A male friend of the patient, a member of the Wisconsin National Guard, received a smallpox vaccination in a U.S. Army facility in Wisconsin at the end of December 1984. In early January the patient assisted her friend in applying compresses to ease the discomfort of a successful smallpox vaccination.

An investigation conducted to determine whether the patient had transmitted disease to her contacts involved five immediate family members and 45 participants in a girls' gymnastics meet on 21 January in which the patient competed. As of 31 January 1985, none of these 50 individuals showed evidence of vesicular or pustular skin lesions.

Note: Since the eradication of smallpox from the world was certified in 1979, several episodes of transmission of vaccinia virus from recently vaccinated military-related personnel have been reported from Canada, the United Kingdom, and the United States. The largest outbreak of vaccinia virus contact spread, which occurred in December 1980 and January 1981 in Canada, resulted in six cases. Four of these cases were contracted directly from an army recruit and the other two came from a patient of the first generation. In all other reported episodes, the virus spread was limited to the immediate contacts of the vaccinees. None of those infected were found to have been successfully vaccinated against smallpox in their childhood.

At present, because vaccination of civilian populations has been discontinued, the proportion of adolescents and young adults not vaccinated in childhood is steadily increasing. In addition to being more vulnerable than children to the complications associated with vaccinia virus, these age groups are more frequently exposed to military recruits of their own age.

The WHO Committee on Orthopoxvirus Infections, meeting in March 1984, noted that smallpox vaccination of military personnel had been discontinued in eight countries and expressed hope that other countries would elect to do likewise and report to WHO on such decisions. For those countries that have not yet decided to discontinue vaccination of military personnel, the committee recommended that vaccinees be confined to their bases and prevented from contacting unvaccinated persons for a period of two weeks following the vaccination.

Source: World Health Organization, *Weekly Epidemiological Record* 60(33):259-260, 1985.

HEPATITIS IN THE AMERICAS

Introduction

Viral hepatitis is currently a major cause of acute and chronic illness and mortality in all parts of the world. Several causative agents—hepatitis A virus (HAV), hepatitis B virus (HBV), and delta virus—are well characterized, and at least three others currently defined as non-A, non-B agents (two blood- or transfusion-associated forms and one epidemic form) are being studied. Worldwide, hepatitis A is known only to cause acute hepatitis, primarily in children. Both hepatitis B and the post-transfusion-associated non-A, non-B agents, however, have been associated with a chronic carrier state and with long-term consequences that include chronic hepatitis and cirrhosis. In addition, hepatitis B virus infection is strongly associated with primary hepatocellular cancer (PHC). Most PHC cases have HBV detectable in serum and HBV deoxyribonucleic acid (DNA) integrated in liver tissue. Prospective studies in Taiwan and Japan have estimated that the relative risk of HB carriers developing PHC is over 200 times that of other persons.

The development of effective vaccines for hepatitis B, and the incipient development of a vaccine for hepatitis A made possible by tissue cultivation of this virus, are now causing a major rethinking of priorities for worldwide hepatitis

control. In response, the World Health Organization convened a technical advisory group on the development of a program for viral hepatitis. A July 1984 meeting of this group strongly endorsed worldwide programs for control of hepatitis B and noted several critical areas for action: regional production of hepatitis vaccines as a means of reducing vaccine cost; development of regional hepatitis B control programs; operational research on hepatitis epidemiology and on hepatitis B vaccine strategies; and basic research on vital hepatitis. A review of progress showed that several regions already have addressed these priorities by convening task forces on viral hepatitis and that these task forces have begun to implement the recommendations of the technical advisory group.

Background on Hepatitis in the Americas

Although viral hepatitis has been identified as a major public health problem in several countries of the Americas, the true impact of the disease in many countries has not been determined. Among the factors that contribute to this lack of knowledge are: (1) deficient epidemiologic information due to inadequate surveillance and notification systems in some countries; (2) difficulties in establishing correct clinical diagnoses due to inadequate laboratory diagnostic support; and (3) failure to adequately assess the incidence and causes of chronic hepatitis, cirrhosis, and primary liver cancer. Seroepidemiologic data for both hepatitis A and hepatitis B are limited and do not yet accurately define the true extent of these problems. Nevertheless, enough information is available to permit general observations about the epidemiology of hepatitis A and B and some conclusions about that of delta and non-A, non-B (NANB) hepatitis.

Incidence of Acute Hepatitis

Acute viral hepatitis is a disease reportable to the national health authorities throughout most of the Americas. National statistics are available from almost all countries in South America except Brazil. In that country, however, reliable data have been compiled for rural areas by national health authorities. In the past, few countries besides the United States and Canada have differentiated cases according to type (A, B, NANB), since serologic tests are not widely enough available to allow accurate determination of type. It must also be assumed that underreporting of the disease is high in all areas.

Generally, incidence rates of acute viral hepatitis (all types combined) are very high in South America, ranging from 24 cases per 100,000 inhabitants per year in Venezuela to 93 per 100,000 in Uruguay and parts of Brazil (Table 1). The rates are highest in temperate South America, reaching two to four times those in the United States and Canada; in all such areas, most (50 to 85%) of the cases are reported in children under age 15. Areas reporting lower disease rates include less populous countries such as Bolivia, Ecuador, Guyana, and Paraguay; and in these areas it is likely that disease reporting is least successful. Rates reported from Central America also tend to be above those in the United States, with the exception of low rates reported from Mexico and Guatemala; as in South America, most cases occur in children under age 15.

Finally, rates reported in the Caribbean are variable, ranging from very high levels in Cuba and the Dominican Republic to low levels on most smaller Caribbean islands. On the larger islands, the large populations probably allow sustained endemic hepatitis A (as in Central and South America), while among the smaller populations of other Caribbean islands cyclic epidemics may be the common disease pattern. On the smaller islands, most cases occur in adults.

Mortality due to acute viral hepatitis in the Americas generally ranges from 0.2 to 0.9 deaths per 100,000 inhabitants per year, with rates being lower in North America (0.2 to 0.3) than in the remainder of the Region. Extremely high mortality (up to 4 deaths per 100,000 inhabitants per year) has been reported in rural parts of the northern (Amazon Basin) and central-western regions of Brazil.

Serologic testing of cases of acute hepatitis

Table 1. Annual morbidity and mortality caused by acute viral hepatitis in the Americas, 1977-1980, by country.[a]

Country or subregion	Morbidity (cases per 100,000 inhabitants)			Mortality (deaths per 100,000 inhabitants per year)
	Four-year annual average	Range (from lowest to highest annual figures)	Percentage of cases in children under 15 years of age	
Central America and Mexico:				
Costa Rica	44.8	(24.4-73.6)	53.0	0.4
El Salvador	47.9	(44.1-51.6)	...[c]	0.4
Guatemala	15.6	(5.3-22.1)	71.0	0.5
Honduras	42.0	(32.8-50.2)	41.0	0.1
Mexico	6.4	(5.7-7.1)	77.0	0.7
Nicaragua	19.4	(7.7-39.0)	49.0	–[d]
Panama	28.0	(22.4-33.9)	66.1	...
Caribbean:				
Bahamas	8.7	(6.4-10.0)	40.5	–
Barbados	6.0	(4.0-8.0)	10.5	0.6
Cuba	170.5	(144.7-190.9)	65.5	0.3
Dominican Republic	51.3	(48.6-54.0)	...	0.7
Grenada	13.0	(12.2-13.8)	12.0	–
Haiti	1.9	(1.7-2.0)	26.5	...
Jamaica	2.1	(1.7-2.4)	44.0	...
Puerto Rico	16.6	(12.4-20.3)	...	0.2
Trinidad and Tobago	6.8	(3.4-10.5)	...	0.5
South America:				
Argentina	58.6	(44.3-67.3)	...	0.4
Bolivia	12.4	...	...	...
Brazil:				
Central West[b]	69.4	(55.9-92.9)	52.5	3.0
Southeast[b]	22.5	(14.5-30.7)	66.2	0.8
Northeast[b]	29.1	(17.8-43.3)	65.8	0.7
North[b]	93.9	(65.7-131.3)	45.9	4.0
Chile	47.7	(37.4-52.2)	85.3	0.6
Colombia	40.0	(33.9-43.6)	73.0	0.5
Ecuador	9.4	...	...	0.4
Guyana	3.3	(2.4-4.2)	21.5	1.1
Paraguay	9.5	(7.1-11.3)	50.3	0.5
Peru	33.8	(30.0-35.5)	54.3	0.9
Uruguay	93.3	(72.9-116.3)	68.0	0.4
Venezuela	23.7	(23.2-24.1)	...	0.4
North America:				
Canada	9.4	...	34.0	0.2
United States of America	14.5	...	15.0	0.3

[a] *Source:* WHO statistical reports, 1977-1983.
[b] *Source:* DS-CIEPRO, Statistics of Transmissible Diseases, Fundação SESP, Brasília, Brazil.
[c] ... = Data not available.
[d] – = No deaths reported.

for markers of both hepatitis A and B has been reported from large cities in certain countries (Argentina, Brazil, Chile, Costa Rica, and Colombia) and from several sites in the United States (Table 2). In children under age 15, most hepatitis cases are due to hepatitis A (78 to 85%). Both hepatitis B (1 to 16%) and non-A, non-B (5 to 20%) are less frequent causes of acute illness. In adults, frequencies of hepatitis types are more variable and more balanced among the

Table 2. Estimated percentages of acute hepatitis cases in children and adults caused by virus types A, B, and non-A, non-B (NANB) in selected countries of the Americas, 1974-1984.

Country or subregion	Children under 15 years			Adults		
	A	B	NANB	A	B	NANB
Argentina	85	4	5	43	35	17
Brazil:						
Southeast	85	5-10	8	27	49	24
Northeast	....[a]	16	...	...	54	...
North	–	–	–	70[b]	25[b]	5[b]
Chile	78-83	1-2	16-20	71	7	22
Colombia	81	...	19	50	25	25
Costa Rica	...	...	...	...	...	12
Honduras	...	...	...	...	67	...
Mexico	...	13	...	...	...	...
Peru	...	...	...	...	42	...
United States of America	78	5	16	38	35	27

[a]... = Data not available.
[b]Adults and children.

three types, with hepatitis A accounting for 27 to 71% of the acute cases, hepatitis B for 7 to 67%, and non-A, non-B for 5 to 27%.

Hepatitis A

Serologic prevalence studies indicate that hepatitis A is an infection of childhood in the whole Region, with the exception of the United States, Canada, and possibly the smaller Caribbean islands. As Table 3 shows, the prevalence of anti-HAV in adult blood donors is above 95% in most countries. Although data for children are not available from most areas, studies of children from Mexico and Chile show that the infection is acquired at an earlier age in lower socioeconomic classes, with the infection rate reaching 95% during preschool years in the lower classes but not reaching this level until later school years in the middle or upper classes.

Incidence rates of acute hepatitis A disease are not available directly; nevertheless, given that most hepatitis in the Region occurs in children under age 15, and that for the most part such hepatitis is due to HAV, one can postulate that most symptomatic acute viral hepatitis cases are due to HAV. Indeed, using numbers of reported cases and serologic data from studies of acute hepatitis in Chile, it can be estimated that 80% of the hepatitis in that country is due to HAV, so that the rate of hepatitis A disease is roughly 40 cases per 100,000 inhabitants per year, three times the rate in the United States. It is likely that this reasoning would apply to most other countries, and that the incidence of acute hepatitis A disease is much higher in the Americas as a whole than in the United States and Canada.

Table 3. Prevalences of anti-HAV among adult blood donors in selected countries of the Americas (1970-1980).

Country	No. tested	Percentage positive
Argentina	1,005	94.2
Barbados	489	64.2
Brazil	1,023	98.4
Colombia	484	97.3
Costa Rica	444	99.8
Chile	491	98.0
Dominican Republic	468	99.8
Ecuador	483	99.4
Mexico	496	98.4
Peru	492	97.0
Puerto Rico	484	84.3
Suriname	486	81.5
United States of America	...[a]	40.0
Venezuela	497	96.0

Source: N. Nath, S. Mazzur, C. Frang, et al. Prevalencia de los anticuerpos contra el virus de la hepatitis (VAH) en donantes de sangre de 13 países y territorios del hemisferio occidental. *Bol Of Sanit Panam* 90:425-429, 1981.
[a]... = Data not available.

Outbreaks of hepatitis A have been reported from several American countries (Argentina, Brazil, Costa Rica, and Panama). A prospective study in Costa Rica indicates the disease is usually transmitted directly from person to person, with susceptible household contacts of an index infection having the highest rates of secondary infection (70 to 83%). Outbreaks of waterborne disease have been reported, but the importance of food or water in hepatitis A transmission has not been clearly documented.

Hepatitis B

Because of the general lack of hepatitis B serologic testing of acute hepatitis cases, except in the United States and Canada, assessment of the epidemiology of hepatitis B in the Americas relies almost entirely on prevalence studies of certain HBV markers in various population groups, particularly volunteer blood donors. The markers include hepatitis B surface antigen (HBsAg) and, less commonly, antibodies to the hepatitis B surface and core antigens (anti-HBs and anti-HBc, respectively). These data (see Table 4) indicate a pattern of HBV endemicity.

The prevalences of HBsAg in blood donors found by sensitive assays—reversed passive hemagglutination (RPHA), radioimmunoassay (RIA), or enzyme-linked immunosorbent assay (ELISA)—ranges from low (0.3%) to very high (more than 10%) within the Region. In most areas the levels detected are low to moderate (0.5 to 3.0%), but in certain areas they are much higher.

In general, the prevalence of HBsAg in South America increases from south to north, going from 0.5-1.1% in temperate regions (Chile, Argentina, Uruguay, and southern Brazil) to moderate levels (1.4-2.8%) in central and northeastern Brazil and in the cities of the Andean countries north of Chile. Very high prevalences (5-15%) of HBsAg have been found throughout the Amazon region, in other areas in Brazil, and in some regions of Colombia, Peru, and Venezuela.

In Middle America and the Caribbean, HBV prevalences are generally low (especially in Mexico) or moderate (1.0 to 3.0%) except on Hispanola—the prevalences being high in both Haiti and the Dominican Republic. However, recent studies in St. Christopher/Nevis and Trinidad and Tobago suggest high HBV endemicity on some of the small islands of the Caribbean.

The prevalences of HBsAg in the United States and Canada are very low (0.3%), except among specific high-risk groups.

The available data are often limited to studies of blood donors from one or two large cities in each country. Almost no data on HBV prevalence by age, race, urban versus rural dwellers, or socioeconomic level are available for any country outside the United States and Canada. In South America, only Argentina and Brazil have reported survey data from more than a few localities. Nevertheless, these limited data suggest that the disease prevalences within each country may be significantly affected by each of the above-mentioned factors. Data from Brazil suggest higher prevalences among people of low socioeconomic status. Similarly, data from Brazil and Trinidad and Tobago indicate higher disease prevalences among people of black or mixed race as opposed to whites, while studies in Suriname indicate that people of Indonesian origin are at higher risk than the rest of the population. Most indigenous peoples in Brazil, Colombia, Panama, and Venezuela generally show very high HBsAg prevalences, although some indigenous groups in the last three countries appear to have low HBsAg prevalences. In this same vein, very high disease prevalences have been found in the Santa Marta region of Colombia, indigenous areas of Venezuela, the island of Tobago, and the Amazon region of Peru. In addition, the northernmost parts of Chile and Argentina may have higher prevalences than the central and southern regions of the same countries. As far as geographic variations within a given country are concerned, the most marked prevalence variations detected have been found in Brazil.

Those groups that appear to be at increased disease risk in South America tend to be similar to those at high HBV risk in the United States

Table 4. Percentages of adult blood donors with HBV markers and estimated numbers of HBV carriers in the Americas, by country.

Country or subregion	Percentage positive		Estimated no. of HBV carriers (thousands), based on estimated 1978 population
	HBsAg[a]	All B markers	
Central America and Mexico:			
Costa Rica	0.6	20.6	12.7
El Salvador	1.2	...[c]	52.2
Guatemala	2.2 (1.4-3.0)	...	145.6
Honduras	3.0	...	103.2
Mexico	1.0 (0.33-1.6)	16.8	669.4
Nicaragua	1.1	...	26.4
Panama	1.0 (0.7-1.4)	...	18.3
Caribbean:			
Bahamas	1.4	...	3.2
Barbados	1.4	13.1	3.7
Cuba	0.8	...	77.8
Dominican Republic	4.1	82.8	209.9
Grenada	2.1	...	2.0
Haiti	2.7 (1.4-4.0)	61.0	130.4
Jamaica	1.6	...	3.4
Puerto Rico	0.2	11.1	6.7
Trinidad and Tobago	1.4	...	15.8
South America:			
Argentina	1.1 (0.7-2.1)	18.6	290.3
Bolivia	1.6	...	84.6
Brazil:			
South	1.0 (0.2-1.8)	...	187.7
Central West	1.0 (0.7-1.1)	...	75.5
Southeast	2.0 (1.2-2.8)	34.0	1,034.5
Northeast	2.5 (1.2-3.9)	...	890.5
North[b]	8.0 (5.0-13.0)	...	411.2
Chile	0.5 (0.4-0.6)	6.7	54.3
Colombia	2.8 (1.0-4.7)	29.3	333.5
Ecuador	2.0	35.3	156.2
Paraguay	0.9	...	26.0
Peru	1.4 (0.8-3.5)	27.3	235.5
Suriname	2.3	41.0	8.6
Uruguay	0.9	...	2.6
Venezuela	2.0 (1.3-2.8)	18.0	262.4
North America:			
Canada	0.3 (0.1-0.5)	5.0	71.5
United States of America	0.3 (0.1-0.5)	5.0	654.3
Total			6,259.9

[a]Hepatitis B surface antigen.
[b]Excludes the city of Belem.
[c]Data not available.

and Canada. Studies of health care workers (in Argentina and Brazil) suggest risks 1.5 to 2.0 times higher than those experienced by local populations. Hemodialysis patients (in Argentina, Brazil, and Colombia), homosexuals (in Brazil and Chile), and mentally retarded children (in Brazil) all appear to be at very high disease risk. In addition, data on prostitutes (in Chile) and diabetics (in Brazil) indicate that these groups may be at higher risk than the general population.

Few studies of HBV transmission have been

completed in Central and South America. Presumably, transmission occurs by the same routes described in other parts of the world—by percutaneous or permucosal exposure to infected blood or other body secretions. In adults, the predominant routes of transmission may be sexual contact (heterosexual or homosexual) and contact with contaminated hypodermic needles (either those used for illicit drugs or ones that for other reasons have been inadequately sterilized). Outbreaks of hepatitis B due to contaminated immune globulin have been reported from Brazil. In areas of high endemicity where the disease occurs among children, transmission may also occur perinatally, via contamination of open skin wounds, perhaps via contaminated needles, or even possibly via insect bites. The importance of these transmission routes, particularly those involved in perinatal transmission, needs to be assessed in such areas.

The consequences of hepatitis B infection—acute hepatitis (chronic active hepatitis and cirrhosis) and primary hepatocellular carcinoma (PHC)—have been assessed by measuring the proportion of cases of each disease that is due to hepatitis B. Studies from large cities in several countries have shown HBV infection to account for only 1 to 16% of all acute viral hepatitis cases in children; nevertheless, in adults HBV infection accounts for a significant proportion (25 to 67%) of the disease in all areas studied except Chile (Table 2). Other studies have shown HBV infection in 15 to 63% of the subjects with chronic active hepatitis and cirrhosis, and in 12 to 70% of those with PHC (Table 5). Reported rates of death due to cirrhosis vary widely—from rates similar to those in the United States to rates three or four times higher (in Chile and Colombia). However, these variations in cirrhosis mortality do not appear to correlate with HBsAg prevalences in the Americas. Population-based studies of PHC incidence are available from only seven areas, all with low to moderate HBV endemicity; they show rates that are similar to those of the United States and Europe, and much lower than those of Southeast Asia and sub-Saharan Africa. No population-based data are currently available on cirrhosis and PHC rates in areas with high HBV prevalences.

Delta Infection and Fulminant Hepatitis

An unusual type of fulminant hepatitis (severe hepatitis resulting in encephalopathy or other signs of hepatic insufficiency) has been documented in three localities of the Americas. In two areas—the Santa Marta region of Colombia and the Amazon Basin—severe hepatitis has been described for over 40 years, and distinct

Table 5. Prevalences of HBV among subjects with chronic acute hepatitis and primary hepatocellular carcinoma in selected countries.

Country or subregion	Chronic hepatitis patients		Primary hepatocellular carcinoma patients	
	No. tested	Percentage positive for HBV	No. tested	Percentage positive for HBV
Argentina	276	63	16	12.5
Brazil:				
Southeast	85	38	246	26-41
Northeast	...[a]	...	...	53
North	89	55	...	...
Chile	...	27	48	70
Guatemala	74	15	...	...
Peru	63	32	12	50
United States of America	...	25-30	...	15-25

[a]... = Data not available.

disease entities exist that are known, respectively, as Santa Marta and Labrea hepatitis. Interestingly, the mortality due to acute viral hepatitis in the Amazon Basin is the highest in the Region. In addition, a severe hepatitis epidemic occurred from 1979 to 1981 among the Yucpa Indians in western Venezuela. Recent studies have documented that all three of these areas are ones with high HBV endemicity, where 5 to 15% of the population consists of HBsAg carriers and where HBV infection occurs during childhood. Studies of the Venezuela outbreak have shown it to be caused by delta infection of hepatitis B carriers. Other studies have shown delta virus infection to be highly endemic in both the Santa Marta region and the Amazon Basin, and it is currently suspected that delta virus is partly or fully responsible for Santa Marta and Labrea hepatitis.

The endemicity of delta infection varies widely throughout the Region. In areas with low HBV endemicity, the prevalence of delta infection is probably modest. Studies of HBV carriers in Chile and the United States have shown 5% to be positive for the delta virus; in Rio de Janeiro only one delta-positive person was found among 200 HBV carriers; and in Argentina, only about 15% of the tested subjects with HBsAg-positive chronic acute hepatitis have shown delta positivity.

In contrast, studies in regions with high HBV endemicity show higher prevalences of delta infection. Studies in the Amazon Basin have detected delta antibody in at least 15 localities, including Manaus. In general, 20 to 30% of the HBV carriers and subjects with acute hepatitis were found to be delta positive, as were 85 to 90% of the subjects with chronic acute hepatitis and cirrhosis, and 30 to 50% of those with fulminant hepatitis B in this region. Studies in Venezuela indicate that delta virus continues to spread among Yucpa Indians who are HBV carriers, and that 5 to 10% of the susceptible HBV carriers become infected yearly. Delta virus infection is also present in the Santa Marta region of Colombia, and is found at the highest frequency in villages with fulminant Santa Marta hepatitis.

Non-A, Non-B Hepatitis

Non-A, non-B hepatitis has been identified in several studies of acute hepatitis cases. In the Americas, it appears to account for 5 to 20% of the pediatric hepatitis cases and 20 to 30% of the adult cases in most localities studied (Table 2). In most studies, NANB is associated with prior transfusions or needle exposures; however, evidence from Costa Rica and Argentina suggests that person-to-person or waterborne transmission may occur. Nevertheless, hepatitis outbreaks due to non-A, non-B agents with waterborne or person-to-person transmission have not yet been documented in this hemisphere. Thus, at present it may be concluded that bloodborne non-A, non-B agents account for significant hepatitis morbidity among adults in the Americas; but while infection with the fecal-oral non-A, non-B agent may occur, there is no clear documentation of such infection at this time.

Source: O. H. Fay, S. C Hadler, J. E. Maynard, and F. Pinheiro, Hepatitis in the Americas, *Epidemiological Bulletin (PAHO)* 6(5), 1985.