

Prevalence of antibody to hepatitis A virus in a Canadian Inuit community

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To determine the prevalence of hepatitis A in a Canadian Inuit population, serum from 85% of the 850 inhabitants of Baker Lake, Northwest Territories, was tested by radioimmunoassay for antibody to the hepatitis A virus (anti-HAV). The overall prevalence of anti-HAV in the community was 71%. Exposure to the virus occurred early in life, such that by the age of 6 years 53% of the children had anti-HAV in their serum. The rate approached 100% by the age of 50 years. These findings document the ubiquitous nature of the hepatitis A virus in this northern Inuit settlement and suggest that immunoprophylaxis be considered for individuals taking short-term employment in such places.

Dans le but de déterminer la prévalence de l'hépatite A au sein d'une population inuite canadienne on a mesuré par radio-immunodosage les anticorps contre le virus de l'hépatite A (anti-VHA) dans les sérums de 85% des 850 habitants de Baker Lake dans les Territoires du Nord-Ouest. La prévalence globale dans cette communauté des anticorps anti-VHA était de 71%. L'exposition au virus survient dans le bas âge, de sorte que dès l'âge de 6 ans 53% des enfants ont des anticorps anti-VHA dans leur sérum. Rendu à l'âge de 50 ans ce taux approche 100%. Ces constatations montrent l'omniprésence du virus de l'hépatite A dans ce village inuit et indiquent qu'il y a lieu de songer à l'immunoprophylaxie pour les individus qui prennent un emploi de courte durée dans ces lieux.

The recent development of sensitive and reliable serologic tests for antibody to the hepatitis A virus (anti-HAV)^{1,2} has enabled epidemiologists to study the prevalence of this antibody and hepatitis A throughout the world.³⁻⁷ Studies employing these techniques have confirmed that the virus is widespread and infectious, and

they have demonstrated that the prevalence tends to be highest in economically deprived populations.

There is little information on the prevalence of anti-HAV in the Inuit population of northern Canada, as studies in Canada have been mostly on selected subpopulations in the industrialized south.^{8,9}

In the past 50 years living conditions have improved considerably in the Canadian Arctic. Nevertheless, overcrowding, poor sanitation and a low standard of personal hygiene remain some of the area's major public health problems. To determine the prevalence of hepatitis A in this region, we tested serum from 85% of the population of a growing Inuit settlement for anti-HAV.

Materials and methods

Survey area and population

Baker Lake is a predominately native community in the Northwest Territories, about 300 km inland from the northwestern shore of Hudson Bay. Of the approximately 850 residents, 90% are Inuit. The others are nearly all Caucasians, who, for the most part, rarely remain more than 2 years in the community.

The people live in detached and well spaced bungalows that run back from the shore of Baker Lake, homes that were without plumbing and sewage disposal systems until the early 1970s. Now water from the lake is chlorinated and delivered by truck into holding tanks in each home twice weekly. In most homes sewage is kept in "honey buckets" and placed outdoors in plastic bags for collection. It is dumped into a refuse area outside the town. The overall sanitary conditions both in and around the homes are poor.

The settlement's own school system provides classes from kindergarten to senior high school, but there is no day school or day care centre for children under the age of 5 years. Medical care is provided daily by government-employed nurse practitioners. Physicians visit monthly, flying up from the regional hospital in Churchill, Man., 750 km away.

Only 15% of the Baker Lake population were unwilling to participate in our study or were absent. Permission for the study was obtained from all adult participants, the local hamlet council and the appropriate federal government agencies. More than half of the study population was less than 20 years old.

Serum was obtained during September 1980 for anti-HAV testing from the 708 participants, 660 Inuit and 48 Caucasians. Of those whose serum was positive

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The results of this study were presented in part to the International Symposium on Viral Hepatitis, New York, Mar. 30 to Apr. 2, 1981, and the 5th International Symposium on Circumpolar Health, Copenhagen, Aug. 10 to 13, 1982.

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for anti-HAV, 90 (20 in each of the age groups 0 to 9 and 10 to 19 years and 10 in each of the remaining 10-year age groups) were randomly selected for further testing for anti-HAV of the IgM class.

Laboratory and statistical methods

Anti-HAV and anti-HAV IgM were detected by solid-phase radioimmunoassay with the commercially available reagents "Havab" and "Havab-M" (Abbott Laboratories, North Chicago, Illinois). The chi-square test was used for all statistical calculations.

Results

Of the 660 Inuit tested, 494 (75%) had anti-HAV in their serum, whereas only 8 of the 48 Caucasians (17%) did, for an overall prevalence of 71%. There was no significant difference in prevalence of anti-HAV between the sexes, but the rate increased strikingly with age (Fig. 1). Of the seven infants less than a year old, three, all less than 6 months of age, had anti-HAV but not anti-HAV IgM in their serum. Between the ages of 1 and 4 years the prevalence of anti-HAV was low. Then began a steep rise in the prevalence, such that by age 7 years over 70% of children had serologic evidence of hepatitis A in the past. Until the age of 40 years the rate remained at approximately 75%, but almost 100% of the older people had serologic evidence of past infection.

The small number of Caucasians in the community, none of whom were over 40 years of age, precluded a detailed assessment of anti-HAV prevalence rates among them. One of the 16 (6%) under the age of 20 years and 7 of the 32 (22%) 20 years or older had anti-HAV in their serum.

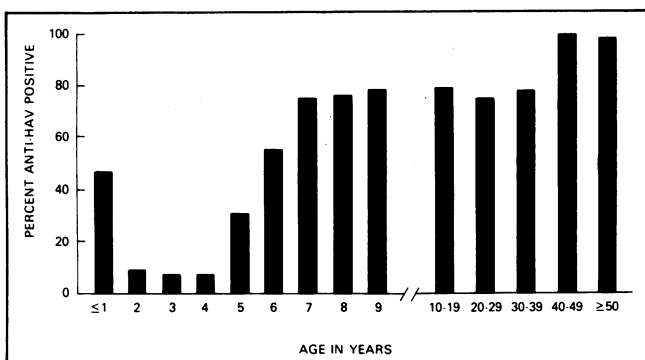


FIG. 1—Age-specific prevalence rates for antibody to hepatitis A virus (anti-HAV) in 708 inhabitants of Baker Lake.

No. of occupants per house	No. of houses	No. with anti-HAV/no. tested (and %)	
		All occupants	Children under 10 years
1	23	20/23 (87)	—
2-3	44	71/111 (64)	7/22 (32)
4-5	50	156/223 (70)	25/65 (39)
6-7	28	139/183 (76)	23/47 (49)
8-10	11	82/95 (86)	23/38 (61)

None of the 90 anti-HAV-positive serum samples that were tested for anti-HAV IgM were reactive.

There was a strong association ($P < 0.005$) between the prevalence of anti-HAV and the number of individuals per house (Table I). In uncrowded houses (those with two or three occupants) only 64% of the inhabitants had anti-HAV in their serum, whereas in houses with eight or more occupants 86% did. The highest rate was found in houses with only one occupant (87%), but this apparent anomaly is likely related to the more advanced age of these individuals. A similar but not significant correlation between household size and anti-HAV prevalence was seen for the children of the community ($0.1 < P > 0.05$).

Discussion

The results of this study establish the high prevalence of exposure to hepatitis A virus in this Canadian Inuit settlement. Indeed, the prevalence here is no less than that reported from developing nations where hepatitis A is known to be endemic (Fig. 2).^{3,6,10} There are several explanations for the high rate of exposure seen in Baker Lake.

Clearly associated with the spread of hepatitis A are cramped living conditions and close personal contact,¹¹⁻¹³ conditions prominent in this community. Although 25% of the houses had six or more inhabitants at the time of

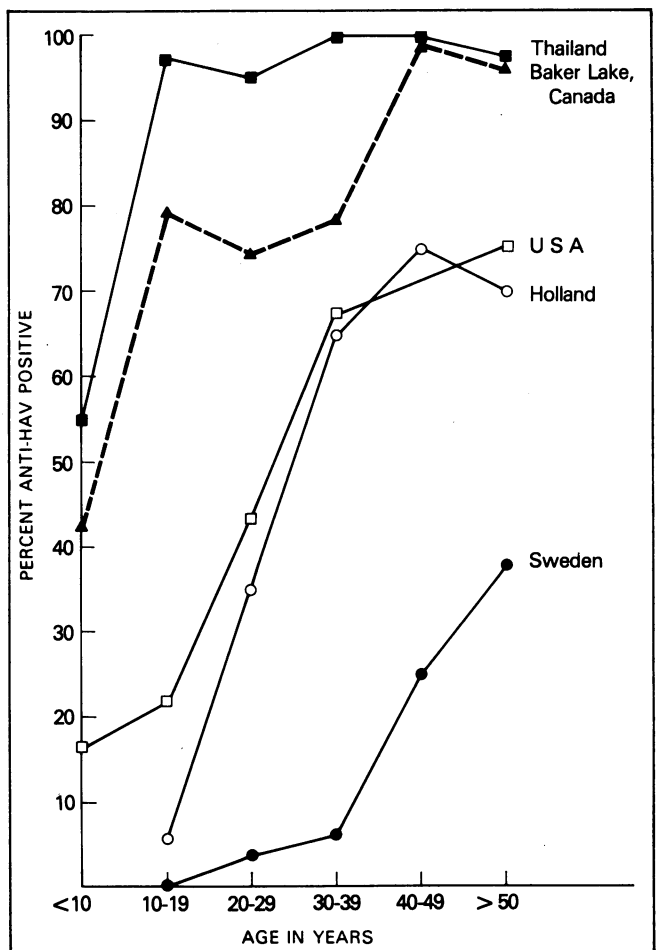


FIG. 2—Prevalence of anti-HAV in five populations.^{3,5}

our study and 7% had eight or more, sleeping quarters in the one- to three-room houses were small, and more than one bed per room was rare. There was little opportunity to isolate sick family members. The crowding was perhaps worse when families travelled "out on the land" during hunting expeditions throughout the year.

The presence of anti-HAV in three infants less than 6 months old, together with the negative results for anti-HAV IgM, suggest that there is some transplacental transfer of maternal IgG antibody to the hepatitis A virus.

Infection with hepatitis A virus by the water-borne route is well documented.¹⁴ This mode of transmission may be important as the spring runoff from the outlying sewage disposal site enters the lake upstream of the community's water pumping station. Although it is intended that drinking water be chlorinated before distribution, a treatment that should inactivate the virus,¹⁵ strict adherence to the procedure is unusual; frequently the water is pumped into homes untreated. Boiling the water, which would also be effective,¹⁵ is not common in this culture. Drinking water is instead brought to lukewarm temperatures for much shorter periods than are necessary for viral inactivation (e.g., 1 hour at 60°C).¹⁶

Also likely to be contributing to the high anti-HAV prevalence is the settlement's poorly developed sewage disposal system. One fourth of the community have recently had sewage holding tanks installed in their homes, but the majority are still bagging sewage and leaving it outdoors for relatively infrequent and erratic sewage pickup. Dogs and cold weather frequently cause tears in these bags, spilling sewage within the residential area. The practice of storing food obtained during hunting expeditions on the same grounds as the ruptured sewage bags only increases the likelihood of contamination.

Although any of these factors could be responsible for the high prevalence of anti-HAV seen in Baker Lake, an alternative explanation would be that an epidemic of hepatitis A passed through the community 5 to 10 years earlier. Such an epidemic was reported in another Eskimo population (the inhabitants of Greenland) by Skinhøj and colleagues⁷ in 1977.

The relatively low prevalence of anti-HAV in the young children of the community, together with the lack of anti-HAV IgM in the 90 randomly selected serum samples imply an absence of recent infection, thus supporting the possibility of an epidemic in the past. However, we could find no other indication of such an event. Nursing personnel and adults of the community when interviewed denied the occurrence of an epidemic compatible with hepatitis A within the past decade. Further, our review of nursing station records identified only three cases of acute viral hepatitis in the same period, and one of these was almost certainly type B hepatitis.

The problems of communication and living conditions combine with the retention of some deep-rooted Inuit traditions to hamper public health efforts that would control the spread of diseases such as hepatitis. Even so, the nurses are instructing the population, through

interpreters when necessary, in matters of personal hygiene, food and water preparation, and general health care.

Until significant improvements in public health measures are made and the prevalence of hepatitis A decreases, individuals travelling or working in the North risk infection. For such people immunoprophylaxis with immune serum globulin should be recommended if their serum is found to be anti-HAV-negative.^{17,18}

We thank Drs. E. Anthony Jones and Jack A. Hildes for assistance in the preparation of this manuscript.

This study was supported by the Northwest Territories region, medical services branch, Department of National Health and Welfare.

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