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**SEROPREVALENCE STUDY FOR ANTIBODY TO RATBORNE PATHOGENS AND  
OTHER AGENTS AMONG SKID ROW RESIDENTS-LOS ANGELES 2000**

## INTRODUCTION

Rats may be reservoirs in disease transmission. From 1996 through 1998, Norway rats (*Rattus norvegicus*) from downtown Los Angeles were examined for evidence of exposure to certain microorganisms; seroprevalence rates were 25.7% for *Rickettsia typhi*, 6.7% for Seoul Virus (SEOV) and 73.1% for hepatitis E virus (HEV). Fifty-two percent of blood specimens collected from rats grew *Bartonella elizabethae*-like isolates when cultured (Table 1).<sup>1,2</sup> Due to high rat isolate and seroprevalence rates, Los Angeles County Department of Health Services began a blinded study among people using a free clinic in the “skid row” area of Los Angeles for evidence of past exposure to these agents.

**Table 1. Overall Seroprevalence and Culture Positive Isolates of Four Agents in *Rattus norvegicus* Captured in Downtown Los Angeles 1996-1998**

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Agent	% positive
<i>Bartonella elizabethae</i> - like isolate, N = 259	134 (51.7%)
Hepatitis E Virus, N = 134	98 (73.1%)
<i>Rickettsia typhi</i> , N = 259	67 (25.7%)
Seoul Virus, N = 120	8 (6.7%)

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## METHODS

Between June and August 2000, serum specimens obtained for other routine tests were collected from patients who visited a free clinic on skid row in Los Angeles. Most of these patients had been homeless at some point during the past year (Weingart Clinic, personal communication, 2001). The serum was sent from the free clinic to the Los Angeles County Public Health Laboratory (LACPHL). At LACPHL, three aliquots were drawn off each specimen for testing by 3 different laboratories. LACPHL tested the serum for *Bartonella elizabethae* (BE), *Bartonella quintana* (BQ), *Bartonella henselae* (BH) and *Rickettsia typhi* (RT) antibodies, using reagent provided by the Centers for Disease Control and Prevention (CDC). Antibody to other pathogens not tested for in the rats (*Bartonella quintana* and *Bartonella henselae*) was tested in the human serum.

The National Institutes of Health (NIH) tested the serum for antibodies towards HEV, and Focus Technologies (FT, Cypress, CA) tested the serum for antibodies towards a non-specific Hantavirus

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panel. Positive tests were later confirmed by CDC for SEOV antibody. Age and sex were the only demographic information collected. No clinical data were collected.

## RESULTS

The ratio of men to women was 3:1 with a median age of 41 years. Overall, 25/200 (12.5%) of the specimens had antibody to BE, 19 (9.5%) had antibody to BQ, and 7 (3.5%) had antibody to BH. Thirty (15%) had antibody towards HEV and one (0.5%) had antibody to SEOV (Table 2). None of the specimens had RT antibody. Eighteen percent (35/200) had antibody towards any species of *Bartonella*. Four of the specimens had titers of 1:512 to BQ antigen.

**Table 2. Overall Seroprevalence of Antibodies to Six Agents in a Population That Uses a Free Clinic in Downtown Los Angeles, N = (200)**

Agent	Seroprevalence, N (%)
<i>Bartonella elizabethae</i> *	25 (12.5%)
<i>Bartonella quintana</i> **	19 (9.5%)
<i>Bartonella henselae</i> **	7 (3.5%)
Hepatitis E Virus	30 (15.0%)
<i>Rickettsia typhi</i> **	0 (0.0%)
Seoul Virus	1 (0.5%)

\* Cutoff = 1:128

\*\* Cutoff = 1:64

## DISCUSSION

These data show that humans and *R. norvegicus* living in downtown Los Angeles have antibodies to similar organisms. *R. norvegicus* rodents serve as reservoirs of RT, SEOV and possibly BE.

This study found that 9.5% of specimens had antibody towards BQ. Studies conducted in Baltimore, Maryland, Seattle, Washington, and Marseilles and Paris, France, have found homeless populations with a high seroprevalence to BQ.<sup>4,7</sup> BQ is transmitted through the bite of the human body louse (*Pediculus humanus corporis*) and causes trench fever. Donor blood tested in other cities found that 0 to 2% of specimens had antibody towards BQ antigen.<sup>3-5, 7</sup> This may indicate that there is a higher seroprevalence to BQ among the homeless in Los Angeles when compared to donor groups. Four of the specimens had titers to BQ of 1:512, indicative of ongoing or recent clinical illness.

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It is not known how BE is transmitted to humans, however, studies suggest that *Rattus norvegicus* may be a suitable reservoir.<sup>2, 8, 9</sup> BE can cause endocarditis<sup>10</sup> There is also one documented case of Leber's neuroretinitis in a patient with serologic evidence of BE.<sup>11</sup> A study done in Baltimore, Maryland, found that IV drug users had a high seroprevalence rate (33%) to BE.<sup>4</sup> Although our study found a seroprevalence rate of 12.5%, the serologic cutoff used was 1:120. Using a cutoff of 1:64 as the Baltimore study did, the seroprevalence in our study becomes 20%. It is not known how participants may have acquired antibody to BE, but it is interesting that the seroprevalence (comparing the same cutoffs) in Los Angeles was similar to that in Baltimore.

The data show that 3.5% of this population had antibody to BH, the agent of cat-scratch disease. This agent is transmitted through the scratch or bite of a cat and is not known to be transmitted by rodents. The seroprevalence in this population is similar to non-indigent populations. BH usually causes pathology in children more than adults.

None of the specimens tested positive for antibody to RT. RT causes murine typhus and is transmitted by the bite of the rat flea or cat flea. It is known to be endemic in LAC but maintains a more suburban cycle between opossums, cats and humans.<sup>12, 13</sup> The negative findings may be because the rat flea is very rat specific. It does not bite humans unless it cannot find another rat host, as opposed to the cat flea, which will readily bite humans. It might be that with enough rats to feed on, the flea rarely bites human as an alternate host. Therefore, we may not see any evidence of urban murine typhus exposure.

One specimen from the downtown LA population had antibody to SEOV for an overall seroprevalence of 0.5% (1/200). This is remarkable when compared with the seroprevalence of two populations studied in Baltimore Maryland, which had a seroprevalence of 0.16% and 0.25% in IV drug users and people with no known risk factors, respectively.<sup>14, 15</sup> SEOV is a Hantavirus and is rodent-borne, through the urine or feces of the Norway rat. It can cause hemorrhagic fever with renal syndrome (HFRS). Seroprevalence to Baltimore rat isolate of SEOV was 44% in Norway rats captured in Baltimore, Maryland. A study in Baltimore found that 2.76% of a group of dialysis patients with end-stage renal disease had antibody to a strain of SEOV. The same study also found that 6.5% of patients with renal disease due to hypertension were seropositive for antibodies towards this same virus, suggesting that SEOV may be associated with renal disease.<sup>16</sup>

HEV is transmitted through the fecal-oral route and has been implicated in many epidemics in the Third World. It causes acute hepatitis and can cause death in pregnant women. It is not known how HEV antibody is acquired in this population or whether rodents and humans were infected with the same strain.

Clinicians who serve homeless populations should be aware of potential patient contact with rodents and possible subsequent infection. Further studies and similar surveys in age-matched groups are needed to determine if exposure to rodents may be associated with clinical illness in this population.

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