world's major agrochemical markets
- close to feedstock
- close to research and development facilities
- where they can share an existing manufacturing location that has the required infra-structure i.e. laboratory, services etc.

From Table 1 it can be seen that the larger part of the world agrochemical market is concentrated in three areas, namely:

	% of world market
North America (USA and Canada)	ca. 35
Western Europe	ca. 20
Japan	12

It is therefore no surprise to find that primary active ingredient plants are almost exclusively located in either North America, Western Europe or (to a lesser extent) Japan. These primary plants are, of necessity, normally designed to produce the major part of the anticipated world requirements of a particular pesticide.
Secondary active ingredient plants are not very common, particularly for proprietary products. This is because of a number of reasons that are beyond the scope of this paper but include the inflexibility of these plants, their high capital cost and the frequent lack of local raw materials and technical resources.
Formulation plants are, however, widely spread around the world, being particularly numerous in those industrialised and developing countries that have a large local agrochemical market and have local availability of raw materials. Flexibility and relatively low capital cost are other key reasons for this proliferation. It should be noted however, that for some biological pesticides instability of the unformulated active ingredients means that formulation must be carried out immediately following production of the active ingredient and therefore the formulation plant needs to be located on the same site as the active ingredient production plant.

Local formulation plants can be divided into several categories and sub-categories, namely:

i) those operated by private enterprise. This includes
   - the manufacturers of the active ingredients (typically major national or multi-national chemical companies), and
   - local independent companies.

ii) those operated by non-profit-making organisations such as farmers cooperatives and local authorities.

A factor to be considered for plants operated by local independent companies and non-profit-making companies is whether the plant is dependent on proprietary products or commodity products.For proprietary products the supplier of the active ingredient must protect his corporate reputation and brand image and therefore before making product and know-how available he will require guarantees from local formulators with respect to safety, industrial hygiene, environmental protection and quality control. In the course of time he will provide the formulator with a regular updating of information relating to matters such as toxicological and analytical developments. For commodity products however, both products and formulation know-how are often freely available and a local formulator will only be obliged to satisfy local legal requirements on safety, quality etc.

KEY ISSUES REGARDING PLANT LOCATION

When deciding whether or not to build a local formulation plant, be it in an industrialised or developing country, there are a number of key issues that must be considered.

JUSTIFICATION

This depends on the standpoint adopted. Private enterprise must be assured of economic viability before committing funds to investment in a plant. At the same time it is highly unlikely that a non-profit-making organisation such as a farmers cooperative or a local authority would contemplate investing capital in a venture that was likely to operate at a loss. In order to make a rational decision the factors that must be analysed and evaluated are as follows:

a) Market volume and potential

A detailed estimate must be made of the local market volume and future potential. This should be accompanied by similar estimates for the selling prices of the formulations to be produced. It is essential that these estimates be as reliable as possible and therefore predictions should be based on as many previous years' figures as can be obtained. Care should be taken not to build in distortions that may have been caused by, for example, unusual climatic conditions. It is also most important in a developing country market environment to take into account any existing and anticipated agricultural development plans or Government policies because these can have a major impact on market direction and rate of change.
Formulation plants, unlike active ingredient plants, are generally reasonably flexible in being able to produce not one specific product but a range of formulations of one type e.g. liquid insecticidal

products containing different active ingredients. This makes them less vulnerable to product changes in the market.

b) Availability of raw materials

A number of key formulation ingredients such as mineral carriers and solvents are locally available in some developing countries and, if they are reasonably priced, this is a major step towards making local formulation an attractive venture. A virtually essential prerequisite is that the product packs must also be locally manufactured because the importation of packaging materials would be a very expensive requirement.
There are countries where the quality of some local ingredients is not high enough or consistent enough for producing formulations having an acceptable minimum quality. Typical problems include impurities in mineral carriers or water in solvents, either of which can lead to decomposition of the active ingredient. If major ingredients need to be imported this can result in locally formulated products costing more than the imported formulations because of freight and packaging costs and the fact that bulk-buying discounts available to high volume central plants are not usually available to low volume local plants.

c) Technical resources

The complexity of a formulation plant depends on the process involved. The commonest type of plant is the liquid blending unit which, although relatively simple still contains items such as flame-proof electrical motors and switchgear, pumps and the filling machine. In addition, items of the plant infra-structure such as the utilities unit and the laboratory require certain technical resources. These resources include:

. design, engineering and construction expertise
. equipment and spare parts supply
. technical service

All of these can of course be imported but this requires foreign currency, it is expensive and it is time consuming. If a developing country already has a chemical or closely related industry in the area of the intended formulation plant it is more likely to have the necessary local technical resources than one that does not. If there is no technological culture or industrial infra-structure in the area of the intended plant, and if the local resources are limited, serious consideration should be given to whether a local formulation venture is worth progressing.

d) Personnel

The key jobs in a formulation plant, for example the plant manager, quality control chemist and maintenance engineer, require a high calibre of staff who have good experience or who have had good training in this type of work. The level of operator in a formulation plant must be good enough to ensure a safe and economic operation. Once again, if a developing country already has its own chemical industry in the area of the intended plant then it may have an adequate reservoir of the right calibre of personnel.

e) <u>Economics</u>

The level of investment required for a formulation plant will depend very much on whether there is an existing site with the necessary infra-structure. The infra-structure required should include a quality control laboratory, a waste disposal unit (incinerator), an effluent treatment unit (if necessary), medical facilities, washing and changing facilities, a canteen (if necessary), warehousing, a workshop, administration offices, utilities (electricity, steam and air), a catchment system for contaminated rain and fire water, firm access roads, firm and impermeable areas for the storage and loading of products, and a building for the formulation and filling units. If this infra-structure is already available then the investment required can be of the order of US$0.5-5 million, depending on the complexity of the process. If only a "green site" is available then the investment required will be significantly higher.

Whether a local formulation venture is being financed and operated by a private enterprise or by a non-profit-making organisation the likely economics of the operation must be evaluated. Such an evaluation requires the making of a cash flow calculation using the estimated figures (over a 5-10 year project life) of sales volume, selling prices, manufacturing costs, working capital costs, financing costs, local taxes and capital investment. From this cash flow calculation various profit indicators can be calculated, such as the internal rate of return, the net present value and the return on investment. Alternatively, the mininum acceptable internal rate of return can be fixed and from that the prices at which the end products should be sold (for example, to members of a cooperative) can be calculated.

GENERAL BUSINESS CONSIDERATIONS

Problems in developing countries that can make investment in local formulation plants unattractive include:

a) <u>Exchange controls</u>

It is not uncommon for certain developing countries to impose exchange controls that can be as severe as preventing the issuing of letters of credit. This can have a disastrous effect on plant production and economic viability if a company is dependent on imported raw materials or spare parts.

b) <u>Extreme changes in exchange rate</u>

A high local rate of inflation against the world's major currencies has been a major problem for a number of developing countries in recent years. This can make local formulation unattractive if key ingredients (including the active ingredient) need to be imported. This is because such imports usually have to be paid for in hard currency around the time of delivery. They are then processed and sold in local currency. In the agrochemical business it is common practice for farmers to pay for products a number of months after taking delivery, and even after harvesting. In the meantime the value of the local currency has been decreasing against the major world currencies but local selling prices have been unable (or not allowed by price controls) to keep pace. This

is particularly the case in countries that occasionally impose maxi-devaluations of their currency.
Such a financial climate is not conducive to attracting investment from private enterprise because it is very difficult to make a reliable estimate of the likely economic viability of a business venture.

c) Profit and dividend remittance

If investment in a local formulation plant is to be made either wholly or in part from outside of a developing country, for example, by a manufacturer of active ingredient, then there should be an assured mechanism for remitting profits or dividends back to the investor.

d) Protection of foreign investment

If a foreign company is considering investing capital in a local formulation venture then it has to be certain that its investment will be protected against such possibilities as nationalization, because experience has shown that compensation, if paid, is rarely adequate.

PROVISION OF KNOW-HOW AND SERVICES

The sort of know-how required for local formulation includes product recipes, processing conditions, product and packaging specifications, analytical methodology and regulatory data. This may be freely available for some commodities but for proprietary products it is the industrial property of the patent holder. The types of services that can be required include process trouble-shooting, safety/quality auditing and training of personnel.
Know-how can, of course, be provided to either an independent, a joint-venture or a wholly-owned local company by the developer of the know-how, but guarantees must be given that the know-how will be protected by the local laws of the country from being disclosed to others. A mechanism for the remittance of know-how fees and/or service-fees may be required.

ESSENTIAL SAFETY, HEALTH, ENVIRONMENTAL AND QUALITY REQUIREMENTS

There are a number of aspects related to the formulation of agrochemicals about which there should be no compromise, whether production be in an industrialised or developing country or whether it be carried out by a major or small company. These aspects are:

a) Safety

Like many other chemicals, pesticides and their formulations can be flammable and are sometimes dust explosive. At the same time they can also be toxic to man. Since the production of formulations involves the handling of large quantities of these products special procedures and precautions must be adopted if hazards are to be adequately contained. This requires good management, good plant design, good operational practices and the provision of the necessary equipment and infra-structure.

Aspects specific to safety include, for example, flame-proof electrical equipment for handling flammable liquids, explosion-prevention or -containment equipment for handling explosive dusts and hydrocarbon propellents (for aerosols), fire-fighting equipment that is appropriate for agrochemical fires, and emergency showers and eye wash units. Such facilities are, of course, of little value if they are not well maintained and if there is no experienced and reliable management with well trained and reliable operators.

b) Industrial hygiene and occupational health

Poor industrial hygiene can lead to poor occupational health. Industrial hygiene is particularly important in agrochemical formulation plants because of the toxic nature of some of the products. Key requirements include an effective ventilation system, the avoidance of drips, splashes and spills, the use of clean protective clothing, regular washing and showering, and the prohibition of practices such as eating, drinking and smoking in the plants.
Even with these requirments being enforced there should also be medical surveillance of the operators together with medical facilities for dealing with emergencies. Once again good management, good maintenance and good operational procedures are essential.

c) Environmental protection

During the past few years a number of agrochemical companies have begun to suffer the consequences of having, many years ago, disposed of agrochemicals in land-fill sites. This was generally done with the consent of the authorities. Poor records of where products were dumped, combined with the development of more sensitive analytical techniques and more rigorous ecotoxicological regulations have resulted in these practices becoming either banned or strictly controlled in a number of industrialised countries. This has led to the development of a thriving waste disposal business in these countries, with either private enterprise or the local authorities setting up and operating incinerators. Such facilities are rarely available in developing countries and hence it is a virtual prerequisite when building a new plant in a developing country to also build an effective waste disposal facility. This naturally increases the initial investment cost, particularly if the facility cannot be shared with other adjacent chemical plants.

d) Quality

Agrochemicals are products that are judged by their performance, and hence, if a local market is to be either maintained or hopefully increased, the farmer must be assured that the product he buys will always be of good quality.
Agrochemical quality control begins with checking the quality of the incoming ingredients and packaging materials. Once the product has been formulated it is necessary to determine the active ingredient content and carry out a number of key physical tests such as emulsion stability and suspensibility. When the formulation is packed, the filled pack should be checked for weight/volume packed, container leakage/damage and correct labelling.

All of these tests require specifications containing the appropriate test methods and specification limits. Active ingredient determination usually requires the purchase of rather expensive instruments such as gas chromatographs and/or infra-red spectrophotometers, with the added need for skilled and competent quality control chemists. The determination of the potency of biological insecticide formulations cannot be done by conventional chemical techniques. These are usually tested by bioassay using live insects. Insect-rearing facilities are therefore required and the quality control technician needs to have entomological training.
Because of the risk of degradation, care should be taken not to hold stocks of active ingredient or formulated product for too long in hot climates.

The above-mentioned aspects are of such importance that it would be unwise to contemplate local formulation if any one of them cannot be made to reach the required standard. (Guidance on the standards required for safety, hygiene and environmental control are given in the GIFAP booklet "Guidelines for the safehandling of pesticides during their formulation, packing, storage and trarsport"). It is most important that standards are maintained once operation commences. They should be monitored by having regular audits. If a local company is undertaking formulation of a proprietary product the patent holder will generally make certain demands regarding quality, safety etc. before allowing local formulation of his product. He is obliged to do this in order to protect his corporate reputation and brand image.

CONCLUSIONS

It is apparent from the foregoing that the issues involved in locating agrochemical formulation plants in developing countries are quite complex. Investment in such ventures can be made by either foreign or local private enterprise, or by a non-profit-making organisation such as a farmers cooperative or a local authority. Independent of who makes the investment the venture must:

- be economically viable i.e. profitable from a private enterprise standpoint and (perhaps) able to produce cheaper products from a cooperative standpoint
- have access to good quality and reasonably priced local raw materials and packaging materials, and have access to active ingredients
- have access to competent and experienced local personnel
- have access to local technical resources
- not be handicapped by exchange-control and exchange-rate problems
- have access to know-how and services
- be safe, hygienic and environmentally secure
- produce products of good quality.

THE ROLE OF THE AGROCHEMICAL INDUSTRY IN HELPING DEVELOPING COUNTRIES

The Agrochemical Industry, either as independent companies or through its international association (GIFAP), can help developing countries who wish to undertake local formulation production in the following ways:

a) <u>as independent companies</u>

. a major agrochemical company may decide that investment in a formulation plant in a particular developing country would be worthwhile. It would then proceed independently or as a joint venture with a local company. There are many examples where this has already been done in developing countries.

. know-how can be provided to a local venture. This can be:

- product-related know-how that could be provided by individual active ingredient suppliers as part of a product- supply arrangement
- know-how related to process design, plant construction or plant operation that could be provided by individual major agrochemical companies on either a straightforward consultancy basis or linked to a product-supply arrangement

b) <u>as GIFAP</u>

GIFAP has recently taken the initiative of producing the following illustrated booklets which cover the general subjects of safety, hygiene, health and environmental protection:

. "Guidelines for the safehandling of pesticides during their formulation, packing, storage and transport". (1982)
. "Guidelines for the safe and effective use of pesticides". (1983)

The formulation booklet has been printed in both English and Spanish and is proving already very popular with both local agrochemical formulators and the appropriate Government authorities. 20,000 copies of the English edition have already been issued.

Agrochemical experts of member companies of GIFAP have also contributed substantially to the second edition of the UNIDO book "Industrial Production and Formulation of Pesticides in Developing Countries". This edition will be published during 1983 and it contains a comprehensive chapter on local formulation plant ventures called "Key Decision Criteria for Establishing a Local Formulation Plant". Other chapters in the book deal with subjects such as plant design, safety and quality control.

GIFAP also acts, from time to time, as an adviser to UN agencies. For example, GIFAP is presently assisting WHO with the reviewing and finalizing of its document called "Control Technology-Guidelines for the safe formulation, storage and transport of pesticides". GIFAP will also contribute to a forthcoming UNEP Workshop on the incorporation of environmental aspects into pesticide development project planning and implementation.

THE ROLE OF THE INTERNATIONAL AGENCIES IN HELPING DEVELOPING COUNTRIES

GIFAP believes that it is essential for the UN agencies to have a balanced and well coordinated approach when considering the local formulation of pesticides in specific developing countries. In order to avoid duplication of effort and to have harmony of purpose it is GIFAP's opinion that formulation plant feasibility studies would best be carried out by an Interagency Task Force. This Task Force would contain the appropriate specialists from each interested UN agency. It would not sit permanently but would be convened whenever a request for assistance was received from a developing country.

It would naturally be important for developing countries to be made aware of the existence of the Task Force. They should also be asked to make clear their specific motives when requesting the help of the Task Force.

However, in addition to undertaking feasibiity studies for new formulation plants in specific developing countries where there is either no or insufficient formulation capacity GIFAP firmly believes that the UN agencies should also make a concerted effort to improve the standards of safety, hygiene, environmental protection, quality and efficiency in those formulation plants that already exist in many developing countries.

GIFAP would be willing to contribute to Interagency Task Group meetings in an observer capacity.

TABLE 1: The world's major agrochemical markets (excluding public health outlets)

Country	Estimated 1981 sales value (US$ million)	% of world market
1. USA	4,200	32.3
2. Japan	1,560	12.0
3. France	965	7.4
4. Brazil	875	6.7
5. Soviet Union	545	4.2
6. United Kingdom	470	3.6
7. West Germany	468	3.6
8. Italy	410	3.2
9. Canada	340	2.6
10. Hungary	275	2.1
11. India	245	1.9
12. Spain	240	1.8
13. Mexico	235	1.8
14. Austrialia	225	1.7
15. South Korea	160	1.2
16. South Africa	150	1.2
17. East Germany	130	1.0
18. Indonesia	120	0.9
19. Netherlands	110	0.8
Total	11,723	90.3
World Market	13,000	100

Note: No reliable figure is available for China

Information taken from: Wood Mackenzie and Co., Agrochemical Service, October 1982

Attachment 4

THE POLICY SCIENCES CENTER, INC.
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NEW YORK, N. Y. 10007, 212-964-6818
CHAIRMAN OF THE BOARD AND PRESIDENT
MYRES S McDOUGAL
EXECUTIVE DIRECTOR
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IMPROVING THE SAFE USE OF AGRICULTURAL CHEMICALS IN LATIN AMERICA:

A RESEARCH REPORT ON LABELING, APPLICATION AND FORMULATION.

by: Dr. Harvey L. Cromroy

Dr. Lawrence O. Roth

Mr. Kenneth J. May

The Policy Sciences Center, Inc.
New York, New York
December 22, 1980

With the support of the
Charles F. Kettering Foundation,
the Rockefeller Brothers Fund,
and the U. S. Agency for
International Development

A Note to the Reader:

This report is a part of a broader project directed by the Policy Sciences Center. The project is a consultative process between governments in Latin America and the international chemical industry, to improve the safe-use of agricultural chemicals.

In the first half of the project, which ended in February, 1979, it was agreed by both government and industry participants that the priority was to improve safe use in three areas: labeling, application and formulation.

At that time, it was also agreed that background research would be done, to be followed by an exchange of position papers, and a final meeting to seek a consensus on action.

This half of the project was funded by the Charles F. Kettering Foundation, the Rockefeller Brothers Fund and the United States Agency for International Development.

It was in this context that the Center commissioned these independent research reports. Research on labeling was commissioned from Dr. Harvey L. Cromroy (University of Florida); research on application from Dr. Lawrence O. Roth (Oklahoma State University) and research on formulation from Mr. Kenneth J. May (International Business Consultant). Dr. Cromroy wrote the general introduction, conclusion and edited the overall report.

5.2.1 Gonzalez (39) noted that agricultural development in Latin America is characterized by a steady expansion of the cultivated area with impressive developments in the production of food crops which have occurred in some countries. Two excellent examples are Columbia's rice production which increased from less than 400,000 metric tons in the late 1950's to over a million tons in recent years and Brazil's soybean production which went from less than 200,000 tons in the late 1950's to 7 million tons in 1974 and currently ranks Brazil as the third largest producer of soybeans in the world. Pesticides have played a significant role in the intensification of agricultural production in Latin America, and it can be anticipated that the ever-increasing demand for food in the region will coincide with an increase in the amounts of pesticides used. The regulation of pesticides is to provide society with maximum protection from adverse effects while not denying it access to benefits. The registration requirements establish the manner in which a pesticide may be marketed and used. Registration implies a number of different controls among which evaluation is the most important. The assessment of a pesticide for registration purposes requires that extensive scientific information be developed by the manufacturer on all aspects of the product, its properties and performance. Legislation for pesticide registration must provide a system under which the public's interest and the manufacturer's rights are protected. There are four levels of responsibility associated with pesticide registration. These are as follows:

A. Manufacturer - The prime responsibility rests with the manufacturer who first must be satisfied that the product fulfills the many requirements demanded by the public, and the government authorities charged to watch the public interest. The manufacturer must ensure that there is adequate scientific evidence to support all claims for efficacy and safety (68).

References

(39) Gonzalez, R.H. 1976 Crop Protection in Latin America with special reference to integrated pest control. FAO Plant Protection Bull. vol. 24(3) : 65-75.
(68) Snelson, J.T. 1978. The need for and principles of pesticide registration. FAO Plant Protection Bull. vol. 26 (3): 93-100.

B. Government - Basically, the responsibility of the government is to protect the unwary from the unscrupulous: prevent unsubstantiated claims; ensure adequate directions for use; highlight precautions and limitations in use; protect the uninitiated from his own ignorance; safeguard reputable manufacturers from spurious claims by disgruntled users; and engender confidence in the system by the general public (68).

C. Vendor - The responsibility of the sellers and distributors of pesticide products is to make certain that they do not offer products for sale which are not registered and that they do not promote uses which are not recommended on approved labels.

D. User - The user is responsible for following the directions on the registered label.

5.2.2 Freed and Snelson (35) have pointed out that it would be desirable to the extent possible in keeping with sovereignty and singular needs of individual nations to achieve a degree of international uniformity in requirements for registration of pesticides. The advantages of such a goal is supported by the following reasons:

A. Developing countries with limited resources need technical guidance to set up and administer laws of their own.

B. The active ingredients of pesticides are international commodities developed by relatively few countries with an advanced chemical industry, but they are formulated in many countries and sold in most.

C. Toxicological, biological and environmental research is extremely costly, and meeting the demands of registering authorities now represents the major component of the cost of developing a new pesticide.

Attachment 5

UNITED NATIONS
ECONOMIC
AND
SOCIAL COUNCIL

GENERAL

E/ESCAP/AD.4/10
5 Nobember 1981

ORIGINAL: ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

Committee on Agricultural Development

Fourth session
12-18 January 1982
Bangkok

REVIEW OF ACTIVITIES AND CONSIDERATION OF ISSUES CONCERNING INCREASED SUPPLIES OF AGRICULTURAL REQUISITES

(Item 5 (c) of the provisional agenda)

ARSAP/2/AGRO-PESTICIDES ACTIVITIES

<u>Note by the secretariat</u>

1. In its early years since 1975 the agricultural requisites scheme for Asia and the Pacific (ARSAP) concentrated exclusively on fertilizer studies. In August 1978, the fertilizer component was taken over by the Fertilizer Advisory, Development and Information Network for Asia and the Pacific (FADINAP), and ARSAP entered its second phase on agro-pesticides with a nucleus staff (ARSAP/2/Agro-pesticides). Only after new international staff joined from February 1979 onwards could its operations gain momentum. The staffing situation is as shown. The project in its totality is funded by the Government of the Netherlands.

Field	Approved positions Employment	Duration
Team leader*	August 1979-May 1980	9 months
Plant protection expert	February 1979-February 1982	3 years**
Marketing economist associate expert	March 1979-August 1981	2½ years
Plant protection expert	November 1979-November 1981	2 years
Agricultural economist associate expert	August 1980-August 1982	2 years

* The team leader served FADINAP and ARSAP/2/Agro-pesticides at the same time.

** An extension of the contract of the senior plant protection expert until August 1982 is expected to be approved (duration 3½ years).

2. Since the departure of the ARSAP/FADINAP team leader in May 1980, the ARSAP team has managed its work programme with the senior officer in charge.

3. The two main components of the ARSAP/2/Agro-pesticides programme concern:

(a) A pesticide management training programme aimed at retail level agro-pesticides distributors within the ESCAP region. The long-term objective of this training programme is to professionalize the retail-level agro-pesticides distributors with special reference to the safe handling and effective use of agro-pesticide These distributors are recognized by ARSAP as being an important communication channel to pass on information about proper handling of agro-pesticides to the farme

4. To carry out long-term and systematic national training of various categorie of pesticides distributors at the retail level, a national training capacity in the form of mobile teams of national instructors needs to be developed. Such teams would have to carry out short (three to five days) but intensive training courses at the district level in the respective national language. Therefore, a two-step approach has been adopted. In participating countries of the ESCAP region, ARSAP has undertaken the training of national instructors in training planning workshops o: two weeks' duration. The workshops are aimed at defining precise training objective: and developing a national training course consisting of a lesson plan, a training manual and supporting training aids in accordance with national needs and conditions. In the second phase, the national counterpart agency in the programme is to implement the training of retailers by the designated instructor teams.

5. More specifically, the direct objectives of these workshops are:

- To increase the ability of the participants in planning, preparing organizing and conducting a training course on pest and pesticide management for agro-pesticides retail distributors;

- To produce together with the participants a lesson plan, training manual and teaching aids for the follow-up training courses as mentioned above;

- To increase the knowledge of the participants of relevant technical matters such as plant protection, integrated pest management and the safe and effective use of agro-pesticides.

(b) The establishment of a regional economic survey and information service on the supply, distribution and use of agro-pesticides, whose purpose is to assess the present situation and the magnitude of possible deficiencies. The information was collected at the source in 13 countries, since in almost none of the countries was it readily available. The information collected was analysed by ARSAP and the findings are disseminated through:

- Publication of Agro-Chemicals News in Brief (joint bulletin with FADINAP);

- Production of country reports;

- Production of a regional comparative study on the supply, distribution and use of agro-pesticides.

6. This kind of information is of paramount importance for proper policy formulation in the field of agro-pesticides by the Governments of the participating countries as well as by international development organizations and private industry. In particular, the regional comparative study will enable Governments of the developing countries in the ESCAP region to assess the agro-pesticides situation in their own countries by comparing it with the situation in other countries in the region and as a result enable them to formulate policies to rectify or improve the situation.

7. In connexion with preparations for the implementation of the regional programme of retail-level distributors in pesticide management, the ARSAP team has contacted 13 countries of the ESCAP region.

8. Since October 1979, the preparations undertaken during that year towards the actual implementation of the work programme have yielded an ongoing flow of activities during 1980 and 1981.

9. The regional programme for training of retail-level distributors in pesticide management was undertaken. Under this programme, eight training planning workshops have been conducted in co-operation with the Governments of Bangladesh, Burma, Indonesia, Nepal, Pakistan, the Philippines, Sri Lanka and Thailand. The next ARSAP training planning workshop will probably be held in the Pacific region, in Fiji During March 1982. Approximately 250 participants have undergone training as prospective instructors for agro-pesticides retailers. Each workshop has produced a lesson plan and teaching manual which are translated into the respective national languages and distributed during the retailer courses.

10. Valuable consultancy services to the preparation of the training programme were rendered by the Ministry of the Environment of Canada for two months, by FAO headquarters for two weeks and by the UNDP programme for development training and communication planning (DTCP) at Bangkok. DTCP developed the training methodology for the workshop programme and directed two early workshops. At three later workshops, support was given by the training supervisor of the Centre for Overseas Pest Research, London, with funding from the Overseas Development Administration.

11. Most of the information needed for the regional comparative study has now been obtained by the ARSAP team. Since September 1980, country studies have been published for Afghanistan, Burma, Indonesia, Malaysia, Nepal, Pakistan, the Philippines and Thailand.

12. In September 1981, the first draft of the comparative study on supply, distribution and use of agro-pesticides in the ESCAP region was completed on the basis of updated information from 13 countries.

13. The main theme of the study (which consists of approximately 200 pages) is "Pesticide management at the government level".

14. This concept, developed by ARSAP/2/Agro-pesticides, could be summarized as:

> "Agro-pesticides are, at present, an indispensable tool in agriculture. If a Government aspires to attain high productivity (yields), it should make agro-pesticides available to all farmers at reasonable prices, at the right time and place. However, such a proliferation of highly hazardous products could lead to most serious damage to people and the environment. How to achieve a balance between these two conflicting considerations is the field of pesticide management at the government level".

15. The study describes in detail the status of pesticide management in 13 developing countries of the region. It covers aspects such as pesticides usage levels, product range marketed, status of the local pesticide industry, pesticide laws and regulations, distribution structure, prices at the farm level, subsidy schemes etc.

16. It is expected that the multidisciplinary approach will lead to a better understanding of the complexity of pesticide management, by indicating many areas in which further (meaningful) assistance should be given to developing countries in the ESCAP region.

17. The current ARSAP/2/Agro-pesticides project will be terminated by mid-1982. By the end of 1981, the major event for ARSAP/2/Agro-pesticides at Bangkok will be the ARSAP/2/Agro-pesticides Regional Consultative and Evaluation Meeting, scheduled to be held from 30 November to 3 December 1981. During this Meeting the past activities of ARSAP/2/Agro-pesticides will be discussed and evaluated. Recommendations will be made for future assistance by the United Nations to the developing countries in the ESCAP region in the field of pesticide management. The report of this Meeting will be before the Committee at its fourth session.

18. For the Regional Consultative and Evaluation Meeting about 24 representatives of the developing countries in the ESCAP region have been invited in their personal capacity on the basis of their involvement with the activities of ARSAP/2/Agro-pesticides. Invitations have also been extended to representatives of international development organizations active in the field of pesticide management, such as the Food and Agriculture Organization of the United Nations, the United Nations Industrial Development Organization, the World Health Organization, the United Nations Environment Programme and the Centre for Overseas Pest Research of the United Kingdom.

19. Representatives of the main donor agency, the Directorate General for International Cooperation in the Netherlands, and others have been invited.

20. The response to the work of ARSAP/2/Agro-pesticides has established beyond any doubt that the field of pesticide management is of crucial importance. The developing countries in the ESCAP region have voiced their appreciation of the ARSAP/2/Agro-pesticide programme on many occasions such as the thirty-sixth and thirty-seventh sessions of the Commission.

21. An internal evaluation commissioned by the ESCAP secretariat in 1981 has evaluated ARSAP/2/Agro-pesticides as an efficient project whose fundamental importance and impact justify continued support.

22. Until August 1982, the following outstanding issues will be concluded and will terminate the ARSAP/2/Agro-pesticide project:

- Publication of ARSAP's handbook for instructors on pesticide management;

- Finalization of the regional comparative study (updated version);

- Editing lesson plan and training manual for Pakistan and Fiji;

- Training planning workshop for instructors of agro-pesticides retailers in the Pacific region, Fiji (under discussion);

- Analysis and finalization of the study of the agro-pesticides retailers based on an interview survey carried out in six ESCAP member countries;

- Mission to the Philippines or Burma to evaluate the implementation of actual retailer training;

- Follow-up on special requests by the participants in the Regional Evaluation and Consultative Meeting (e.g., assistance in implementation of local training);

- Handing over of ARSAP's programme elements to UNIDO/FAO and/or transition into the ARSAP/3/Pesticide Management project;

- Administrative and financial termination of ARSAP/2/Agro-pesticides.

23. Taking into account the activities and achievements of the ARSAP/2/Agro-pesticide project, the Committee may wish to consider the recommendations of the ARSAP/2/Agro-pesticides Regional Consultative and Evaluation Meeting, with specific reference to possible follow-up activities in the field of agro-pesticide management in the developing countries of the ESCAP region.

SYMPOSIUM ON CHEMICAL EMERGENCY PREPAREDNESS

JULY 23-27, 1984

METEPEC, EDO. de MEXICO

* MERIT *

MONSANTO COMPANY'S TRANSPORTATION EMERGENCY RESPONSE PROGRAM

STANLEY H. BRAND

MANAGER, OPERATIONS
EMERGENCY RESPONSE

MONSANTO COMPANY'S EMERGENCY RESPONSE PROGRAM

Timing, technology and individual training were key factors in developing Monsanto Company's unique system of responding to hazardous materials transportation emergencies.

The timing of Monsanto's decision to upgrade the emergency response system was coincidental to a valuable development in information gathering within the company. A massive new medical and environmental health information computer system became the vehicle for storing pertinent data and being able to retrieve it in emergencies. It was a small step to expand the data banks to include spill control contractors, local regulatory agencies and a complete rundown on chemicals used, produced or shipped by various Monsanto plants.

Detailed accessible information, however, was only part of the system. Individuals at every Monsanto plant were designated as coordinators and trained to respond to emergencies which involve their plant's products and raw materials.

In addition, special "mutual aid" training was given to a select number of individuals from plants located along major transportation corridors. This mutual aid training allows a near-the-scene Monsanto plant to respond for a sister plant, possibly located hundreds of miles away, saving valuable time during the initial stages of an incident.

Thus, a decentralized network of trained individuals plus the highly centralized, yet readily accessible bank of vital information provides an emergency response capability at Monsanto which is unique in the industry.

MERIT

MONSANTO COMPANY'S TRANSPORTATION EMERGENCY RESPONSE PROGRAM

S. H. BRAND
MANAGER, OPERATIONS
EMERGENCY RESPONSE

Monsanto uses over 2,000 pieces of equipment--rail cars, barges, trucks, and ships--each day to move its over 100,000,000 tons of material annually. This volume of material includes over 650 materials classified as hazardous according to Department of Transportation regulations. It covers products ranging from electronics to plastic bottles, textile fibres to aspirin, and process control values to the playing surface of a soccer field. The 40 plants that produce these chemicals in the United States have had trained teams responding to transportation incidents for over 25 years.

We have few significant transportation incidents; our incidents typically are minor with our current level of CHEMTREC calls running about 6 or 7 per month. However, because of the public perception of hazardous materials and our continuing sense of social responsibility, we felt the need to upgrade our emergency response program to provide an improved and uniform level of response across the company and, more importantly, to increase the speed of getting trained response teams to the scene of a transportation incident. In 1980, we assigned an individual full time to develop and carry out a modern and progressive emergency response program. Called MERIT--an acronym for Monsanto Emergency Response Information Teams--the program was put in place in 1981. The basic premise for the MERIT program can be explained in this way:

- o The shipping plant has the prime Monsanto responsibility for its materials in a distribution incident.
- o Each plant is trained to respond to all of its shipments and inbound raw materials.
- o Select plants in key geographic areas are trained to effectively aid Monsanto sister plants by responding to nearby incidents.
- o MERIT Teams will respond to non-Monsanto emergencies if requested to do so by CHEMTREC or local authorities.
- o Centralized data generation and training produces more effective and timely results.

In brief, the program can be described as containing four parts--a Monsanto emergency center, plant MERIT Coordinator and response teams, central database, and mutual aid. I will address each segment separately.

The first segment is emergency center. This center is located at our company headquarters in St. Louis and is staffed 24 hours a day, 7 days a week. It is the central receiving point for CHEMTREC calls. The CHEMTREC calls are received as a visual screen as well as a "hard copy" to minimize transportation of letters and errors since we deal with complex chemical terms. Additionally, this center occasionally receives calls concerning distribution incidents from other sources. The emergency center is equipped with an on-line computer which allows us to enter the chemical compound and identify the producing plant to be contacted in the event of an incident, if that information has not already been supplied by CHEMTREC.

The next, and most important segment, is the plant MERIT Coordinator and Response Team. The MERIT Coordinator is designated as the prime transportation incident contact at the plant site. It is his job to implement the Monsanto

philosophy in his dealings with the local emergency services and carrier, as well as federal and state agencies at the incident scene. He develops the transportation incident plan specifically for his plant. He identifies and procures equipment for his team. He trains his personnel. He receives the call from the emergency center and in turn contacts the scene to obtain more information as well as to provide additional information to the scene to properly handle the emergency. He is charged with the responsibility of making the decision to dispatch a team if one is warranted, plus keeping CHEMTREC informed of the status of the incident as time progresses. He is Mr. Monsanto to the outside world in a distribution incident.

The next segment is the computerized central database. The database has been in the process of development for some years, and it is referred to internally as the MEHI program. MEHI represents Medical Environmental, and Health Information System. MERIT uses a portion of the MEHI program tapping into the primary chemical database to do part of its job. All of the chemicals we produce (products, intermediates, or waste streams) as well as the inbound raw materials we use, are listed in the MEHI database and are associated with something in the range of 50,000 synonyms. This allows us to ultimately identify a plant that produces or uses a chemical and to do this within a few seconds. Additionally, the MEHI/MERIT system includes names and phone numbers of plant sites as well as the plant contacts that will be needed in a transportation incident. We also identify by state cleanup contractors with emergency phone numbers, waste disposal sites plus state and federal regulatory agencies that are typically associated with a transportation incident. We also include the Materials Safety Data Sheets for Monsanto products. With this volume of information in the computer database, a MERIT team at the scene can call the center and request specific information.

With this capability, virtually no matter what the situation is, a person can get the information he needs quickly from an approved source.

The fourth segment of the MERIT program concerns itself with mutual aid. Inappropriate action during the initial stages of an incident can severely increase the complexity. Again, we are fighting the enemy, time. In an effort to shorten the time needed to get our trained experts to the incident scene quickly, we studied historical records. These showed a tendency for the incidents to cluster in certain geographical areas associated with major distribution artery interchanges. Taking advantage of that phenomenon, we identified 13 key areas. We selected an appropriate Monsanto plant central to each of these areas and have identified it as a MERIT Mutual Aid plant. The MERIT team at each mutual aid plant has received additional training and materials that will allow them to respond to Monsanto products that are not produced by that site. This can save a considerable time in getting a trained team to the incident scene. As I mentioned earlier, the shipping plant retains the prime Monsanto responsibility for responding to an incident. The mutual aid plant now gives the shipping plant the capability of having rapid assistance provided by a sister plant to resolve minor problems or to provide the initial MERIT response capability until the shipping plant team can arrive at the scene.

As an adjunct to the MERIT program, we have developed carrier guidelines that identify what we expect the carrier capabilities to be as it relates to a transportation incident when handling our materials. This is a key consideration in our carrier selection process.

Other aspects of the MERIT program include periodic issues of a MERIT bulletin which identify key areas of concern in the industry and provides a

learning experience as our plants share their handling of transportation incidents. Additionally, we have biennial MERIT Coordinator meetings where we exchange experiences, identify areas that require new technology or improved techniques to more efficiently handle an incident. Select portions of this program may be converted to a slide/cassette program and distributed to the plants for use by the plant MERIT Coordinator as an aid in training his teams.

Throughout this presentation, I have referred to Monsanto's participation at an incident as the "handling of an incident." This point needs clarification. In the United States the carrier (or spiller) is legally responsible for the handling of the incident, with Monsanto's prime function at the incident being that of providing technical advice to the carrier and local emergency services present at the incident. On the rare occasion that no one is present at the scene to coordinate and assume the leadership role of handling an incident, we have trained our teams to handle an incident.

This describes the Monsanto Company's Transportation Incident Handling program. A significant factor in the smooth and rapid flow of information during the important initial stages of an incident, in fact the starting point of our MERIT system, is the CHEMical TRansportation Emergency Center better known as CHEMTREC. CHEMTREC is a public service organization funded by the chemical industry through the Chemical Manufacturing Association (CMA).

CHEMTREC began operating in September of 1971. CHEMTREC's purpose is twofold: First, it provides immediate advice to callers on how to cope with chemicals involved in a transportation emergency. Next, it activates the shippers response system so they can take appropriate followup action including sending a team to the incident.

Although CHEMTREC is funded by CMA's 200 member companies, its services are open to all shippers of chemicals in the states. More than 25% of CHEMTREC

activities involve over 600 non-member chemical companies. By the end of its first 10 years of operation, the center has received 146,000 telephone calls. Of that, only 12% were related to transportation emergencies involving a chemical release--roughly 17,000. The remainder of the calls were associated with minor transportation emergencies, warehouse problems, plus calls from private citizens who had contact with a chemical and didn't know what to do.

CHEMTREC has been officially recognized by the Department of Transportation as the central emergency response service for dealing with incidents involved in the transportation of hazardous materials. The Hazardous Materials Transportation Act of 1974 called for the Secretary of Transportation to establish and maintain a central reporting system and data center. Since CHEMTREC was already well established, DOT gave CHEMTREC its approval to provide the services required by law. I might add this not only assures the nation a continued emergency service, but also does it for considerably less money.

CHEMTREC works in this fashion: participating chemical companies include in their shipping documents instructions on how to reach CHEMTREC by phone in the event of a spill, leak, fire, exposure or accident involving their products in transit. The emergency call to CHEMTREC is taken by a member of the CHEMTREC communicator team who records the details in writing, on a video screen, and by tape recorder. From a file of 50,000 product trade name listings, he can retrieve the best available information on the chemicals involved. This puts him in a position to answer many of the questions that come from the scene of an incident such as: Is it dangerous? Can the cargo explode? Will it burn? Can we use water on it? What is the best extinguishing agent? How can I neutralize the chemical? Can I approach the scene without breathing equipment and protective clothing? Do I need special clothing and equipment?

After the how-to-handle-it information is passed to the caller, CHEMTREC immediately relays relevant facts to the company that shipped the product. At that point, responsibility for further guidance rests with the shipper.

Producers of some unique chemicals have formed mutual aid systems to make certain that incidents involving those chemicals are taken care of as quickly as possible. Regardless of the shipper, the member nearest the transportation incident will be notified. He would evaluate the problem and dispatch an emergency response team if needed. Examples of this are the CHLOREP teams representing the Chlorine Institute and the Pesticide Safety Team Network (PSTN) of the National Agricultural Chemicals Association. Each of these programs have approximately 50 emergency teams throughout the U.S.

Additionally there are mutual assistance programs that exist for other products including vinyl chloride, phosphorus, hydrogen fluoride and hydrogen cyanide. Cooperation among mutual aid groups saves time, often the essential element in protecting the public.

PRINCIPALES DAÑOS PRODUCIDOS POR AGENTES QUIMICOS EN COSTA RICA

Trabajo preparado para el "SIMPOSIO SOBRE EMERGENCIAS PRODUCIDAS POR AGENTES QUIMICOS"; organizada por el Centro Panamericano de Ecología Humana y Salud (ECO) a desarrollarse del 23 al 27 de julio de 1984 en TOLUCA-MEXICO.

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SAN JOSE - COSTA RICA

MAYO DE 1984

PRINCIPALES DAÑOS PRODUCIDOS POR AGENTES QUIMICOS EN COSTA RICA.

I. INTRODUCCION:

La investigación acerca de daños o emergencias producidas por agentes químicos en Costa Rica es muy reciente y la poca información disponible se encuentra dispersa en varias oficinas gubernamentales, universidades, hospitales y otras dependencias oficiales.

En general puede decirse que los principales daños causados por productos químicos en el país han sido provocados por el empleo de plaguicidas y fertilizantes produciendo no solamente graves daños en la salud para trabajadores y otras personas sino que también en algunos casos, efectos detrimentales en los suelos, en la agricultura y en la vida acuática de distintos cuerpos receptores de aguas.

Existen varias leyes en Costa Rica que regulan el empleo de plaguicidas entre ellas, la LEY DE SANIDAD VEGETAL y la LEY GENERAL DE SALUD.

El artículo 245 de esta última Ley establece que " las personas naturales o jurídicas que se dedican al control de plagas, podrán operar sólo con permiso del Ministerio de Salud utilizando las sustancias, mezclas de sustancias, los productos y mezclas de productos autorizados por el Ministerio de Salud y con sujeción a las normas técnicas procedentes; a fin de evitar accidentes o daños a la salud de las personas que realicen tales tareas o de terceros ". Es debido a la falta de observacia de las recomendaciones técnicas a que se refiere esta Ley que se han presentado tantos accidentes y daños a la salud.

Otros casos de daños producidos por agentes químicos que merecen mencionarse han consistido en derrames accidentales de productos tóxicos y algunos casos de contaminación de aguas.

II. PRINCIPALES ACCIDENTES Y DAÑOS PRODUCIDOS POR AGENTES QUIMICOS.

Seguidamente se presenta una breve descripción de los principales accidentes y daños de los cuales fue posible obtener alguna información.

II.1. PLAGUICIDAS:

De acuerdo a CHAVES (1), hasta la fecha las consecuencias más graves desde el punto de vista médico que se han tenido en Costa Rica por el uso de plaguicidas, se derivan del uso equívoco de los insecticidas organofosforados. Estos insecticidas son muy activos sobre el sistema nervioso central y esto provoca un intoxicación aguda casi siempre mortal.

II.1.1.CONTAMINACION DE HARINA CON EL PLAGUICIDA PARATHION:

Uno de los casos más lamentables de daños a la salud humana que se han producido en el país, mencionado por CHAVES (1) es el que ocurrió en la zona sur del país hace algunos años cuando un camión que transportaba un cargamento de harina junto con recipientes de parathion y aparentemente uno de estos recipientes se derramó contaminando varios sacos de harina que luego fueron vendidos a lo largo de la carretera interamericana inclusive a un precio menor porque estaban manchados.

En Costa Rica esta situación produjo la muerte de 7 personas que ingirieron la harina; otras 36 personas resultaron gravemente enfermas y lograron salvarse gracias a que se identificó la sustancia y se trató rápida y adecuadamente. Sin embargo en Panamá adonde llegó este mismo cargamento aparentemente no se hizo el diagnóstico adecuado; ya que se creyó que se trataba de arsénico y ésto trajo como consecuencia la muerte de 25 personas. En este caso se hizo patente la falta de acuerdo entre las autoridades médicas de los dos países.

II.1.2 ENVENENAMIENTOS ACCIDENTALES:

El Instituto Nacional de Seguros,que es el organismo encargado del aseguramiento de los trabajadores en el país, reportó los siguientes datos de lesionados para el año de 1982.

CUADRO No. 1 (2)

ENVENAMIENTO ACCIDENTAL POR PREPARADOS QUIMICOS Y FARMACEUTICOS PARA USO EN AGRICULTURA Y HORTICULTURA DISTINTOS DE LOS FERTILIZANTES Y DE LOS ALIMENTOS PARA PLANTAS .

PREPARADO QUIMICOS	No. DE LESIONADOS
1. Insecticidas a base de compuestos orgánicos clorados.	119
2. Insecticidas a base de compuestos orgánicos fosforados	95
3. Herbicidas	171
4. Fungicidas	12
5. Rodenticidas	1
6. Fumigantes	1
7. Otros y los no especificados	62
TOTAL	461

II.1.3. INTOXICACIONES CON PLAGUICIDAS:

El Centro Nacional de Control de Intoxicaciones (3) por su parte menciona los siguientes datos de intoxicaciones con plaguicidas en cuanto a número y clasificación según el grupo químico.

CUADRO No. 2 (3)

TOTAL DE INTOXICACIONES CON PLAGUICIDAS EN LOS AÑOS DE 1978 a 1983 .

AÑO	No. DE CASOS	PORCENTAJE RESPECTO AL TOTAL DE INTOXICACIONES DEL AÑO.
1978	307	29.3
1979	423	20.3
1980	593	19.9
1981	491	14.7
1982	613	16.7
1983	790	19.0

De este cuadro se observa como el número de casos por intoxicaciones con plaguicidas ha ido siempre en aumento con excepción del año 1981.

CUADRO No. 3 (3)

PLAGUICIDAS CAUSANTES DE INTOXICACIONES EN EL AÑO 1983

CLASIFICACION SEGUN EL GRUPO QUIMICO

GRUPO	No. DE CASOS	PORCENTAJE
Organofosforados	215	27.2
Carbamatos	142	18.0
Mezclas	86	10.9
Paraquat	82	10.4
2,4 D/2,4,5-T	51	6.5
Desconocidos	47	5.9
Derivados de Cumarina	36	4.6
Derivados del Piretro	30	3.8
Organoclorados	29	3.7
Otros	23	2.9
Derivados de Anilida	12	1.5
Dicarboximidas	11	1.4
Sales de Cobre	7	0.9
Ditiocarbamatos	5	0.6
Abonos	5	0.6
Triazinas	3	0.4
Derivados de Pentaclorofenol	2	0.3
Bromuro de Metilo	2	0.3
Derivados del Nitrofenol	1	0.1
Arseniato de Plomo	1	0.1
TOTAL	790	100.%

Los datos anteriores muestran como el mayor número de casos de intoxicaciones se sigue dando con los insecticidas organofosforados que actúan sobre el Sistema Nervioso Central, produciendo intoxicaciones casi siempre mortales.

II.1.4 EFECTOS DE LA APLICACION DEL CALDO BORDOLES EN LOS SUELOS DEL PACIFICO SUR DE COSTA RICA. (6)-(7)

En Costa Rica entre los años de 1930 a 1950 las compañías fruteras hicieron aplicaciones de caldo bordolés (2.5 Kg de sulfato de cobre y 2.5 Kg de carbonato de calcio en 200 litros de agua) para el control de enfermedades fungosas en el cultivo del banano. Se aplicaron anualmente unos 100 Kg/ ha de compuestos de cobre lo que causó deterioro, en algunos casos irreversible, de suelos que reunían características de un alto potencial agrícola.

Se han registrado valores desde 20 hasta 3.900 ppm de cobre en unas 50.000 hectáreas en el sur de Costa Rica cuando el nivel de cobre normal en el suelo es de 20 ppm.

En el siguiente cuadro tomado de CORDERO Y RAMIREZ (6), puede observarse como en diferentes cultivos de otros países en los cuales se aplicaron productos fitosanitarios cúpricos la mayor acumulación corresponde al caso de las aplicaciones en los cultivos de banano de nuestro país.

CUADRO No. 4

ACUMULACION DE COBRE EN SUELOS DE DIFERENTES PAISES

CULTIVO	ACUMULACION DE COBRE (Kg/ha/año)	PAIS
Vid	15 - 50	Francia
Vid	10	Estados Unidos
Lúpulo	37. 7	Alemania
Manzano	25	Reino Unido
Banano	100	Costa Rica

Los primeros síntomas de toxicidad de cobre en plantas de arroz fueron observados por arroceros radicados en la zona del Pacífico Sur a inicios de

la década de los 60 en tierras sembradas antiguamente de banano. El exceso de cobre provocaba una clorosis blanquecina en la parte aérea de los arrozales y un sistema radical raquítico con escasa proliferación de raíces secundarias.

Algunas de estas tierras compradas por el Gobierno de Costa Rica para cooperativas agrícolas todavía no han podido producir ninguna cosecha. Por la persistencia de cobre a niveles tóxicos hay poca probabilidad de que estos suelos aluviales sean productivos durante lo que queda de este siglo.

II.1.5 OTROS DAÑOS CAUSADOS POR PLAGUICIDAS:

Aunque no se cuenta con estudios detallados, el Ing. Nanne (4) del Ministerio de Agricultura indica que se han reportado muerte de peces, garzas, patos etc., provocados por fumigaciones con plaguicidas empleados sobre todo en el cultivo del arroz. Este problema se ha presentado sobre todo en los ríos Tempisque en la zona norte del país y en el río Parrita en la Zona Sur, dos de los más grandes ríos del país.

En el río Tempisque inclusive se denunció que la contaminación de las aguas ha sido intencional con el fin de envenenar a los patos que se comen el arroz. Sin embargo esto nunca pudo ser comprobado.

En el río Parrita,el envenenamiento ha ocurrido, de acuerdo a lo denunciado, porque los pilotos de los aviones dejan caer el plaguicida en el cauce del río para terminar más rápido su labor, pues se les paga por volumen de líquido fumigado.

II. 2 DERRAME DE DIISOCIANATO DE TOLUENO (5)

En el mes de diciembre de 1980 un furgón guatemalteco que transportaba DIISOCIANATO DE TOLUENO propiedad de la COMPAÑIA BAYER DE COSTA RICA hacia Panamá se volcó, provocando un derrame de cuatro tambores de los 75 que transportaba.

Debido a que este producto es peligroso y puede afectar los órganos respiratorios, los ojos, la piel y puede producir reacciones químicas

peligrosas, ésta emergencia se controló extrayendo los recipientes que se encontraban dañados por medio de personal que utilizó el equipo de protección personal adecuado y con ayuda del Cuerpo de Bomberos de Costa Rica que arrojó agua para formar una niebla de agua que lavara los vapores existentes.

Los recipientes dañados fueron enterrados a una profundidad aproximada de 5 metros conjuntamente con 1.200 galones de kilogramos de cal viva y 3.000 litros de agua con el objeto de evitar un sobrecalentamiento y con ello la producción de vapores de isocianato.

II.3 DESTRUCCION DEL HERBICIDA PHOSVEL 3 CE (5)

En 1981 la COMPAÑIA VELSICOL DE CENTROAMERICA S.A. debió destruir alrededor de 3.500 galones de herbicida organofosforado PHOSVEL 3 CE que tiene como ingrediente activo el LEPTOPHOS el cual se produciría en una cantidad de 10.500 libras aproximadamente.

Esta destrucción se realizó empleando un incinerador móvil traído especialmente por esta Compañía en la Ciudad de Liberia, Provincia de Guanacaste en el norte del país y se empleó el equipo de protección personal adecuado suplido por la misma compañía empleando técnicos traídos especialmente de lso Estados Unidos.

Este mismo equipo se empleó también para destruir 22 tambores del insecticida METHIL PARATHION 48% CE y 23 tambores del METHIL PARATHION S-7 que se encontraban contaminados y que eran propiedad de la Compañía QUIMICAS ORTHO DE CALIFORNIA LTD.

II.4 CONTAMINACION POR NITRATOS EN AGUAS SUBTERRANEAS PRODUCIDA POR EL USO DE FERTILIZANTES: (8)

De acuerdo a un estudio realizado en 1980 por la Escuela de Química de la Universidad de Costa Rica en la zona norte del país (Cañas-Guanacaste), aparentemente existe contaminación por nitratos en las aguas subterráneas que son empleadas en su mayoría para consumo humano.

En el 16% de las muestras tomadas durante la época lluviosa en 116 pozos estudiados se presentaron valores superiores a los 45 mg/l, que es el valor

máximo fijado para agua potable para evitar daños tales como cianosis o metahemoglobinemia. Esta contaminación se atribuye a fertilizantes aplicados en los cultivos de algodón, sorgo, maíz y, principalmente de arroz.

II.5 OTROS DAÑOS:

Los desechos de tipo industrial probablemente han afectado negativamente diferentes usos del agua en Costa Rica.

Un ejemplo de esto lo constituye la Companía SCOTT PAPER CO DE COSTA RICA S.A. (5) que se dedica a la producción de papeles absorventes y papeles planos delgados en una cantidad de 13.000 T.M. anuales y produciendo alrededor de 5.700 m^3 / día de aguas residuales.

Estas aguas eran enviadas a una quebrada utilizada por productores de tomate y cebolla como fuente de irrigación lo que afectó a las plantas y provocó la producción de frutos más pequeños.

Ante una queja de los afectados, el Ministerio de Salud obligó a la Compañía a construir una planta de tratamiento con un costo de alrededor de EUA $300.000 y cambiar el destino del efluente de la planta lo que corrigió el problema.

Cabe mencionar también que se han producido denuncias de diferentes personas (5), indicando que desechos conteniendo cianuro procedentes de diferentes minas en el sur del país han provocado mortandad de peces; sin que se halla podido determinar con certeza que este tipo de contaminación se halla dado.

La REFINADORA COSTARRICENSE DE PETROLEO (RECOPE), la cual importa petróleo y combustible ya refinado (Costa Rica no produce petróleo), indica que han sufrido de algunos problemas en la descarga de los barcos que transportan el combustible, debido a roturas de mangueras o tuberías, que han sido solucionados rápidamente.

III. CONCLUSION

Los principales daños o emergencias producidas por agentes químicos en Costa Rica han sido provocados por el mal empleo de plaguicidas formulados principalmente a base de compuestos organofosforados y organoclorados.

El número de lesionados e intoxicados por estas sustancias lejos de disminuir ha ido en aumento año con año.

Los plaguicidas también son responsables de la disminución de la capacidad productiva de diversos tipos de suelos.

Existen otra serie de pequeñas emergencias y daños, originados por derrames y destrucción de productos químicos tóxicos o en mal estado y una serie de denuncias que no han podido ser comprobadas, principalmente referentes a contaminación de ríos por cianuro utilizado en diversas minas en el sur del país, así como por plaguicidas y contaminación de aguas subterráneas utilizados para consumo humano por fertilizantes.

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U.S. HAZARDOUS MATERIAL IDENTIFICATION SYSTEM DEVELOPMENT AND HISTORY

ALBERT ROSENBAUM

U. S. HAZARDOUS MATERIAL IDENTIFICATION SYSTEM - DEVELOPMENT AND HISTORY

The objective of this presentation, today, is to outline--briefly but substantively--the development of the hazard information system currently in effect in the United States as it applies to the transportation of hazardous materials.

As one who has been involved in the promotion of this system for several years, I hope to give you some insight into how the objectives and procedures of this system have changed and evolved during this period of time.

Additionally, I will attempt to describe how the two prime parties--government and industry--have worked together to reach a common objective...namely, a hazard information system which provides basic, protective information to the public; some degree of technical guidance to the emergency responder; and a system which can be uniformly implemented at the hundreds of thousands of shipping points in the United States.

Mr. Albert Rosenbaum
National Tank Truck
Carriers

As you might expect, the growth and sophistication of the U.S. Hazard Information System has paralleled the growth of industry. Even in the immediate Post World War II era, the largest portion (geographically) of the United States was basically an agrarian economy, with heavy industry situated almost exclusively in the Northeast, North Central and Far Western States. Transportation emergency warning systems differed from state-to-state, were exclusively oriented to rail transportation, seldom enforced and designed to assist fire and police personnel.

In the early 1950's, three factors combined to emphasize the need for an improvments in the existing system. First of all, the railroads began to exit the business of carrying packaged freight. This put more trucks carrying hazardous materials on the nation's road system. Consequently vehicles carrying hazardous materials came in closer proximity to the general public--particularly in urban areas.

Second, the United States' industry began to decentralize. Factories were no longer built or rebuilt in the same places. New factories went to new sites in the West, South and other "new" industrial areas. Thus, instead of involving a small number of transportation "corridors", the transportation of hazardous materials gradually became an issue of nationwide concern.

Third, the United States' chemical industry began a rapid technological growth which put a greater number of substances into the transportation network in ever-increasing volumes.

The first organization to recognize this was a private association--representing the interests of fire fighters--called the National Fire Protection Association (NFPA). Historically, NFPA Committees of experts in fire protection wrote "codes" which were adopted as laws by State governments. Eventually, the NFPA fire "codes" were adopted by the U. S. government as a national standard. Variations by State and local government were prohibited.

By today's standards, the NFPA's early standards on hazardous materials were rudimentary, at best. Generally speaking, the placard or warning sign on a truck or rail car consisted of one or two words (such as "Flammable" or "Compressed Gas"). Again, this was to warn fire personnel. There was no national training scheme. There was no supplemental information provided other than the words printed on the placard. Finally, the system did not embody consideration of environmental hazards from the products.

Even as late as the early 1960's product classification--in terms of listing a commodity by its primary hazard characteristic--was done by an agency of privately-owned railroads. There was little official governmental involvement in the process.

In this area, attitudes of both government and the public changed. The social activism of the 1960's and '70's (particularly the environmental movement) elevated public concerns to include not only the acute effects of a transportation incident, but also the chronic effects on human health from exposure to a hazardous chemical products.

The social activism of that period also resulted in greatly increased involvement by our Federal government toward the promulgation of health and safety regulations. Between the years 1965 and 1975, the number of agencies and departments in the United States government doubled--almost solely reflecting the involvement of the bureaucreacy in matters related to health and safety, safer workplaces, more comprehensive medical care, and significantly, environmental concerns.

At the same time, U. S. industry--particularly the energy and chemical industries, were producing thousands of new compounds in large volumes. As a result we were transporting those new compounds, by all modes, both domestically and internationally.

Of course, the United States was not alone (within the community of nations) in experiencing the factors of increased use of and demand for products with hazardous characteristics. Neither was it the only nation with legitimate public concerns for the health and safety effects of their transport and use.

Through the auspices of the United Nations, representatives of many countries recognized that social, environmental and economic concerns must be blended in some type of internationally-recognized system of controls--lest free trade in these valuable commodities be jeprodized.

After considerable discussion, it was decided that any such a proposed system would have to meet at least the following criteria: 1) effectively warn the public who would be inadvertantly exposed to a product by reason of an accident or incident; 2) provide suitable knowledge to those who might be exposed by virtue of their occupation; 3) be free of the constraints of language or custom; 4) be simple enough to convey a message to those untrained in its use; and 5) be easy to use in the transportation industry.

As one might expect, it was this last criterion--the actual implementation of a system--which proved most difficult to overcome in the United States.

First of all, there was what I will call "the comfort factor". Both shippers and carriers had used the old system for years, had trained their personnel (and fire and emergency response personnel) in its meaning and use, were cognizant of the fact that over 99 percent of the shipments of hazardous materials were domestic, and frankly just did not want to change.

Economics also dictated against any change. Briefly stated, recognition of the fact that it would cost millions of dollars to implement a new hazard warning system on the millions of trucks, rail cars, barges and containers in our economy, plus the enormous related costs such as training, and the ability of this investment to measurably improve safety performance created large obstructions.

Resistance--from all types of carriers-rail, truck, water and air--was high.

It is at this point, our Federal Government's Department of Transportation chose an excellent tactical route to gain broad support for domestic implementation of the new hazard warning system. This new system was based on concepts adopted for international trade via the United Nations transportation committee. The U. S. Department of Transportation participated in the development of the new system so it was anxious to introduce it into its domain.

Recognizing that our chemical industry would be the most significantly affected sector of the US economy by any new hazard warning system, our Department of Transportation gained their support.

They knew that the chemical industry produced most of the hazardous materials of concern. It is also an industry deeply involved in the import/export market of chemicals. Since carriers of all modes are customers of the chemical companies it was recognized that they could put economic pressure on the carriers to accept the new system.

Therefore, by the mid-1970's, our present hazard information system was a matter of Federal law. Again, no individual State or locality may enforce any other standard in this area.

The principles of the system are simple. Both placards (for vehicles) and individual labels (for containers in vehicles) are composed of a symbol, a so-called "alert word", a four-digit number and a single digit number.

The purpose of the pictograph symbol is to identify the nature of the hazard, such as flammability, corrosivity or poison. The four digit hazard information number (most prominent on the placard or label) is for guidance to emergency responders. The single digit number at the bottom of the placard is to indicate the United Nations hazard classification.

While some variations in applications of this system are permitted--the basic elements may not be compromised. For instance, you may use placards containing just the pictograph and numerical designation or, a placard with the pictograph and hazard classification and the number on a separate panel may be used. Or for tank trucks so laden, the words "Gasoline" or "Fuel Oil" may be placed for the red flammable placard.

In other cases, information in addition to the placard must be supplied. For instance, in the case of tank vehicles laden with certain compressed gases--the specific shipping name of the product must be on each end and side of the vehicle. Examples are propane, butane and anhydrous ammonia.

This is part of the U.N./U.S. "system". Of course, a "system" is more than just signs on a vehicle or labels on a container.

Note, for instance, that the four-digit number on the placard or label is coordinated with an Emergency Response Book which has been distributed by U. S. government and industry to fire fighters and emergency service personnel who would respond to a transportation incident. By referencing the book, with the four-digit number on the placard, emergency personnel are given written instructions on how to react to a fire, spill or leak of the product. Additionally some environmental and human factors warnings are outlined.

Almost one million of these booklets have been distributed throughout the Nation.

In addition, the system is coordinated with the documentation which must accompany each shipment. Federal governmental regulations dictate that such documentation must contain: (1) the exact name of the hazardous product as specified in the regulations; (2) the hazard classification of the product (flammable, corrosive, poison, etc.); and the four digit hazard information number. Obviously, the purpose is to provide some redundancy for the emergency responder should the placards or labels (on the vehicle or container) be destroyed or illegible.

In implementing the hazard warning system, the Federal Department of Transportation has recognized that it is the shipper (or manufacturer) of the product to be transported that is the key because it is in the best position to determine the material's hazard characteristics.

Therefore, U. S. regulations mandate that: (1) it is the shipper who is legally responsible for testing the product to determine its hazardous properties; and, (2) it is the shipper who is responsible for providing the placards to the carrier.

As I noted at the beginning of this presentation, the hazard information system in use in the United States has evolved from a very basic system to one of increased sophistication and complexity.

An additional and critical part of the emergency response system in our country is CHEMTREC--the Checmial Emergency Transportation Center--founded by the U. S. Chemical Industry's National Association--the Chemical Manufacturer's Association. This 24 hour-free call in system provides immediate technical assistance for first responders. It uses data sheets containing a great deal of information on individual chemicals which are provided by the makers of the chemicals. CHEMTREC also acts as a telephonic liaison between the accident scene, the chemical companies' technical experts and the carrier. In its 10 years of existence, this industry/government cooperative project has been instrumental in improving first response at accidents.

Of course, this is not a perfect system. Critics note that the system does not offer appropriate warnings as to the potential long-term or chronic effects of exposure to humans in the event of a transportation incident. Others point out that the system's reliance on numerical designations detracts from its impact on untrained members of the public who might be inadvertantly exposed.

These criticisms are valid, however, those critics must also remember that the system is a significant improvement over past practices.

All in all the current placard system provides a generally acceptable level of warning to shippers, carriers and the public. Adoption of this system, combined with training in the companion Emergency Response Guide, provides a far higher level of on-scene technical assistance than existed previously.

Each year since 1976 this system has gained wider acceptance in the public domain. Fire services, state and local governments, shippers and carriers have come to know and understand it. While it is impossible to quantitatively measure the value of the hazard information system in the U. S. we can assume that it has contributed in the enhancement of safe operations, improved emergency response, and resulted in fewer avoidable deaths and injuries.

THE CHEMICAL TRANSPORTATION EMERGENCY SYSTEM OF THE USA

ROBERT MESLER

"THE CHEMICAL TRANSPORTATION EMERGENCY SYSTEM OF THE U.S.A."

Today I would like to tell you about the Chemical Emergency Response System in the United States, to explain how it is put together, how it operates and what makes it work. Then in the remaining time, answer any questions you may have concerning this system.

In 1970, with the encouragement of the United States Department of Transportation, the Chemical Manufacturers Association (CMA) created CHEMTREC, the Chemical Transportation Emergency Center. Funded solely by CMA, CHEMTREC, through its single telephone number, provides information and assistance to those responding to chemical emergencies.

CHEMTREC operates on a two-step basis. First, the caller identifies the product involved and the communicator provides information on how to handle the problem. Second, the communicator contacts the shipper or other source of expertise for additional telephone advice and/or assistance.

The initial call to CHEMTREC is usually made by a fireman, a policeman, a truck driver, or a member of a train crew. The CHEMTREC communicator makes a detailed record of the incident, including the callers name and a call back phone number. When the essential information has been received, the communicator relays prerecorded emergency response information to the caller. CHEMTREC's files include physical characteristics of the

material, data on the general nature of the products and information on how to handle, spill, leak, fire or exposure.

Once the communicator has given this information to the caller, he immediately contacts the company who's material is involved. This is done either directly by telephone, or through a teleprinting link-up that transmits a "hard copy" of the report. This "hard-copy" system has advantages because it eliminates problems of improper spelling, mixed up phone numbers and delays that can occur with telephone transmission. The "hard copy" is sent to dedicated telephone numbers at the company sites.

By making this call, the communicator turns the problem over to the shipper. Under certain circumstances, this call may go to a mutual aid team, such as those operated by the Chlorine Institute or the National Agricultural Chemical Association. In these incidents, the team nearest the accident scene may be called for assistance.

There are also mutual assistance groups that handle specific products, such as Hydrogen Cyanide, Vinyl Chloride, Hydrogen Fluoride, Phosphorus or Liquidfied Petroleum Gas (LPG) products. CHEMTREC will call the U. S. Department of Energy and State Radiological Emergency Response Groups for assistance with incidents involving radioactive material. They also contact the U. S. Department of Defense for military shipment incidents.

The Transportation Act of 1974 required the Department of Transportation to establish a single telephone contact for reporting spills or leaks of hazardous substances. In 1980, CHEMTREC, because of excellent past performance, was designated to be that single contact.

When a call is received from CHEMTREC by a chemical manufacturer, the Emergency Response system of that manufacturer goes into action. Each company's E/R system is designed to meet their needs. Some systems are very elaborate, others very simple. As an example, the call may come into a central plant security dispatch center. Here dedicated equipment and designated people are available to respond. The equipment is mobile and contains safety equipment, specialized tools and miscellaneous related items. When on site, this equipment is used by the company's trained Emergency Response Team. These company emergency response teams and the mutual aid teams are sent to the incident site to assist the public safety people on the scene. They are not there to be the people-in-charge.

The concern about pollution of water and air has changed the method of handling spills. We no longer use water to flush spills down the drain. All spills are confined and picked up for disposal.

Incidents can and do occur at places that are very remote and during adverse weather conditions. At these times, the emergency response teams are required to use all means possible to reach the incident and minimize the effects on the general public. An incident may happen in a populated area, on a highway, on board ship, barge, and in rail yards.

Training of public safety people to handle a chemical emergency incident is very important. It is my belief that this training should be designed for the needs of the trainees. What does the job require that person to know and do? I feel there are three levels of training necessary: one for first responder; second, the decision maker; third, for the special team. All police and fire fighters should receive the first responder training, which is how to safely approach an incident, how to identify what's involved and how to communicate accurately what's happening.

In the United States, we have begun the first responder training; I say only begun, because of personnel turnover it must be repeated every year. The Chemical Manufacturers Association and the American Association of Railroads produced and promoted this training program. They have since turned it over to an U. S. Agency for further presentations and updating. In addition, there are chemical companies, railroads and individuals who have also developed training programs.

Advanced training programs for the decision makers or special teams are also available. The one I'm most familiar with is offered by Texas A&M University. It is recommended by CMA and it is an excellent program.

In 1980, the U. S. Department of Transportation published an Emergency Response Guidebook. A new 1984 addition is now available. This guidebook is an attempt to provide a single quick reference to the first responder so that once it has been determined what material is involved, certain immediate actions can be started. If evacuation is required, the first responder can secure the area and begin to evaluate any people present.

The DOT Guidebook lists all materials on the U. S. list of hazardous materials or hazardous substances. The materials listed have been assigned a four digit identification number. The identification number is preceded by either the letters UN or the letters NA.

The UN prefix is for those materials assigned number by the United Nations list of dangerous goods. The NA prefix is for materials regulated in the U.S.

Next, each material is assigned a guide number. This guide number refers to a prepared sheet that lists the potential hazards of the material and the emergency action to be taken to assure public safety in the event of spill, leak, fire or exposure.

As I mentioned before, this guidebook has been revised - the 1984 edition is now available. This is an excellent reference to have in the hands of every person who is likely, as part of their job, to become involved in an chemical emergency. The statements are simple one-liners and can be easily translated into other languages. This guidebook is the result of a good cooperative effort of chemical industry and the Department of Transportation.

The chemical emergency response system in the United States is working and beginning to work even better because certain essential elements are in place.

First, we have the regulations that govern transportation of hazardous materials. These regulations establish a competent authority, list minimum packaging requirements and outline the labeling and placarding requirements so that a material and its hazards may be adequately identified. This assures a material is handled safely during normal transportation or in an emergency.

These regulations require that hazardous materials be identified on all shipping papers. The identification number, including the UN or NA prefix shall appear on all shipping papers and the required placards have the four digit identification number on them.

The United Nations recommendations are a very good starting point for establishing this type of regulations in your own country.

Second, we are improving the enforcement of the regulations by encouraging the enforcement at the lowest level possible, where adequate training and supervsion can be provided. This is generally at the state level. However, we do have federal audits of hazardous material shippers. This has led to:

Third, improved compliance by the shippers. Compliance is encouraged by making non-compliance unattactive through the use of citations and fines. Repeat offenders become the target for stricter enforcement.

Fourth, making available aid and assistance to state and local governments. This may be in the form of grants for training, training programs and printed literature. Example, the E/R Guidebook.

We in the United States have been fortunate during the past ten to fifteen years that there has developed a feeling of trust and cooperation between the chemical industry and the Department of Transportation. This has made it possible for us to develop CHEMTREC, The Department of Transportation Emergency Response Guidebook, the Chemical Manufacturers Association, Association of American Railroads training programs, the CMA Emergency Response Workshops and the Texas A&M Training Programs. Any one of these programs is available to you to copy or learn from.

There are very good programs and aids in other countries. Many are available for the asking or may be purchased. I would suggest you do not try to reinvent the wheel. Use what others have learned. Adapt ideas to meet your own needs.

Thank you for this opportunity to be with you and I will now try to answer any questions you might have.

HANDLING CHEMICAL SPILL RESULTING FROM TRANSPORTATION INCIDENTS (SLIDE PRESENTATION)

CLYDE STRONG

HANDLING CHEMICAL SPILLS RESULTING FROM TRANSPORTATION INCIDENTS

Slide #1 The Oil and Hazardous Material Control Training Division of the Texas Engineering Extension Service has conducted training on an international basis for the past seven years for the safe and effective handling of oil and hazardous chemical spills.

Slide #2 To be prepared for the safe handling of tank truck incidents which involve spilled chemicals, considerable pre-planning and training is needed. This will help ensure that those responding to the incident are properly prepared and equipped to handle the situation.

Slide #3 Lectures and instruction by those knowledgeable in such areas as...

Slide #4 tank truck valve systems and tank truck design are important.

Slide #5 Examination and awareness of special safety equipment such as this diesel engine "runaway" control device is also useful.

Slide #6 More importantly, responders should be knowledgeable and skilled in the essential safety aspects and handling procedures for dealing with the overturned vehicle and spilled chemicals.

Slide #7 Response personnel should continually check for the presence of flammable vapors with a combustible gas indicator device when flammable liquids or gases are involved. If these vapors are detected...

Slide #8 the vehicle and flammable liquid spill should be covered with firefighting foam. This will reduce the amount of vapors in the air and reduce fire hazards. Any time flammable vapors are detected, foam should be reapplied.

Slide #9 Before any work is done, on or near the overturned truck, the truck should be grounded to prevent static sparks.

Slide #10 A copper rod driven 4-6 feet into the ground and a 40-ft. length of wire are used for this purpose.

Slide #11 If the product is spilling and flowing away from the tanker, containment will be necessary. Culverts should be blocked off. One method is to use an inflatable rubber plug.

Slide #12 Drains such as this may be covered with a plastic tarp or...

Slide #13 sealed by the use of a portable foam insulation unit which delivers quick-setting rigid urethane foam.

Slide #14 In flowing ditches or small streams, planks or other materials may be set up to act as a weir and thereby skim the floating fuel from the water.

Slide #15 Underflow dams such as this are also useful for floating spills.

Slide #16 Sorbent filter fences can be constructed relatively easy by using straw, commercial absorbent products, or other materials that will absorb the spilled chemical.

Slide #17 Braces should be used to support an overturned truck if there is any danger that it might shift while work is going on near it.

Slide #18 Leakage from hatch covers can be stopped or slowed down by the use of...

Slide #19 dome compressor devices such as the one being applied here.

Slide #20 This can be very effective.

Slide #21 Various types of patching devices and tools should be put into a kit and carried by response personnel.

Slide #22 In the event that there are small holes or punctures in the shell of the tank, these devices can be used to stop the leak. Here an inflatable patch is being applied.

Slide #23 It is generally recognized by the transportation industry that off-loading of the product should be done before attempting to upright any aluminum skinned vessel. For this reason, various off-loading techniques should be learned and the equipment necessary for these operations should be on hand.

Slide #24 One technique for MC 306 gasoline tank trucks, is to open the internal valves then pump-off through the discharge lines.

Slide #25 A special 90^o adaptor fitting is needed for this. Notice that the washtub and adaptor are bonded to the tank trailer to prevent static sparks.

Slide #26 In some cases, if it is undamaged, the vapor recovery system may be used for off-loading.

Slide #27 Special dome funnels can be attached to off-load through the domes.

Slide #28 Once in place, it is possible to reach into the funnel with a special built-in rubber glove and open the manway.

Slide #29 The product is then pumped out through the discharge hose, seen here.

Slide #30 Another method, used only on aluminum shelled tank trucks carrying gasoline, is the drill and pump technique. An air or water-powered drill is used to cut a hole in the aluminum shell. Water is sprayed over the surface while cutting is taking place, to cool the surface and wash away shavings.

Slide #31 When the opening has been made, a grounded downspout is inserted and the gasoline is pumped out.

Slide #32 Pumps used for off-loading should be explosion-proof and units such as this air-operated diaphragm pump and...

Slide #33 this water powered centrifugal pump work quite well.

Slide #34 Once the product has been off-loaded, the tank truck is ready for uprighting.

Slide #35 Slings should be used in place of steel cables as the cables could cut and damage the tank.

Slide #36 Low pressure air cushions work very nicely for uprighting the tank.

Slide #37 As these bags inflate, the truck is gently raised.

Slide #38 Tow trucks are positioned with straps around the tank on either side and allow the tank to be slowly lowered back...

Slide #39 to an upright position.

Slide #40 With diligent preplanning and preparation, in combination with trained and knowledgeable response personnel, hazardous chemical spills resulting from transportation incidents can be safely and effectively handled.

Slide #41 The End.

LA PRODUCCION Y TRANSPORTE DE ACIDO SULFURICO PROVENIENTE DE LA PLANTA DE ZINC DE CAJAMARQUILLA, LIMA, PERU

OSCAR CACERES LOPEZ

SIMPÓSIO SOBRE EMERGÊNCIAS CAUSADAS POR AGENTES QUÍMICOS
Centro Panamericano de Ecologia Humana y Salud - "ECO"
Metepec - México

SISTEMAS DE AÇÕES DE EMERGÊNCIAS CAUSADAS POR ACIDENTES QUÍMICOS NO ESTADO DE SÃO PAULO, BRASIL

Engº Carlos Celso do Amaral e Silva
julho,1984

SISTEMAS DE AÇÕES DE EMERGÊNCIAS CAUSADAS POR AGENTES QUÍMICOS NO ESTADO DE SÃO PAULO, BRASIL (*)

I. INTRODUÇÃO

Os acidentes envolvendo liberação de produtos químicos perigosos durante seu transporte não são muito frequentes no Brasil mas, quando ocorrem, trazem graves consequências para a comunidade.

Falhas operacionais devidas a erros humanos que variam de inadmissível negligência até completa ignorância das normas e procedimentos de prevenção estão entre as causas daqueles eventos.

Os riscos sociais associados a tal problema não têm recebido adequada atenção dos responsáveis pela movimentação daquelas cargas o que é agravado pela provada insuficiência e pela relativa ineficiência dos sistemas fiscalizadores.

Os noticiários dos jornais nos últimos anos têm destacado ocorrências de liberação de produtos químicos como por exemplo: ácido sulfúrico, amônia - anidra, agrotóxicos, xileno, benzeno, pentaclorofenato de sódio, gasolina, óleo diesel, óleo cru, nafta e outros. Mananciais de água de abastecimento público têm sido atingidos direta ou indiretamente por aqueles produtos por ocasião dos incidentes. O que é mais dramático, centenas de vidas humanas foram perdidas em cerca de pelo menos dois acidentes de grandes proporções como os ocorridos recentemente no estado da Bahia e na Baixada Santista, estado de São Paulo.

Veículos com cargas perigosas - explosivos, produtos inflamáveis, substâncias tóxicas, substâncias radioativas, corrosivos - circulam no território brasileiro sem a existência de sistemas de segurança efetivos contra acidentes, fato que tem sido denunciado tanto por técnicos de trânsito como por empresários do setor. Basta dizer que da frota de cerca de 1.500 caminhões para tal tipo de transporte, apenas 30% podem ser considerados relativamente obedientes às normas de segurança, incluindo a qualificação adequada de seus motoristas através de cursos especializados. Os 70% restantes não atendem

(*) Emergências causadas por disposiçao inadequada de aguas residuárias, contaminantes de atmosfera ou do solo, parte das atividades de controlo da poluiçao, não são aqui abordadas.

adequadamente as exigências e muitos deles são carreteiros autônomos que se mantêm no setor pelo fato de cobrarem fretes inferiores aos das empresas do ramo.

Apesar desses fatos, o Decreto Federal nº 88.821, de 06 de novembro de 1983, introduzindo legislação específica para o transporte de cargas perigosas, modifica substancialmente o instrumental legal brasileiro procurando enfrentar o problema de maneira responsável e abrangente que vise a saúde pública, a segurança e a proteção do meio ambiente.

II. ASPECTOS DA NOVA LEGISLAÇÃO

O Decreto Federal nº 88.821, acima mencionado, conceitua produtos perigosos como sendo aqueles que "pelas suas características sejam perigosos ou representem riscos para a saúde de pessoas, para a segurança pública e para o meio ambiente". O decreto, além de submeter esses produtos à normas específicas, não ab-roga nem dispensa "legislação e disciplina peculiar a cada produto perigoso" não abrangendo, portanto, a licença de fabricação do produto e não interfere com o problema de localização das indústrias fabricantes dos mesmos. Estes aspectos são de alçada de outros instrumentos de ação legal.

Anteriormente, os produtos perigosos já haviam sido classificados pelas Normas Brasileiras (NBR 7502) baseando-se em ampla listagem que seguia catalogação das Nações Unidas. A experiência a se adquirir com base no Decreto citado poderá eliminar ou acrescentar produtos daquela listagem.

A competência para legislar sobre o assunto pertence ao Governo da União enquanto que aos estados cabe legislar supletivamente mas respeitada a lei federal. O município também pode legislar supletivamente em questões de tráfego e trânsito de veículos conduzindo produtos perigosos. Essa competência supletiva dos estados e dos municípios permite que sejam feitas exigências maiores porem nunca poderão ser mais permissivas do que a União.

Pela nova legislação o expedidor e o transportador daquelas mercadorias são responsáveis por todos os cuidados que a lei exige para a embalagem, a rotulagem, a carga, a amarração, o transporte e a descarga das mesmas no que diz

respeito à sua segurança. A Administração Pública deverá efetuar um controle posterior sobre o sistema, podendo os estados e municípios, entretanto, intervir no controle prévio instituindo licença, autorização, aprovação ou permissão para a circulação daquelas cargas por via rodoviária.

Tomando, por exemplo, o caso dos itinerários dos veículos de transporte de cargas perigosas, o Decreto 88.821 estabeleceu as três hipóteses seguintes:

a) não haverá necessidade de comunicação sobre o itinerário se o veículo não passa por áreas densamente povoadas, áreas de proteção de mananciais, reservatórios de água, reservas florestais e reservas ecológicas, nem a elas se destina.

b) o veículo passa por uma das áreas acima ou a elas se destina, neste caso exigindo-se comunicação às autoridades.

c) o veículo transporta cargas consideradas extremamente perigosas necessitando então de aprovação do itinerário por parte das autoridades.

O estacionamento dos veículos com cargas perigosas, a necessidade de declarações em documentação apropriada de seu conteúdo, as medidas de emergência e os equipamentos para seu atendimento, a responsabilidade civil e as sanções penais também são objeto da nova legislação.

As inovação apresentadas podem ser resumidas no seguinte:
- exigência do Certificado para Despacho e Embarque de Produtos Perigosos para cada viagem,
- comunicação do itinerário do veículo transportador,
- Ficha de Emergência para acompanhar o produto transportado,
- utilização obrigatória de tacógrafos e sinais externos apropriados nos veículos transportadores.

Algumas deficiências, segundo os técnicos, ainda persistem. Dentre elas, a ausência de previsão de consulta a órgãos ambientais e a ausência de seguro especial obrigatório para danos a terceiros e ao ambiente.

A Companhia de Tecnologia de Saneamento Ambiental - CETESB que no estado de São Paulo é responsável pelas ações executivas de controle do meio ambiente, apesar das deficiências apontadas na nova legislação, tem procurado desenvolver programas de ação preventiva e tem procurado chamar a atenção das demais autoridades para o problema do risco ambiental associado ao sistema.

III. O CASO ESPECÍFICO DOS PRODUTOS TRANSPORTADOS POR TUBULAÇÕES

Uma série de acidentes com consequentes danos ambientais e perdas de vidas humanas tem sido recentemente atendidos pela CETESB na área de oleodutos e gasodutos no estado de São Paulo.

Em novembro de 1983 uma rocha de 18 toneladas, deslocada de seu leito por explosão com dinamite durante obras de construção de uma rodovia no litoral, atingiu um oleoduto da companhia estatal de petróleo provocando o derramamento de grande quantidade de óleo que atingiu cerca de 20 km^2 de manguesais além de várias praias na região de Bertioga.

Em fevereiro de 1984 um grande incêndio ocorrido após um vazamento de grandes proporções em tubulações da mesma companhia que havia espalhado gasolina de alta octanagem em área do município de Cubatão, perto de Santos, causou cerca de 100 mortes, dezenas de feridos e mais de 1.000 desabrigados além dos danos ambientais.

Os relatórios técnicos da CETESB na ocasião concluiam que a inexistência de um processo adequado de planejamento integrado era a responsável principal pela disputa de escassos espaços físicos remanescentes da crescente urbanização por usos tão diferentes como localização industrial, lazer, turismo, atividades portuárias e proteção ambiental. A necessária harmonização desses usos do solo é uma demanda de grande importância para a solução dos conflitos que caracterizam a região da Baixada Santista, no estado de São Paulo.

Tais conflitos são ainda agravados pela crescente poluição das águas, do ar e do solo pelos detritos lançados "in natura" pelas cidades e indústrias alí localizadas.

O setor de transportes na região, com grandes investimentos realizados, está sub-utilizado e não exerce o papel de estruturador da ocupação do espaço por falta de um plano diretor de desenvolvimento integrado a nível regional que oriente os investimentos complementares.

Em vista da complexidade da interação da atividade humana com o meio ambiente naquela área, os derramamentos de petróleo e produtos derivados são apenas um problema adicional ao potencial de agressividade daquele sistema.

Os acidentes demonstraram a ausência de planos de ação de emergência eficientes e de recursos humanos e materiais disponíveis nessas ocasiões.

Os esboços apresentados nos Mapas III-1, III-2 e III-3, em anexo, mostram a rede de oleodutos no estado de São Paulo com detalhes na Grande São Paulo e locais dos acidentes mais recentes devido a vazamentos.

O atendimento a esses incidentes por intermédio de entidades ligadas à Defesa Civil do Estado de São Paulo e pela CETESB serviu como fonte de estudo e de avaliação para a elaboração de um Plano de Ação de Emergência específico.

No litoral do estado de São Paulo, desde junho de 1978 e em consequência de uma série de impactos ambientais causados por derrames de óleo por navios-tanques, funciona o Comitê de Defesa do Litoral - CODEL (Decreto Estadual 11.762) cujo braço executivo tem sido a própria CETESB. Esse Comitê elaborou um Plano de Ação de Emergência e treinou uma equipe de técnicos para atender a tais incidentes. Esse Plano (v. Quadro III-4) tem sido adaptado para o atendimento de ocorrências semelhantes no restante da área do estado.

O Anexo 1 apresenta detalhes do Plano de Ação de Emergência do CODEL.

Infelizmente, por vários motivos, não conta ainda o estado com recursos humanos e materiais em nível suficiente e dotados de suporte institucional definido que possibilitem uma ação preventiva e corretiva proporcional ao risco proporcionado pelo manejo de produtos químicos perigosos.

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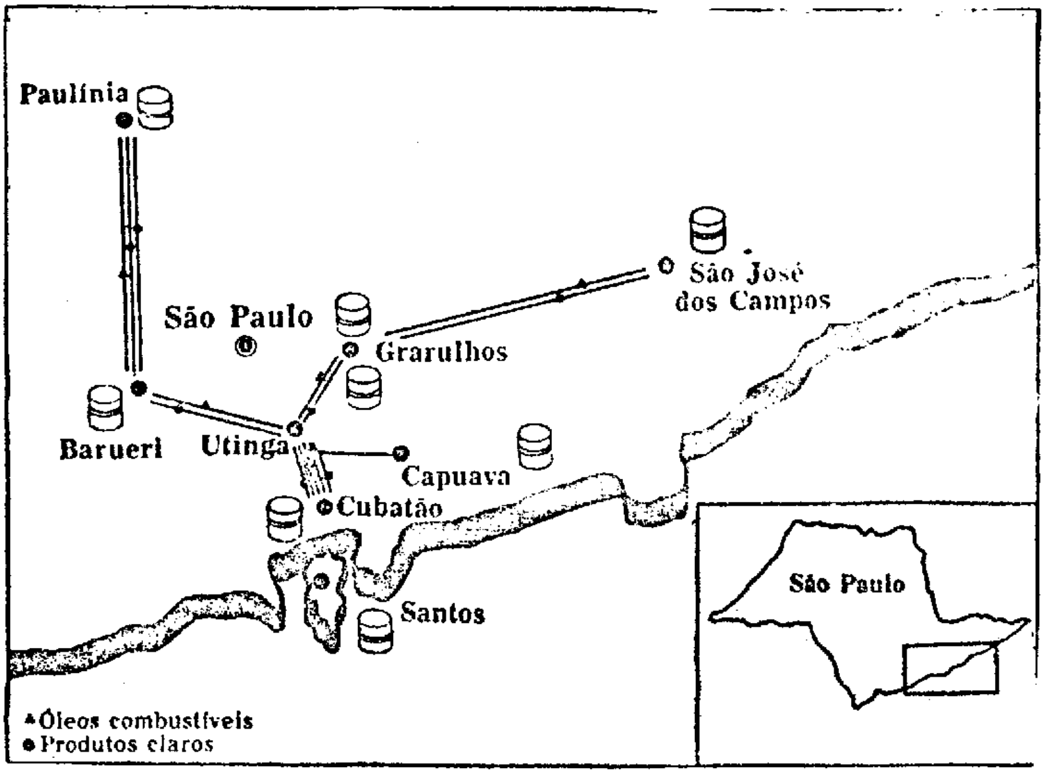
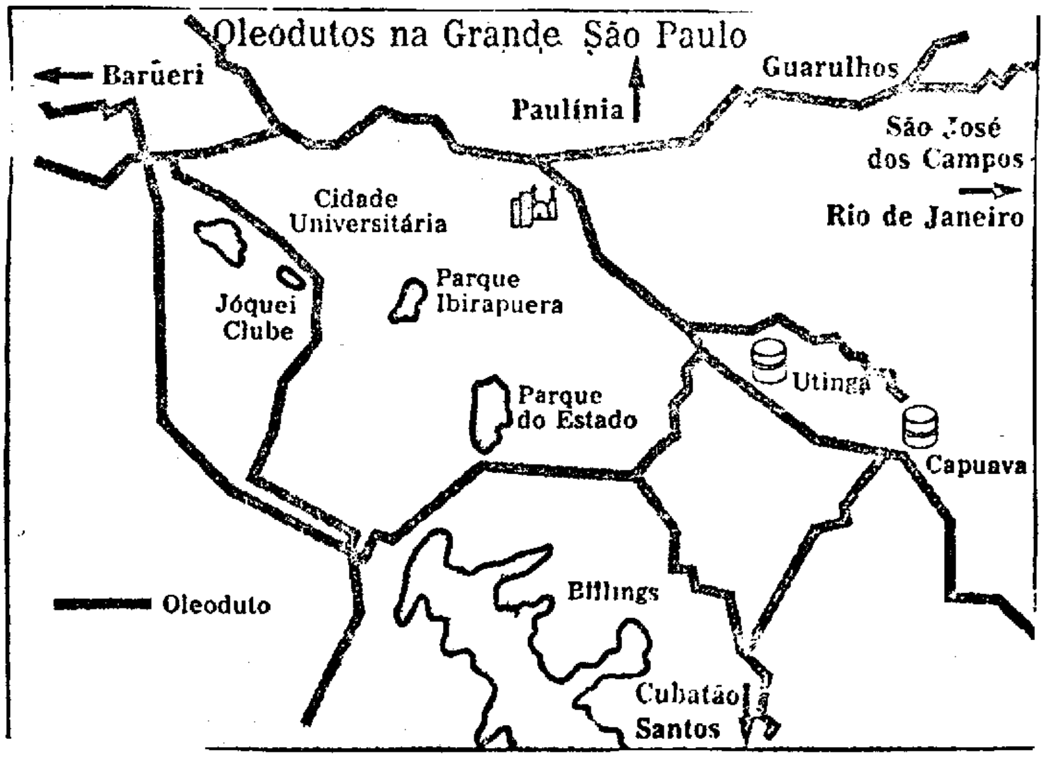
3. CETESB - "Relatório da Comissão de Emergência de Cubatão", maio 1984.

4. COMITÊ DE DEFESA DO LITORAL - CODEL, Sub-Comitê para Ações de Emergência - Plano de Ação", São Paulo, junho 1984.

MAPA III-1: OLEODUTOS NO ESTADO DE S.PAULO (*)

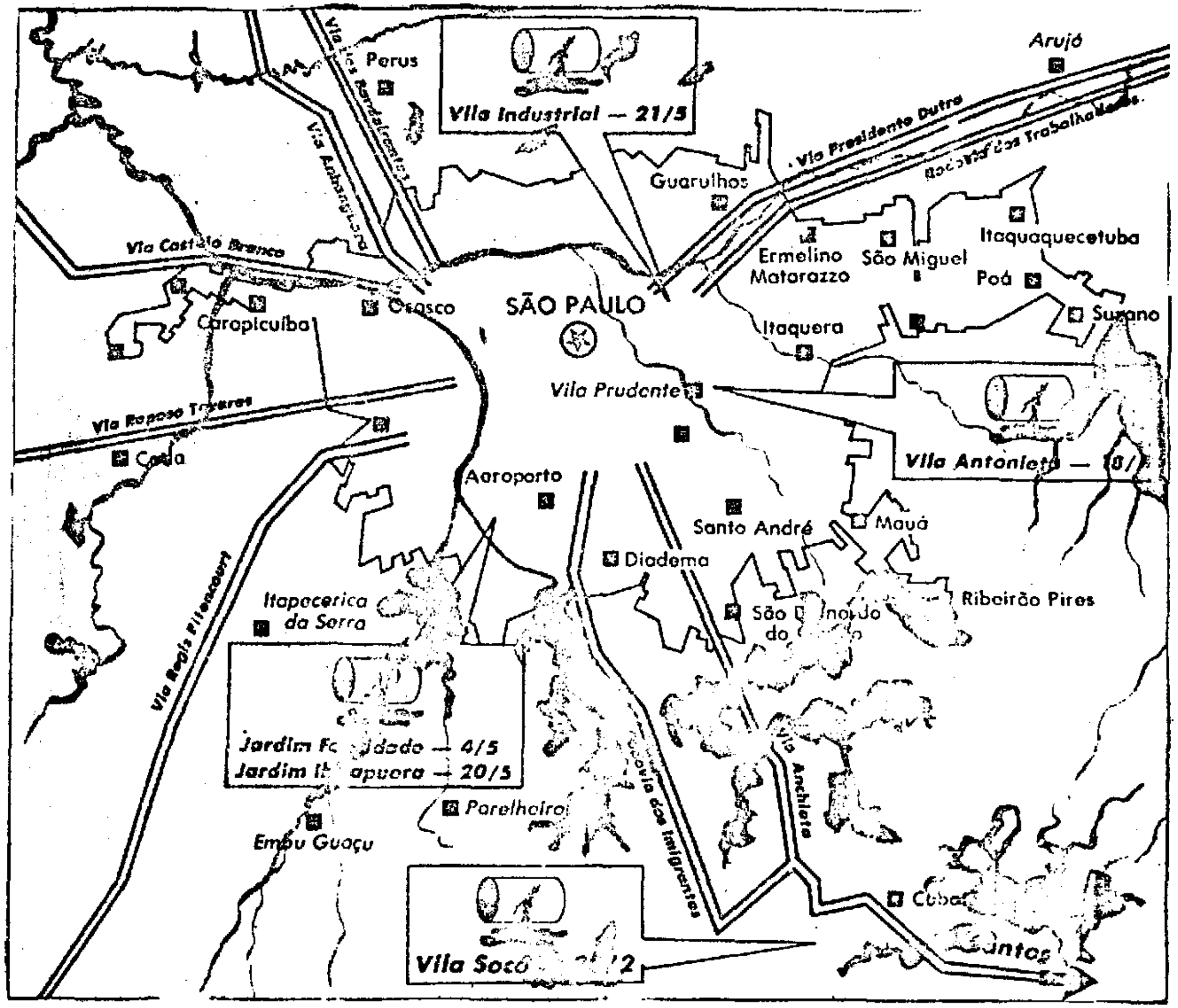


MAPA III-2: OLEODUTOS NA GRANDE S.PAULO (*)



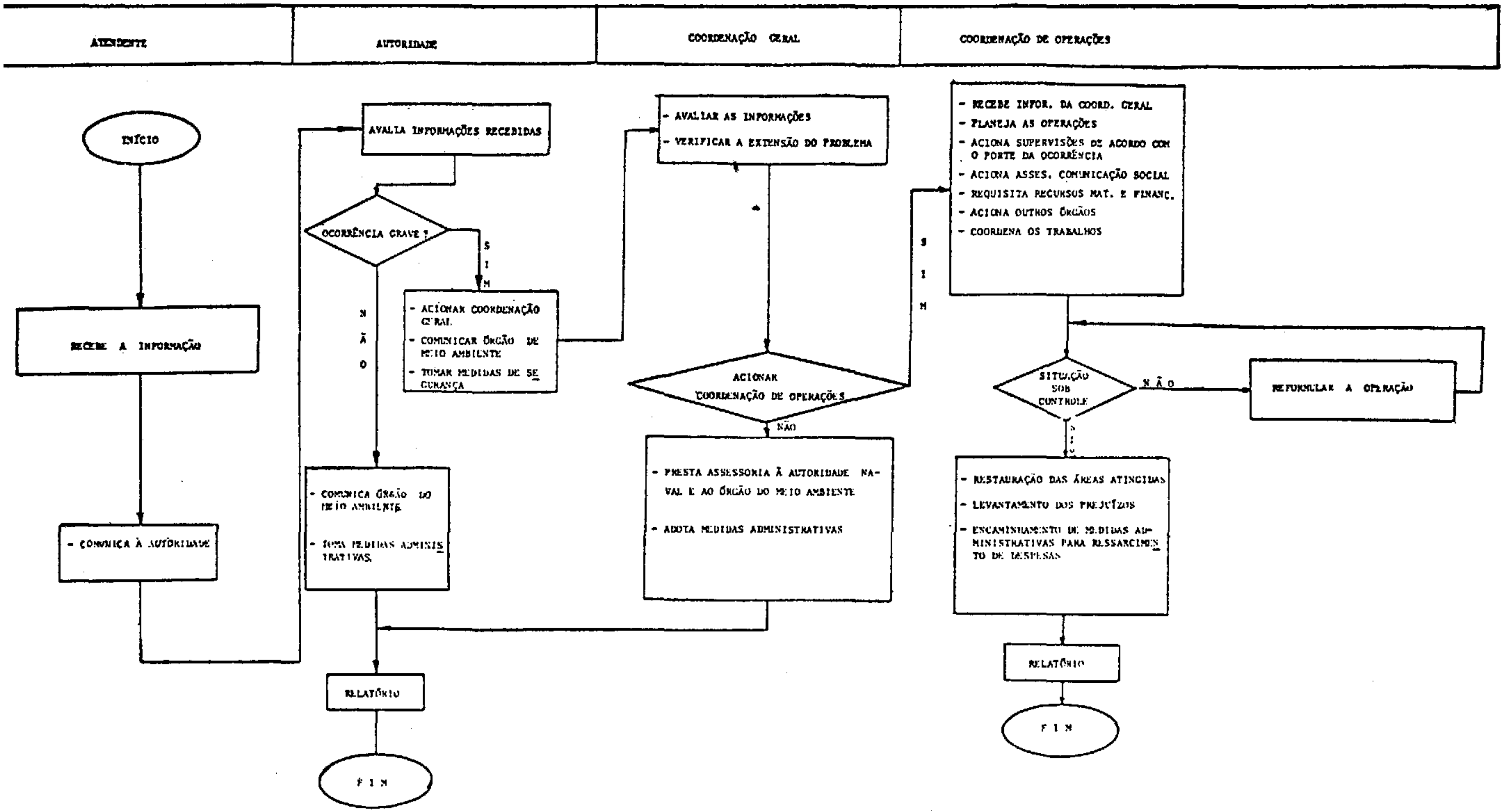
(*) . Fonte: Notícias CETESB

MAPA III-3: ACIDENTES CAUSADOS POR DERIVADOS DE PETROLEO NA GRANDE S.PAULO (*)



(*) Fonte: Notícias CETESB

QUADRO III-4: ACIONAMENTO DO PLANO DE AÇÃO DE EMERGÊNCIA DO CODEL



A N E X O 1

CODEL - Comitê de Defesa do Litoral

SUB-COMITÊ PARA AÇÕES DE EMERGÊNCIA

PLANO DE AÇÃO

JUNHO/1984

Í N D I C E

1 - Autoridade

Este Plano de Ação de Emergência - PAE foi desenvolvido segundo o que determina o Decreto Estadual 11.762 de 22 de junho de 1978, quando da criação do Comite de Defesa do Litoral CODEL. Neste Decreto o Governo do Estado de São Paulo congrega 05 entidades federais (SEMA, Ministério da Marinha, PORTOBRÁS, PETROBRÁS, CTA) e 05 estaduais (SOMA, CETESB, CPRN, SUDELPA, I.O.), com o propósito de promover e coordenar todas as ações que se fizerem necessárias para implementar a qualidade do ambiente do litoral de nosso Estado.

Este Plano fornece os elementos básicos, para a tomada de decisão em casos de acidentes, sendo que para cada natureza de ocorrência são utilizadas Rotinas de Ação de Emergência que prevêem procedimentos específicos, sendo divididas em dois grupos: derrames de petróleo e de produtos químicos e/ou biológicos.

Em outros casos específicos tais como; ocorrências naturais, e epidemias serão tratados por um plano específico a ser abordado pelo Sub-Comitê a ser designado.

2 - Objetivos

Este Plano de Ação estabelece a orientação básica para a coordenação e integração das ações necessárias para minimização dos riscos à saúde pública e ao meio ambiente decorrentes de acidentes com vazamentos de petróleo, produtos químicos e/ou biológicos, proporcionando resposta rápida e eficaz durante episódios envolvendo situações de emergência.

3 - Área de Abrangência Geográfica

Este Plano abrange todo o litoral do Estado de São Paulo, de Cananéia até a Ponta de Trindade no município de Ubatuba.

Entende-se por litoral toda região que se situa entre a plataforma continental e as áreas sob influência da maré alta (mangues, bancos de espartina, praias, costões, etc.

Em casos limítrofes em que o Litoral do Estado de São Paulo venha sofrer ou ocasionar poluição ou riscos à saúde pública em outros Estados, o CODEL poderá de comum acordo com as autoridades dos mesmos auxiliar na intervenção e erradicação do problema.

4 - Grupo de Ação de Emergência e Atribuições Gerais

GAEP - Grupo de Ação de Emergência de Combate à Poluição terá por objetivo atuar sempre que houver um derrame de petróleo, produtos químicos e/ou biológicos que envolvam riscos à saúde pública e ao meio ambiente.

A atuação do GAEP deve ser no sentido de:

- Avaliar a ocorrência
- Planejar as operações
- Coordenar os recursos humanos, materiais e financeiros
- Informar a Imprensa
- Esclarecer a opinião pública sobre o andamento das operações, riscos e cuidados gerais
- Manter esquemas de segurança
- Restaurar áreas atingidas
- Fornecer elementos para ressarcimento de danos e despesas.

. Avaliar as operações para ações posteriores

. Divulgar os resultados

5 - Estrutura do Grupo de Ação de Emergência de Combate à Poluição .

A estrutura organizacional do GAEP é composta por duas Coordenações, uma Assessoria e nove Supervisões.

Em função da característica da ocorrência deverão ser seguidos os procedimentos previstos nas Rotinas de Ação de Emergência, RAE-1 para Petróleo e seus derivados e RAE-2 para produtos químicos e biológicos.

6 - Atribuições por Nível de Coordenação

- Coordenação Geral

Cabe à Coordenação Geral a atribuição deste Plano, bem como a coordenação das atividades nele previstas.

A Coordenação Geral deverá proceder da seguinte forma;

. Avaliar as informações recebidas sobre o incidente

. Decidir sobre o acionamento da Coordenação de Operações

. Autorizar o uso de recursos

. Acionar assessorias

. Coordenar as atividades de Comunicação Social

. Coordenar as atividades entre outros orgãos

- Coordenação de Operações

A Coordenação de Operações será composta por um Coordenador e um suplente, responsável por toda área de abrangência deste

Plano e por quantos acidentes ocorrerem.

A Coordenação de Operações deverá proceder da seguinte forma:

- Determinar em função da RAE adotada quais as supervisões que deverão ser acionadas.
- Executar a operação conforme planejamento aprodo pela Coordenação Geral.
- Requisitar e coordenar os recursos necessários
- Adotar as medidas de segurança
- Avaliar o progresso das operações e decidir quanto à suas reformulações
- Obter dados para ações posteriores
- Interpretar e preparar a divulgação dos resultados
- Encaminhar dados para a Coordenação Geral para efetuação do ressarcimento de danos e despesas
- Elaborar relatório técnico.

\- Assessoria de Comunicação Social

Esta assessoria será acionada pela Coordenação Geral tendo como atribuição informar as autoridades locais e ao público em geral garantindo a fidedignidade dos fatos, mediante informações obtidas com as Coordenações Geral e de Operações.

Sua função é facilitar o acesso à imprensa e ao público em geral, distribuindo notas oficiais, bem como programar, em horários pré-determinados, entrevistas com os diversos segmentos da imprensa.

- Supervisões

As supervisões estarão diretamente subordinadas à Coordenação de Operações.

- Supervisão de Operações em Praias

Esta supervisão ficará encarregada de proceder e supervisionar todos os trabalhos das diversas entidades oficiais e privadas envolvidas nas operações de restauração de praias.

Vale ressaltar que as entidades envolvidas nos trabalhos serão acionadas por esta supervisão segundo orientação da Coordenação de Operações.

- Supervisão de Operações de Mar

Esta supervisão acionará, mediante orientação da Coordenação de Operações, todas entidades que deverão direta ou indiretamente participar das operações de mar, cabendo ainda à esta supervisão o controle total destes trabalhos.

- Supervisão de Análises Químicas e Biológicas

Esta supervisão deverá providenciar o monitoramento de análises químicas e/ou biológicas durante e após qualquer ocorrência em que se façam necessários tais procedimentos, devendo portanto esta supervisão acionar as entidades específicas para cada natureza de problema.

- Supervisão de Transportes

Esta supervisão terá como função acionar todos os sistemas de transportes necessários para as ações de campo, de acordo com as necessidades apresentadas pela Coordenação de Operações, responsabilizando-se portanto por aeronaves, embarcações, viaturas

caminhões, etc..

- Supervisão de Impacto Ambiental

Esta supervisão deverá desenvolver estudos sobre todo ambiente geofísico afetado pela ocorrência, no sentido de assessorar a Coordenação de Operações para a minimização dos danos durante a operação, bem como avaliar os danos ecológicos ao término das operações de restauração das áreas atingidas.

- Supervisão Administrativa

Cabe à esta supervisão dar total apoio administrativo às operações de campo, tanto no controle dos resultados parciais no decorrer dos trabalhos, bem como na administração dos recursos financeiros envolvidos, controlando, sob supervisão da Coordenação de Operações, as despesas em campo.

- Supervisão de Segurança

A Supervisão de Segurança terá como objetivo providenciar e manter durante os trabalhos todos os sistemas necessários de segurança, tanto das pessoas envolvidas diretamente nas operações de campo, como do público em geral, evitando portanto eventuais acidentes, bem como mantendo a tranquilidade da comunidade.

- Supervisão de Monitoramento

Cabe a esta supervisão assessorar a Coordenação de Operações quanto à obtenção de informações técnicas necessárias como bibliografia específica, dados sobre condições meteorológicas das regiões afetadas, informações sobre correntes marítimas, marés etc., prevendo assim a movimentação real da mancha, emitindo dados para a Coordenação de Operações, conforme previsto no manual de monitoramento.

- Supervisão de Comunicação Operacional

Cabe à esta supervisão providenciar e operar todos os sistemas de comunicação entre as diversas frentes de trabalho em campo, centralizando todas informações da Coordenação de Operações informando as diversas supervisões envolvidas, bem como comunicar à Coordenação de Operações as solicitações de recursos materiais e equipamentos.

7 - Acionamento do GAEP

Sempre que houver acidentes decorrentes de derrames de petróleo, produtos químicos e/ou biológicos, que causem riscos à saúde pública ou ao meio ambiente o CODEL deverá ser acionado para tanto a Secretaria Executiva deve, dentro de sua competência, divulgar este Plano, orientando os vários segmentos da sociedade de como poderão acioná-lo e colaborarem para que possam ser minimizados os danos e prejuízos ambientais decorrentes de possíveis eventualidades.

- Fases do Acionamento

7.1. Registro de Ocorrência

Qualquer entidade que registre uma ocorrência, prevista neste plano deverá procurar obter o máximo de informações possíveis de modo a retratar a realidade dos fatos.

Após o recebimento destas informações caberá ao atendente acionar a Autoridade Naval da região que desencadeará as providências preliminares do acionamento deste Plano.

7.2. Autoridade Naval

Assim que acionada caberá a esta entidade realizar uma avalia-

ção preliminar, devendo utilizar para tal o formulário nº 1, o qual deverá ser preenchido de modo a retratar a realidade da ocorrência.

Caberá ainda a Autoridade Naval acionada classificar a gravidade da ocorrência, decidindo quanto ao acionamento da Coordenação Geral do GAEP.

Caso a ocorrência não seja classificada como grave, a autoridade naval comunicará o Órgão de Meio Ambiente, que tomará as medidas administrativas cabíveis e emitirá um relatório para a Coordenação Geral do GAEP.

No caso da ocorrência ser classificada como grave, a autoridade naval acionará a Coordenação Geral do GAEP, comunicará o fato ao Órgão de Meio Ambiente e tomará medidas imediatas de segurança.

7.3. Órgão de Meio Ambiente

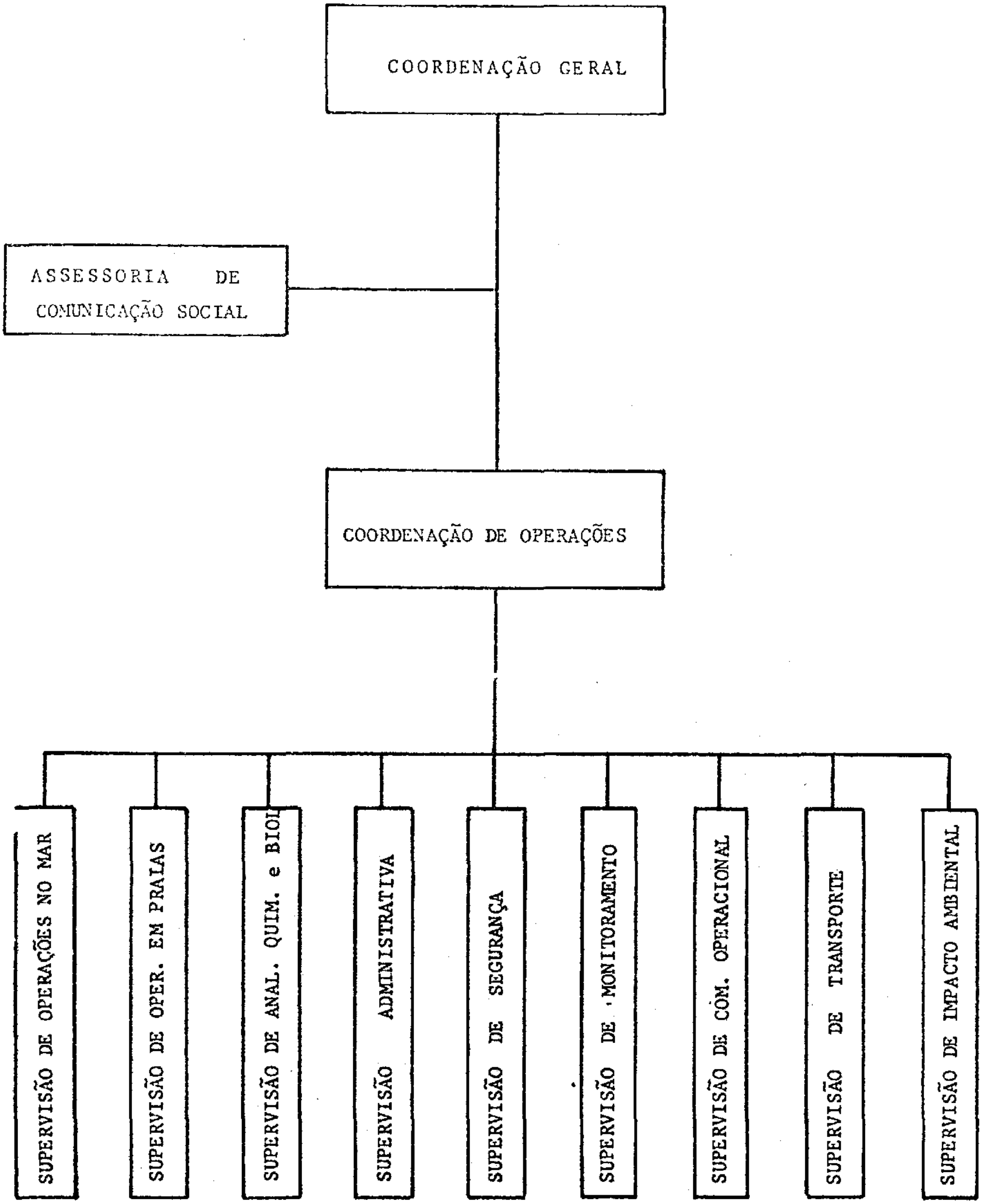
Em qualquer das situações mencionadas anteriormente, o Órgão de Meio Ambiente deverá tomar as medidas cabíveis, segundo as normas de fiscalização e controle, compatíveis com a natureza do problema.

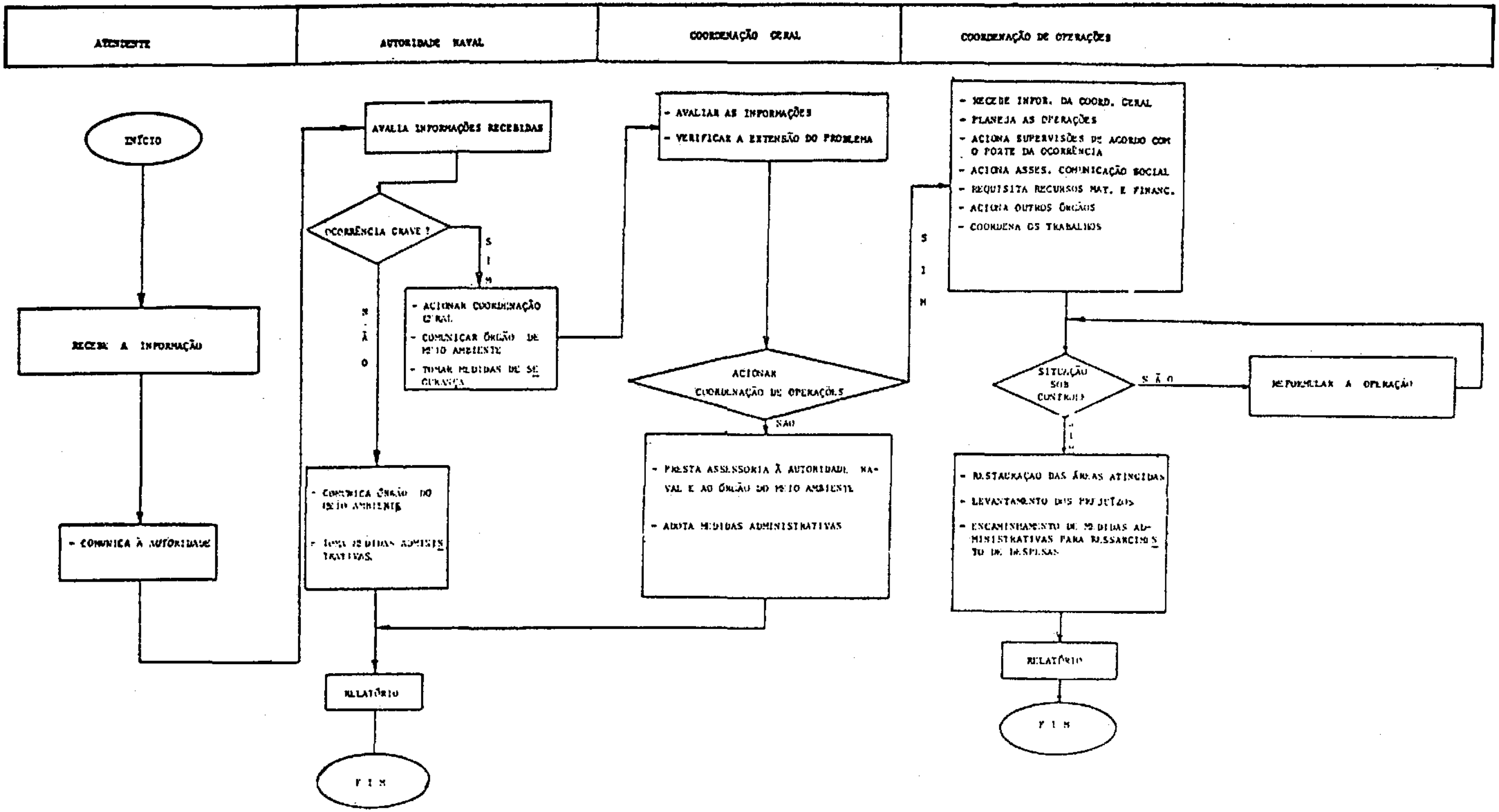
7.4. Coordenação Geral

Assim que acionada a Coordenação Geral, esta avaliará as informações recebidas, analisando a extensão do problema, decidindo quanto ao acionamento da Coordenação de Operações.

No caso da Coordenação Geral não julgar necessário o acionamento da Coordenação de Operações, deverá prestar assessoria a Autoridade Naval e ao Órgão do Meio Ambiente para que os mesmos possam desempenhar suas atribuições, visando a minimização e

ORGANOGRAMA ESTRUTURAL DO GAEP




ATENDENTE
AUTORIDADE NAVAL
COORDENAÇÃO GERAL
COORDENAÇÃO DE OPERAÇÕES
INÍCIO
RECEBE A INFORMAÇÃO
- COMUNICA À AUTORIDADE
AVALIA INFORMAÇÕES RECEBIDAS
OCORRÊNCIA GRAVE ?
SIM
NÃO
- ACIONAR COORDENAÇÃO GERAL
- COMUNICAR ÓRGÃO DE MEIO AMBIENTE
- TOMAR MEDIDAS DE SEGURANÇA
- COMUNICA ÓRGÃO DO MEIO AMBIENTE
- TOMA MEDIDAS ADMINISTRATIVAS.
RELATÓRIO
FIM
- AVALIAR AS INFORMAÇÕES
- VERIFICAR A EXTENSÃO DO PROBLEMA
ACIONAR COORDENAÇÃO DE OPERAÇÕES
SIM
NÃO
- PRESTA ASSESSORIA À AUTORIDADE NAVAL E AO ÓRGÃO DO MEIO AMBIENTE
- ADOTA MEDIDAS ADMINISTRATIVAS
- RECEBE INFOR. DA COORD. GERAL
- PLANEJA AS OPERAÇÕES
- ACIONA SUPERVISÕES DE ACORDO COM O PORTE DA OCORRÊNCIA
- ACIONA ASSES. COMUNICAÇÃO SOCIAL
- REQUISITA RECURSOS MAT. E FINANC.
- ACIONA OUTROS ÓRGÃOS
- COORDENA OS TRABALHOS
SITUAÇÃO SOB CONTROLE
NÃO
REFORMULAR A OPERAÇÃO
SIM
- RESTAURAÇÃO DAS ÁREAS ATINGIDAS
- LEVANTAMENTO DOS PREJUÍZOS
- ENCAMINHAMENTO DE MEDIDAS ADMINISTRATIVAS PARA RESSARCIMENTO DE DESPESAS
RELATÓRIO
FIM

eliminação do problema.

7.5. Coordenação de Operações

Assim que acionada pela Coordenação Geral a Coordenação de Operações deverá planejar a operação, acionar;as supervisões, Assessoria de Comunicação Social, órgãos e entidades para apoio aos trabalhos.

Caberá ainda ao Coordenador de Operações requisitar à Coordenação Geral recursos materiais, financeiros e humanos.

Após serem tomadas estas medidas preliminares o Coordenador de Operações tomará a frente dos trabalhos de campo, agindo de acordo com a Rotina de Ação de Emergência específica.

8 - Rotinas de Ação de Emergência

8.1. RAE - 1 - Rotina de Ação de Emergência para Vazamentos de Petróleo ou Derivados

Ao assumir o comando dos trabalhos de campo a Coordenação de Operações e suas respectivas Supervisões deverão considerar os seguintes aspectos:

8.1.1. Medidas de segurança quanto à:

a) risco de incêndio e/ou explosão;
b) risco de intoxicação;
c) danos ao meio ambiente;
d) prejuízos econômicos às atividades locais.

8.1.2. Divulgação de medidas preventivas à comunidade e imprensa através da Assessoria de Comunicação Social

8.1.3. Medidas Operacionais

8.1.3.1. Dispersão:

Nos casos que sejam verificadas as possibilidades de lançamento de agentes químicos dispersantes, tal operação deverá ser efetuada conforme orientações constantes do Manual - "Procedimentos para Aplicação de Agentes Químicos Dispersantes".

8.1.3.2. Contenção

Com base nos resultados da avaliação preliminar deverá sempre se procurar conter a maior quantidade possível de óleo, levando-se em consideração as seguintes variáveis:

a) Velocidade de vento e correntes marítimas;
b) Segurança à navegação e instalações da região;
c) Relação custo/benefício.

Os procedimentos adequados de contenção estão detalhados no Manual - Teoria e Prática de Operação de Sistemas de Contenção, onde poderão ser encontradas informações sobre os tipos de barreiras existentes, improvisações, cuidados, fórmulas para cálculo de posicionamento, etc..

8.1.3.3. Remoção

A remoção do óleo pode ocorrer, basicamente, em quatro situações distintas:

a) Óleo contido na superfície da água;
b) Óleo impregnado em pedras, costões, áreas de iates-clubes, hotéis, etc.;
c) Óleo na praia;
d) Óleo em embarcações.

Para limpeza e remoção do óleo nestas quatro situações recomenda-se que seja consultado o Manual - Teoria e Prática de Sistemas de Remoção de Óleo.

8.1.3.4. Monitoramento

As dificuldades de se localizar manchas de óleo no mar são signific tivas. Portanto, a Coordenação de Operações deve dispor de recursos tais como helicópteros e aeronaves de pequeno porte para detecção do deslocamento de manchas de óleo no mar.

Em muitos casos são necessários, além do monitoramento aéreo, acompanhamentos marítimo e terrestre, que devem atuar em conjunto para troca de informações durante as operações. Consultar Manual - Monitoramento Aéreo, Marítimo e Terrestre.

8.1.3.5. Acompanhamento dos Impactos Ambientais Durante as Operações de Campo

Em acidentes de médio e grande portes são imprescindíveis acompanhamento das operações de contenção, remoção e disposição de resíduos, por técnicos da Supervisão de Impacto Ambiental para que desde o momento do incidente sejam avaliados os danos ecológicos causados pelo óleo e pelas próprias operações de restauração.

8.1.3.6. Análises Laboratoriais durante as Operações de Campo

A Coordenação de Operações deverá acionar a Supervisão de Análises laboratoriais para a realização de análises de rotina em campo e coletas de amostras para determinação de análises posteriores em laboratórios especializados, de modo que estes possam auxiliar na avaliação dos danos causados ao meio ambiente.

8.1.3.7. Disposição Final de Resíduos

Os resíduos de petróleo podem ser, dependendo da quantidade e grau de contaminação, material reaproveitado, evitando-se assim gastos desnecessários com transporte eoperações de disposição.

Os resíduos oleosos podem ser originados por duas situações distintas:

a) Resíduos oleosos removidos diretamente da água:

Nesta situação, após a remoção através do processo mais adequado, em quase todos os casos é possível o reaproveitamento do óleo pela Petrobrás, evitando-se assim operações de disposição.

b) Areia contaminada por resíduos oleosos:

Após a limpeza de praias atingidas pelo derrame através de processos manuais ou mecânicos a mistura óleo/areia deverá ser disposta levando-se em consideração os seguintes pontos:

1 - A área de disposição não deve estar próxima à corpos d'água
2 - A área não pode ser de uso público comum
3 - A área deve ser próxima ao local de remoção

O processo de disposição em valas cobertas ou em aberto deverá depender da disponibilidade de áreas apropriadas para cada caso.

Para estas operações são indispensáveis consultas à prefeitura local e a presença de técnicos especializados em disposição de resíduos sólidos.

8.1.3.8. Restauração das Áreas Atingidas

Deverão ser observadas que sempre ao término das operações de emergência resultam-se em transformações das áreas atingidas, tais como;

a) Restauração de jardins, praças ou propriedades particulares danificadas pela movimentação de veículos e equipes de trabalho.

b) Remoção e limpeza de areia das praias e áreas contaminadas.

8.1.4. Acompanhamento Posterior à Fase Emergencial

8.1.4.1. Avaliação dos Impactos Ambientais

Após o término de todas operações emergenciais deverá ser realizado um estudo de levantamento de impactos ambientais causados pela ocorrência.

8.1.4.2. Relatório Final e Medidas Legais

Após a realizadção de todas ações de campo deverá ser realizado um relatório final da operação detalhando os trabalhos executados e seus respectivos resultados, ressaltando os aspectos operacionais e fornecendo os subsídios para que sejam tomadas as medidas jurídicas e administrativas determinadas pela Secretaria Executiva do CODEL.

8.2. RAE - 2 - Rotina de Ação de Emergência para Vazamentos de Produtos Químicos ou Biológicos

Ao assumir o comando dos trabalhos de campo a Coordenação de Operações e suas respectivas supervisões deverão considerar os seguintes aspectos.

8.2.1. Medidas de segurança quanto a:

a) risco de incêndio e/ou explosão;

b) risco de intoxicação;

c) danos ao meio ambiente;

d) prejuízos econômicos às atividades locais.

8.2.2. Divulgação de Medidas preventivas à Comunidade e Imprensa através da Assessoria de Comunicação Social.

8.2.3. Medidas Operacionais

8.2.3.1. Neutralização

De acordo com as características do produto derramado deve-se procurar neutralizar seus efeitos na água, devendo-se portanto avaliar possíveis reações que eventualmente possam ser geradas pela combinação produto/neutralizante de modo que o meio ambiente não venha sofrer impactos com esta operação. Recomenda-se portanto que previamente seja consultado o Manual - Produtos Químicos, para decisão quanto à aplicação de neutralizantes

8.2.3.2. Contenção

Visando facilitar a remoção do produto da água deve-se sempre procurar conter a maior quantidade possível do produto, concentrando-o de preferência num só ponto.

Consultar Manual - Teoria e Prática de Operação de Sistemas de Contenção.

8.2.3.3. Remoção

Consultar o Manual - Teoria e Prática de Sistemas de Remoção.

8.2.3.4. Monitoramento

As dificuldades de se localizar derrames de produtos químicos ou biológicos são significativas. Portanto, em função desta dificuldade a Coordenação de Operações deve recorrer à helicópteros e aeronaves de pequeno porte para detecção e acompanhamento do produto no mar. Consultar Manual - Monitoramento Aéreo, Marítimo e Terrestre.

8.2.3.5. Acompanhamento dos Impactos Ambientais durante as Operações de Campo.

Em acidentes de médio e de grande portes é imprescindível o acompanhamento das operações de restauração por técnicos especializados em impactos ambientais, para que sejam avaliados os danos ecológicos causados pelo derrame.

8.2.3.6. Análises Laboratoriais durante as Operações de Campo

Em se tratando de produtos perigosos é recomendável um constante monitoramento das regiões atingidas, devendo portanto a Coordenação de Operação acionar imediatamente a Supervisão de Análises Laboratoriais para realização de análises de rotina em campo e coletas de amostras para análises posteriores em laboratórios especializados, devendo a Coordenação de Operação ser periodicamente informada sobre o grau de contaminação e riscos de toxicidade que as regiões afetadas estão sujeitas, para que sejam providenciadas medidas adequadas para os diferentes casos apresentados.

8.2.3.7. Disposição Final de Resíduos

Resíduos de produtos químicos bombeados diretamente da água podem, muitas vezes, serem reaproveitados pela indústria, evitando-se assim gastos desnecessários com transporte e operações de disposição.

No caso de areia ou terra contaminada com produtos químicos e/ou biológicos, a mistura deverá ser disposta levando-se em consideração três pontos básicos:

1 - A área de disposição não deve estar próxima à corpos d'água.
2 - A área não deve ser de uso público comum
3 - A área deve ser próxima ao local de remoção

Para os trabalhos de disposição são indispensáveis consultas à Prefeitura local para escolha do local adequado, bem como o acompanhamento das operações por especialistas em disposição de resíduos sólidos.

8.2.3.8. Restauração das Áreas Atingidas

Ocorrências com produtos de certa periculosidade podem gerar transformações de ordem física na região atingida devendo ser processada sua imediata restauração, tal como;

a) Restauração de jardins, praças e propriedades particulares danificadas pela movimentação de veículos, máquinas e equipes de trabalho.
b) Limpeza de praias e áreas atingidas.

8.2.4. Acompanhamento Posterior à Fase Emergencial

8.2.4.1. Avaliaçao dos Impactos Ambientais

Após o término das operações de emergência deverá ser realiza

do levantamento de danos ecológicos e impactos ambientais caudos pela ocorrência.

8.2.4.3. Relatório Final e Medidas Legais

Após a realização de todas ações de campo deverá ser realizado um relatório final da operação detalhando trabalhos executados e seus respectivos resultados ressaltando os apectos operacionais e fornecendo os subsídios para que sejam tomadas as medidas jurídicas e administrativas determinandas pela Secretaria Executiva do CODEL.

9 - Recursos Financeiros

Os recursos financeiros necessários para o acionamento do GAEP deverão ser solicitados a cada órgão competente do mesmo, sendo que verbas especiais serão solicitadas através da Secretaria Executiva do CODEL, ao Secretário de Obras e do Meio Ambiente-Presidente do CODEL.

A N E X O S

ANEXO I

Definições

Ambiente	: é o conjunto de condições que afetam existência, desenvolvimento e bem-estar dos seres vivos.
Entidades Primárias	: são aquelas entidades que, em caso de incidentes possuem uma responsabilidade operacional estabelecida neste Plano.
GAEP	: Grupo de Ação de Emergência para combate à Poluição
Incidente	: é todo fato ou conjunto de fatos que tem a mesma origem e que possam resultar ou resultem em danos por poluição.
Litoral	: é toda região que se situa entre a plataforma continental e as áreas sob influência da maré mais alta (mangues, bancos de espartina, praias, costões, etc.).
Medidas Corretivas	: significam todas as medidas tomadas para proceder a remoção do poluente do ambiente, bem como restaurar o ambiente que sofreu degradação resultante destas medidas.
Medidas Preventivas	: são aquelas medidas a serem desenvolvidas por qualquer pessoa, após a ocorrência do incidente, para prevenir ou reduzir os danos que poderão ser causados pela

poluição decorrente desde que proporcionais e compatíveis com o fato.

Navio Tanque : qualquer embarcação que transporte efetivamente granel líquido como carga.

Áreas ecologicamente sensíveis : são áreas do litoral cujas comunidades biológicas são sensíveis a agentes químicos tais como: viveiros, criadouros, santuários, bancos de espartina, áreas de desova, captura e coleta de peixes, moluscos, crustáceos e outras.

Coordenador Geral : responsável pela coordenação e execução de todas as atividades relativas a reduzir os danos da poluição, dentro do esquema de operação do Grupo de Ação de Emergência de Combate à Poluição - GAEP.

Danos por Poluição : são todas as manifestações que perturbam ou afetam os fatores de equilíbrio que condicionam a vida, bem como danos materiais a objetos e instalações situadas no local. Também são considerados os prejuízos econômicos e financeiros a terceiros, como ao turismo indústria, etc..

Dispersantes : são produtos químicos que emulsificam, dispersam ou solubilizam o óleo na coluna d'água ou atuam de forma a acelerar o espalhamento da mancha na superfície da água e facilitar sua dispersão naquela coluna d'água.

Entidades Assessoras	:	são quelas entidades que em caso de incidentes passam a assessorar o Coordenador Geral.
Óleo	:	significa qualquer óleo persistente, tal como: petróleo bruto, óleo combustível, óleo diesel, óleo lubrificante, óleo de baleia e outros.
Plano de Ação de Emergência	:	é a sequência de comunicação e ações que podem ser rapidamente iniciadas para enfrentar um incidente, de ocorrência possível porém incerta.
Produtos Químicos e/ou Biológicos	:	produtos que causem ou possam causar danos ao ambiente e à saúde pública.

ANEXO 2

Entidades Oficiais (Siglas)

São todas as entidades municipais, estaduais e federais que poderão ser acionadas em caso de um incidente.

CEDEC - Coordenadoria Estadual de Defesa Civil

CETESB - Companhia de Tecnologia de Saneamento Ambiental

CODEL - Comitê de Defesa do Litoral

COMAR - Comando Aéreo Regional

CTA - Centro Técnico Aero-Espacial

DAEE - Departamento de Águas e Energia Elétrica

DER - Departamento Estadual de Estradas e Rodagem

DERIN - Departamento de Polícia do Interior

DERSA - Desenvolvimento Rodoviário S/A

DNER - Departamento Nacional de Estradas de Rodagem

DPC - Diretoria de Portos e Costas do Ministério da Marinha.

INPE - Instituto de Pesquisas Espaciais

IOUSP - Instituto Oceanográfico da Universidade de São Paulo

PETROBRÁS - Petróleo Brasileiro S/A

PORTOBRÁS - Empresa de Portos do Brasil S/A

PRODESAN - Progresso e Desenvolvimento de Santos S/A

SEMA - Secretaria Especial do Meio Ambiente

SOMA - Secretaria de Obras e do Meio Ambiente do Estado de São Paulo

SUDELPA - Superintendência de Desenvolvimento do Litoral Paulista

SUNAMAN - Superintendência Nacional da Marinha Mercante - Ministério da Marinha

SUDEPE	- Superintendência do Desenvolvimento da Pesca
CIRM	- Conselho Interministerial para os Recursos do Mar
SUCEN	- Superintendência de Controle de Endemias

ANEXO 3

FORMULÁRIO Nº 1 - AVALIAÇÃO PRELIMINAR

1 - Origem da Ocorrência

- Oleoduto: ☐

  Linha: Diâmetro da Tubulação:

- Caminhão tanque: ☐
- Vazamento de tanque industrial: ☐

  Nome da Indústria:

- Navio: ☐

  Nome: Bandeira:

  Armador: Comandante:

  Outra: ☐

  Qual? ______________________________

  ____

2 - Causa da Ocorrência:

- Ruptura de tubulação ☐
- Colisão ☐
- Operação inadequada: ☐
- Outra: ☐

  Qual? ______________________________

  ____

3 - Produto:

- Petróleo: ☐
- Óleo Combustível: ☐
- Óleo Diesel: ☐
- Nafta: ☐
- Gasolina: ☐
- Álcool: ☐

- Outro: ☐

  Qual? ____

  ____

- Estado físico do produto:

  Sólido: ☐

  Líquido: ☐

  Gasoso: ☐

  Pastoso: ☐

- Quantidade estimada de produto vazado: ________________ m^3

4 - <u>Horários</u>:

- Ocorrência: ________________ hs.

- Comunicação: ________________ hs.

5 - <u>Local da Ocorrência</u>

- Endereço: ____

  Município: ________________ Acessos: ________________

  ____

6 - Áreas Atingidas:

- Mar: ☐

- Praias: ☐

  Quais? ____

- Rios: ☐

  Quais? ____

- Represas: ☐

  Quais? ____

- Áreas de Manguesais: ☐

- Outras: ☐

7 - Comunicação recebida de:

- Nome: ____

Endereço: ____

Município: ____________________ TEL.: ______________

Entidade: ____

8 - Comunicação recebida por:

- Nome: ____

Endereço: ____

Município: ____________________ TEL.: ______________

Entidade: ____

______________, _____ de ___________ de ______

____

ASSINATURA

ACCIDENTE QUIMICO POR ESCAPE DE AMONIACO

Organización del Centro de Información y Accesoramiento Toxicológico y del Departamento de Emergencia frente a accidente de esta naturaleza.

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El uruguay cuenta con una superficie de 187.000 Km^2 en la cual se distribuye una población de 3.000.000 de habitan tes, de los cuales más de un millón se encuentra en la capital, Montevideo. La base de la economía del país es fundamentalmente agrícola-ganadera, estando las principales industrias vinculadas al agro. Otras industrias que han adquirido desarrollo en los últimos años son: la pesquera, curtiembres, refinerías de hidrocarburos, materiales plásticos y textiles.

El Uruguay se encuentra situado entre dos países industrializados como Argentina y Brasil (Fig.1) con los cuales existe intercambio comercial activo que implica transporte de diferentes tipos de mercadería, exponiendo a eventuales accidentes.

Es nuestro objetivo presentar un importante accidente químico ocurrido en el Uruguay que enfrentamos como toxicólogos y emergencistas.

La Cátedra y Depto. de Toxicología al cual pertenece el Centro de Información y Asesoramiento Toxicológico (C.I.A.T.) y el Depto. de Emergencia funcionan dentro del Hospital de Clínicas dependiente de la Facultad de Medicina de la Universidad de la República.

El siguiente organigrama (Fig.2) esquematiza las interrelaciones existentes entre los diferentes Servicios a los cuales nos referiremos.

Un estudio retrospectivo de los accidentes químicos en el Uruguay nos muestra que desde 1911 hasta 1976 no se conocen desastres de índole química. El primer hecho registrado fue en 1976 y ocurre como consecuencia de un incendio de los gasómetros del gas de cañería ubicados en un área céntrica

de nuestra ciudad. Felizmente no hubieron víctimas en virtud de una rápida alerta y evacuación del personal. En diciembre de 1977 se registra un accidente químico grave por amoníaco primero del que tenemos conocimiento en nuestro país, si bien en la literatura médica internacional se mencionan algunas intoxicaciones importantes.

Kaplin (1) en 1941 describe la intoxicación colectiva de 47 personas durante la segunda guerra mundial, cuando a raíz de un raid aéreo sobre la ciudad de Londres un depósito de amoníaco fue alcanzado por un proyectil.

En 1964 Levy (2) reporta cuatro casos de intoxicación que ocurren en una industria de refrigeración y en 1972 Kass (3) describe un accidente por descarrilamiento de un vagón que conducía amoníaco en el que hubo 70 accidentados con ocho muertos.

El accidente al que nos referimos conmovió los centros asistenciales de Montevideo. En el mes de diciembre de 1977, 140 empleados de una empresa pesquera emprendían la labor diaria en diversos sectores de la planta de procesamiento de pescado. Cuando todo parecía normal, por uno de los tubos que conducía el gas refrigerante (amoníaco) hubo un escape del fluído. De inmediato los operarios frente al riesgo que implicaba esta situación comenzaron a abandonar sus puestos de trabajo en procura de no inhalar el gas. Nueve empleados que se encontraban muy próximos al lugar del escape, no tuvieron tiempo de ponerse a salvo y fallecieron, algunos en forma inmediata y otros posteriormente.

No sólo cundió el pánico en la empresa sino también en la población próxima en virtud de estar ubicada la planta en una zona urbana. Los vecinos experimentaron irritación conjuntival y respiratoria sintiéndose el olor característico

en el aire. En menos de una hora, la zona se convirtió en un lugar desgarrante: los propios obreros ayudaban a los más afectados y retiraban los cadáveres de quienes no tuvieron escapatoria. Las primeras medidas de rescate fueron tomadas por obreros de la planta como ya lo hemos dicho. Rápidamente concurrieron al lugar del hecho los bomberos, quienes junto con la Policía comenzaron a actuar. A continuación se resume el informe de la Dirección Nacional de Bomberos.

Recepción del llamado: 8:25 hs.; salida: 8:26 horas; llegada: 8:32 horas. Personal que intervino en el rescate: 39 funcionarios de diferente escalafón con la participación del Jefe de Policía, equipo médico y enfermería. Concurrieron 3 autobombas, una cisterna, un guinche, ambulancias, camionetas, otros.

Llegados al lugar del hecho comprobaron el escape de gas amoníaco en el interior del local destinado al procesado de peces (Fig.3). Ya habían sido rescatadas 30 personas por los operarios del lugar, quedando atrapados en el lugar algunos funcionarios. Los Bomberos penetraron al local con equipos autónomos y filtrantes, conjuntamente con el equipo de salvamento y ataque, rescatando con vida a seis personas que fueron trasladadas a distintos centros asistenciales en ambulancias y coches particulares. Se neutralizó el gas amoníaco con línea fina a niebla y lluvia, hasta lograrse la culminación de las operaciones. El tiempo transcurrido entre llegada y el final de la operación fue de los 2:15 horas. El único personal de la planta que estaba adiestrado para este tipo de accidentes, era el especializado de máquinas, no así el personal en general que nunca recibió instrucción al respecto.

Según el informe del Cuerpo Nacional de Bomberos el accidente se produjo en uno de los armarios congeladores de placas de la planta procesadora. Se desprendió un tubo de goma que conducía amoníaco a una presión de 2 Kg por cm^2 al sistema de placas de congelación del referido armario (Fig.4), por lo cual el local se vió rápidamente inundado, con la consecuente repercusión sobre la salud del personal. La sección Pericias de la Dirección Nacional de Bomberos calificó el hecho dentro de lo "hipotético accidental imprevisible" y por "defecto de diseño", elementos éstos que pudieron dar lugar al accidente aún en caso de que el sistema hubiera sido debidamente probado antes de integrarlo a la planta.

Alertados los centros asistenciales, solicitaron al Centro de Información y Asesoramiento Toxicológico(C.I.A.T.), aún antes de la llegada de los pacientes, las medidas terapéuticas a adoptar (Fig.5). Este Centro recibió en un lapso de 30 min. 28 llamados procedentes de 5 centros asistenciales diferentes, dando el asesoramiento correspondiente.

Los centros asistenciales que recibieron pacientes fueron públicos y privados. Centraremos nuestro reporte a los que ingresaron en el Depto. de Emergencia del Hospital de Clínicas.

Los pacientes llegaron al hospital alrededor de la hora 9 de la mañana en ambulancias del Ministerio de Salud Pública, carros de Bomberos y coches particulares. De los 41 accidentados, 15 llegaron al Depto. de Emergencia, número significativo, tomando en cuenta el área de atención y el personal que cumplía el servicio habitual en este turno.

Luego de la evaluación primaria en el área de selección (Fig.6),

pudo comprobarse que una de las obreras ya había fallecido y se trasladó a la morgue; a otra operaria con una severa insuficiencia respiratoria se le prestó la atención primaria y se trasladó con la premura del caso al Centro de Tratamiento Intensivo. En forma simultánea se evacuaron los pacientes que estaban internados en los boxes laterales 4, 5 y 6 como muesta la Fig.6, a los boxes 1, 2 y 3 y al sector de Cuidados Intermedios, para evitar que éstos se vean afectados por los gases que se desprendían de la ropa de los accidentados. A su vez los accidentados fueron ubicados en los boxes 4, 5 y 6 prestándole la atención lo más rápida posible. Como medidas inmediatas, se les quitó la ropa, impregnada en amoníaco, se los lavó y se instituyó el tratamiento sintomático de su manifestaciones respiratorias, oculares y cutáneas. Estos pacientes, luego de realizadas las primeras medidas terapéuticas y comprobado que no había ninguna patología que impidiera su traslado, fueron transferidos al Sanatorio del Banco de Seguros del Estado, por tratarse de un accidente laboral.

El personal del Depto. de Emergencia a quien correspondió asistir a estos pacientes, si bien estaba bien adiestrado para actuar en accidentes de tránsito y otros, no lo estaba para accidentes de causa química que son muy raros en nuestro país. No se pudo tomar las precauciones del caso por falta de tiempo y además no se dispone de medios de protección adecuados (máscaras, ropas, etc.). Por tal causa el personal médico y para-médico trabajó con mucha dificultad, porque todos comenzaron con las manifestaciones de irritación cutáneo-mucosa (respiratoria y ocular).

El personal médico permanente de este Servicio y que actuó en esta emergencia estaba integrada por el Director del

Depto. de Emergencia, 4 Profesores Agregados, 4 Profesores Adjuntos, Otorrinolaringólogo, Oftalmólogo, Cirujanos Plásticos, Anestesistas, Practicantes Internos.

En cuanto al personal para-médico, estaba integrado por enfermeras universitarias, auxiliares de enfermería, personal auxiliar de limpieza, mensajeros. También intervino personal de registros médioos y admisión de enfermos, Servicio Social, vigilantes internos del Hospital, Policías. Los servicios del Hospital que intervinieron en apoyo del Depto.de Emergencia fueron: Farmacia, Laboratorio, Radiología, Otorrinolaringología, Oftalmología, Centro de Tratamiento Intensivo y Servicios de Medicina y Cirugía que rápidamente liberaron camas frente a eventuales internaciones.

El sector Comunicaciones funcionó con dos telefonistas para comunicaciones extra e intrahospitalaria.

La evolución de los accidentados en los otros centros asistenciales fue seguido por el Centro de Información y Asesoramiento Toxicológico y es de nuestro conocimiento que hasta la fecha hay 9 fallecidos y otros que evolucionaron con secuelas de tipo ocular y respiratoria.

A raíz de este accidente y otros también por amoníaco que lo siguieron (en 1978 con 35 accidentados, en 1979 con 28 accidentados), fueron tomadas en nuestro país medidas a nivel de las instituciones oficiales con el fin de evitar en el futuro la repetición de estos hechos. El decreto Nº 334/979 del Misnisterio de Salud Pública, División Higiene Ambiental, se refiere a la construcción adecuada de los locales según normas establecidas, incluyendo posibilidades de desalojo del personal en 30 segundos. También se refiere a las prue-

bas de seguridad en las instalaciones y su control periódico, sistemas de seguridad como ser alarmas, material de protección personal (máscaras, vestimenta, etc.).

A partir de la aplicación de este decreto, los accidentes por escape de amoníaco en las cámaras de refrigeración fueron de entidad mínima.

A su vez en el Depto. de Emergencia del Hospital de Clínicas se hicieron modificaciones locativas, con ampliación de los locales de atención y se elaboró un Plan de Desastre para el Hospital Universitario.

La experiencia vivida, aunque lamentable por su saldo trágico, fue de enorme utilidad al demostrar las fallas que podía adolecer nuestro plan de emergencia y sirvió para mejorar la asistencia a víctimas de desastres de orígen tóxico.

Como médicos toxicólogos y emergencistas sabemos de los riesgos potenciales que día a día surgen, amenazando grupos de nuestra población. Consideramos una obligación el conocerlos, saber detectarlos, prevenirlos y encararlos adecuadamente.

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Fig. Nº 1

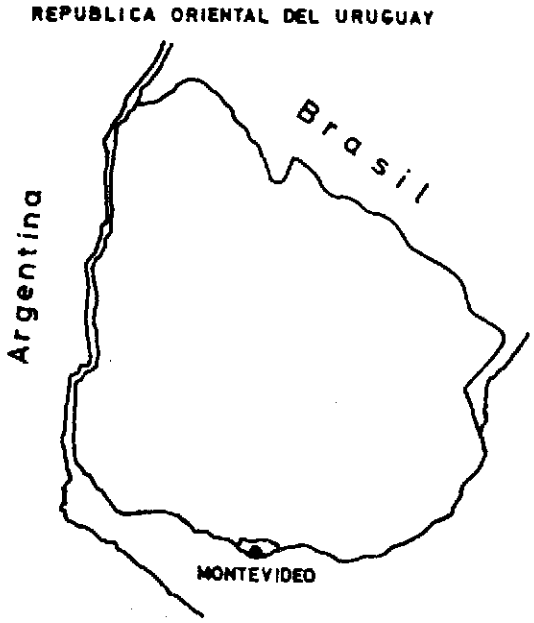


Fig Nº 2

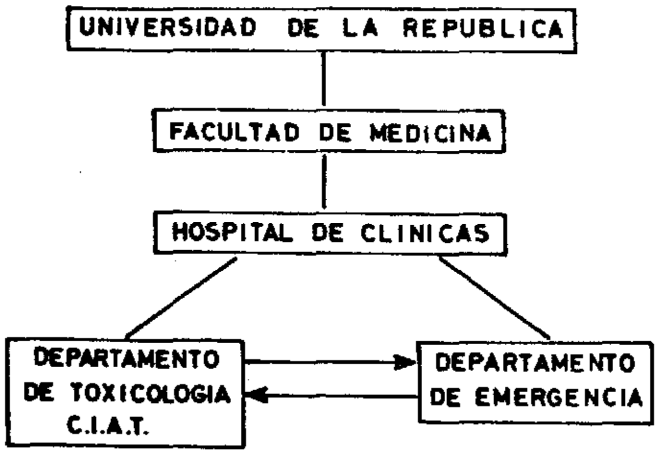


Fig Nº3

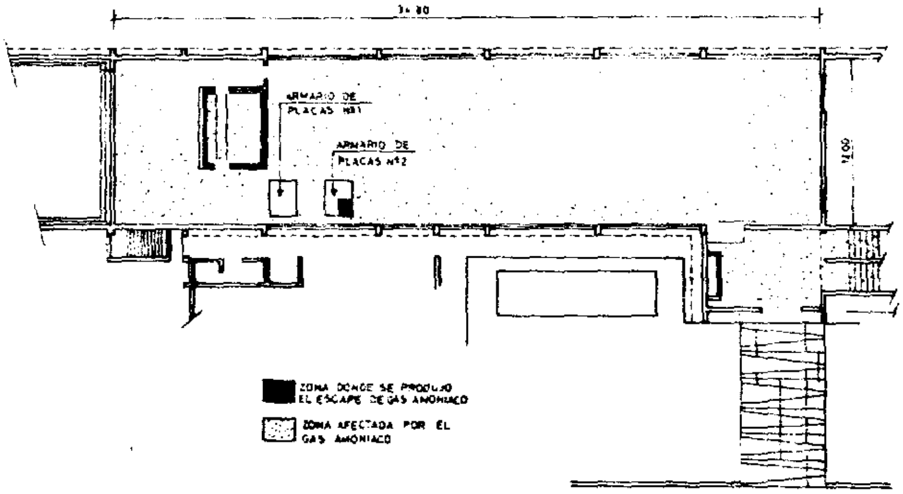


Fig Nº4

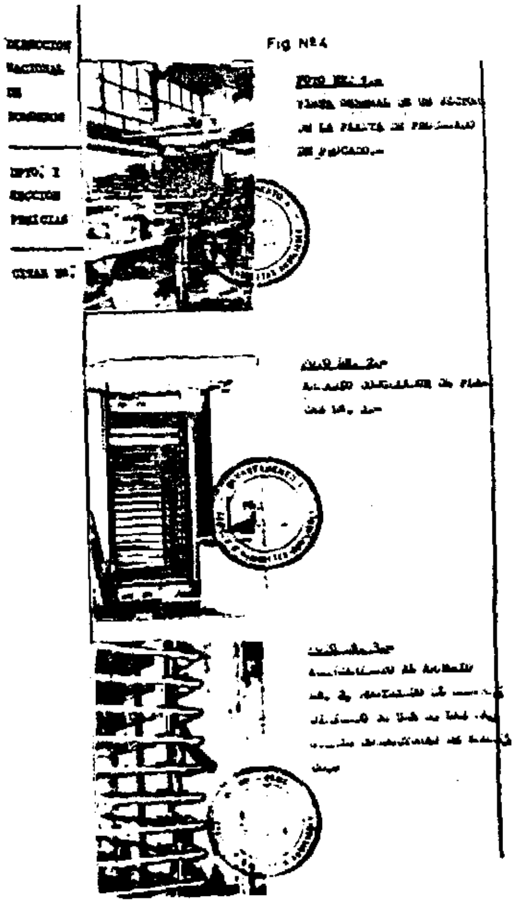


Fig Nº 5

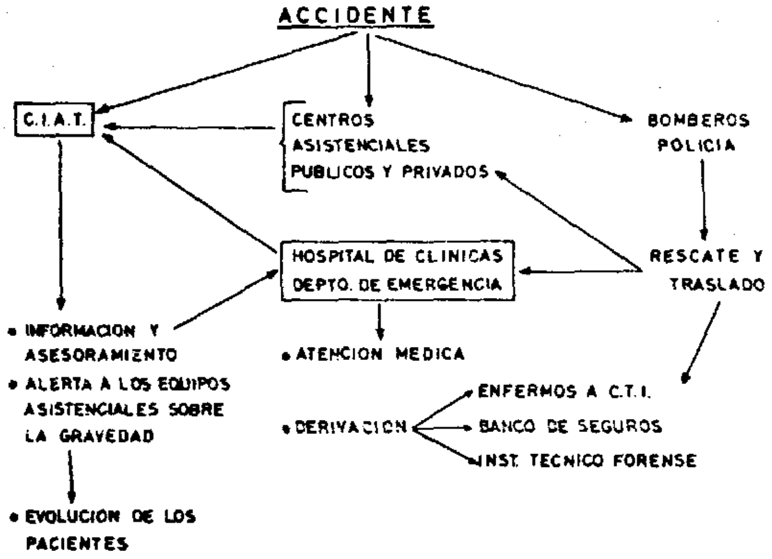
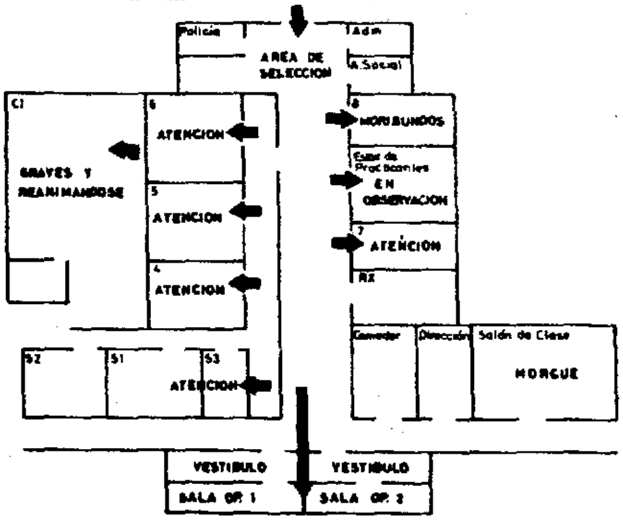


Fig Nº 6

AREA DEL DEPARTAMENTO DE EMERGENCIA
DE ATENCION DE LOS PACIENTES



OFICINA PARA DESASTRES NATURALES.

CONSIDERACIONES SOBRE LOS ACCIDENTES EN OBJETIVOS INDUSTRIALES QUE EMPLEAN EN SU PRODUCCION PRODUCTOS QUIMICOS O TOXICOS

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CONSIDERACIONES SOBRE LOS ACCIDENTES EN OBJETIVOS INDUSTRIALES QUE EMPLEAN EN SU PRODUCCION PRODUCTOS QUIMICOS O TOXICOS

Nuestro continente ha vivido el impetuoso desarrollo científico técnico de las últimas décadas y por supuesto dentro de éste el de la rama química, que ha traido aparejado el surgimiento de un gran número de industrias, almacenes y otros centros que emplean, almacenan o producen una amplia gama de productos químicos de los cuales una cantidad apreciable son tóxicos.

Esta situación, la cual es derivada del desarrollo,no es característica exclusivamente de los países capitalistas industrializados, sino que está presente en las naciones sub-desarrolladas del llamado Tercer Mundo, como resultado de las inversiones hechas en ellos por terceros países.

Cuba, heredó del sistema capitalista una economía con características neocolonialistas, por lo que no está exenta de lo expuesto, a lo cual se añade el desarrollo económico ocurrido a partir del triunfo revolucionario.

Un gran número de productos químicos de carácter tóxico son manipulados de una forma u otra en las más diversas ramas de nuestra economía como son las de la Industria Básica, Ligera, Sideromecánica, Alimentación, Azucarera, Agricultura y otras. Estos productos Tóxicos industriales pueden provocar diversos grados de afección en los seres vivos, los cuales fluctúan entre la simple irritación de las mucosas o de la piel, pasando por diversos trastornos en el organismo que pueden provocar en algunos casos la muerte. Las vías a través de las cuales estos productos pueden ejercer su acción lesiva son: mediante ingestión, a

través de las vías respiratorias o de la piel. Algunos pueden provocar, además, lesiones en la piel y en diversas partes del cuerpo, incluyendo los ojos. A los efectos de este trabajo la atención especial la prestaremos a aquéllos que sean capaces de afectar a los seres vivos a través de las vías respiratorias.

Los productos tóxicos industriales más difundidos en Cuba y que existen en cantidades considerables en la economía de nuestro país son el ácido sulfúrico, amoníaco, azufre, ácido clorhídrico, cloro y ácido nítrico. De ellos algunos son gases a temperatura ambiente, como el cloro y amoníaco, y los demás requieren una temperatura más elevada para emitir vapores tóxicos en volúmenes capaces de crear concentraciones peligrosas en el aire.

En los objetivos económicos donde se manipulan productos tóxicos industriales en cantidades considerables,pueden crearse focos secundarios de contaminación química. De acuerdo con ésto, llamamos objetivos económicos con peligro químico a aquéllas donde se manipulan productos tóxicos industriales en cantidades apreciables (o con índices de toxicidad muy elevados) y que son capaces, en determinadas condiciones, de contaminar el aire y afectar no sólo a los trabajadores del objetivo, sino también a la población residente en las cercanías y fundamentalmente en la dirección de propagación del viento.

Estos focos secundarios de contaminación pueden producirse como resultado de accidentes en las plantas o en los medios de almacenamiento. Puede resumirse que éstos se producen por:

- Explosión de depósitos del producto tóxico y su liberación al medio ambiente.

- Incendio en los depósitos de productos tóxicos en forma líquida o sólida con el consiguiente desprendimiento de vapores o humos tóxicos.
- Mezcla de los productos tóxicos industriales líquidos o sólidos con otros productos químicos que provoquen su transformación en vapores o humos tóxicos.

En dependencia de la forma en que se encuentren almacenados los productos tóxicos, será más o menos probable el surgimiento de un foco secundario de contaminación química, ya que los depósitos soterrados o semisoterrados brindan una mayor protección que los aéreos.

Pueden también surgir focos secundarios de contaminación química durante la transportación, carga o descarga de los productos tóxicos industriales a causa de accidentes o algunas de las condiciones expuestas anteriormente.

La propagación de los vapores o humos tóxicos, en caso de originarse un foco secundario, dependerá de un grupo de factores entre los cuales son fundamentales los siguientes.

- Carácter de la avería.
- Propiedades físico-químicas y tóxicas de los productos y forma en que se emplean o están almacenados.
- Características de la zona donde está enclavado el objetivo, que incluye:
  a) Carácter de las edificaciones que lo rodean (si es una ciudad o pueblo, si predominan las casas de dos o más pisos, etc.).
  b) Características del relieve del terreno (llano, ondulado,montañoso).
  c) Características de la vegetación de la zona.

Condiciones meteorológicas.

a) Dirección y velocidad del viento en la capa superficial.

b) Grado de estabilidad vertical de la atmósfera.

c) Existencia de precipitaciones en el momento de surgir el foco secundario.

La afección de las personas y animales se producirá fundamentalmente a través de las vías respiratorias, por lo que el empleo de medios individuales de protección específicos o universales será la principal medida de protección.

Para organizar las medidas de protección en los objetivos con peligro químico se debe partir de un pronóstico, elaborado con anticipación, acerca de la posible situación que se crearía en caso de surgir un foco secundario de contaminación química. Este propósito se elabora generalmente a partir de las asistencias máximas posibles del producto tóxico en el objetivo y de las condiciones meteorológicas medias del territorio, lo que permite organizar más adecuadamente las medidas de protección en el mismo.

Por las fórmulas y tablas existentes se determina la profundidad de propagación peligrosa de los vapores o humos tóxicos, tanto para el caso de la zona donde se pueden producir muertes, como en el que se manifiestan distintos grados de afección en los seres vivos. Con este fin, para reflejar el propósito anticipado en los mapas, se toma el dato de la profundidad de propagación donde pueden producirse muertes, como radio de un círculo alrededor del objetivo determinado, en este caso, la zona donde debe producirse el 100% de probabilidades de muertes. Igualmente, la cifra de la profundidad de propagación peligrosa total, se toma como radio del círculo que limita exteriormente la superficie en que debe encontrarse el 100% de los probables afectados por el aire contaminado.

Además de la planificación y organización de las medidas se deben realizar algunas actividades destinadas a la búsqueda de soluciones tecnológicas que permitan disminuir los productos tóxicos que se emplean, así como reducir a cortos plazos las existencias de los mismos. Las medidas referidas a la organización del aviso a los trabajadores y a la población circundante, la instrucción acerca de las medidas a tomar en cada caso; el abastecimiento con medios individuales de protección y otras, deben desarrollarse sistemáticamente y garantizar el constante perfeccionamiento de éstas.

Al producirse el foco secundario, se ejecutan organizadamente las medidas previstas en los planes, lo que permite reducir el probable número de bajas entre la población y los trabajadores.

Como último elemento queremos significar que además de las actividades de protección que se planifican y ejecutan en los mismos,los estados mayores municipales de la Defensa Civil, organizan y ejecutan también la protección de la población residente en los alrededores de los objetivos y prevén todas las medidas que posibiliten la reducción de las posibles cifras afectadas en caso de surgimiento de focos secundarios de contaminación química.

Este tema, que indudablemente reviste gran importancia, es motivo de estudio en la actualidad en casi todos los países del mundo, ya que en la medida en que se impone el desarrollo industrial, surgen nuevas posibilidades de afección a los trabajadores y la población en general, lo cual sólo puede ser resuelto con un cuidadoso estudio y planificación, así como con una rigurosa organización de las medidas de protección.

Regulatory Requirements for Dangerous Goods Transportation Emergency Planning Resulting from the Mississauga Accident

Notes of an address to be given by

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Director-General
Transport Dangerous Goods
Directorate
Transport Canada

to

Pan American Health Organization Conference
July 23-27, 1984
Metepec, Mexico

Regulatory Requirements for Dangerous Goods Transportation Emergency Planning Resulting from the Mississauga Accident

Introduction

The railway accident at Mississauga, Ontario was a major social and safety trauma for Canada. Accidents involving dangerous goods in transport had taken place before, and indeed still occur from time to time. Mississauga, however was and still is unique: up to three hundred thousand citizens of Mississauga and its neighbouring municipalities were evacuated from their homes for varying periods of time up to 5 days. Businesses, schools, and hospitals in the area were all closed and the incendary at the derailment was fought, through the electronic communication media, in the livingrooms of every home in the country. Television, more than anything else established in the minds of every Canadian, the awesome risks and potentials for danger and damage, from the transportation of dangerous goods.

After the accident response was concluded, after the rail services were re-opened, after people were returned to their homes and the schools, businesses and hospitals had been re-opened, the formal and informal examination and assessment period commenced. Could such an accident happen again? - the answer was yes; what were the probabilities of another accident? - the answer was as low as one billion to one and as high as one hundred million to one, but while such probabilities could be calculated, how relevant were they? and would any statistics make people feel more at ease? - the answers were both no; what could be done to reduce the probabilities? - the answer was many things - but the question remained - which would be the most effective? could we as a Nation afford the solutions? - the answer was clearly that we could not afford all of them; was the legislation in place sufficiently powerful and comprehensive to handle the probability of such an accident and the probable consequences? - the answer was by and large yes but some amendments might be desirable.

Background

Before proceeding, it might be desirable to have some broad general idea about our transport situation in Canada. Canada is an industrial nation in the primary and secondary industrial sense, with a relatively small population for the

very large land area of the country. It has also one other significant characteristic - most of our resources or products are in areas distant from their markets whether domestic or export. Hence our reliance on an extensive transportation system intended to move large quantities of products over long distances efficiently and cheaply. Our road and railway network in terms of kilometers per capita is extremely high on a world comparitive basis. Our trucks and railcars are some of the heaviest and largest in the world in order to offer economies of scale in transportation necessary to compensate for the excessive distances our products must travel. Trains, in particular are often pulled by 5 or more locomotives, even on flat lands, and the longest trains are nearly two kilometers in length.

Canada is also a major producer and user of dangerous goods and has a considerable foreign trade in these products. We need for our domestic industrial purposes hydrocarbon products and inorganic chemicals. We export large quantities of basic chemical products - mainly hydrocarbons. We import in return, mainly from the United States of America, a smaller total volume of secondary or speciality chemical products. We are largely self sufficient or net exporters of other products such as explosives and compressed gases.

Regulatory Powers

Canada's regulatory initiatives and powers have evolved over the years. In the past, safety in the transportation of dangerous goods had been obtained by a series of discrete and narrowly focussed federal and provincial statutes dealing with individual modes of transport or with individual products or groups of products. Where the Acts dealt with a single mode of transport (such as the Canada Shipping Act, the Railways Act, the Aeronautics Act or the provincial highway traffic Acts) the Acts dealt with the mode comprehensively but with the transport of dangerous goods only peripherally. Where the Acts dealt with products of groups of products (such as the federal Explosives Act or for example, the Ontario provincial Gasoline Handling Act) the Acts dealt with the product comprehensively (i.e. from all aspects of manufacture or importation through all phases of the commercial cycle to use or disposal of that product or group of products) but with the transportation of that product or group of products only peripherally.

In response to a review of broad policy issues in the transport field the Government of Canada and the Provinces considered in the mid 1970's that it would be desirable to treat the subject of dangerous goods in transport in a more comprehensive manner. It recognized that while the manufacturing, storage and use of products that are dangerous goods should be and was adequately regulated by specially focussed legislation that would set the parameters for the appearance of such products in the economy and society, the transportation legislation should specifically reinforce and link up with the "before-transport" and "after-transport" legislation already existing or perhaps planned. The new dangerous goods transport legislation should however ensure that certain things were done by and responsibilities set out for people other than the carriers if safety in transportation was to be achieved - a failing in the existing modally-oriented legislation that would be replaced. Finally the new comprehensive legislation had to take into account the constitutional division of authority and responsibility between the federal and provincial governments to make sure that each level of government could and should continue to play its proper role.

A new Act, the Transportation of Dangerous Goods Act, was prepared in conjunction with the provincial governments. It was first presented to Parliament more than a year before the Mississauga Accident took place. That legislation contained provisions that:

1. made it apply not only to carriers of dangerous goods but also to shippers and consignees and to those who manufacture and sell the packagings, containers and vehicles in which dangerous goods may be packed or loaded;

2. allowed for improved response to dangerous goods emergencies by setting out extra-ordinary, but specific powers of inspectors that could be used only during the course of "a serious and imminent danger to --- life, health, property or the environment";

3. introduced sufficiently strong penalties and a means of allocating responsibilities between the employees, employers and corporations to ensure compliance; and

4. allowed special emergency powers for use to prohibit or designate the manner in which activities that are not regulated by the Act and that are considered to be a threat to public safety should take place.

The legislation was already under review by Parliament when a special Inquiry was established to look into the Mississauga Accident. In an unusual action, the Minister of Transport asked the Commissioner of the Inquiry to advise him in a preliminary way, if the Inquiry to date had shown or implied any weakness in the provisions of the proposed new legislation.

Recommended Adjustments to Statute

Mr. Justice Grange, the Commissioner, recommended that, if amendments could be made, four changes in particular should be introduced:

1) to require that persons and companies engaged in dangerous goods activities should report that activity;

2) to provide for the requirement to train employees in their special duties respecting dangerous goods;

3) to provide more precise authority to deal with safety standards for the "design, construction, equipping, functionning or performance of..." vehicles containing dangerous goods; and

4) to ensure appropriate powers were available for inspectors to take remedial measures at the site of any accident.

Each of these changes were adopted by Parliament and are included in the Transportation of Dangerous Goods Act now in force.

Recommended Adjustments to Regulatory Program

The real and detailed impact of the Government's action lies in the regulations under the Act and the supporting program of the government agencies involved in its implementation. Following completion of the Inquiry by Mr. Justice Grange, he included in his report a number of specific recommendations for further actions. Those recommendations which respected emergency planning or response and the Commissioner's Comments, if any, on his recommendations were:

1. RECOMMENDATION FOUR

As a condition of shipment anywhere in Canada of dangerous goods by rail, the shipper should have in effect a plan for control of the escape of his product in an accident and that plan should be submitted to and approved by the Minister or such agency or person as he may designate. The right to ship may be revoked at any time the plan, either in concept or operation, is deemed inadequate.

COMMENT

This recommendation which is basic to the reliance upon the private sector will take a little time to implement but I do not intend that the implementation be long delayed. Most of the shippers already have plans in effect and I should think all shippers could submit their plans within three months. The nature of the plans will, of course, vary with the product and the response may, by arrangement, be made by others than the shippers themselves. The important thing however is that the plan be in place and be acceptable. Nothing should be shipped unless we are able to deal with its escape. If private industry cannot do it, then the government must supply the protection, something government at this time is quite unable to do. What government must do is examine the plan critically and keep it under constant surveillance.

The power to implement this recommendation seems clear from the Transportation of Dangerous Goods Act, s. 21 giving the Governor in Council power to make regulations in s-s. (i) and (k) thereof as follows:

> "(i) prescribing circumstances in which the handling, offering for transport or transporting of dangerous goods is prohibited;"

> "(k) prescribing safety marks, safety requirements and safety standards of general or particular application."

Section 17 of the Transportation of Dangerous Goods Act ... provides in effect that an inspector may "request" the shipper to put the plan into effect. Although s. 14(5) makes the failure to comply with a reasonable request an offence, I would have preferred the use of the more imperative word "require".

2. RECOMMENDATION FIVE

Transport Canada should make available through CANUTEC* or otherwise the advice and direction needed upon a rail accident involving dangerous goods. In particular it should make available at the scene of, and within hours of, an accident, a person capable of directing the clean-up of that accident and of protecting the populace. He will lend all assistance to the local or provincial authorities and will take charge of the scene if no such authorities are evident. This person, no doubt an inspector under the Transportation of Dangerous Goods Act, should report in writing after every accident to which he is summoned.

COMMENT

This, as I see it, is the major contribution by the Federal Government to the response to an accident, but it is no more than would be expected. The importance of the training of the federal representative at the scene cannot be overemphasized and there must be an adequate number of such representatives so distributed that any part of the country covered by rail will be able to obtain their assistance in person within a few hours. The 24-hour telephone number of CANUTEC should be in every police and fire station in the land and Transport Canada should prepare and provide to local emergency forces educational programmes in response to a dangerous goods spill.

RECOMMENDATION SIX

The railways should be required either by the CTC** or by Transport Canada as appropriate to take action forthwith as follows:

a) to publish to Transport Canada and any private or public response agencies their response plans which will include a 24-hour emergency telephone number where information as to the contents of trains may be obtained;

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*CANUTEC - The 24 hour-a-day emergency response centre for dangerous goods operated by Transport Canada.

**CTC means Canadian Transport Commission which is the regulatory agency for railway safety.

b) to have available on all dangerous goods trains and at all division offices an accurate intelligible consist* containing at least the car number and the name of the dangerous commodity carried and to provide such consist to CANUTEC and to any municipal or provincial official forthwith on request, whether or not there has been an accident; the railways should also provide municipalities or communities having response personnel with information on the types of dangerous goods normally transported through them.

4. RECOMMENDATION TEN

The CTC or Transport Canada should require shippers and carriers to replace all present dangerous goods placards with ones as nearly as possible impervious to fire and weather conditions.

5. RECOMMENDATION ELEVEN

Transport Canada should forthwith establish a permanent body to consider with research assistance -

a) the means of measurement of the amount of product remaining after a spill;

b) the means of determining the risk posed by an escaping product;

c) the colour-coding of dangerous goods tank cars;

d) the raising of the numbers of other means of clear identification of the numbers of tank cars;

e) the raising of the numbers of other means of clear indentification of the numbers of tank cars;

f) the marshalling of a dangerous goods train;

g) the re-routing of dangerous goods trains around urban areas.

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*consist is a railway term meaning a train's cargo manifest

COMMENT

I can only regret that I am here doing what I have complained of in others, i.e. making recommendations for further study. The matters listed are, however, real problems to which I do not have the answers. I can only hope that these answers will be forthcoming shortly and where the answers dictate affirmative action that such action will be taken immediately.

Response to the Recommendations

Upon receipt of the Report on the Railway Accident at Mississauga, the Minister of Transport established a small and very senior level advisory committee to assist him in deciding upon the disposition of the recommendations included in the Report. In principle all were accepted by the Government as having merit, but it was pointed out that their implementation could take time or might be difficult to achieve due to costs or to the necessity to involve other levels of government. It was also decided to accept them in the context of any mode of transport (where relevant) rather than just for rail transport.

Examination of the recommendation regarding the mandatory filing of contingency plans for dangerous goods prior to shipment took into account the following factors:

1. there existed already CANUTEC, Transport Canada's 24 hour emergency information centre for dangerous goods;

2. different dangerous goods consignments pose varying risks: butane lighters in boxes are not as dangerous as butane tank cars, but small quantities of fissile radioactive materials are more dangerous than large quantities of yellow-cake (uranium oxide);

3. emergency response forces across the country generally know how to deal with a wide range of flammable materials;

4. risks to the populations have to be considered in terms of both immediate off-the-right-of-way dangers as well as the longer term although the latter risk is less important for the immediate reaction of the contingency plan.

5. individual companies often belong to industrial associations which might form (and indeed have formed) mutual self-help groups;

6. the industrial groups and individual companies here, in Canada, demonstrate a strong social responsibility to do whatever needs to be done to provide public safety.

As a result, the regulations dealing with this subject that have been published,

1. have named 489 individual dangerous goods for which contingency plans shall be filed, under

2. one of four separated conditions, only one of which would apply to each dangerous good:

   a) for any quantity being transported;

   b) for only bulk or full vehicle or container load consignments;

   c) for consignments comprising more than 25 kg or 25 L of the dangerous good, or

   d) for consignments comprising more than 1000 kg or 1000 L of the dangerous good.

The regulations propose that a plan should be filed by consignors of such consignments where the consignor is in Canada and, in the case of imports, the consignee who presumably has caused the dangerous goods to enter the Canadian transport system. In addition the carrier must file a response plan as a transporter and where the carrier is transporting the goods into Canada he must have proof that the consignee has filed such a plan.

Plans must include information respecting:

1. the name and address of the consignor or carrier;

2. the name and address of any agent named under Subsection 19(2) of the Act (for non-resident shippers);

3. the name and address of each person on whose behalf the plan is filed (e.g. a National Association filing a common plan for all its membership or an emergency response contractor for an individual shipper);

4. a description of the emergency response capability of the person filing the plan;

5. the means of activating the plan; and

6. the name, address and telephone number of the person filing the plan.

It is intended that the plans will be assessed by special inspectors to satisfy the Government's desire for comprehensiveness and practicability of the plan. Plans will be registered on satisfaction and that registration number should appear on any consignment documentation for which the plan is relevant. These plans would be triggered by CANUTEC on notification that an emergency was taking place.

Commissioner Grange's fifth recommendation, as his comment points out, recognizes that notwithstanding the good corporate - citizen's attitude of Canada's dangerous goods shipper industry and the best efforts of its carriers, very often the site of the accident is frequently some hours travel away from the shipper or consignee both of whom are presumed to have a competence to provide expert assistance and who may also have a legal responsibility to do so. In response to this recommendation and recognizing that the principal responsible for emergency response is a provincial one, the federal government has entered into the first of a number of expected arrangements with national industrial associations to establish emergency assistance teams throughout the country that could be called upon if needed. When that call is made, the government will assume the financial responsibility for the costs incurred until the shipper of the goods can arrive at the site and take over his natural responsibilities. There is provision in the Act though for these costs to be recovered from the person who owned the goods, or who had charge, management or control of them at the time the accident occurred or any person who may have caused or contributed to the causation of the accident.

The Mississauga Accident Inquiry determined that the procedures for the railway companies for responding to emergencies were not well known by the public (municipal and provincial) emergency response agency. Commissioner Grange dealt with this issue in his sixth recommendation which has been almost fully implemented without the need for regulatory intervention. The railway companies embarked on a major public relations program that established a liaison between their emergency response and control centres and the agencies in every municipality through which they operate intended to ensure the most immediate establishment of contact between the railway company and the municipality whenever the need might arise. In addition, the documentation on the trains respecting the dangerous cargos has been considerably improved both in quality of documentation (legibility etc.) and in its nature. Any regulatory requirements in this area will be post facto for the railway mode, but will encompass the other modes of transport where the present experience may be judged less satisfactory. The "advance planning" implicit in meeting these regulations has enbabled the municipal agencies to better prepare themselves for certain eventualities in terms of training of their personnel, purchase of equipment and in identification of sources of "antidote or counter measure" chemicals that could be useful.

Grange's recommendation ten and parts of eleven ((c), (d) and (e)) should really be considered together since they relate primarily to improving the means of identifying the product present. For better certainty there are several parallel but alternative sources of information to response forces who must find out what the product is before they can respond. The first and by far the most important is the shipping document (or cargo manifest) - these are however subject to technological advances and are often non-existant (despite regulations requiring them) having been replaced by computer messages or simply telex messages. A second method is the placard - a 250 mm by 250 mm or greater sign attached to all four sides of the vehicle that is colour-coded, has various symbols and words or numbers that show the hazard class and often the identification number of the specific product being transported. Mr. Grange noted that the quality of those placards has not been very good. His specific recommendation for fire-proofness has not been accepted because the socio-economic impact analysis did not show the benefits were sufficient to outweigh the costs. The

placards are, however, being markedly improved by regulations requiring that they be retro-reflective - something the fire forces prefer because of the night-time and long distance visibility.

The third method of identifying the contents of the vehicle is to trace the owner (and from him if necessary, the user) from its registration numbers. These numbers are often painted on the sides of the vehicles and has, on review been found to be sufficient. Consequently the recommendation to physically raise the numbers was not accepted.

Because the placards are to be retro-reflective, the recommendation to colour-code the cars carrying dangerous goods also was not accepted. To do so would in any case have introduced problems from the point of view of conflicts with company colour schemes and the use of the same vehicle to transport alternately dangerous and non-dangerous goods.

With respect to the remaining portions of the Eleventh Recommendation research is underway. A special program is established to find simple indicators of the remaining contents of tank vehicles - but the need for accuracy, robustness and cheapness seems to be limiting success. There is continuing research going on in Canada to record accident experience and assess the risks produced by escaping products. Here, we are aware of research in the USA and Europe that involves not only conventional chemical reaction analysis - but also computer modelling to predict spill areas, vapour cloud dispersion etc. As this research is continuous, the data banks of information are updated.

Some improvements have been made to train marshalling rules, but the placement of cars carrying dangerous goods in the train and their separation one from the other is problematic in as much as almost no two derailments or accidents are similar - hence a change to solve one problem may create another in a different circumstance.

Finally, the question of re-routing trains around urban areas has been addressed and has been largely rejected as a solution due to the direct costs of rail-line relocation and the need to continue to service industries in the cities themselves. In some cases partial re-routings have been made, but the preferred approach is to control better the risk of accidents - hence rail line quality is being

improved, rail crossings and switches are being eliminated, train inspections are being held more frequently and at the gateway to all large towns and finally train speeds are being reduced. For the highway mode of transport, dangerous goods truck routes are being established - indeed a special traffic sign has been adopted for this purpose - and time of day restrictions are being also introduced for access by some dangerous goods vehicles in the downtown cores.

In addition to these regulatory initiatives, the governments concerned are also stepping up their inspection and publicity activities to ensure compliance and are revising their other supporting activities of training, public awareness and emergency response assocations.

Conclusion

In closing, I should point out that none of the activities that have resulted from the analysis of the Mississauga Accident can be claimed to be radical. All of them are based upon strengthening the natural willingness of our citizens - corporate, public and private - to act in a responsible manner. All of them too can be seen to be logical extensions or improvements to requirements or activities already taking place but which were found in Mississauga to be inadequate in the ultimate test.

PLANNING AND PREPARING FOR RESPONSES TO HAZARDOUS MATERIAL EMERGENCIES

R.T. RUFE, Jr.

Planning and Preparing for Responses to Hazardous Material Emergencies

On a summer evening, after stopping at a truck stop outside of a busy metropolitan area, a truck driver discovers that the fuming sulfuric acid that he is hauling is leaking steadily from his truck. It is running across a parking lot into a gutter which leads to a storm drain.

In another incident, shortly before midnight, 24 cars of a train derail within a large town. Eleven cars are filled with propane, three with styrene, four with caustic soda, three with toluene and one with 90 tons of liquid chlorine. Within minutes, one propane car bursts in a BLEVE (a particularly wide ranging violent explosion known as a Boiling Liquid Expanding Vapor explosion). In the next half hour, two other propane cars explode, one car becoming a projectile and flying more than 600 meters. There are over a quarter million persons in the community and evacuation appears imminent.

And finally, elsewhere, in the middle of a major port, two ships collide. One of the vessels is a fully laden tanker containing more than 2 million gallons of highly flammable oil. The second is a container ship with a variety of general cargo, including a large quantity of hazardous materials such as poisons, corrosives and explosives. As a result of the collision, fires break out aboard both vessels. The engine room of the freighter fills with smoke and is abandoned by the crew, causing the ship to lose power and fire fighting ability. Oil spilling from the tanker ignites and is burning on the water. Both vessels are soon engulfed in flames. Surviving crewmen abandon ship as the two burning hulks drift to shore.

I have just described three incidents with varying degrees of seriousness - each of them having the potential to cause loss of life, injury, and environmental and property damage. Hazardous material spill incidents can be far more serious than oil spills in that health and environmental hazards are generally much more immediate, dramatic and often unseen. When there is a hazardous materials spill, traditional measures of fire fighting or of combatting spills may not be adequate or even possible because of the specific hazards involved. Using water may cause even more problems because of spreading and water reactivity of many chemicals. Personnel who respond to such incidents must be specially trained if they are to be safe, be effective and be able to ensure the safety and health of the surrounding community.

In the United States, millions of tons of hazardous materials are safely transported each day and worldwide, this would be multiplied many times. The majority of these shipments are transported by ship, barge, rail or highway. Many of the products carried are highly toxic to both man and the environment and the accidental release of even small quantities can have serious consequences. The ever present dangers, inherent in handling these materials have forced increasing emphasis on environmental protection since the mid 1970s. During the course of this growing interest, legislation and regulations have been written and implemented; subsequently amended and new laws now passed. Systems of preparedness have been developed and continue to undergo refinement to keep pace with expanding areas of concern.

Throughout the entire evolutionary process, one major element has always persisted - Planning is a vital aspect of response. In fact, the title of this paper Planning and Preparing for Responses - could be better stated as Planning is Preparing for Responses. Any experienced response organization will affirm - that no matter how severe an incident is, if a contingency plan exists, it provides organization, stability and control to what could otherwise be a real disaster.

Of course there are different levels of contingency planning such as - national, regional, local and even specialty team plans. Today, I want to concentrate on the first two - national and regional. I will use the U.S. Plan to illustrate a working example.

Hazardous chemical spills can be extremely complex from both a political and ecological perspective. The U.S. has found that no one person or Federal agency has the experience or the expertise to adequately respond to these incidents alone. Indeed, we found that the experience and expertise was available to address these problems, but that it was maintained in separate agencies and not easily accessible. Therefore, a method had to be devised whereby these resources could be rapidly brought to bear upon a hazardous chemical release in order to quickly mitigate the dangers that arise. This circumstance provided the impetus to develop a National Oil and Hazardous Substances Pollution Contingency Plan. Today it forms the basis for all Federal action to minimize pollution damage from discharges of oil or hazardous substances. It was first published as an interagency agreement in November 1968, and assumed its present format in August 1973 to comply with

legislative mandate under the Federal Water Pollution Control Act (or FWPCA). The plan has undergone several revisions since then in order to improve it. The Plan includes but is not limited to:

(1) The assignment of duties and responsibilities among Federal departments and agencies;

(2) Identification, procurement, maintenance, and storage of equipment and supplies;

(3) Establishment of a national strike force to provide necessary specialized services to carry out the Plan;

(4) Establishment of trained and equipped emergency task forces in major ports;

(5) A system of surveillance and reporting designed to insure the earliest possible notice of discharges to the appropriate Federal agency;

(6) Establishment of a national response center to provide coordination and direction for operations in carrying out the Plan;

(7) Procedures and techniques to be employed in identifying, containing, dispersing, and removing hazardous substances;

(8) A schedule, prepared in cooperation with the States, for identifying dispersants and other chemicals, if any, that may be used in carrying out the Plan; and

(9) A system whereby the State or States affected by a discharge may be reimbursed for reasonable costs incurred in the removal of such discharges.

It is also important to note here that our laws and regulations are designed to encourage the spiller to clean up chemicals released in an accident. Here we have found several important roles for government:

-Prevention - Ensure transportation practices and methods are safe and professionally carried out in order to reduce the probability of spills occurring

-Oversight - Ensure the spiller is cleaning up properly and with a minimum of damage to the environment, and

-Response - Assume responsibility for the clean up if the spiller refuses, is unable to, or is unknown. Pollution trust funds have been established under our laws to provide for this. (The government hires a clean up company from the private sector and the spiller is held liable for the costs incurred.)

The primary thrust of the U.S. National Contingency Plan is to provide a coordinated Federal response capability to the scene of unplanned or sudden, and usually accidental, discharges of oil or hazardous substances that pose a threat to public health or welfare.

The Plan accomplishes this by establishing a flexible organization consisting of individuals designated as Federal On-Scene Coordinators (OSCs), and advisory groups capable of providing expertise and assistance as required. The latter groups consist of Regional Response Teams (RRTs), a National Response Team (NRT), and a National Strike Force (NSF).

Every square meter of U.S. territory is assigned a Federal On-Scene Coordinator. Generally speaking, the Coast Guard is responsible for the coastal region, the Great Lakes, and ports and harbors, and the Environmental Protection Agency is responsible for inland areas.

The Coast Guard and Environmental Protection Agency (or EPA) are also responsible for developing and implementing Regional Contingency Plans for their respective areas of responsibility. These plans are utilized for the purpose of identifying potential problems within the region; for identifying the environmental resources which would be jeopardized should a discharge occur; and procedures, equipment and techniques to protect and/or reduce damage to the environment in the event of a polluting discharge.

The National Response Team (NRT) draws its membership from many Federal Agencies at the national level such as the Department of Transportation, Defense, Commerce, and Interior, to name but a few.

The NRT may be activited as an emergency response team in the event of a discharge which (a) exceeds the response capability of the region in which it occurs; (b) transects regional boundaries; (c) involves significant numbers of persons or nationally significant amounts of property; or (d) when requested by any primary Agency representative. This Team is capable of providing such services as the use of Air Force cargo planes or Naval salvage assistance.

When the National Team is not activated, its members meet monthly to discuss and review matters pertinent to the Nation's response posture. The NRT is specifically charged with maintaining a continuing review of the National Plan and providing suggested revisions of the Plan to the EPA. Except for periods of activation because of a pollution incident, the representative of EPA acts as chairman of the NRT, and the representative of the USCG acts as vice-chairman. When the Team is activated for a pollution incident the chair is assumed by either EPA or USCG depending upon which agency has the responsibility to provide the OSC.

Regional Response Teams (RRTs) draw their membership from the Federal Agencies at the regional level. Additionally, appropriate State agencies are actively encouraged to participate as full members of the RRTs. The RRT acts within a region on an emergency basis to provide advice and assistance to the OSC as necessary. The RRT can assist the OSC in any number of ways. For example, it could arrange for the use of local law enforcement officials to keep sightseers under control at the scene of a pollution incident, or for State Fish and Game Officials to place bird scaring devices at appropriate locations to reduce the possibility of water fowl becoming contaminated.

The RRT also provides advice and assistance in the development of Regional Contingency Plans. These regional plans provide detailed information on responsibilities and capabilities of each agency in executing the plan; inventories and locations of equipment; location and telephone numbers for clean up contractors and their capabilities; contact numbers for each Federal, state and local agency having direct or peripheral responsibilities in

executing the plan; and action plans for specific geographical locations within the region. To supplement the regional plans, the Coast Guard and the EPA have directed their OSCs to develop local plans in high risk areas such as ports, harbors and commercial waterways.

The RRTs are chaired by the Coast Guard or the Environmental Protection Agency, depending on which of the two agencies has the responsiblity to provide the OSC. The RRT is activated for the same reasons as the NRT as it relates to the regional organization.

The OSC concept is vital to making this system work. The on-scene coordinator is that Federal official, pre-designated by the Coast Guard or the EPA, with responsibility for coordinating and directing all Federal pollution control efforts in any given incident in a given area. He is responsible for carrying out the duties of on-scene coordinator specified in the plan in accordance with the policies and procedures established by his parent agency. The RRT and NRT are advisory bodies who provide advice and specialized assistance as the OSC may request. Their role is not to direct the OSC but to help solve the OSC's problems - provide advice, extra resources, and assistance of that nature.

Whenever a pollution incident occurs, the Federal on-scene coordinator for the area is notified. It is the OSCs responsiblity to insure that a prompt and accurate assessment of the situation is made. The OSC will monitor the situation where the responsible party is known and is found to be taking all the steps possible to contain and cleanup the pollutant. If the identity of the responsible party is unknown or the party is not considered to be taking

adequate steps to contain and cleanup the pollutant the OSC shall initiate whatever steps are necessary.

The OSC conceivably can be confronted with an unlimited number of problems when carrying out a Federal response action. In like manner however, by maintaining close coordination with the RRT, the OSC can avail himself of the many resources and numerous disciplines available within the Federal and State establishments. Further, this capability can be supplemented at the National level if required.

Under the National Plan, the National Strike Force is maintained under the auspices of the Coast Guard. It consists of three Strike Teams; any or all of these teams being available to advise and provide assistance to the OSC. Members of these teams have specialized training in personnel protection for hazardous substance incidents, pollution containment and removal, diving, and vessel damage control. Each team is equipped with specialized pollution control equipment.

The National Contingency Plan is a dynamic document that undergoes continual evaluation. It has built-in mechanisms to provide for review of its provisions on a periodic basis and after the conclusion of each major pollution discharge requiring a federal Response action. This is accomplished through the deliberations of the National Response Team and through the review of OSC reports by the NRT and RRT as appropriate.

In summary, the U.S. National Contingency Plan provides a flexible and capable organization that is able to provide a timely, effective, well coordinated effort to control and mitigate the effects of any polluting discharge.

RESEARCH FINDINGS ON COMMUNITY AND ORGANIZATIONAL PREPARATIONS FOR AND RESPONSES TO ACUTE CHEMICAL EMERGENCIES

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RESEARCH FINDINGS ON COMMUNITY AND ORGANIZATIONAL PREPARATIONS FOR AND RESPONSES TO ACUTE CHEMICAL EMERGENCIES

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Introduction

By almost any criteria the threat of sudden chemical disasters is on the increase. However, while the technical aspects of such incidents have been much studied, the social aspects of such situations have been largely ignored. To study this problem the Disaster Research Center recently concluded a four year study of community and organizational preparedness for and responses to actual and potential sudden disasters resulting from chemical agents. Field studies were conducted on preparedness planning in 19 communities around the United States; an additional 20 field studies were undertaken of responses in the emergency time periods of incidents involving chemical explosions, fires, and spills. Using a sociological framework which indicated relevant variables and factors, intensive interviews were obtained from over 400 respondents. In addition, considerable data were gathered from participant observing and document collecting. The data were quantitatively and qualitatively analyzed, and a general theoretical model of preparedness and response was derived. In this paper the major findings about the sociobehavioral aspects of disaster preparedness for and of the organizational and community responses to chemical disasters are briefly summarized.

Findings About Disaster Preparedness

1. Threat Perceptions

There is a degree of perception that chemical agents, compared with other agents, have more potential as disaster agents. However, different communities, sectors, and organizations selectively vary in their perceptions of the chemical threats. In particular, there are noticeable differences between threat perceptions of public and private groups, with the latter seeing chemically-based disasters as less likely than the former. This variability in perception may partially be the result of role expectations as they apply to these different sectors of the community. That is, many public sector groups (such as fire departments) have official responsibility for emergency preparedness and are expected by the community to carry out these responsibilities. This type of role expectation can sensitize these groups to the various demands of their domains. On the other hand, fewer private sector groups (with the exception of chemical companies) have formal responsibility for preparedness planning and, therefore, are less likely to be aware of disaster threats in general.

2. Availability and Mobilization of Resources

In principal, but not in fact, there are many potential resources available to prepare for chemical emergencies. Many tangible resources are either unknown, unrecognized as such, or are the property of private groups, and even when available tend to be segregated inefficiently from other kinds of community disaster resouces. More intangible resources are also undependably and unevenly available and there is a lack of leadership and responsibility for their availability particularly prevailing in the public sector.

There is little collective mobilization of resources except in a minority of communities with local comprehensive mutual aid systems (i.e., networks of disaster-relevant organizations from both the public and private sector which form for the express purpose of sharing resources in disaster preparedness and response). Such systems have multiple chemical emergency functions and are particularly strong with respect to resource sharing and communication, although they are usually weak in risk assessment, in providing a role for the medical area, and in addressing the problem of evacuation. Extra-community resources are seldom part of any individual or collective mobilization of resources for chemical emergencies.

3. Patterns of Community Social Organization

There is a variety of social linkages (i.e., formal or informal contacts between and among organizations and groups) for chemical preparedness planning in most of the communities we studied. In particular, there tend to be links between local fire departments and the chemical companies in their areas. The general pattern, however, is one of weak vertical rather than horizontal linkages within communities. That is, the structure tends to be hierarchical in nature, with authority vested in the upper-most levels and with few provisions for effective cross-communication among the various disaster-relevant groups. There is also an almost total absence of local extra-community linkages even though the collective resources of the latter sources are extensive in nature. More integrated linkages are slowly evolving but overall there is a pattern of weak community social organization for chemical emergencies.

4. Social Climate

As a whole, the social climate in most local communities in the United States is not favorable to preparedness planning for chemical emergencies. While some of the existing norms, values, and beliefs provide incentives for planning, most do not. There is a tendency to believe that communities could respond to emergencies better than they probably could. This reinforces a disinclination to disturb local economic benefits from chemical plants or to argue against what is seen as a public unwillingness to spend governmental funds for most anything, including disaster preparedness planning.

5. The Planning Process and Preparedness

There is only a low degree of preparedness planning for chemical emergencies in most communities in the United States. In fact, such planning is frequently nonexistent among public emergency organizations, with the exception of some fire departments. Preparations for chemical disasters are especially

handicapped by the public-private sector split in the United States. An additional impediment to local planning efforts is the fact that the most relevant resources rest in the hands of extra-community groups (i.e., state and federal level organizations), rather than with the local community organizations which invariably are confronted with problems associated with the immediate post-incident response.

Findings About Responses to Chemical Emergencies

1. Effects of Preparedness Planning on Response

Preparedness is often incorrectly equated with formal disaster plans, an end product of the planning process, or viewed as an extension of everyday operations. However, good preparedness is actually a knowledge-based realistic process stressing general principles aimed at reducing the unknown in a problematical situation. As such it is all the activities, practices, documents, formal and informal agreements, and associated social arrangements which, over the long or short term, are intended to reduce the probability of disaster and/or the severity of the community disruption occasioned by its occurrence.

Community disaster preparedness for chemical emergencies is generally poor if not nonexistent in most localities. However, the private sector is relatively well-prepared especially for in-plant accidents. Extra-community groups which do have resources for chemical emergencies are seldom incorporated into local planning. Nonetheless, to the extent there is preparedness planning of any kind, it tends to make for a better response to chemical emergencies.

2. Impact and Situational Contingencies

The way and the degree to which any community will respond to a particular chemical emergency is often greatly influenced by impact and situational contingencies. The impact contingencies resulting primarily from the property of the chemcial agents themselves present different risk threats particularly in terms of the destructive or damaging potential of the chemical and the controllability of the chemical. Other contingencies are more situational in nature, resulting from spatial, temporal, or circumstantial factors such as the jurisdictional locale of the mishap, the social time in which it occurs, and if the speed of onset allows preventive measures. Both impact and situational contingencies introduce much variety and complexity in the organized response to chemical emergencies. However, they are not completely independent of perceptual and other social factors, and thus can be effected by preparedness planning.

3. First Responders and Initial Definitions

There are some important differences between responses in fixed site situations (mostly chemical plants) and those in transportation accidents involving dangerous chemicals. In general, the response is better in the former situations, although there are problems if the threat spreads from the plant to the community (primarily due to the lack of communication and coordinated efforts between public and private sector groups). In transportation accidents involving chemicals, the initial response is highly ad hoc (i.e.,

specific to that particular time and situation). Much effort is spent on trying to define the chemical threat (or identify the specific chemical agents involved) in the situation. This is not always easy to do correctly and often there is a delay in realizing that a transportation accident may have the potential for becoming a chemical disaster, depending partly on the definitions and behaviors in the situation by first responders.

4. Convergence and Outflow Patterns

Much of what happens after the arrival of the first responders and their initial definition of the situation can be visualized as convergence and outflow patterns. There is a movement of organizations, things, and information outward from the disaster site, and a similar flow toward it. Both the outflow and the convergence patterns are marked by much uncertainty and uneveness of knowledge of the situation by selectively involved organizations. What flows out is even more erratic than what converges, and some behaviors tend to compound the difficulties in the situation and almost ensure lack of coordination. There are also special problems in chemical emergencies with respect to exactly how to handle the often overwhelming numbers of mass media representatives, how to obtain accurate information relevant to the diagnosis and treatment of victims (often the chemical agent is unknown, or if known, medical personnel are uncertain on measures to take especially in relation to very unfamiliar chemicals, and there are no centralized sources to turn to for quick references), and how to identify the appropriate procedures for the neutralization of the chemical threat.

5. Similarities and Differences Between Chemical and Nonchemical Disasters

Differences in chemical and nonchemical disasters exist especially in the risks they pose. This requires some different preparations for chemical emergencies. However, many similar response tasks are necessary in both kinds of disasters and all disaster phases. Actual responses in chemical emergencies also differ somewhat from what occurs in natural disasters. Nonetheless, the similarities between both are more important than the differences. Therefore, a generic rather than agent-specific approach to preparedness and response seems warranted.

What are the implications of our study? From a general perspective, our work suggests that locally-based preparedness planning using existing resources can lead to an improvement in integrated community responses. From a more specific perspective, there are three aspects which preparedness planning ought to consider. There is a major public-private sector split, with weak linkages between the two sectors. The split hinders chemical disaster preparedness, and is not helpful in chemical disaster response. Also, chemical disasters are more problematical than disasters resulting from most other kinds of agents. A chemical disaster can be occasioned by rather different things, can physically have rather different outcomes, and frequently require rather different coping mechanisms. Put another way, chemical disaster agents tend to be relatively more heterogeneous than other kinds of disaster agents. This also makes for problems in preparedness and response. Finally, there is a strong technological bias in the planning activities and operational measures undertaken with respect to hazardous chemicals. There is the strong belief that technical solutions can be found to both prevent and soften

chemical disasters. While in one sense this is undoubtedly true, as we have suggested in our paper there are social as well as technical aspects of preparing and responding to actue chemical emergencies. Even if all the technical problems were solved, there would still be problems inherent in the group and human aspects of the situation. These require the application of a sociological perspective, which we have partly tried to illustrate in the remarks we have made.

For further information, the following publications can be obtained from the Disaster Research Center.

Kathleen J. Tierney. A Primer for Preparedness for Acute Chemical Emergencies. Columbus: Disaster Research Center, The Ohio State University, 1980. (Can be obtained for $7.50 from the Disaster Research Center.)

Jane Gray and E. L. Quarantelli (eds.). "Social Aspects of Acute Chemical Emergencies. Special Issue," Journal of Hazardous Materials 4 (March 1981): 309-394. (Copies can be obtained for $10.00 from the Disaster Research Center.)

E. L. Quarantelli. Sociobehavioral Responses to Chemical Hazards: Preparations for and Responses to Acute Chemical Emergencies at the Local Community Level. Final Report #28. Columbus: Disaster Research Center, The Ohio State University, 1981. (Can be obtained for $7.50 from the Disaster Research Center.)

Until November 1984, write to Disaster Research Center, Derby Hall, The Ohio State University, Columbus, Ohio 43210 U.S.A.; after November 1984, write to Disaster Research Center, Department of Sociology, University of Delaware, Newark, Delaware 19716 U.S.A.

PRESENTACION CASO ACCIDENTE ORIGINADO POR COMPUESTOS QUIMICOS

DR. HERNAN VENTURINO P.

PRESENTACION CASO ACCIDENTE ORIGINADO POR COMPUESTOS QUIMICOS

"CONTAMINACION CURSOS DE AGUA, FUENTE DE ABASTECIMIENTO PARA CONSUMO HUMANO, POR RELAVES DE EMPRESA MINERA"

DR. HERNAN VENTURINO P.

I.- ANTECEDENTES:

En Chile los accidentes producidos por compuestos químicos han sido escasos. Esto obedece principalmente a su característica de país en vias de desarrollo con - industrias manufactureras y químicas incipientes, bajo nivel de explotación agrícola y a una Legislación Sanitaria que obliga a una aprobación previa de funcionamiento de toda empresa o faena, que se ha cumplido satisfactoriamente y ha permitido prever eventuales riesgos ambientales y adoptar las medidas oportunas para prevenir accidentes.

El caso de accidente que se relatará ocurre en una Empresa Minera, ubicada en la IV Región del país, a - 4.000 metros de altura sobre el nivel del mar y a 190 kms. de dos ciudades de aproximadamente 180.000 habitantes ambas.

La empresa minera en referencia extrae minerales de oro, plata y cobre. Para el procesamiento de estos minerales construyó una planta de tratamiento que incluye tres procesos principales:

a) Flotación para la obtención de concentrados.

b) Lixiviación y electrodeposición, para obtención de Metal Dore.

c) Tostación de concentrados, para eliminación y recuperación de trióxido de arsénico.

En el proceso de lixiviación se emplea Cianuro de Sodio, compuesto usado comunmente para el tratamiento de minerales de oro y plata. Como parte de las instalaciones anexas a la Planta de Tratamiento, se construyó un tranque para acumulación de relaves, en la quebrada de un río que es afluente de otros que son fuente de abastecimiento de agua para consumo humano de pequeños poblados y de las ciudades citadas anteriormente. La empresa minera estableció, además, como procedimiento de su operación normal, un control de la calidad de las aguas del río en cuya quebrada construyó el tranque de relaves.

La Autoridad Sanitaria de la IV Región, en conocimiento de la empresa minera y previo a la iniciación de sus procesos productivos, estableció en agosto de 1981 una red de muestreo de las aguas de los distintos afluentes a partir del río vecino al tranque de relaves, con el objeto de medir la presencia de distintos elementos químicos, lo cual se ha mantenido en forma permanente en 6 puntos de muestreo.

A partir de Enero de 1982 la empresa minera empieza su producción utilizando el cianuro de sodio para la lixiviación de oro y plata.

Los resultados de los muestreos de agua citados demostraron que no habia contaminación química con riesgos para la salud de las personas, en el lapso previo

al inicio de faenas de la empresa minera y en el período posterior a la puesta en marcha del proceso de cianuración, hasta el mes de Julio de 1982. El 4 de Agosto de 1982 el cianuro libre detectado en uno de los puntos de la red de muestreo, vecino a la planta de agua potable, alcanzó a - 0,18 mg/lts. (la norma de calidad de agua potable en Chile consulta un límite máximo de cianuros de 0,20 mg/lts).
Este hecho determinó que la Autoridad Sanitaria, haciendo uso de la legislación vigente, ordenara a la empresa minera suspender el proceso de lixiviación con cianuro de sodio hasta que se descubrieran las causas de la contaminación de la fuente de agua y se adoptaran las medidas para corregirla (5 de agosto de 1982).

El estudio de las causas de este accidente reveló fallas en el tranque de relaves que produjeron filtraciones subterraneas, por debajo del tranque, que originaron la presencia de residuos de cianuros aguas abajo. Con estos antecedentes la Autoridad Sanitaria ordenó corregir las deficiencias del tranque de relaves y puso como condición del funcionamiento del proceso de cianuración, no sobrepasar, en forma permanente, las concentraciones de cianuro de 0,20 mg/lts. en las aguas del primer afluente del río vecino al tranque y de 0,05 mg/lts. en las aguas que - llegan a la planta de agua potable.

El 23 de Diciembre de 1982 se autoriza la reanudación del funcionamiento del proceso de lixiviación con cianuro de sodio y desde esa fecha los controles fisico - químicos de las aguas, fuente de abastecimiento, revelan que los niveles se mantienen dentro de límites aceptables.

II.- COMENTARIO:

El caso relatado, aunque no significó un daño mayor o detectable en poblaciones humanas, que hubiere obligado a otro tipo de estudios y medidas de control, demuestra que la disposición de legislación, reglamentos y normas adecuadas para el manejo de sustancias químicas y la implementación de sistemas de vigilancia de eventuales daños a las personas o el medio ambiente, pueden prevenir y diagnósticar precozmente en forma efectiva, la ocurrencia de accidentes.

SUBSECRETARIA DE DESARROLLO URBANO Y ECOLOGIA

SUBSECRETARIA DE ECOLOGIA

DIRECCION GENERAL DE PREVENCION Y CONTROL DE LA CONTAMINACION AMBIENTAL

ATENCION DE CASOS DE EMERGENCIA PRODUCIDOS POR AGENTES QUIMICOS EN MEXICO

M. en C. PORFIRIO ALDANA TORRES

Los desastres tecnológicos en México, se han intensificado a partir de- los años cuarentas cuando la política nacional fué la industrialización acelerada para que México ingresara al grupo de países de alto desarro- llo industrial, teniendo en ese tiempo la limitante de la insuficiencia de tecnología, infraestructura y personal capacitado, lo que además mo- dificó la distribución y la ocupación de la población y otros aspectos- de nuestro país que en esa epoca era eminentemente agrícola.

Paralelamente se amplió la agricultura de riego, construyendo grandes - presas y perforando pozos, creando distritos de riego, con el consi---- guiente incremento en la utilización de transporte, maquinaria agrícola, fertilizantes y plaguicidas.

Todo ello, aumentó los riesgos de accidentes y emergencias que su mani- pulación pueden causar ya sea por accidentes o por falta de capacidad - en su manejo.

México es un país con una amplia experiencia en lo que se refiere a de- sastres naturales, pues en su territorio ha sufrido las consecuencias de todo tipo de ellos, desde terremotos, inundaciones, hasta erupciones - volcánicas, por lo cual se ha creado un dispositivo para amortiguar sus consecuencias y atender de inmediato a los afectados, esto en la mayo-- ría de los casos es posible, ya que se tienen identificadas las regio-- nes en que es posible se presenten los desastres, como son las zonas -

volcanicas, sísmicas, de inundaciones, etc. salvo ocaciones en que ocurra algo inesperado.

El origen del desastre, sea natural o tecnológico, no modifica en modo alguno la atención al mismo, puesto que una vez identificado el riego, las acciones tanto preventivas, como las que se realicen durante y posteriormente al evento son similares, por lo que no vale la pena llegar a una discusión para diferenciar uno de otro, para nuestro trabajo podemos identificar como una emergencia ambiental "El riesgo potencial o realizado de una obra, instalación o actividad del hombre que afecta o pone en peligro el equilibrio ecológico y la salud de las comunidades" cabe hacer notar la diferencia con una situación de emergencia en desastres naturales la que se define como "Una situación en que no son suficientes los recursos normales existentes en la localidad de los servicios de socorro y salud pública y es necesario acudir a medios de urgencia municipales, estatales o nacionales para hacer frente a dicha situación".

Por las características de nuestro país en cuanto a la contaminación y los riesgos para la salud y la vida que esto significa, en las acciones relativas a emergencias ambientales es muy importante determinar los riesgos que puedean desembocar en una tragedia por lo que se han dividido para su estudio y ataque estos riesgos en dos tipos.

1°.- Los de poblaciones con alto índice de contaminación atmosférica y aquellas que por sus instalaciones industriales con altas emisiones contaminantes a la atmósfera, ya sean actuales o potenciales, están en peligro de rebasar los límites aceptados por nuestro -- país y la OMS, para los contaminantes presentes en la atmosféra.

2°.- Las emergencias potenciales o reales causadas por el manejo de - sustancias tóxicas y peligrosas en su producción, almacenamiento, transporte, distribución, y uso.

Nuestro país al igual que en el resto de las naciones se han tenido - problemas por emergencias, algunos de ellos, inclusive conocidos a nivel mundial. Como ejemplo nos referimos al suceso en la población de-Poza Rica Veracrúz, México, en 1950; Poza Rica es un centro de refinación de petróleo y de tratamiento de gas natural, cerca de la Costa -- del Golfo de México, con una población en 1950 de 22,000 habitantes. - El 24 de noviembre, la población sufrió las graves consecuencias de un escape accidental de sulfuro de hidrógeno, que causó la intoxicación - de 320 personas y la muerte de 22. El episodio se debió al deterioro-accidental de la maquinaria de tratamiento de gas natural, a causa de-la cual se desprendió una gran cantidad de sulfuro de hidrógeno que se extendió sobre el barrio residencial de la Ciudad. Una inversión me-- teorológica asociada a un desplazamiento lateral del aire, agravó la - situación. No obstante que la fuga de gas se cortó a los 20 minutos - de haber empezado, en tan breve periódo de tiempo se produjeron las in

toxicaciones y defuciones señaladas. Los efectos del gas fueron los característicos de la inhalación de sulfuro de hidrógeno.

Más recientemente, en diciembre de 1983, en la Ciudad de Guadalajara, Jalisco, en una industria situada dentro de zona urbana, rodeada por casas habitación debido al crecimiento de la ciudad, se originó una fuga de - gas amoniaco, causando pánico en la ciudad y más de mil intoxicados los- que fueron atendidos oportunamente.

Se han comentado casos agudos por contaminación atmosférica que afectan- el ambiente y la salud, pero los problemas por emergencias causadas por- agentes químicos no se limitan a la atmosféra, ya que se tienen experiencias debidas a la contaminación de los alimentos, del agua y del suelo,- las que generalmente se presentan como casos crónicos o sea ingestión de una substancia tóxica en pequeñas dósis durante largo tiempo, como sucedió en Minamata Japón.

En México, País agrícola en gran parte del territorio, cuenta con extensas áreas de riego donde es necesario e indispensable el uso de plaguicidas, es frecuente que tengamos casos de intoxicaciones, tanto agudas como crónicas, principalmente, por el manejo indadecuado o negligente de - plaguicidas.

En el campo industrial es común que por diversas causas, los residuos líquidos y sólidos no reciban el tratamiento adecuado y se arrojen al am--

biente donde la población indefensa sufre las consecuencias, ya que de alguna manera es afectada por diverso tipo de contaminantes en el aire, suelo y agua. Como ejemplo podemos citar un caso que se presentó y que se consideró una emergencia; la industria denominada "Cromatos de México, S. A." Ubicada en la Población de Tultitlán, Edo. de México, la que tenía como residuo, material polvoso con alto contenido de cromo hexavalente, cancerigeno plenamente identificado. Este material era almacenado en los patios de la empresa, cercano a una escuela de nivel elemental y a una zona habitacional, a las cuales los vientos dominantes transportaba el polvo. La ignorancia contribuyó a que se agrave la contaminación del suelo ya que la empresa regaló parte de este material para "Bachear", es decir para rellenar los hoyos de las calles cercanas a petición de los vecinos. En consecuencia el problema creció, porque en tiempo de secas el viento esparcía más el contaminante en la zona, pero en la temporada de lluvias, se contaminaron además los mantos freáticos, es decir las aguas subterráneas, lo que aumentó la exposición y el riego para los habitantes de la zona.

Generalmente cuando existen problemas de intoxicación crónica, se realizan acciones de control cuando ya se presentan daños a la salud y el pánico hace presa de la comunidad afectada, y la circulación de rumores alarmistas es inevitable, este caso no fué la excepción y se llegó a mencionar que había varias muertes principalmente niños. En esta población según los estudios epidemiológicos realizados posteriormente no se pueden-constatar muertes, pero si varios enfermos seguramente afectados por los residuos. Inclusive, en algunas investigaciones realizadas con los traba

jadores de la empresa no se logró comprobar casos de cancer, solamente se detectó que los de mayor antiguedad tenían destruído el tabique nasal.

Como medida de control se cubrieron los residuos conteniendo cromoexavalente con material impermeable, se asfaltaron las calles y se cegaron los pozos de agua potable de la zona. Sin embargo, no hay un grupo de investigación que observe las consecuencias de este problema a largo plazo; estos y otros ejemplos de emergencia, afortunadamente hasta ahora la mayoría de ellos sin defunciones, los tenemos constantemente. Algunos, además de los descritos fueron el incendió de un yacimiento de fósforo en explotación, el descarrilamiento de un furgón de ferrocarril, que transportaba gas claro, sectores de la población afectados por el consumo de alimentos contaminados con altas concentraciones de plaguicidas como el caso de Tijuana, B.C., en fin, que las experiencias que hemos tenido en México nos dan la pauta para preparar un plan de acción para prevenir y controlar episodios de contaminación.

La creación de la Secretaría de Desarrollo Urbano y Ecología con su Subsecretaría de Ecología en el presente periódo de Gobierno Federal ha significado la voluntad de proteger el ambiente y la salud de los habitantes en una forma más decidida, ya que en su organización se contempla un departamento para la atención de emergencias ambientales dentro de la Dirección General de Prevención y Control de la Contaminación Ambiental, apoyadas las acciones en el Plan Nacional de Desarrollo, que dentro de sus líneas generales de acción, del Capítulo Ecología, establece contar con un Programa de Atención de Emergencias, y además la Ley Orgánica de la Administración Pública, establece que a esta Secretaría le corresponde formular y conducir la Política de Saneamiento Ambiental, en coordinación con-

la Secretaría de Salubridad y Asistencia, motivo por el cual se tiene en proceso de aprobación un Programa de Emergencias que contempla los dos aspectos más importantes del problema como son:

1°.- La posibilidad de que en algunas poblaciones del país con alto indice de contaminantes en la atmosféra se presentan inversiones atmosféricas por un largo periódo de tiempo que evite la dispersión de los mismos.

2°.- El manejo inadecuado de sustancias tóxicas y peligrosas en su producción, almacenamiento, transporte y distribución que es causa de accidentes y pone en peligro la salud humana.

El alcance del programa comprende las siguientes áreas.

1.- Contaminantes
2.- Substancias tóxicas
3.- Selección de sitios de acción
4.- Condiciones ambientales
5.- Instituciones participantes
6.- Industrias contaminantes
7.- Transporte
8.- Adistramiento y capacitación
9.- Normas técnicas
10.- Bases legales

Uno de los problemas que se presentan para implantar un Programa de Atención de Emergencias o de Vigilancia Contínua de la Contaminación por Sustancias Químicas es que no existen suficientes laboratorios especializados en detectar y determinar residuos de sustancias químicas y los que existen, cuentan en su mayoría con equipo e instalaciones inadecuadas, presentando ineficiencia en su funcionamiento.

Sin embargo, está en proceso la integración de una Red Nacional de Laboratorios ya que existe un buen número de instituciones tanto del sector gubernamental (SSA, SARH, SECOFIN) como del sector educativo (universidades, institutos y centros de investigación) laboratorios equipados parcialmente y con interés para participar en la realización de estudios ambientales. Dichas instituciones participarán en la Red Nacional de Laboratorios proporcionandoseles algunos recursos materiales consistentes en reactivos equipos y material especializado, para desarrollar los programas de evaluación de la calidad ambiental y de atención a emergencias.

La Red Nacional de Laboratorios se presenta como opción de integrar los esfuerzos de todos los sectores de la población en su afán por mejorar su calidad de vida y proteger su entorno.

EMERGENCY HEALTH PLANNING

FOR

CHEMICAL DISASTERS

F. LORRAINE DAVIES

EMERGENCY HEALTH PLANNING FOR CHEMICAL DISASTERS

F. Lorraine Davies
Director

The Department of National Health & Welfare has been given the responsibility for ensuring that plans exist to deal with the health and social services consequences of disasters. To this end the Emergency Services Division of the Department of National Health and Welfare was established a number of years ago and tasked with the development of contingency plans for the departmental response to disasters and the coordination of planning with provincial and municipal health and social services officials.

First, the Department identified the various hazards which exist in Canada and evaluated their potential impacts on health and well-being of Canadians. These hazards are constantly reassessed and new risks identified such as technological advances and the increase in the transportation of hazardous products throughout the country, by various modes of transport, road, rail, air or sea. Additionally, we have looked at stationery hazards, such as chemical plants, refineries, offshore drilling for oil, and nuclear reactor sites across the country.

Many of you are probably aware that a few years ago, in Mississauga, Ontario, a major event occurred which involved the evacuation of approximately 1/4 of a million people. The incident of which I am speaking was a derailment of a train carrying various kinds of toxic substances, including chlorine. It had the potential for, and in fact, did have an explosion of one or more tank cars. The evacuation of the 250,000 people was a phased and controlled evacuation, but required that a number of people be received in Reception Centres, registered, fed and in some cases accommodated for up to one week. In addition to the evacuation of residents of the area, the local community was also confronted with the evacuation of three large hospitals and five nursing homes in the area. This meant the organization of ambulance services, the re-distribution of patients in hospital to other facilities in the nearby area and the release of some ambulatory and convalescent patients to their homes outside the affected area.

This is not the only incident which occurred in Canada in recent years. In February 1982, in an isolated area in the northern part of the province of Ontario, a railway accident occurred which involved the derailment of a number of box cars and tankers. A tanker car filled with hydrogen fluoride was buried under burning box cars. The question of possible explosion could not be ruled out. The site was extremely difficult to access, the closest crossroad was one third of a mile away and a road had to be built beside the rail line. The water supply was limited and fire personnel had to pump water from a local stream and because of the temperature, the water kept freezing. Consideration at that time was given to the evacuation of a rural area approximately five miles around the site of the incident.

A third incident which has occurred was a gas leak at a refinery. The leak was brought under control, however, consideration was given to the evacuation of a five square miles area around the area. This would have involved approximately 60,000 people being relocated from their homes for an unknown period of time.

In each of these incidents, we had either a potential problem or a very real and very large problem with which to deal. We have also recently looked at the nuclear reactor sites across the country and have developed a plan for the federal government response to any offsite release of radio-active material whether it be from a reactor itself, or during the transportation of radio-active material. Health and Welfare Canada played a "Lead" role in the development of the plan and will be the lead agency federally should such a release occur.

How does a division within the national government deal with chemical and other types of emergency? First of all, as I mentioned, we have to identify that a risk exists and determine the potential impact on the health and well-being of Canadian citizens. Canada is a very large country composed of 10 provinces and two territories and covers approximately 4 million square miles. The provinces have primary responsibility for the delivery of health and social services and as such each has its own Emergency Health and Social Services Divisions which deals with the planning at the provincial level. The National Department of Health and Welfare (federal government) therefore provides support to provinces and municipalities in their planning and response to disasters.

In an effort to stimulate awareness of the need for planning and motivate health and social services personnel the Health and Welfare, Emergency Services Division, has developed a series of courses related to community emergency planning for health and social services. The course addresses the issues of public health and hospital care as well as other people-oriented services related to disasters, feeding, lodging, clothing, registration and inquiry programs and personal services or family and individual counselling services.

The courses are conducted at the Federal Study Centre outside of the capital city of Ottawa. In recent years the demand for course spaces has increased significantly, partly because of a greater awareness on the part of health and social services professional, related to the need for disaster preparedness. During the courses on Community Emergency Planning for Health and Social Services, one of the topic areas dealt with is that of the transportation of hazardous products and the potential risks involved. We have asked that the Department of Transport (Transportation of Dangerous Goods Division) to provide us with a lecturer for each of the courses which we conduct. The participants at the course are therefore made aware of the regulations and legislation governing the transportation of hazardous products, are given examples of recent disasters or near disasters, and are asked to look at their own communities, when they return home, to determine the extent of the risk, and to review their hospital and community plans to ensure that those elements, which need to be addressed in such a situation, have been considered during the planning process.

Occupational Health and Safety personnel are also asked to identify particular risks at plants and sites within the community and to address this issue with local hospital emergency departments so that if special treatment is required, the necessary equipment and medications are on hand and the local emergency response people are well aware of the treatment protocols.

Cooperation with other federal departments is important to the education process. We need to know what other Departments and Agencies are doing and they in turn, need to know our capabilities and concerns. An example of such cooperation is the request received from Transport Canada to lecture in one of our larger cities. Representative of Emergency Services Division and Provincial Health and Social Services presented information on the Health and Social Services response and planning to a multi-disciplinary, cross-sectoral group of people. The attendance included approximately 100 people representing a wide variety of agencies, from the Ports Authority, police, fire and local hospital personnel.

Ambulance personnel in various provinces have also been indoctrinated, along with the police and fire personnel, so that they are aware of the on-scene response requirement. They are thoroughly briefed on the hazards related to rescue, care and transport of the injured. One example of an ambulance attendant who made extremely good use of the training, was during the response to a spill of cyanide pellets following an accident in a rural area. The local fire department was composed of volunteers and, at that time had very few of the fire personnel in the community trained to deal with hazardous materials. The ambulance attendant was able to identify the spilled product and, as a result, prevented the pellets from being "flushed off the road" so that the highway could be opened. I think this is a very important argument for the need of multi-disciplinary training, to ensure all emergency response personnel are thoroughly familiar with the procedures and protocols to be followed, and also with the placards, regulations and legislation in force.

Health and Welfare Canada, has identified a number of expert personnel within the Department as well as provincial contacts. In the event of an incident where the transportation of hazardous products section (CANUTEC), require additional expertise to be made available for consultation the Department has the ability to identify these experts and to provide the assistance required. This may include the Poison Control Program, Environmental Health Program, Toxicologists, Departmental Pharmaceutical personnel, Drug Adverse Reactions, Radiation Protection Bureau and others.

As you have heard, the Department of Transport has a 24-hour emergency response number, as does our own Department of National Health and Welfare through the Emergency Services Division.

I have tried to give you several examples of situations where Canadians have been at risk, where we have handled situations requiring evacuation and emergency health and social services response. We must all continue to look at our own countries, determine the risks that exist, determine our response capabilities and those of our health personnel and identify those with particular kinds of expertise which can be brought to bear in the response to an incident in order to prevent further injury or death, not only to the responders, but to those persons at the community level.

Because of the possibility that large numbers of people may have to be evacuated in some incidents, it is also essential that we address the planning requirements for feeding, clothing, shelter, and that we are capable of identifying evacuees and providing counselling and re-assurance to victims of the incident. If we are faced with a long term evacuation, then we must also be concerned about the public health problems which might occur and establish surveillance programs similar to those provided in other types of disaster.

The location where the disaster occurs, the tank car derails, the accident happens, is the area that must be prepared to respond first. The response agencies must know who to call for information, they must know what to do at the scene, in order to prevent additional problems. Health personnel need to know the role and capabilities of other agencies and the other agencies must be aware of the role of health. Plans should be developed, training programs provided and multi-disciplinary, cross-sectoral discussion held to ensure coordination and a cooperative, effective response. At the federal level, plans must also be prepared to ensure an appropriate response in support of provincial/regional and local efforts. Expertise and technological information, reference centres and material should all be identified before the emergency so that, when the incident occurs, a timely response is possible.

CHEMICAL EMERGENCIES

THE JAMAICAN EXPERIENCE

HENRY ROBINSON

CHEMICAL EMERGENCIES - THE JAMAICAN EXPERIENCE

INTRODUCTION

Although problems may be common to both developed and developing countries it is important to note that whereas developed countries have the necessary expertise and legal requirements in place for dealing with the manufacture storage transportation and use of harmful substances, there is dire lack of similar controls in developing countries. Some common chemicals include various solvents and pesticides.

In view of the fragile nature of the economies of most developing countries, serious consideration must be given to the impact of chemical emergencies in such situations. Further economic decline would in most cases be catastrophic.

THE JAMAICAN EXPERIENCE

Jamaica like most developing countries has been progressing steadily along the path of industrialization. Currently there are approximately 2000 factories in operation; over 70 of these are engaged in the manufacturing of various chemical products and employing some 2700 workers. A large number of other factories use harmful chemicals in one form or the other, hence the exposure to such substances could involve a large percentage of industrial workers. In the rubber industry for instance there are some 500 workers employed and using solvents which could in time cause bladder cancer which take some time to surface, hence an entire working population could be affected.

Fortunately, in Jamaica we have not had many cases of large scale chemical emergencies or disasters in comparison with what has occurred elsewhere.

Before dealing with the proposed case studies I wish to give an overview of the capability of the various government agencies and to mention in passing a number of incidents which may prove interesting though not serious enough to be classified as disaster.

LEGAL AND OTHER RESPONSIBILITIES OF GOVERNMENT AGENCIES

1. The Industrial Safety Division - Ministry of Labour - has responsibility for administration of the Factories Act and Regulations. The Division supervises factory and other industrial operations to ensure adequate standards of Safety Health and Welfare of workers.

2. The Environmental Control Division of the Ministry of Health, concentrates mainly on environmental matters in industrial establishments. The work done encompasses the Public Health and other related Acts. However there does not exist any Legislation dealing exclusively with the subject.

3. The Mines and Quarries Division of the Ministry of Mining and Energy administers the Mining Act and Regulations with responsibility for Safety Health and Welfare in Mining and Quarrying operations bauxite processing works and includes licence for mining and quarrying and blasting operations.

4. The Natural Resources Conservation Department of the Ministry of Science Technology and Environment, administers the Beach Control and Watershed Protection Acts. There is general responsibility for environmental matters and advising other agencies on pollution matters.

5. The Harbours Department administers the Harbours Act and Regulations and exercises supervision of all traffic in and out of the harbours as well as all marine installations, i.e. navigational aids and pipelines etc.

6. The Jamaica Defense Force Coast Guard has responsibil8ty for certain matters particularly oil spills incidents. The J.D.F.C.G. has direct responsibility for on scene command of clean-up operation.

7. The Jamaica Bureau of Standards was established under the Standards Act of 1968 and is engaged in setting of standards for the manufacturing distributive and consumer sectors and includes chemical engineering raw materials, food, etc. Within the Bureau is the Industrial Safety Committee which was set up for a rationalizing of the situation as it relates of the various agencies, legal matters and making recommendations for the making of codes of practice and other rules.

8. Professional Bodies include the Jamaica Association of Safety Professionals and the Jamaica Agr. Medical Association. The Agr. Med. Assn's approach embraces the medical and agricultural

professions and is concerned with all aspects of the manufacture formulation, mixing and application of chemicals with emphasis on regular monitoring to ensure safe and effective use.

9. Historically, the various Government Departments have in the main operated in virtual isolation, there being only taken collaboration on occupational safety, health and related issues, the need for greater collaboration has in recent years been stressed particularly through the efforts of the office of Disaster Preparedness and Emergency Relief co-ordination. This organization came into being in the aftermath of massive flooding in western Jamaica in 1979. The establishment of the office was recommended by the joint review committee involving the United Nations Disaster. Relief Office (U.N.D.R.O.), the U.S. Office of Foreign Disaster Assistance (O.F.D.A.) and the league of Red Cross Societies (C.R.C.S.).

O.D.P.E.R.C. is engaged primarily in

a. Public information and training

b. Planning and research

c. Coordinating activities of other agencies

d. Disaster preparedness in general

During a disaster event the Jamaican Prime Minister directs emergency operations through to Director (ODPERC) who may if necessary activate the National Emergency Operations Center which functions on a 24 hour basis. Regional Centers may also be established.

In performing a coordinating role the ODP provide communications resources and back up for key agencies and conducts simulations and drills for testing contingency plans.

CASE STUDY 1

FOOD POISONING - AGRICULTURAL CHEMICAL

Agricultural workers are exposed daily to a variety of pesticides but there has fortunately been only isolated cases of illhealth and death resulting from normal use. Although accidental poisoning occur and even misuse for human pests, such as the most disturbing incident in recent years involving food poisoning.

Samples of the contaminated flour were analyzed by the Government Chemist who found that the poisoning was due to the presence of the organo-phosphate-parathion.

A commission of enquiry with sole commissioner E.G. Green (now Parliamentary Ombudsman) found among other things that the Health Authority has failed in their task of containing the epidemic within the shortest possible time. Reported cases spread over the period of January 2 - January 24 when the decision was finally taken to withdraw the item from the market. The investigation also revealed that contamination occurred before the flour was unloaded at the docks. It must therefore be concluded that food for human consumption was carelessly stowed with the poisonous substance.

The foremost recommendations were:

a. Exporting countries should certify shipments of food as to safety and other precautions taken and should include identity of the manufacturer, transporter and should provide also for suitable markings to be placed on containers.

b. Improved packaging ti include where possible impermeable material on the outside of sacks.

c. There should be established in Jamaica a body (within the Bureau of Standards) of highly competent persons to inspect foodstuff in ports, warehouses and retail outlets.

d. That all vessels carrying food items be inspected before and during unloading.

e. Specific duties should be imposed on importers, wholesalers and retailers to comply with such provisions as may from time to time be laid down by a competent authority.

CASE STUDY 2

OIL SPILL INCIDENTS

The wider caribbean region may be regarded as being among the largest producers of oil. The Gulf of Mexico and off the coasts of Venezuela, Trinidad and Tobago are, at about 50 percent capacity, producing some 3 million barrels per day. It is estimated that seven percent of production could spill to the marine environment. There is threat also from tanker traffic which transports another 4-5 million barrels daily.

Although Jamaica is yet to experience a spill of the magnitude of the Ixtoc spill of 1979, we have had our fair share of problems. In the period 1978-79 eight spills were recorded involving some 200,000 gallons of oil. The most significant involved the MV. Erodona which ran aground off the South Coast of Jamaica, causing a spill of 150,000 gallons.

Of concern also was the incident of the disabled Ogden Williamette having 36,000 tons of crude aboard. She drifted dangerously close to our south east coast for about three days before being taken in tow.

Accidental spills are by no means the only problem. There are numerous instances of bilges being pumped in our coastal waters and the unauthorized use of dispersants.

Response to oil spills involves the calling out of the National Response Team which is comprise of the ODP, NRCD, JDFCG, PA, AG, PAJ and relevant agencies dealing with Health, Public Utilities, Agriculture, Works, Local Government, Fire Department. The team operates the Draft Marine Pollution Contingency Plan. This plan was drafted as a result of recommendations made by an IMO representative who assisted in assessing the impact of the Erodona spill. Clean-up operations have been done manually and with the assistance of machinery. However our capacity to deal with spills was recently enhanced with a gift of equipment from the Canadian Government. Included in the package were skimmers, booms and dispersant gears. Additional equipment mus however be provided and strategically placed arounc the island

as transportation over relatively long distances could mean losing the advantage of affecting an early containment of a spill.

CASE STUDY 3

THE WHERRY WHARF INCIDENT

This involved the leakage of chemical into the public water supply system. The relevant operation at the wharf was the pressure treatment of lumber with a solution of chronic acid, arsenic pentoxide and copper oxide. These are stored in large tanks which could contain over 25,000 gallons of the material at any one time.

Investigations revealed that extreme low pressure condition resulted from a water lock of which allowed a backflow of chemical through a number of defective check valves. In addition it was found that the installation was patently, defective as both the water and chemical lines entered the tanks at the base.

A formal inquiry from the relevant Government Agencies in their duties found that the Plant was built and put in operation without prior approval. Adequate monitoring of the installation was also lacking.

The detection of the chemical in the water was facilitated by the greenish colour. Down town Kingston is heavily populated and includes also several offices, shops and a major public general hospital.

In closing it must be stressed that chemicals will be in use for a number of years to come. Therefore safety in their use must be

based on available information and the inputs of the various disciplines such as medicine, chemistry and experimental toxicology, developing countries need to take seriously the responsibility for legislative and other controls and when necessary appropriate penalties should be imposed on offenders.

In the case studies mentioned no legal action was taken hence the offending organizations got off lightly indeed. Wheery wharf was simply required to rectify faults in the piping system and it was then in business as usual.

In the case of the flour poisoning not even the recommendations of the inquirey seemed to have been implemented.

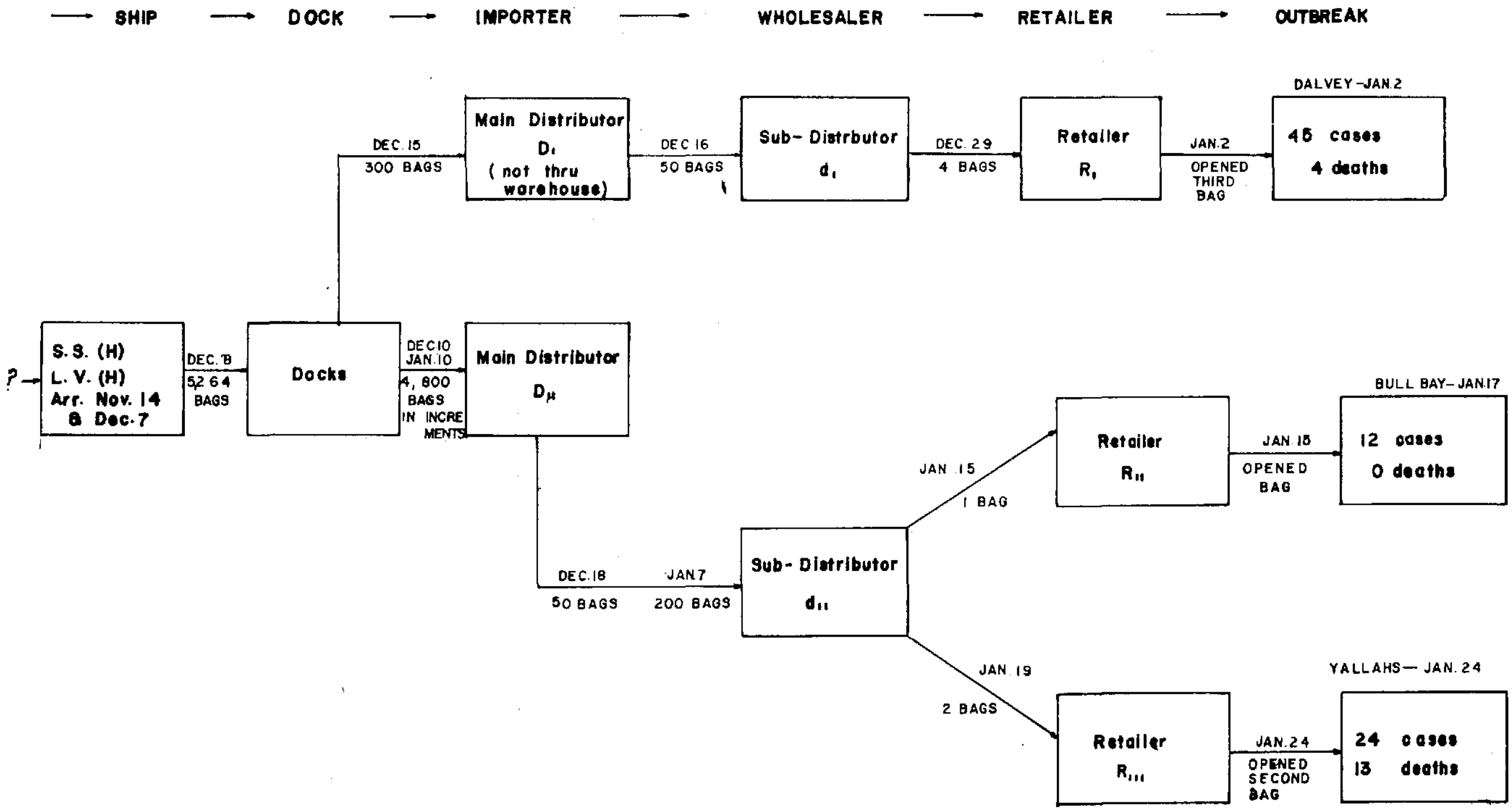
The spillers of oil were simply required to meet the cost of the clean-up.

Government agencies are in the main ill-equipped to deal with emergencies. The need for adequate training of personnel and the provision of instrumentation must be urgently addressed.

Unfortunately the issues at hand do not seem to occupy the minds of the Political Directorate until an emergency arises. It is therefore the duties of technical authorities to ensure by whatever means, that the highest priorities be accorded to safety and health as well as to environemtnal matters, since this is the only way that our work could be worthwhile and not exercise in futility.

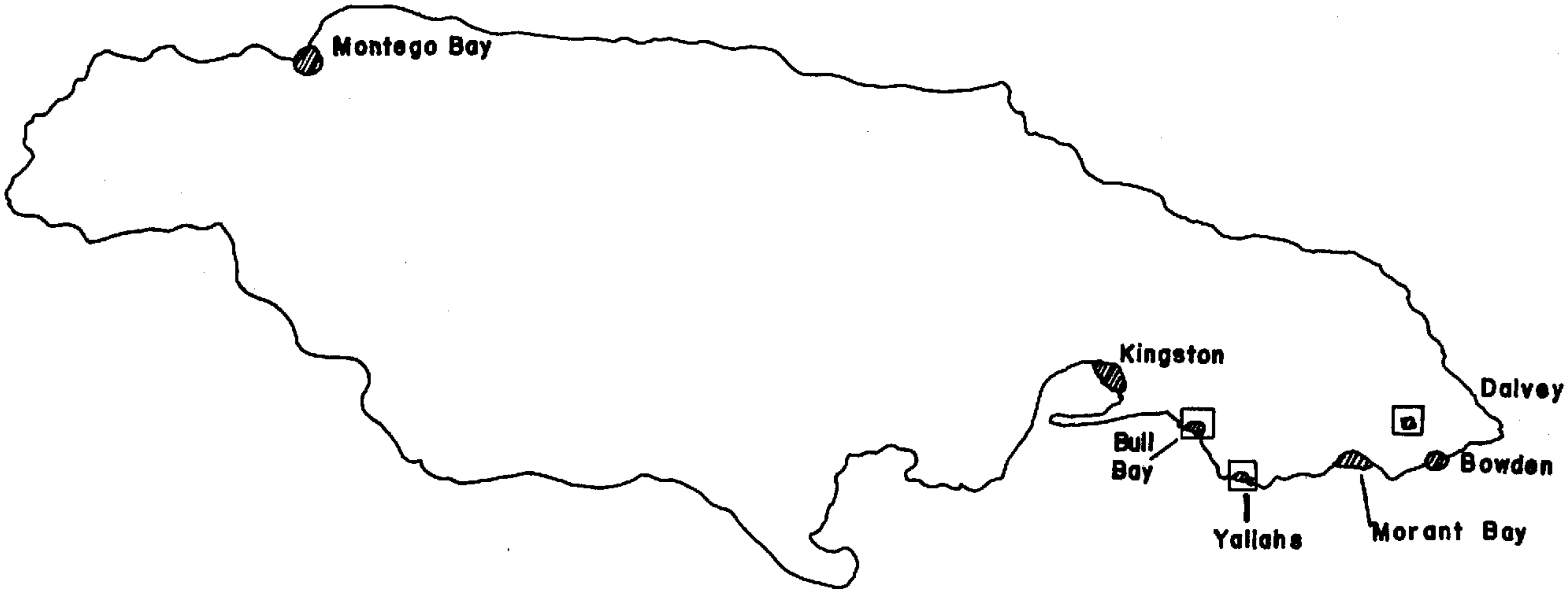
FLOW CHART OF CONTAMINATED FLOUR

FIG. II



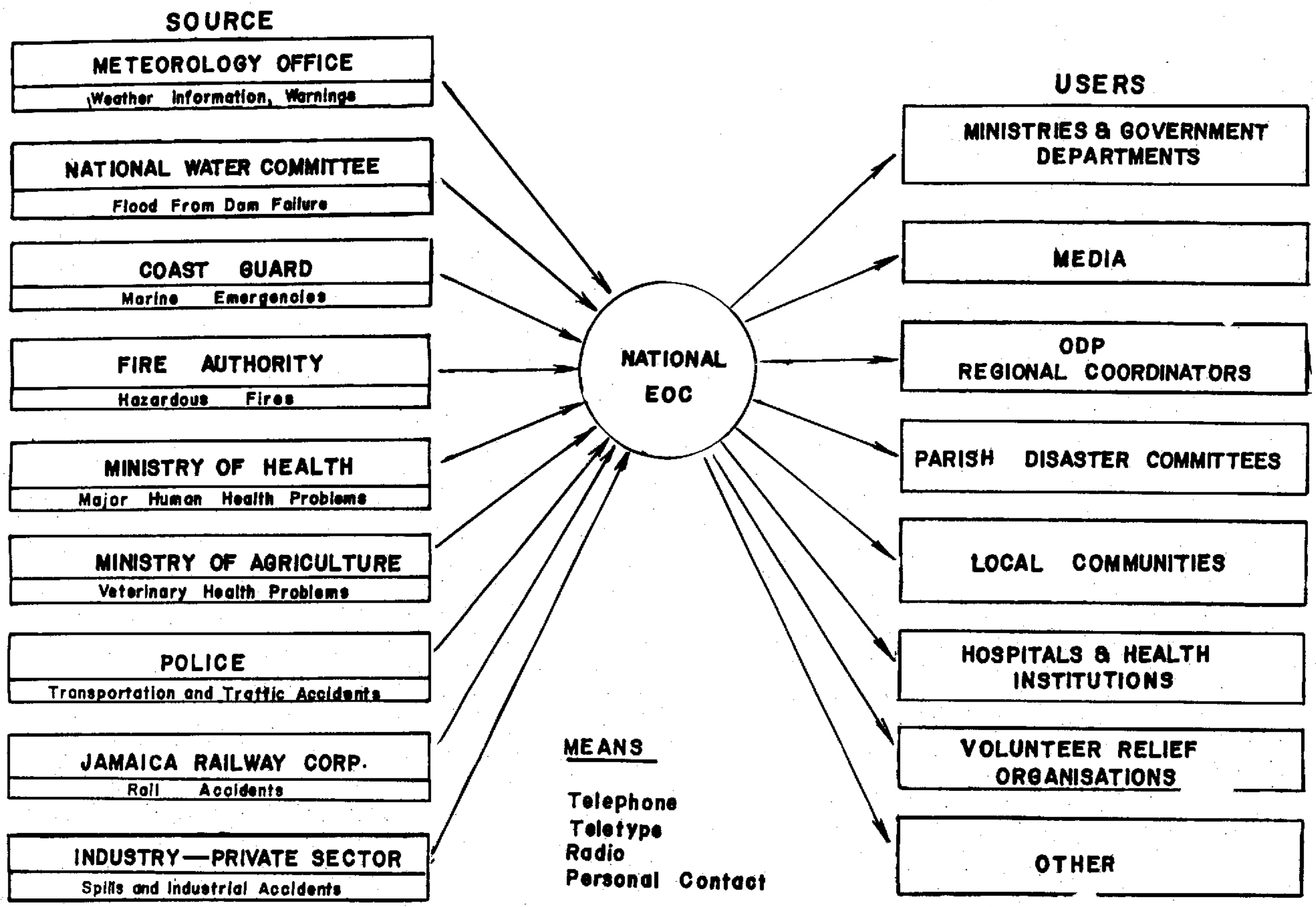
OUTLINE MAP OF JAMAICA

FIG. I



Key= Areas where outbreaks occurred

NATIONAL WARNING AND ALERTING SYSTEM



FACTORIES ENGAGED IN THE

MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS

TYPES (I.S.I.C. METHOD)		NUMBERS	EMPLOYMENT
311	Basic Industrial Chemicals Including Fertilizers	17	847
312	Vegetable and Animal Oils and Fats	15	172
313	Manufacture of Paints Varnishes and Lacquers	6	403
319	Manufacture Miscellaneous Chemical Products	43	1089
321	Petroleum Refineries	1	103
329	Manufacture of Miscellaneous Products of Petroleum and coal	5	112
	TOTAL	76	2726

ACCIDENTES PRODUCIDOS POR AGENTES QUIMICOS EN PANAMA

DR. AQUILES ESPINO

PANAMA, 28 JUNIO 1984

P A N A M A

En Panamá tenemos muy poca experiencia en el manejo de accidentes por sustancias químicas. Entendemos que el conocimiento de las medidas a tomar preventivas y en caso de accidentes, son de suma importancia, ya que nuestras industrias están localizadas, en los centros urbanos, o muy cerca de ellos. Además de los riesgos que representan para el hombre propiamente dicho, debemos considerar los peligros de las alteraciones del medio ambiente, ya que en muchos casos, estas instalaciones se localizan en ríos, lagos o cerca de los mares. Otro factor de riesgo, se nos presenta con la mecanización, y la evolución técnica, de la agricultura, por el incremento de agroquímicos, insecticidas, herbicidas, etc. incluyendo su uso por medio de fumigación aerea, poco precisa.

En un informe del Banco Mundial podemos observar que Panamá tiene solamente el 5% de la participación de la industria química, relacionados por el valor agregado, en la fabricación de alimentos agrícolas y químicos siendo la agricultura el 52%. Es fácil comprender que una gran industria química conlleva el aumento del Nº de personas que están expuestas a los accidentes con sustancias químicas.

En relación a este punto del 25 al 34% de la fuerza de trabajo de nuestro país se dedica a la agricultura.
Por estos y otros datos podemos clasificar a Panamá como país de actividades agrícolas básicamente. Esperaríamos que los principales problemas de salud asociados con las actividades agrícolas son los accidentes y las lesiones, aunque no debemos desatender los riesgos que implican para la salud personal y ambiental, nuestra incipiente industria química. Para la población en general los riesgos se relacionan con el transporte y el uso de químicos agrícolas como serían:

- La contaminación del agua
- Residuos en productos alimenticios
- Contaminación accidental de los alimentos
- Riesgos personales del individuo que ejerce una función en las labores agrícolas.

En nuestro país estos riesgos, casi se sircunscriben al uso y la aplicación de pesticidas, órganos fosforados e hidrocarburos clorinados.
En la industria química es en donde podemos encontrar los verdaderos accidentes para la salud de la población en general y trabajadores individualmente. Al igual que el resto de América Latina, en nuestro país no están bien definidas las leyes que protegerían a la comunidad de la contaminación y así vemos que se expelen al aire sustancias tóxicas o se vierten en los ríos otras sustancias y se depositan inadecuadamente los desechos industriales, incluso con peligro de contaminación de las aguas subterráneas.

El transporte de tóxico químico peligroso se hace a través de las areas urbanas sin mayores controles. Podemos indicarles algunas de las reglamentaciones existentes en nuestro país, en relación al manejo de estas sustancias químicas. Estas reglamentaciones existen pero como el resto de nuestro paises no se cumplen,completamente. Estos artículos forman parte de la reglamentación de la Oficina de Riesgos Profesionales de la C.S.S. de Panamá y están comprendidos,lo relativo a las sustancias químicas nocivas, desde el artículo 37 hasta el 42.
Llamamos la atención sobre algunas notas de este reglamento por Ejem: el artículo 37 clasifica la sustancias químicas, nocivas en tóxicas, corrosivas, cáusticas e irritantes. El artículo 38 reglamenta la forma en que deben realizarse las operaciones de manipulación, carga, descarga y transporte. El artículo 39 establece los requisitos que deberán cumplir los locales donde se utilicen las sustancias químicas. Después se establece en los siguientes artículos algunas disposiciones individuales relacionadas con las sustancias corrosiva, irritante, tóxica, etc.
Estas reglamentaciones, por su extensión no puedo leerlos en el tiempo que se me ha estipulado, pero revisando estas disposiciones vemos que predominan las medidas preventivas, destinadas a proteger a los trabajadores manipuladores de las sustancias químicas, que son los más expuestos.

3) En los lugares en que se manipulen sustancias químicas nocivas, se tendrán a la disposición inmediata de los trabajadores, medios de protección individual adecuados, para los casos en que se produzcan averías imprevistas.

4) Cuando se detecte un recipiente que contenga sustancias química nociva dañado o con filtraciones, se comunicará inmediatamente al responsable de la manipulación. Este deberá suspender las operaciones y evacuará a los trabajadores hacia un lugar seguro hasta que pase el peligro. De inmediato se adoptarán las medidas siguientes:

4.1) Si la carga desprende vapores o gases nocivos:

4.1.1.) Se pondrá a disposición de los trabajadores encargados de sacar los recipientes deteriorados, un medio de protección respiratorio según lo indicado en el capítulo de equipo de protección individual.

4.1.2.) Estarán rápidamente disponibles para el socorro; un material de salvamento adecuado y un personal adiestrado en su utilización.

4.1.3.) Se deberán ventilar estos lugares, sometiéndolas a un control para asegurarse de que la concentración de los vapores, gases en la atmós-

fera, no sufran las concentraciones peligrosas.

4.2.) Si la carga la constituye una sustancia corrosiva:

4.2.1.) Se dispondrá de medio de protección individual (ver capítulo de equipo de protección individual), para asegurar la debida seguridad de los trabajadores encargados de extraer los recipientes deteriorados.

4.2.2.) Se utilizarán sustancias absorbentes o neutralizadoras apropiadas para recoger los derrames.

5) Queda terminantemente prohibido:

1) Toda manipulación de sustancias químicas nocivas, en recipientes descubiertos.

2) Arrastrar o lanzar desde altura los recipientes que contengan sustancias químicas nocivas.

3) Trasladar cargas que contengan sustancias químicas nocivas, sobre la espalda, hombros o contra el cuerpo independientemente de la forma y tamaño del recipiente o contenedor.

6) Como medida preventiva a posibles accidentes y a fin de lograr una adecuada ventilación, antes de iniciar las operaciones de descarga

de sustencias químicas nocivas, se abrirán las puertas en los vehículos cerrados.

7) En los lugares donde se realicen operaciones de carga y descarga de sustancias químicas nocivas y si en estos existiese deficiencia de la ventilación natural; se instalarán sistemas de inyección y extracción de aire, ya sean móviles o fijos y dispuestos convenientemente, según las indicaciones dadas en los artículos sobre ventilación.

8) Cuando se trasladen cargas contentivas de sustancias químicas nocivas, en estado líquido, en camiones, cisternas, estos se examinarán antes de iniciar el recorrido para asegurarse que no existen escapes o fugas.

9) Todo vehículo automotor que traslade cargas contentivas de sustancias químicas nocivas, deberá llevar exteriormente y en forma legible a ambos lados y en la parte trasera del vehículo, un rótulo con letras no menores de 10 cms. con la palabra "Peligro" e indicando la característica principal de nocividad de la sustancia transportada.

10) Todo envase que proteja exteriormente un envase de vidrio que contenga sustancia química nociva; llevará impreso el contenido y características que señale el contenido del envase primario u original.

11) La transportación de cargas contentivas de sustancias químicas nocivas, en los centros de trabajo y áreas de almacenamientos, se regirán por las medidas que se detallan a continuación:

a) Se utilizarán carretillas u otros medios adecuados que garanticen una total seguridad.

b) Se utilizarán carretillas de gran tamaño no difíciles de manejar.

c) Si la carga es demasiado pesada, se utilizará equipo mecánico adecuado.

ch) Cuando se trate de una carretilla de motor o de horquillas, no deberán hacerse paradas o arranques bruscos. En estos casos el vehículo se llevará a poca velocidad, observándose las debidas precauciones al llegar a los puntos que puedan ofrecer peligro.

d) Las carretillas se cargarán siempre de tal manera, qur la carga quede equilibrada y sin movimiento y no serán sobrepasadas en peso.

e) Los lugares por donde transiten las carretillas, deberán estar siempre bien ilumin dos.

f) Cuando la carga consiste en sustancias con propiedades corrosivas, se le adoptarán a las carretillas u otros medios de transportación, aditamentos revestidos con material amortiguador, del tamaño y forma del contenedor.

Artículo 39.- Los locales donde se utilicen o almacenen sustancias químicas nocivas, deberán cumplir los requisitos mínimos siguientes:

a) Tener fácil drenaje natural para las aguas que eviten inundaciones y con buenas condiciones de ventilación según lo indicado en los artículo sobre este aspecto.

b) Las estructuras, techos, paredes, puertas y ventanas, serán de materiales:

1) Resistentes a la corrosión.
2) Que no faciliten la acumulación de sustancias químicas nocivas y no dificulten las labores de limpieza y mantenimiento.
3) Que no absorban gases, vapores ni humedad.

c) Tendrán la amplitud suficiente para permitir la instalación adecuada de:

1) Maquinarias.
2) Equipos.
3) Aparatos.
4) Utiles.
5) Enseres y otras instalaciones; cargas para

- el almacenamiento y contarán con espacios libres y adecuados que permitan realizar las labores y transitar libremente.

ch) Tendrán aberturas en cantidad suficientes y con la distribución adecuada, con el fin de aprovechar al máximo la ventilación e iluminación natural y para la entrada y salida de personas.

d) Las instalaciones eléctricas colocadas en los locales donde se manipulan y utilicen sustancias químicas nocivas, serán resistentes o estarán debídamente resguardadas contra la acción química de las sustancias empleadas.

e) Las instalaciones eléctricas referidas en el artículo anterior, se revisarán periódicamente, comprobándose en especial el estado del material aislante de las partes conductoras. Los daños detectados serán reparados dentro de la mayor brevedad posible.

f) Toda operación de trasvase de sustancias químicas deberá estar orientada por una persona experimentada, que tendrá la responsabilidad de cumplir con todas las medidas de seguridad, que se requieran según los productos químicos nocivos de que se traten.
Además velará por que en tales operaciones, se utilicen los medios de protección personal requeridos y supervisará dichas operaciones.

g) Toda operación de trasvase de sustencias químicas que realice, se regirá por las disposi-

y otras regulaciones vigentes.

h) Las operaciones de trasvase; se realizarán siempre fuera de los locales destinados al almacenamiento o al uso de sustancias químicas nocivas, para ello se habilitarán una zona descubierta, un cobertizo o un local alejado de las demás edificaciones.
Cuando se destine un local para estas operaciones, deberá reunir los requisitos de seguridad y ventilación consignados en el presente Reglamento.
Estos lugares no podrán ser utilizados para depositar en forma permanente envases con sustancias químicas, ni otros materiales u objetos.

i) En las operaciones de trasvase, se utilizarán aquellos envases vacios que se encuentran en óptimas condiciones de uso y serán del mismo tipo, de aquel en que viene el producto químico de origen u otros constituídos por un material resistente a la sustancia que vaya a ser reenvasada.

j) Los locales destinados al almacenamiento, uso y trasvase de sustancias químicas nocivas; estarán dotados de fuentes de agua a presión para el lavado de los ojos; y de duchas para baños en casos de accidente.

Artículo 40.- Sustancias corrosivas:

1) En los locales de trabajo en que se empleen sustancias corrosivas o de produzcan gases o vapores de tal índole, se protegerán las instalaciones y equipos contra los efectos de las corrosiones.

2) Los bidones, cubas, barriles, garrafas, tanques y, en general, cualquier otro recipiente qu

contenga corrosivos o cáusticos, serán rotulados con indicación de tal peligro y precauciones para su empleo.

3) Los depósitos de sustancias corrosivas tendrán tubos de ventilación permanente y accesos para drenaje en lugar seguro, además de los correspondientes para carga y descarga.

4) Los bidones se colocarán siempre con el tapón hacia arriba, y si el almacenaje es prolongado, se abrirán periódicamente para evitar cualquier presión interna que haga saltar el tapón y verter el contenido de aquéllos.

5) Los recipientes para líquidos peligrosos se destruirán cuando no deban utilizarse más.
Los que hayan de contener repetidamente un mismo líquido serán cuidasomente revisados para comprobar que no sufren pérdidas. Si se intentara usarlos para líquidos diferentes, se limpiarán cada vez con una solución neutralizante apropiada.

6) El trasiego de líquidos corrosivos se efectuará preferentemente por sistemas de gravedad. El transporte se efectuará en recipientes adecuados y su vaciado se utilizará mecánicamente o con carretillas provistas de plataforma con dispositivos de sujeción para los recipientes portátiles.

7) Todos los recipientes con líquidos corrosivos se conservarán cerrados, excepto en el momento

de extraer su contenido o proceder a su limpieza. Nunca se hará su almacenaje por apilamiento.

8) Se evitará el derrame de líquidos corrosivos, y si se produjera, se señalizará y resguardará la zona afectada para evitar el paso de trabajadores sobre ella. El líquido derramado no se absorberá utilizando materia orgánica, sino que se lavará con agua a presión o se neutralizará con greda o cal.

9) La manipulación de líquidos corrosivos o calientes sólo se efectuará por trabajadores previamente dotados del equipo protector individual más adecuado.

Artículo 41.- Sustancias irritantes, tóxicas o infecciosas.

1) En todos los locales de trabajo en que empleen, manipulen o fabriquen sustancias irritantes o tóxicas, se instalará, siempre que sea factible, un dispositivo de alarma destinado a advertir las situaciones de riesgo inminente en los casos en que se desprendan cantidades peligrosas de dichos productos. Los trabajadores serán informados de la obligación de abandonar inmediatamente el local, oída la señal de alarma.

2) Estos locales, para facilitar su cuidadosa y repetida limpieza, reunirán las siguientes con-

diciones:

a) Las paredes, techos y pavimentos serán lisòs e impermeables y estarán desprovistos de juntas o soluciones de continuidad.

b) Los suelos serán acondicionados con pendientes y canalillos de recogida que impidan la acumulación de líquidos vertidos y permitan su fácil salida.

c) No contendrán en su interior ningún objeto que no sea imprescindible para la realización del trabajo, y los existentes serán, en lo posible, de fácil limpieza.

d) Estarán construídos y aislados de tal forma que las sustancias nocivas no penetren en los restantes locales de trabajo.

3) La limpieza de todo local en que se empleen productos irritantes o tóxicos se ajustarán a las siguientes normas mínimas:

a) Será diaria y completa, alcanzando a sus superficies estructurales como a sus bancos, mesas y equipos de trabajo.

b) Se realizará fuera de las horas de trabajo, si es posible.

c) Se efectuará por sistema de aspiración o, en su defecto, en húmedo.

4) Cuando se manipulen sustancias infecciosas, se extremarán las operaciones de limpieza,

efectuándose después de las mismas una desinfección general, por procedimiento adecuado. Siempre que sea factible, la desinfección alcanzará también a los productos y sustancias antes de su manipulación.

5) Toda operación en que se utilicen o desprendan líquidos o gases irritantes o tóxicos será efectuada, a ser posible, en aparatos cerrados o se realizará bajo cubiertas con sistema de aspiración.

6) Los trabajadores expuestos a sustancias tóxicas irritantes o infecciosas estarán provistos de ropas de trabajo y elementos de protección personal adecuados. Con respecto a estos equipos protectores se seguirán las siguientes prescripciones:

   a) Serán de uso obligatorio, dictándose normas concretas y claras sobre forma y tiempo de utilización.

   b) Se quitarán en todo caso antes de las comidas y al abandonar el local en que sea preceptivo su uso.

   c) Se conservarán en buen estado de conservación y se limpiarán y esterilizarán al menos con periodicidad semanal o con mayor frecuencia, si fuera necesario.

   d) Nunca se sacarán de la fábrica, depositán-

dose después de su utilización en el lugar específicamente asignado.

7) Donde exista riesgo derivado de sustancias irritantes, tóxicas o infecciosas estará rigurosamente prohibida la introducción, preparación o consumo de alimentos, bibidas y tabaco.

8) Será obligatorio para los trabajadores expuestos a estos riesgos el lavado de manos, cara y boca antes de tomar alimentos o bebidas o de fumar o salir de los locales de trabajo; para ello dispondrán, dentro de la jornada laboral, de diez minutos para su limpieza personal antes de la comida y tros diez antes de abandonar el trabajo.

9) Los trabajadores serán informados verbalmente y por medio de instrucciones escritas, de los riesgos inherentes a su actividad, medidas a tomar para su propia protección y medios previstos para su defensa.

Artículo 42.- Productos animales o vegetales.

1) En aquellos trabajos en que se utilicen materias de origen animal, tales como huevos, pieles, pelo, lana, etc. o sustancias vegetales peligrosas, será preceptiva, siempre que el proceso industrial lo permita, la desinfección previa de dichas materias antes de su manipulación, por ebullición u otro medio adecuado.

2) Se evitará en todo la acumulación de materias orgánicas en estado de putrefacción o saponificación, a menos que se conserven en recipientes cerrados y se neutralice la producción de olores desagradables.

3) En las Empresas dedicadas a trabajos con productos animales o vegetales, serán de aplicación los preceptos de esta Ordenanza; señalados en el artículo anterior, en cuanto se refiere a:

a) Condiciones de los locales de trabajo para su fácil limpieza.

b) Prohibición de tomar alimentos o bebidas durante el trabajo.

c) Técnica y periodicidad de las operaciones de limpieza y desinfección.

d) Uso obligatorio de ropa de trabajo y elementos de protección individual adecuados.

e) Tiempo libre dentro de la jornada laboral, para proceder al aseo personal antes de las comidas y al abandonar el trabajo.

A CONTEMPORARY APPROACH TO MANAGING HAZARDOUS MATERIALS EMERGENCIES

By The

Honorable Fred J. Villella

Executive Deputy Director

Federal Emergency Management Agency

Presented to the

Symposium on Emergency Chemical Spills

Hosted by the Pan American

Center for Human Ecology

and Health/Pan American

Health Organization

Good Afternoon,

It is a special pleasure for me to be with you representing the Federal Emergency Management Agency's Executive Deputy Director, the Honorable Fred J. Villella. He sends to you his best wishes for a highly successful Symposium on Emergency Chemical Spills. The fact that this important symposium is being held and that all of you are here attests to the increasing significance of planning for hazardous materials incidents. Executive Deputy Director Villella has asked me to extend congratulations to Dr. Finkelman and the others present for realizing how necessary it is to call attention to this important area of emergency management.

Let me explain, very briefly, what the Federal Emergency Management Agency (FEMA) is and what we do.

The Federal Emergency Management Agency is the central point of contact within the Federal Government for a wide range of emergency management activities in both peace and war. We are dedicated to working closely with all members of the emergency management community to achieve a realistic state of preparedness and an increased capacity to respond to all types of emergencies.

Among FEMA's responsibilities are:

- o Ensuring continuity of the government and coordinating the mobilization of resources during national security emergencies.
- o Supporting state and local governments in a wide range of disaster planning, preparedness, mitigation, response, and recovery efforts. Included in this category are hazardous material incidents.

- o Coordinating federal aid for presidentially declared disasters and emergencies.
- o Developing practical application of research to lessen the damaging effects of emergencies and disasters.
- o Determining which materials are strategic and critical and setting goals for the national defense stockpile.
- o Coordinating civil emergency preparedness for nuclear attack, nuclear power plant accidents, and nuclear weapons accidents.
- o Providing training and education to enhance the professional development of federal, state and local emergency managers.
- o Reducing the nation's losses from fire.
- o Administering the national flood insurance program.
- o Developing community awareness programs for weather emergencies and home safety.

The Federal Emergency Management Agency places great emphasis and follow-through on its coordination role--at all levels of government and with private organizations.

In 1982, FEMA developed an Integrated Emergency Management System (IEMS) as a means of administering its training and education programs and its intergovernmental coordination responsibilities. This approach to the management of problems associated with natural and man-made disasters has been in a rapid stage of contemporary development. The State and Local Programs Support Directorate within FEMA is responsible for implementation of the IEMS program at the state and local level. The hazardous materials program is an integral component of the IEMS's concept.

The basic IEMS approach recognizes that there are certain characteristics and requirements which are common across the full spectrum of emergencies -- evacuation, sheltering, communications, direction, control, continuity of government, resource management, law and order and the providing of food and medical supplies. In all the programs conducted by the Federal Emergency Management Agency, the IEMS approach is being instituted to assist state and local officials in building emergency management capabilities. This creates a solid foundation for planning, mitigating, responding to and recovering from emergencies, whether they are related to natural or technological disasters, resource shortages or war-related national security situations.

FEMA's objetives in its hazardous materials program are to improve Federal, State and local, and industry partnerships in the management of hazardous materials incidents; to reduce duplication of effort; to avoid disjointed expenditure of dollars on behalf of health, safety, and protection of the environment. Emphasis is placed on awareness and integrated emergency management.

I cannot over-emphasize the importance of training, especially in the area of hazardous materials incidents. The Federal Emergency Management Agency is the designated federal agency responsible for development and delivery of emergency management training. The individuals who face the dangerous task of responding to hazardous materials incidents must routinely take immediate action and frequently suffer death and injury because they have not been sufficiently trained. Often these response forces are unaware of the hazardous content of the incident

until they are, in fact, hospitalized.

One broad goal of our training program is to raise not only the skill level of the initial responders but also that of the emergency managers, coordinators, directors and executives. The purpose is to make these representatives more knowledgeable, and competent to perform at the state and local level.

As today's technological disasters occur, particularly those we call hazardous materials incidents, there must be equally contemporary training to help the emergency management community prepare, mitigate, respond to and recover from these disasters.

Fundamental to all of the training and education efforts conducted by the Federal Emergency Management Agency's National Emergency Training Center (NETC) is the focus on raising the overall state of emergency preparedness. The primary goal of emergency preparedness is that it must be designed so as to quickly, smoothly, and effectively respond to the interruptions of normal government activities created by an emergency. NETC also serves to disseminate emergency management education through state-of-the-art training at the national level and encourages the replication of similar training at the Regional, State and local level.

Since its opening in 1981, the National Emergency Training Center's growth has been phenomenal. The audience is no longer restricted. In the past, the audience had almost entirely been civil defense people. Today our audience includes: majors, city managers, federal and state officials, police and fire chiefs, public administrators, National Guarel Major Generals, and chief executive officers representing both

the public and the private sector. The number of graduates increased from 1200 in 1981, to a projected 4 080 in 1984. In fact, since 1981, 12 530 students have been trained in the residence programs at NETC and over 300 000 students have been reached through the total program activities. One-third of these totals have received hazardous materials emergency management training. Over the previous 10 years, approximately 100 000 students have been trained.

NETC is located on the 107 acre campus of the former Mt. St. Joseph's College just south of the Pennsylvania border near Gettysburgh. Dormitorics and classrooms are modern, well-equipped, and air conditioned. Five residence halls can accommodate over 450 students in single and double occupancy rooms while classrooms accommodate up to 1 000 students at one time. The facilities include a 240-seat lecture hall, an 800-seat auditorium, an arson fire-scene laboratory, a computer laboratory, a fire tactics simulator, a hazardous materials tactical simulation area and an integrated emergency management exercise facility.

This training facility impacts the three major characteristics of FEMA's philosophy which are:

1) Expand the audience;
2) Emphasize training in emergency management; and
3) Emphasize scenario-based exercise and performance.

This philosophy is manifested in FEMA's new Integrated Emergency Management Course, which brings together State and hands-on, simulation experience in working under stressful emergency situations. Such training strengthens the overall preparedness posture of the emergency

management team and builds more effective community partnerships.

The total emergency management team must always be considered in order to properly and efficiently plan for, mitigate, respond to, or recover from an emergency such as a hazardous materials incident or chemical spill, bridges must be built that lead to productive working partnerships among all levels of government.

However, emergency preparedness for the mobilization of industrial and economic resources for any catastrophic event is not just the job of the Federal Government alone.

For too long, it has been perceived that emergency planning and mobilization are solely Federal responsibilities. Scenarios are written but the cast seldom includes state and local governments who, in fact, must be key players in order to achieve effective and productive preparedness. The United States requires an emergency management program which is not fragmented by lack of coordination or convoluted by territorial imperatives.

Government and the emergency management community must seek solutions to overcome the problem of provincial attitudes -- the traditional parochial and self-interest obstructions which impede progress in the development of an overall Emergency Management Program. In order to overcome these problems it is imperative that responsible policy-makers understand the need to remove these barriers by establishing collaborative and cooperative partnerships to provide for preparedness at all levels for all possible disasters.

Now, I would like to elaborate further on the subject of

hazardous materials training, specifically on the topic of how our agency is planning to meet the hazardous materials training challenges of today and tomorrow.

In 1981, the National Emergency Training Center (NETC) was established to place a higher priority on advancing the development of people who plan for and respond to all types of emergencies. As it is FEMA's mission to reduce the impact of natural and man-made disasters, it is the challenge for and the function of the Center to deliver training programs that will assist local officials in reducing the loss of lives and damage to property.

Four training entities exist on the campus location: The Senior Executive Policy Center, National Fire Academy and the Emergency Management Institute, along with the United States Fire Administration. Newest of these entities is the Senior Executive Policy Center. Here top state and local officials train and discuss major emergency policy issues along side university officials. International experts are included.

The National Fire Academy was authorized by the Fire Prevention and Control Act passed by Congress and signed by President Ford in 1974. The Act recognized the need for both a residential facility to offer long-term courses, and an extensive outreach effort for this nation's fire and rescue service and allied professionals to help them become proficient in planning for and taking appropriate action in responding to emergencies and disasters. Since the National Emergency Training Center was established, the National Fire Academy's Resident Program

has trained more than 10 000 students with over 1 500 attending the Academy's Hazardous Materials Program consisting of the following three courses:

- o Chemistry of Hazardous Materials
- o Hazardous Materials Tactical Considerations
- o Hazardous Substances Specialist Training

This is a small portion of the numbers who should be trained. Our nationwide outreach effort has conducted over 500 course offerings in cooperation with the Fifty State Fire Training programs reaching over 40 000 career and volunteer firefighters. During 1982, the National Fire Academy instituted a Train-the-Trainer program in which field-tested course packages were distributed to state and local authorities. This past spring and this summer, 160 lead trainers from the states, territories, Department of Defense, and the 100 largest fire departments in the country are being trained to deliver three hazardous materials courses:

- o Hazardous Materials Recognition and Identification
- o Hazardous Materials Incident Analysis
- o Hazardous Materials: The Pesticide Challenge

The Academy is also in the process of developing a computer-aided package and videotape series focusing on the chemistry of hazardous materials.

The U.S. Fire Administration (USFA), also located at NETC, is the agency that carries out research, development and technical

assistance activities aimed at reducing the nation's fire problem. Among its activities, the USFA conducts research into the equipment and methods which the nation's fire service must employ to be of maximum effectiveness in combating fire and other incidents such as those involving hazardous materials. The projects include efforts to enhance and improve protective wearing apparel, self-contained breathing apparatus, and related personal safety items that have been under development for some time. In association with the medical profession, a standard protocol to assist medical personnel in evaluating the extent of injuries, particularly those associated with exposure to toxic products of combustion is being developed.

Hazardous materials related research projects include: the development of a long duration oxygen rebreathing unit for use at emergency incidents, an improved short-range radio for better safety and coordination, and the development of a quick entry suit for fire service use. These efforts represent another facet of the Agency's commitment in addressing the problems of hazardous materials incidents in the United States.

The Emergency Management Institute (EMI) offers professionals many advanced courses and seminars in comprehensive emergency management activities. Training is available in residence at the EMI campus, and off-campus through cooperative efforts with the Federal Emergency Management Agency, Regional and State emergency management organizations, and also through home study.

A major feature of the Emergency Management Institute curriculum is the Integrated Emergency Management Course (IEMC). This course enables key members of a community emergency management team to rehearse, exercise, and test its capacities together. The program points out potential weaknesses in existing plans, preparations, and response to emergency management problems including hazardous materials incidents. This is accomplished through lecture learning blocks delivered by experts, planning sessions, and full-blown simulation exercises designed to test the skills, knowledge, awareness, and responsiveness of the participants under pressure. Other course materials on hazardous materials have been prepared for the Emergency Management Institute's program. A radiological emergency preparedness package teaches skills needed to effectively manage an incident involving radioactive materials during the first several hours until either the incident is resolved or state and federal aid arrives. The radiological emergency preparedness materials present technical information and develop specific tactics and strategies for all types of radiation accidents.

In addition, another course -- "Analysis of Hazardous Materials Emergencies" focuses on both the nature and characteristics of hazardous material and the key situational factors at the incident scene.

Although the Emergency Management Institute and the National Fire Academy are involved in hazardous materials training, Mr. Villella appointed a Federal Emergency Management Agency Hazardous Materials Task Force in 1983 to examine the hazardous materials training activities of federal agencies and to submit recommendations designed to improve such training.

This talk force found ten federal agencies, including FEMA, to be involved in some facet of hazardous materials training. It found further that:

1. Few U.S. government agencies have developed comprehensive hazardous materials training programs, or prepared assessments of existing training facilities.
2. No federal coordinator or single point of contact exists within the federal framework of hazardous materials training.
3. There are few facilities in existence for comprehensive hazardous materials training, particularly where responders can be trained in a simulated accident environment.
4. There is no systematic federal approach to hazardous materials training; and
5. Since no federal coordinator exists, the federal government has not provided the means with which to "rationalize" hazardous materials training.

After careful assessment and evaluation, the task force recommended that the Federal Emergency Management Agency chair a National Conference on Hazardous Materials in FY 1985 and negotiate Memoranda of Understanding with the other U.S. agencies, and also recommended the expansion of the Train-the-Trainer course to address the issues of emergency preparedness and response to hazardous materials accidents.

In conjunction with the Integrated Emergency Management System, and

in coordination with other agencies, FEMA has developed several interagency initiatives related to hazardous materials emergencies. They include:

1) The development and publication of Guidance for State and Local Radiological Emergency Response Plans for Transportation.
2) Through an interagency agreement between FEMA, the Department of Energy, the Department of Transportation, and the Nuclear Regulatory Commission, the Federal Emergency Management Agency is supporting a study on the magnitude and characteristics of commercial shipments of radioactive material within the continental U.S. The study is scheduled for completion in FY 1984.
3) The FEMA Region is working closely with the State of New Mexico to develop a prototypical emergency response plan for hazardous materials transportation incidents. This information will be published for the use of other State and local governments in FY 1985.
4) The Agency has also developed and has commenced a 36-hour course utilizing a simulated railroad accident involving numerous types of hazardous materials and radiological mishaps. The participants included representatives from federal agencies, state organizations, local governments, shippers, and carriers, and
5) We have published and distributed a planning guide and checklist to assist in the development of hazardous materials contingency plans.

In addition to these initiatives, the Federal Emergency Management Agency has been and continues to be engaged in other interagency efforts related to hazardous materials. FEMA has established a productive relationship with the Department of Transportation, the Environmental Protection Agency, and other Federal agencies in this broad area. For example, we served as the federal coordinating agency for the response and recovery efforts for the dioxon incident at Times Beach, Missouri. We are also a charter member of the National Response Team (NRT) established by the Clean Water Act and mandated by Presidential Executive Order 12316. FEMA also chairs the Federal Radiological Preparedness Coordinating Committee which has the responsibility for coordinating the development of a Federal Radiological Emergency Response Plan (FRERP) for coordinating all types of radiological emergencies.

A similar coordinating body exists in each of the Ten Federal Regions of the U.S. to assist State and local government officials in the development of their radiological emergency plans, to review their plans, and to observe exercises to evaluate the adequacy of the plans.

It is FEMA's belief that the ability of any government, at any level, to fulfill its primary function as protector of its citizenry is directly dependent upon the ability of various individuals, groups, and jurisdictions to react in a coordinated, predictable, effective and acceptable manner to any emergency irrespective of cause or magnitude. A government cannot expect to effectively manage and respond in a crisis unless there has been adequate planning, preparation, training and exercising during periods of little or no stress.

Plans have been made in the United States for the expansion of the hazardous materials program in order to support our nation's

emergency personnel who are dealing with the increased problem of hazardous materials substances and wastes. There are serious national concerns being voiced in countries throughout the world for the potential impact of hazardous material accidents.

FEMA is considering the sponsorship of an International Hazardous Materials Conference in the near future at the National Emergency Training Center. I would greatly appreciate any suggestions you may have concerning this conference.

As a representative of the United States government, and as a person who values the life and safety of all people, it is my strongest hope that this conference will address those concerns and provide opportunities to develop a framework for long-lasting cooperative relations.

Once again, it is a pleasure to be with you at this very prestigious symposium and I thank you for extending to me an invitation to speak with you today.

INVESTIGACION SECTORIAL A LARGO PLAZO PARA LA POBLACION ACCIDENTALMENTE EXPUESTA A RADIACIONES EMITIDAS POR COBALTO 60, EN LA COLONIA BARRIO ALTO, CIUDAD JUAREZ, CHIHUAHUA, MEXICO

DR. ALFREDO CARBONEY

INVESTIGACION SECTORIAL A LARGO PLAZO PARA LA POBLACION ACCIDENTALMENTE EXPUESTA A RADIACIONES EMITIDAS POR COBALTO 60, EN LA COLONIA BARRIO ALTO, CIUDAD JUAREZ, CHIHUAHUA.

(RESUMEN)

A fines del mes de noviembre de 1983, dos empleados de la bodega de una clínica de Ciudad Juárez, Chih., desmantelaron y sustrajeron la unidad de radioterapia que contenía una bomba de Cobalto 60 (Co^{60}), la cual encerraba aproximadamente 6,000 pellets del isótopo radiactivo mencionado; durante su traslado esa unidad fue fracturada, lo que originó la dispersión de los gránulos de Co^{60}. Lo que permitió que existieran diferentes fuentes de contaminación por radiación gamma tanto en Ciudad Juárez, como en otras ciudades donde se encontraban los pellets fundidos con varilla corrugada.

Consecutivo al conocimiento y notificación del accidente, se conjuntaron las acciones de la investigación para los propósitos de prevención y control de la salud de la población expuesta al riesgo por esa contaminación. Coordinados por la SSA han participado el Instituto Mexicano del Seguro Social, el Instituto de Seguridad Social al Servicio de los Trabajadores del Estado, el Sistema para el Desarrollo Integral de la Familia, los Institutos Nacionales de Salud, como son el Instituto Nacional de Pediatría y el Instituto Nacional de la Nutrición, y la Comisión Nacional de Seguridad Nuclear y Salvaguardias. Se ha contado también con la asesoría del punto focal de la OMS para contingencias ambientales por radioactividad, el Oak Ridge REAC/TS en Oak Ridge, Tennessee, así como con el Center for Diseases Control de Atlanta, Georgia.

Como parte de las reuniones técnicas que han realizado los grupos de trabajo responsables de esta investigación, se ha considerado que la población de Barrio Alto, Ciudad Juárez, Chihuahua, tiene prioridad número uno para investigarse en relación a otras poblaciones expuestas, tanto de Ciudad Juárez como del resto del país; se propuso también la posibilidad de realizar otros estudios como son los de computación simulada y termoluminiscencia, con el fin de precisar los datos de isódosis anteriormente obtenidos.

Los estudios a largo plazo que se tienen programados para conocer la exposición individual y otros indicadores de salud, están enfocados al riesgo genético, reproductivo, hematológico, producción de malformaciones congénitas y cáncer.

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"Emergency Response Guide for Dangerous Goods"

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