Hepatitis A and B in the Family Unit

Nonparenteral Transmission by Asymptomatic Children

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• **Investigation of an outbreak of hepatitis A among members of an adoption organization implicated recently arrived Vietnamese orphans as the source of infection. A serologic study disclosed a 27% prevalence of hepatitis B surface antigen among Vietnamese orphans and a 23.1% (6 of 26) prevalence of hepatitis B antibody among American children of adopting families. Five of the six antibody-positive American children were in families with HB_sAg-positive orphans. Thus, healthy orphans from high hepatitis incidence areas may transmit hepatitis B, as well as hepatitis A, in the family unit.**

(*JAMA* 235:2829-2831, 1976)

OUTBREAKS in families are among the most common manifestations of hepatitis A.[1] Such outbreaks are often traced to a child with atypical or subclinical infection, who has transmitted the infection nonparenterally to other family members. Nonparenteral hepatitis B transmission in similar circumstances has not been conclusively demonstrated, but the expanding literature on hepatitis B suggests this possibility. Our investigation of an outbreak of acute hepatitis among members of an adoption organization disclosed evidence of nonparenteral transmission of both hepatitis A and B from adopted Vietnamese children to adopting family members. A group of recently adopted Vietnamese children were epidemiologically implicated as sources of hepatitis A. Other Vietnamese children, many of whom had positive reactions for hepatitis B surface antigen (HB_sAg), were linked to a high prevalence of hepatitis B antibody (anti-HB_s) positivity among American children in adopting families.

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Background

The adoption organization was founded by Colorado mothers interested in helping American families adopt Vietnamese orphans. At the time of the outbreak, the Colorado chapter consisted of 37 middle- and upper-middle socioeconomic-status families living in the Denver-Boulder metropolitan area, among whom fund-raising projects and social intermingling was common.

Vietnamese children were gathered for adoption from orphanages in outlying hamlets of South Vietnam and transported to a central Saigon orphanage, where they resided at least one month before departing for the United States. They were then flown from Saigon to Denver, the main stopover en route to their final destinations.

METHODS

The organization's president provided a complete list of names, addresses, and telephone numbers of all organization-affiliated families and a chronology of adoptions. A questionnaire was completed, usually by telephone, by each hepatitis patient or a parent and by an adult member of all organization families who could be reached. Each family was queried about additional hepatitis cases, associations with known hepatitis patients, participation in business or social functions with other members of the organization, and the amount and intimacy of contact with adopted Vietnamese children. The chronology of adoptions was confirmed with each family, and special emphasis was placed on contact with children arriving for adoption during the two months before the outbreak. Contact with these children was defined as intensive (adoption of a child or baby-sitting in the home more than 24 hours), casual (short-term baby-sitting, briefly coddling a child, and other limited contact), or no contact.

Blood specimens for HB_sAg and anti-HB_s testing were requested from all members of families with adopted Vietnamese children and from all Vietnamese adoptees. Both the electroimmunodiffusion[2] and the solid-phase radioimmunoassay technique were used for the HB_sAg determinations. Anti-HB_s was determined by the passive hemagglutination technique employing HB_sAg-coated erythrocytes.

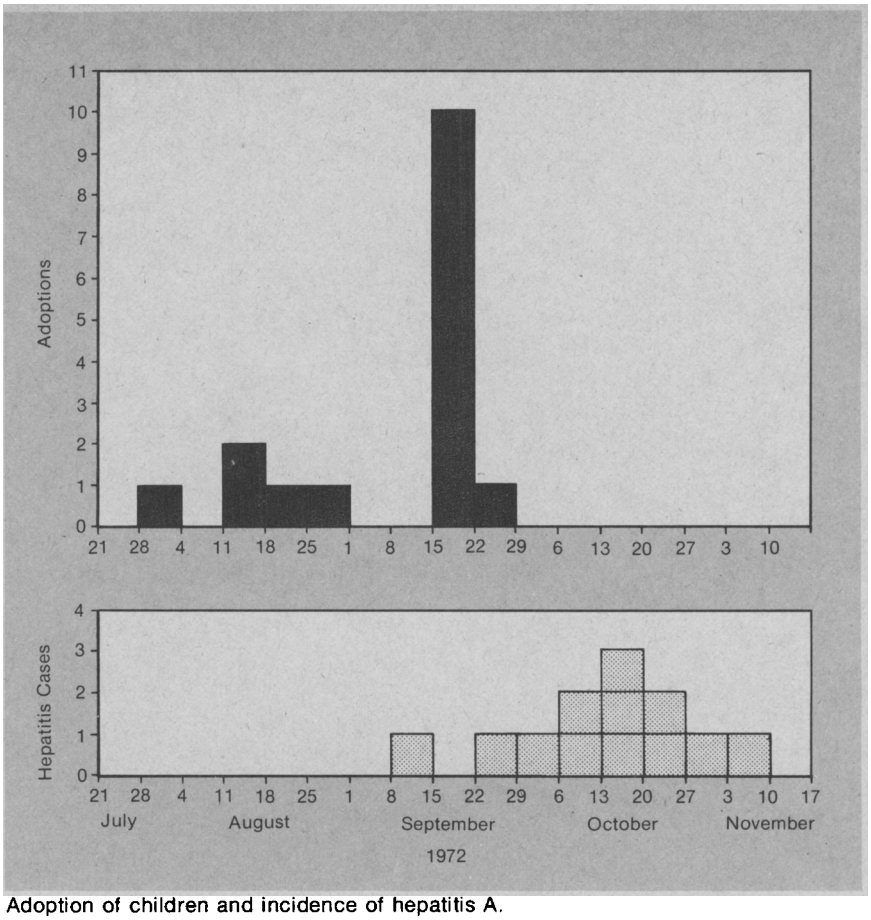
RESULTS

Hepatitis A Investigation.—Thirty-two (86.5%) of the organization's families in the Denver-Boulder area were studied. Twelve cases of hepatitis, none in a Vietnamese, had been

found in six families between Sept 13 and Nov 5, 1972 (Figure). All patients were reported by their physicians to have substantial transaminase level elevations. Five of the patients had serum tests for HB_sAg and anti-HB_s during their illnesses, and another five were tested during convalescence. All samples were negative for antigen and antibody.

The September-November hepatitis cases differed considerably from those in the previous hepatitis experience of organization families, and their incidence did not correlate with any increase in statewide or Denver-Boulder hepatitis. Only three of the 12 hepatitis patients had contact with another hepatitis patient prior to illness onset. No patient had a history of transfusion or parenteral inoculations during the six months before illness onset; none had ingested nondisinfected water or raw shellfish within the previous two months.

Members of the Denver-Boulder organization had adopted 30 children by November 1972. The highest rate of adoptions occurred in August and September, approximately one month before the peak of the hepatitis epidemic (Figure). Hepatitis was strongly related to contact with one or more of the August-September group of adoptees, even though none of them was clinically ill with hepatitis. Forty family members had intensive contact with these children; 10 of the 12 cases occurred among these 40 (Table 1). Eighty-five organization members had either intensive or casual contact; all 12 cases occurred among these 85, while none occurred among 74 family members without contact ($P < .01$). The maximum incubation periods for the 12 patients, from first contact with the Vietnamese children until disease onset, were 18 to 49 days, with a mean of 33.2 days.



Adoption of children and incidence of hepatitis A.

Table 1.—Hepatitis A Among Families Having Contact With Vietnamese Children

Type of Contact	No. of Family Members	Hepatitis Cases	Attack Rate per 100 ($P < .01$)
Intensive (child adopted or cared for in home >24 hr)	40	10	25.0
Casual	119	2	1.7
Total	**159**	**12**	**7.6**

Serological Studies.—During and after the investigation of the outbreak, 33 Vietnamese adoptees and 59 Americans (33 adults and 26 children) in 26 adopting families were tested for HB_sAg and anti-HB_s (Table 2). Nine of 33 Vietnamese (27.3%) were positive for HB_sAg and ten (30.3%) for anti-HB_s. The median age of Vietnamese children with HB_sAg and anti-HB_s was 2 and 3 years, respectively. None of the Americans was positive for HB_sAg. Two of 33 adults were positive for anti-HB_s, and six of 26 American children (23.1%) were positive for anti-HB_s (age range, 4 to 16 years). A summary of all positive test results is shown in Table 3.

The eight Americans with positive reactions for anti-HB_s represented six families, all of whom had adopted a Vietnamese child. Five of the six antibody-positive American children had an HB_sAg-Vietnamese child in their families at the time of serologic testing (Table 3). Unlike the more recently adopted group of children associated with the hepatitis A cases, the Vietnamese children associated with the antibody-positive Americans had been adopted at least five months before serologic testing.

Hepatitis A occurred in two families in which anti-HB_s was found among Americans. Both families not only had intensive contact with the recently adopted group of children but also had adopted at least one HB_sAg-positive child more than one year earlier.

With the exception of one adult who had a history of foreign travel, no factor other than adoption of a Vietnamese child could be elicited to explain the anti-HB_s positivity rate.

COMMENT

This investigation of an outbreak of 12 hepatitis A cases among families in an organization for adopting Vietnamese children shows a strong epidemiologic association between

Table 2.—Results* of Serologic Testing for Hepatitis B Antigen and Antibody

Family Members	No.	Tested No.	Tested %	HB_sAg, Positive No.	HB_sAg, Positive %	Anti-HB_s, Positive No.	Anti-HB_s, Positive %
Vietnamese Adoptees	40	33	83	9	27.3	10	30.3
Americans	139	59	43	0		8	14.0
Adults	70	33	47	0		2	6.0
Children	69	26	38	0		6	23.0
Total	179	92	51	9	10.0	18	20.0

*The serologic study included families who had joined the organization after completion of the hepatitis A investigation.

Table 3.—Positive HB_sAg and Anti-HB_s Results

Family	Birth*	Age (yr)/ Sex	HB_sAg	Anti-HB_s	Titer
1	V	7/F	+	−	
	A	9/F	−	+	1:1,024
	V	8/F	−	+	1:256
	V	3/F	+	+	1:128
2	V	6/F	−	+	1:8,192
	A	13/F	−	+	1:1,024
	A	16/M	−	+	1:512
	A	15/M	−	+	1:4
3	V	4/F	+	+	1:32
	A	5/M	−	+	1:512
4	V	4/F	+	−	
	A	37/F	−	+	1:2,048
5	V	2/M	+	−	
	V	3/M	−	+	1:128
6	V	2/M	+	−	...
7	V	3/F	−	+	1:4
8	V	4/12/M	−	+	1:8
9	A	34/M	−	+	1:128
10	V	2/M	+	−	...
11	V	4/12/F	−	+	1:8
12	V	4/M	−	+	1:1,024
13	A	4/M	−	+	1:8
14	V	3/12/M	+	−	...
15	V	2/F	+	+	1:4

*V indicates Vietnamese (9, HB_sAg positive; 10, anti-HB_s, positive); A, American (8, anti-HB_s, positive).

the cases and a group of recently adopted children. All 12 cases occurred among families who had contact with Vietnamese children arriving in the United States within a six-week period in Fall 1972. Hepatitis A was probably introduced into adopting families by the asymptomatic children, in conformity with a well-recognized pattern of transmission.

The concurrent serologic survey for HB_sAg and anti-HB_s disclosed a high prevalence of both antigen and antibody, 27.3% and 30.3%, respectively, among adopted Vietnamese children. None of the Americans was positive for HB_sAg, but 8 of 59 were positive for anti-HB_s, including 6 (23.1%) of 26 children tested. This prevalence of anti-HB_s among middle- and upper-middle-class American children is significantly different ($P < .05$) from the prevalence data of Cherubin et al,[3] who detected anti-HB_s in only 3 (4.1%) of 73 children, 0 through 19 years of age, in a middle class-Staten Island population[3]; it approximates levels seen in institutions for the mentally retarded, especially among children with Down syndrome.[4] The antibody-positive Americans were all members of families that had adopted Vietnamese children. Five of the six antibody-positive American children were in homes in which the Vietnamese child was HB_sAg-positive at the time of serologic testing.

Nonparenteral transmission of hepatitis B in normal family units has been suggested by Lander et al[5] and is predictable from epidemiologic evidence in the literature. Nevertheless, nonparenteral transmission from infants and children to family members is rare in the United States, perhaps because HB_sAg-positive children are uncommon. The only such family outbreak reported to date occurred after an 8-year-old child with Down syndrome, later found to be HB_sAg-positive, returned home from an institution.[6]

The full impact of an antigen-positive child in a household cannot yet be evaluated. Young siblings could be at particular risk of becoming chronic HB_sAg carriers, since age at first exposure to hepatitis B appears to be a major determinant of antigen persistence.[4,7] Newborn infants, at very high risk of becoming HB_sAg carriers when born to mothers with antigen-positive hepatitis,[8,9] may also be susceptible to infection from their older siblings. Since this investigation was completed, HB_sAg-positive hepatitis has developed in the mother of a 7-year-old adopted Vietnamese child. The Vietnamese child, known to be an antigen carrier from previous testing, was adopted approximately 11 months before onset of the patient's illness. The patient denies contact with other sources of hepatitis or with other Vietnamese children.

Whatever the true risk to families may be, we believe that the possibility of nonparenteral introduction of hepatitis B must be recognized when children from high-prevalence areas are adopted and should be made known to families interested in adopting children from these areas.

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