

MURINE TYPHUS CONTROL PROGRAMS

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In discussing typhus fever it must be remembered that the problem, as existing in the United States, is rat-borne or murine typhus; however in the Republic of Mexico both types are well known. As this paper deals with typhus control programs in the United States, hereafter when the word typhus is mentioned, it refers to the murine type.

It is well known that one of the major means of transmission of typhus fever from rat to rat and from rat to man, is by means of the rat flea or *Xenopsylla cheopis*. For decades the method employed to break this chain of transmission was to control the rat by trapping, poisoning, and ratproofing buildings. The results were not satisfactory. The number of cases of typhus fever being reported to the State Health Departments in the United States increased steadily, until it reached a peak of 5,353 in 1944. It is needless to repeat that because of poor reporting and often misdiagnosis, this figure probably represents about one fifth of the number of cases which actually occurred.

With the discovery of the effectiveness of DDT as an insecticide, and after exhaustive experiments by Davis in San Antonio in 1944, an attempt to break the chain of transmission by the control of the rat flea, was made. Congress appropriated money and the Epidemiological Division of the Communicable Disease Center in Atlanta selected the counties for typhus control operations. These selections were based on the number of cases of typhus reported from 692 counties in 9 South-eastern States. As funds were too small to attempt control in all counties, those counties which reported 10 or more cases a year for the previous 5 years, plus those counties with ten or more cases reported during 1944 or 1945, were selected. The reason the nine Southeastern States were selected is because these States reported 98.9% of the total number of reported cases in the United States.

The plan was to apply 10% DDT dust either by means of hand shakers or hand operated dust pumps to all rat runs, entrances, harbors, burrows and other places where rats frequent. Epidemiological information was fairly complete relative to the counties to be worked, and where this information indicated the source of infection to be urban, only the cities were dusted. However, in many counties where the source of infection appeared to be rural as well as urban, rat runs and burrows on every premise in the county were dusted.

In order to check the effectiveness of DDT and the efficiency of the dusting crews; evaluation work was carried on by Biological Aides, both before and after dusting. Live rats were trapped, combed and bled.

The expectation, if DDT is successful in controlling typhus, is first a reduction in rat fleas and other ectoparasites, second a drop in typhus infection among the rats and last a decrease in the number of human typhus cases. All ectoparasites from each rat were collected, identified and counted. Results for the first year from over 6,000 rats showed a reduction of over 85% in *Xenopsylla cheopis*, the most common rat flea. All fleas were reduced by 77%. Rat mites and lice were reduced only about 30% to 70% by DDT dusting. Rat blood specimens were centrifuged and the complement fixation test for typhus antibodies was performed on the sera. The test does not reveal whether infection in the rat was recent or old. In other words, a rat may be reported as positive, yet he may have had typhus 4 to 6 months before being trapped. Little control indicated by the complement fixation reactions would therefore be expected until the generation of rats living at the time of dusting had been replaced.

In the first year 29% reduction in typhus in Norway rats was reported. Young rats showed only a slightly greater per cent reduction than did old ones. While some counties were dusted in the fall of 1945 and typhus cases were reduced to 5,180 from 5,353 reported in 1944, the program did not gain full momentum until 1946. During this year, 1946, typhus cases dropped to 3,339. The program was expanded during 1947 and official figures just released show only 1,911 cases reported during that year. These figures are very gratifying when it is considered that the program is only two years old.

While we, in public health, may be satisfied with the progress of the program to date, the public is not. We evaluate our program by the decrease in number of reported cases. The public judges a program by the absence of rats. We have been accused of dusting rats with DDT to make them more comfortable. Therefore, DDT dusting for rodent ectoparasite control is only the first step in a modern program. It must be followed by (2) ratproofing of buildings, (3) eradication of rats from these buildings, (4) education in and practice of good general sanitation, (5) rat poisoning in alleys and vacant lots and (6) general maintenance of the entire program.

Ratproofing and rat eradication in business buildings of cities and towns are very important parts of a permanent program for typhus control. One measure is not effective without the other and both will fail unless they are properly maintained. Ratproofing may be defined as a relatively inexpensive method of construction designed to keep rats from entering business buildings and to limit their travel from establishment to establishment as much as is feasible. It includes the closing or protecting, with ratproof materials, of all exterior actual or potential rat entrances, together with such interior rat stoppage, harborage removal and cleanup as may be deemed necessary to reduce or eliminate rat

breeding and feeding places. Rat eradication means the complete elimination of all rats in a building after it has been ratproofed. Most buildings can be ratproofed and freed of rats. Those that cannot be ratproofed economically should be serviced by continuous rat extermination measures.

General sanitation includes many measures which in themselves will do much to reduce the rat population. Among these are the following: (1) proper storage, collection and disposal of all garbage; (2) proper storage of food and feeds; (3) cleanliness in eating and drinking establishments; (4) harborage elimination in and adjacent to buildings; (5) sanitary methods of excreta disposal; and (6) elimination of ramshackle buildings.

Rat poisoning in alleys and vacant lots is a necessary adjunct to the methods of typhus control already outlined. Poisoning reduces the rat population which has been blocked out of establishments by the ratproofing measures. If not reduced to a minimum, this group would try to gain entrance to the ratproofed structures and would place an unnecessary strain on the ratproofing features. The most effective community poisoning program consists of the complete poisoning of all infested areas at one time. If this cannot be accomplished, each poisoning operation should cover as large a section as possible until all infested areas have received one complete poisoning. Each area should be inspected regularly for reinfestation and poisoning repeated where new rat generations have developed. If good sanitary conditions are obtained and maintained, repeated poisoning of the entire city will not be necessary to control the rat population.

However, regardless of the efficient manner in which the program has been conducted, all the measures will prove temporary and unsatisfactory unless constant maintenance and follow up of every phase of the program is carried out. The rat population in the United States and Mexico did not reach its present status over-night, neither will it be greatly reduced in a like period. It is going to be a long hard battle and we will do well to hold the rat population at its present level.

The Institute of Inter-American Affairs, the Dirección de Cooperación Interamericana de Salubridad Pública and the Secretaría de Salubridad y Asistencia are now assisting in a demonstration and training program in murine typhus and rat control in Mexico. Nuevo Laredo was selected as the first point for institution of study and control measures, and Mexico City is the principal site of training. Although we feel that progress is being made, the program is too recent to report on definite results. It is hoped that at the 1949 meeting of the Border Public Health Association, someone may be able to give a comprehensive report regarding this program.

PROGRAMAS DE CONTROL DEL TIFO MURINO (*Sumario*)

Al discutir el control del tifo, debe recordarse que el problema existente en Estados Unidos es de origen murino. Como este trabajo se refiere a los programas de control del tifo en Estados Unidos, al mencionar la palabra tifo nos referimos al tipo murino. El número de casos comunicados a los departamentos de salubridad de Estados Unidos aumentaron constantemente hasta llegar a 5,353 en 1944, número que probablemente representa sólo una quinta parte de los casos realmente ocurridos. Con el descubrimiento de la eficacia del DDT como insecticida tras extenuantes experimentos por Davis en San Antonio, en 1944, se trató de quebrantar la cadena de transmisión por el control de la pulga de la rata. El Congreso consignó fondos y la División Epidemiológica del Centro de Enfermedades Transmisibles, en Atlanta, seleccionó los condados para realizar las operaciones de control de tifo, basándose en el número de casos de tifo comunicados de 692 condados en nueve estados del sudeste. Como los fondos eran muy reducidos para intentar el control en todos los condados, se seleccionaron los que durante los cinco años anteriores habían comunicado diez o más casos anuales, más los condados que comunicaron diez o más casos durante 1944 o 1945. La razón para escoger los nueve estados del sudeste fué que los mismos comunicaron 98.9% del total de casos comunicados en Estados Unidos.

Se colectaron, identificaron y contaron todos los ectoparásitos de cada rata, con el resultado que el primer año se notó en más de 6,000 ratas una reducción de más de 85% en *Xenopsylla cheopis*. El total de pulgas se redujo en 77%. Mediante la pulverización con DDT los ácaros fueron reducidos sólo en un 30 a 70%. Aunque algunos condados fueron pulverizados con DDT en el otoño de 1945 y los casos de tifo se redujeron de 5,353 comunicados en 1944 a 5,180, el programa no adquirió fuerza hasta 1946, en cuyo año descendieron a 3,339. El programa fué ampliado para 1947 y las cifras oficiales acabadas de dar a la publicidad representan sólo 1,911 casos durante ese año. La pulverización con DDT para control de los ectoparásitos de los roedores representa sólo el primer paso en un programa moderno. Debe ir seguido de (2) edificios a prueba de ratas; (3) erradicación de ratas de esos edificios; (4) educación y práctica en buenas medidas de saneamiento general; (5) envenenamiento de ratas en callejones y solares yermos, y (6) mantenimiento de todo el programa.

El Instituto de Asuntos Interamericanos, la Dirección de Cooperación Interamericana de Salubridad Pública y la Secretaría de Salubridad y Asistencia están cooperando en un programa de demostración y adiestramiento sobre tifo murino y control de ratas en México. Nuevo Laredo fué escogido como el primer punto para la institución de medidas de estudio y control, y la Ciudad de México es el principal lugar de preparación. Aunque creemos que se ha adelantado, el programa es demasiado reciente para poder comunicar resultados positivos. Se espera que en la reunión de la Asociación de Salud Pública de la Frontera, en 1949, alguien pueda dar un informe comprensivo de este programa.