Seroprevalence of Antibodies to Hantavirus in Health Care Workers and Other Residents of Southern Argentina

In 1996, an investigation of an outbreak of hantavirus pulmonary syndrome (HPS) due to Andes virus in southwestern Argentina provided the first reliable evidence of nosocomial and person-to-person transmission of a hantavirus [1–3]. To further characterize the setting of this outbreak, we conducted a study to estimate the seroprevalence of hantavirus antibodies in health care workers and residents of the outbreak area.

The outbreak was first recognized in El Bolsón, a semi-rural town (population, 15,000), 350 m above sea level in the foothills of the Andes. Patients were first seen in the hospital in El Bolsón, but many were referred to hospitals in Bariloche (population, 80,000), ~130 km north of El Bolsón. Our seroprevalence study of 524 people included: (1) 150 health care workers, of which 126 were from the hospital in El Bolsón and 24 were from the hospital in Bariloche; (2) 294 residents of El Bolsón representing 164 randomly selected households; (3) 67 residents of ''control'' households who participated in a case-control study as part of the outbreak investigation (50 from El Bolsón and 17 from Bariloche); and (4) 13 asymptomatic household contacts of confirmed HPS patients (nine from El Bolsón and four from Bariloche). Participants in the case-control study were administered a questionnaire that allowed collection of data on demographic and socioeconomic characteristics, as well as any prior contact with rodents or with HPS patients. Samples were tested by use of EIA [4] for IgG and IgM antibodies to hantavirus in two laboratories (Instituto Nacional de Enfermedades Virales Humanas [INEVH] in Pergamino, Argentina; and Instituto Nacional de Enfermedades Infecciosas [INEI] in Buenos Aires, Argentina), using Sin Nombre virus (SNV) and Andes virus nucleocapsid protein antigens, respectively.

Of the 294 participants in the household survey, 165 (56%) were female; 17 were younger than 10 years of age, 220 were between 10 and 50 years of age, and 42 were older than 50 years of age. Age was not recorded for 15 individuals; these 15 and the 17 children younger than 10 years old (all of whom were seronegative) are not included in the following statistics. Of the 262 respondents, 53% reported rodent sightings in 1996, compared with 60% who recalled sightings during 1995. Fewer respondents recalled having touched rodents, and this percentage was also smaller for 1996 (9%) than for 1995 (11%). Forty-three individuals reported contact with an HPS patient.

Table 1. Results of serologic screening for antibodies to hantavirus among health care workers, case-control study participants, and household contacts of HPS patients from 164 households in El Bolsón and Bariloche, Argentina, December 1996.

Study participants	No. tested	No. IgG antibody positive	No. IgM antibody positive	IgG seroprevalence (%)
Random population sample (El Bolsón)	294	3	0	1
Health care workers (El Bolsón)	126	0	0	0
Controls and household members of controls (El Bolsón)	50	0	0	0
Health care workers (Bariloche)	24	0	0	0
Controls and household members of controls (Bariloche)	17	0	0	0
Asymptomatic household contacts of patients with HPS (nine from El Bolsón, four from Bariloche)	13	0	0	0
Symptomatic household contacts of patients with HPS*	6	6	6	100

NOTE. HPS = hantavirus pulmonary syndrome.

* All six contacts with IgM and IgG antibodies were patients with HPS who were diagnosed during the 1996 outbreak.

There was a >99% concordance in serology results between the two laboratories by using different hantavirus antigens, and both laboratories detected IgG and/or IgM antibodies from all 20 outbreak case-patients (data not shown). The only sera with IgM antibodies to hantavirus antigens were from known HPS cases (table 1). Only three individuals (other than confirmed HPS cases) had IgG antibodies to hantavirus: a 68-year-old female and two males, aged 28 and 68 years. These individuals belonged to the random-population sample and none of them recalled contact with an HPS patient. Seroprevalence in the random household survey was 1% (three of 294 participants). If health care workers and control-household participants from El Bolsón are included, the community-wide seroprevalence is 0.6% (three of 470). These results are similar to the low seroprevalences reported in other areas of Argentina (0.1%–1.5% [5, 6]), but much lower than the seroprevalence found in Paraguay [13% [7]).

The occurrence of HPS in five health care workers during the El Bolsón outbreak and the strong evidence for nosocomial transmission [1–3], prompted us to test health care workers from hospitals caring for HPS patients for evidence of infection with Andes

Informed consent was obtained from all individuals who participated in this study, and parental consent was obtained for children.

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virus. Nevertheless, as was true for a similar study that was conducted after the 1993 HPS outbreak in the southwestern United States [8], no evidence for asymptomatic infection among health care workers was found. Because the last HPS patient left the El Bolsón hospital 35 days before our sampling of the 126 health care workers in El Bolsón, it is unlikely that any seroconversions occurred among this group after our study was conducted. We can be less confident about the 24 health care workers from Bariloche.

It remains unclear why secondary transmission occurred with this hantavirus when it has not been evident in the past. Careful epidemiologic investigations may find that person-to-person transmission is occurring unrecognized elsewhere. A recent review of the epidemiology of HPS in the United States did not find convincing evidence of person-to-person transmission with SNV [9]. Additional studies of hantavirus epidemiology and seroprevalence in human and rodent populations are needed to better understand the epidemiology of HPS in South America.

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Enterovirus Meningitis in Adults

The enteroviruses are the most common cause of aseptic meningitis in the United States, resulting in >75,000 cases each year [1]. With use of viral culture techniques, enteroviruses are identified in 85%–95% of cases of aseptic meningitis for which an etiologic agent is found [1]; the use of the PCR assay has resulted in a further increase in the identification of the enteroviruses [2, 3]. Although children are the primary victims of CNS infections due to enteroviruses [1, 4], the viruses are also the most common cause of aseptic meningitis among adults, with both epidemic and endemic patterns of disease [5–9]. Because specific viral diagnoses are sought less often in adults than in children, there is less known about the natural history of enterovirus meningitis in adults. We studied the clinical course and outcome for adults who presented to emergency departments with enterovirus meningitis.

This prospective observational study included patients ⩾14 years of age who presented to one of four emergency department study sites for evaluation of signs and symptoms suggestive of meningitis that prompted lumbar puncture. Informed consent was obtained for all study participants. Patients with bacterial meningitis, those with other nonviral etiologies, and patients with HIV infections and/or other potentially confounding underlying neurological conditions were excluded. Daily visits or phone calls were conducted by the study nurse or physician until the patient was entirely asymptomatic and had resumed normal activity. At each contact, a symptom score was assigned by the patient (on a scale of zero [absent] to 4 [severe]) for each of the following: headache, light sensitivity, stiff neck, muscle ache, nausea, vomiting, and overall ''feeling bad.'' Temperatures were obtained twice daily (at the same times each day), and analgesic use was recorded. CSF was tested for routine parameters of meningitis, and the presence of enteroviruses was assessed with use of the Amplicor (Roche Diagnostic Systems, Somerville, NJ) enterovirus PCR assay, performed at a single laboratory and validated as previously reported [2]. An additional group of patients for whom meningitis was initially suspected, but for whom CSF parameters were normal, was tested for enterovirus infection with the same assay. Fisher's two-tailed exact test was used for statistical comparisons.

Between August 15 and October 31, aseptic meningitis was diagnosed in 39 patients. Twenty-three of the patients had CSF WBC counts of ⩾20/mm^3, and the remaining 16 patients had CSF WBC counts of 5–19/mm^3. Sixteen (70%) of the 23 patients with CSF WBC counts of ⩾20/mm^3 had PCR assays positive for enterovirus, in contrast to one of 16 patients with aseptic meningitis who had CSF WBC counts of <20/mm^3. None of the 14 controls with

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