

Environmental hepatitis A detection and awareness on a Native American reservation

Editor – Inequalities in health between and within populations are a major public concern (1). Hepatitis A incidence among Native Americans is the highest of any subpopulation in the USA, similar to that in developing countries (2). Outbreaks on the Hoopa Valley Reservation, California, reinforce the cyclical trend of community infection. During the last outbreak in 1993-95, over 10% of the community were treated for exposure to hepatitis (D. Marshall, personal communication). Several environmental factors exacerbate the risk of hepatitis A infection, including dumping of human waste near swimming and camping areas, high winter groundwater and old septic tanks, and an itinerant community in the area.

To evaluate the environmental risk of infection by hepatitis A virus (HAV) on the reservation, sample sites were selected by assessing the opportunity for virus-infected faeces to enter the water and by examining the levels of water use. Global Information System (GIS) technology data and previous thermotolerant (faecal) coliform testing results were used for this purpose. Five litres of water were collected from each of 24 environmental sites, representing a cross-section of source water (rivers and creeks) and groundwater (wells). Previously described methods were modified to accommodate larger samples and laboratory facilities which were a considerable distance away, over 443 km, from the reservation (3). Briefly, 1-litre water samples were passed over a positively charged filter, transported, and eluted with urea-arginine phosphate buffer. Following RNA extraction using guanidinium isothiocyanate, reverse-transcription polymerase chain reaction (RT-PCR) detected the presence of HAV based on amplification of a 247-bp amplicon sequence bridging the VP3/VP1 regions (nucleotides 2413–2389). Positives from agarose gels were purified and sequenced (4).

The molecular detection technique reliably detected 30 plaque-forming units (PFU) of HAV per litre of environmental water. Positive and negative controls for RT-PCR and the entire protocol confirmed

that the technique was consistently executed. One of the five samples from a creek was consistent with presence of HAV; nucleotide sequencing of the fragment showed a sequence identical to HAV strain HM-175. In addition, a person upstream of the sampling site showed symptoms consistent with HAV, indicating a possible source of water contamination. Ruling out contingencies proved futile, as the symptomatic individual would not consent to an HAV test and not enough RNA remained for expanded RT-PCR.

Health education for culturally appropriate hepatitis A prevention was tailored to Native Americans at Trinity Valley Elementary School (ages 5-13) and Hoopa Elementary and High School (ages 5-18), linked to ongoing activities through student artwork, previous school work, and the use of the Hoopa language. Young children learned the importance of hand washing, while older students explored the connection between environmental health and hepatitis A.

Student and local Native art were used for hepatitis A pamphlets and posters to enhance cultural awareness, with the common theme of 3Ws: Washing hands, Waste disposal, and Wellness (vaccinations). Separate pamphlets were prepared for adults, health care workers, teachers, travellers, food workers, and environmental workers, following extensive community testing and three rounds of revision. Over 500 pamphlets were distributed to students with free bars of soap. Two posters detailed the two most proactive individual techniques for preventing the transmission of hepatitis A — hand washing in schools and not dumping waste near water sources.

Detection of HAV on a Native American reservation corresponds to the high environmental hepatitis A risks associated with the area. Old septic tanks and outhouses in the region and the elevation make seepage of virus a possible event. The periodic nature of hepatitis A outbreaks suggests the reservation may be at risk for another outbreak; HAV has been reported to be stable at room temperature for over 300 days which might allow an environmental reservoir on the reservation (5).

Environmental reservoirs of hepatitis A are important to HAV control and prevention. The lack of wastewater management,

an underdeveloped economic base, presence of a travelling tourist population, and decentralized health resources make Native American reservations prone to periodic outbreaks of hepatitis A. Simple molecular detection methods and cultural awareness efforts could benefit any Native American reservation or area where HAV is endemic.

The synergistic effects of linking medical, public health, and environmental resources empowered the reservation in disease control. Beyond continued environmental detection, a vaccination drive for children was investigated, and a cooperative referral system linked medical and environmental leaders. Although Native Americans live in some of the most developed nations, their precarious health conditions demand cooperative public health strategies. Combining environmental detection and community awareness provides a robust approach to controlling infectious disease.

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