Infections in the homeless

Didier Raoult, Cédric Foucault, and Philippe Brouqui

Homeless people in developed countries have specific problems predisposing them to infectious diseases. Respiratory infections and outbreaks of tuberculosis and other aerosol transmitted infections have been reported. Homeless intravenous drug users are at an increased risk of contracting HIV, and hepatitis B and C infections. Skin problems are the main reason the homeless seek medical attention, and these commonly include scabies, pediculosis, tinea infections, and impetigo. Many foot disorders are more prevalent in the homeless including ulcers, cellulitis, erysipelas, and gas gangrene. The louse transmitted bacteria *Bartonella quintana* has recently been found to cause clinical conditions in the homeless such as urban trench fever, bacillary angiomatosis, endocarditis, and chronic afebrile bacteraemia. Treatment of homeless people is complicated by financial constraints, self-neglect, and lack of adherence. Patients with serious and contagious illnesses should be hospitalised. Physicians should be aware of these specific issues to enhance care.

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Homelessness is a major problem in both developing and wealthy countries. Today at least half a million Americans are homeless. Comparable numbers of people were estimated to be homeless in England in 1988 and in France in 1996. Homeless people are predisposed to infections because of their poor physical state and lack of hygiene, hence outbreaks of contagious diseases are more prevalent in the homeless. Furthermore, homelessness not only damages the health of the affected individuals but also promotes the spread of diseases such as tuberculosis into the general population.

The treatment of homeless people is a therapeutic challenge because they are often unable to pay for their treatment and adherence is often poor. In addition, access to health care may be limited by mental illness, transport problems, self-neglect, and fear of institutions. We have worked with the homeless population of Marseilles since 1993 in ongoing studies of louse-transmitted diseases. In this article we review the infectious diseases of the homeless since there are few reviews or books on this topic in what seems to be a neglected field of study.

Who are the infected homeless?

Homeless people are defined as "those who do not have customary and regular access to a conventional dwelling or residence." The homeless populations that have been studied have varied greatly depending on the country and type of study. Studies have been done in shelters, emergency medicine departments, and in the street by social workers or the welfare services. Homeless people are predominantly male (60–95%) with children and adolescents being frequently reported in several countries such as the USA, but only rarely in others. Other groups of people at an increased risk of becoming homeless are refugees and illegal immigrants. Homelessness is frequently associated with mental disease, in particular psychosis, and with substance abuse. The proportion of mentally ill patients reported in homeless populations is dependent on how the mental health status of individuals is evaluated.

Among homeless people the prevalence of alcohol abuse, intravenous drug users (IDUs), and heavy tobacco usage is significantly higher than in the general population. In an American study, 50% of patients were IDUs, 21% alcoholics, and 78% heavy smokers. Such substance abuse predisposes to specific infections and is associated with a weakened immunity and other biological abnormalities that...
should be considered when treating infectious diseases in the homeless. Chronic alcohol abuse is associated with abnormal liver function and increased mean corpuscular erythrocyte volume. This predisposes individuals to pneumonia, tuberculosis, and *Bartonella quintana* infections. The IDUs are more frequently exposed to HIV and hepatitis B virus (HBV) infections. Heavy smokers have bronchitis and are predisposed to pneumonia. Raised polymorphonuclear cell counts in these patients is usual and does not necessarily reflect an infectious process.

The homeless are also more exposed to burns, and physical trauma from fights or falls. Skin lesions predispose to secondary bacterial infections because of the lack of hygiene. The homeless are on their feet for a longer duration than the general population, and usually have inappropriate footwear. These factors coupled with the lack of hygiene and exposure to cold temperatures, predispose the homeless to develop foot problems (figure 1). Finally, the lack of personal hygiene and clean clothes often leads to infestations with ectoparasites and the development of associated skin conditions. Moreover, the close proximity of the homeless in shelters and on the streets favours the transmission of ectoparasites as well as pulmonary pathogens in aerosols.

There have been few systematic studies of infectious diseases on the physical health of the homeless (table 1). Bronchitis, chronic coughs, and pulmonary infections are frequently seen in the homeless. Dental status of individuals is usually very poor. Legs and feet frequently have cutaneous infections, and ectoparasites and skin wounds are common. In shelters, contagious diseases spread easily by aerosol as well as by direct contact. In a study comparing poor people with a home and those that were homeless, the latter were found to have significantly more dermatological problems, seizures, chronic obstructive pulmonary disease, serious problems with vision, foot pain, and grossly decayed teeth. They also had a higher prevalence of alcoholism, drug abuse, and cigarette smoking. The sexual activity of the homeless, however, was not significantly different nor were the prevalences of sexually transmitted diseases when prostitution linked to IDU was excluded.

### Respiratory diseases and pulmonary tuberculosis

Crowded shelters provide the ideal conditions for spread of respiratory infections including influenza. Moreover, alcoholism, drug addiction, and HIV infection predispose to pneumonia caused by *Streptococcus pneumoniae, Haemophilus influenzae b*, aspiration of anaerobes, and, in HIV positive patients, *Pneumocystis carinii*. Minor upper respiratory infections have been found to be twice as common in homeless children and represent 40% of the acute medical complaints of the homeless. Death from respiratory diseases is reported to be seven times higher in the homeless. In Boston, between 1986 and 1988, respiratory diseases caused 20% of the total deaths in the homeless population. Tuberculosis was responsible for 16% of these deaths while 44% were caused by non-tuberculosis pneumonia (25% *S pneumoniae* and 25% *P carinii*).

*H influenzae b* can also cause pneumonia in adults, and this has mostly been reported in alcoholic homeless patients. Tuberculosis is an important health problem among the homeless and residents of cheap lodging houses, night shelters, hotels, and hostels. The prevalence of latent tuberculosis infections among homeless people is reported to be as high as 9–79%, while the prevalence of active disease has been reported to be 1–6–6.8%. The incidence of tuberculosis has recently been estimated to be 270 cases/100 000 per year in the homeless population of San Francisco.

**Table 1. Infections in the homeless**

<table>
<thead>
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<th>Author (reference) and study type</th>
<th>Country</th>
<th>Number of cases</th>
<th>Year</th>
<th>Bronchitis</th>
<th>Pulmonary</th>
<th>Dental problems</th>
<th>Psychiatric problems</th>
<th>STDs</th>
<th>Skin problems</th>
<th>Foot cramps</th>
<th>Headaches</th>
<th>HIV infection</th>
<th>Hepatitis</th>
<th>Tuberculosis</th>
<th>Intravenous drug use</th>
<th>Alcohol abuse</th>
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**NATIONAL WEEK OF ACTION ON VIOLENCE AGAINST WOMEN**

The Lancet Infectious Diseases Vol 1  September 2001

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Individuals; and clusters were significantly associated with strains isolated in Paris consisted of 26 groups of two to 12 tuberculosis. Greater for homeless patients than for other patients with length of hospitalisation and overall treatment costs are significant reductions in the number of behavioural practices that put homeless people at risk of HIV. Homelessness is also an important risk factor for acquiring HIV infection as shown by 33·7% homeless IDUs in Chicago who were HIV positive compared with 20·5% of non-homeless IDUs. In another US study, homeless people on the street had a significantly higher HIV prevalence (19%) compared with non-homeless IDUs (11·2%) because of frequent high-risk drug injection and needle-sharing. The seroprevalence of HIV in homeless adolescents is also high and was estimated to be 2·1–7% in the Netherlands compared with 0·034–0·2% among non-homeless youths in the same period. Data from the USA showed intravenous drug use in 3–30% of homeless adolescents, prostitution or "survival sex" (ie, the exchange of a sexual favour for money, food, a place to stay, clothes, and/or drugs) in 19–43% of homeless, and multiple sexual partners in 24–67%. Similar data has been obtained in Canada, Australia, and the Netherlands. Homeless women are also at high risk for HIV infection as a result of IDU, risky sexual behaviour, and prostitution. In a multicenter cross-sectional study in western Europe on 1198 female IDUs, the absence of a fixed address was associated with increased HIV prevalence. There is a need for targeted public health interventions and designed educational programmes to prevent the spread of HIV in the homeless population. These programmes should specifically target homeless people on the street. Intensive intervention programmes may contribute to a reduction in the number of behavioural practices that put homeless people at risk of HIV. High-risk behaviour also predispose homeless people to acquiring HBV infection. 1·6% of 434 homeless youths studied in Montreal were hepatitis B surface antigen (HBsAg) positive. In a New York study involving 169 high-risk homeless men living in a shelter, 12% were HBsAg positive and 43% had HBs antibodies (HBsab). Among 119 women and 100 men recruited at two inner city soup kitchens, 21% had already been exposed to HBV and 6% were chronic carriers. Homelessness was significantly associated with HBV exposure. Among 87 street youths in Toronto, eight were found to be HBsab positive and, were more likely to be prostitutes. 21% of 46 homeless adolescents attending a clinic based at an urban drop-in centre in New York had evidence of prior HBV infection. Whereas it is difficult to ensure vaccine coverage in the homeless population, it is clear that hepatitis B vaccination and pre-vaccination screening should be promoted as preventive interventions. Promoting such programmes is difficult, and in Montreal only 12% of 437 homeless youths completed a three-dose vaccination schedule despite the availability of free vaccine. Thus there is clearly a necessity for targeted programmes for homeless people. Little information is available on homelessness and the prevalence of infections with the hepatitis C virus (HCV), but homeless people seem to have an increased risk of this.
infection compared with the general population. The prevalence of hepatitis C antibodies was investigated in 1378 individuals consisting of children, students, and street youths from central Brazil. All children attending day-care centres were anti-HCV negative, whereas 0.2% of the students and 3% of the homeless street youths were positive. Blood transfusion, having tattoos, IDU, and sexual intercourse with multiple partners were also correlated with the presence of anti-HCV in street youths.48–50 Syringe exchange programmes and the distribution of free condoms to homeless people may help to prevent the spread of these diseases.

Foot problems and cutaneous problems

Foot problems are a major cause of illness and may represent up to 20% of the medical complaints of homeless people.51 The main cause of foot lesions is minor, repetitive trauma because the homeless often walk for long periods in inappropriate shoes. Standing for long periods and sitting, a position often used for sleeping, results in venous stasis and leg oedema sometimes associated with ulcers (figures 1 and 2). Cold (frost bite) and moisture (immersion foot or trench foot) also frequently cause primary foot lesions. Peripheral neuropathy, diagnosed by the absence of the Achilles reflex, is frequent in homeless people because of alcoholism. The resultant loss of pain sensation promotes more extensive foot lesions. The high prevalence of hypertension and heavy tobacco use in homeless people, causes arteriosclerosis causing ischaemia of the lower limbs. Lack of hygiene, such as unwashed socks worn for weeks or months, and overgrown toe nails also promote the development of foot lesions with maceration contributing to the formation of ulcers. Nails and toes are frequently infected with Tinea pedis, and onychomycosis is common (figure 1). The combination of trauma, stasis, and ischaemia in the feet promotes infections, particularly streptococcal cellulitis. Foot ulcers are usually infected by a mixed bacterial population including Staphylococcus aureus, anaerobes, and enterobacteria. Such infections may result in osteomyelitis, cellulitis, and gangrene and necessitate amputation of the limb. Tetanus may also occur, and homeless patients should be routinely vaccinated for the disease. Prevention of foot lesions is based on promoting hygiene, providing appropriate footwear, and the early treatment of lesions. The treatment of osteomyelitis, cellulitis, and foot ulcers is best achieved in hospital.

Dermatological conditions are probably the most common health problems of the homeless52. When poor people with and without homes were compared, dermatological problems were found more often in the homeless group. Moreover, homeless people tend to neglect skin problems until they become serious and those in shelters tend to hide skin lesions to avoid being ostracised for possibly having a contagious disease.53 Two studies have reported the prevalence of the cutaneous problems seen at a specialised dermatology outpatient facility for the homeless. In the first study, skin infections and cellulitis occurred in 48% of patients and were the commonest condition seen. In the second study of 189 patients, the most common problems were scabies (57%), pediculosis (22%), and skin infections (7%).53 Other dermatological problems were considered non-specific and included eczematoid eruption (27%), prurigo (3%), burns, and acne. Lesions from scratching the bites of ectoparasites were frequently secondarily infected...
leading to *S aureus* impetigo. Foot ulcers and secondarily infected skin wounds were also frequently seen. The treatment of dermatological diseases of homeless people is routine but hospitalisation is required more frequently to achieve a cure.

Scabies is frequently observed in the homeless and because it is a very contagious disease, health workers coming into contact with such patients should be aware of the risk and take appropriate protective measures. Scabies lesions are more frequently secondarily infected by *S aureus* in homeless people (figure 3). The current treatment for scabies is ivermectin given orally at a single dose of 200 µg/kg. The drug is highly effective and enables treatment without hospitalisation. It is particularly useful in patients with secondary impetigo where topical miticides might irritate the lesions. With ivermectin, topical antibacterials may be used to treat secondary bacterial infections.

**Pediculosis and louse transmitted diseases**

With the re-emergence of the body louse, bacterial diseases in which body lice are vectors are now seen more frequently. These include typhus caused by *Rickettsia prowazekii*, trench fever due to *B quintana*, and louse-borne relapsing fever caused by *Borrelia recurrentis*. The body louse lives in the clothes of people and is associated with a lack of hygiene. In our experience 30–50% of the homeless in shelters have body lice. However, body lice are seldom detected, with a median number of only three adult lice found on these patients after an exhaustive search (unpublished data). Body lice are extremely contagious and are transmitted by contact through clothes or bedding. They multiply rapidly and a population can increase by 11% per day. Lice and their transmitted diseases have been recently identified in refugee camps in the Congo and Burundi, in the Andes in Peru, Russia, and Algeria. They have also been reported in developed countries such as France, USA, and the Netherlands. Pediculosis causes allergic, pruritic, skin reactions that cause scratching which may result in skin abrasions and secondary bacterial infections (figure 4).

Louse-borne relapsing fever and typhus are severe diseases but have not yet been observed in the homeless in developed countries; however infections with *B quintana* are seen. Lice are frequently infected (5–10% on average) with *B quintana*, and it is now known that homeless people infected with the organism may have a number of possible clinical presentations (table 2). *B quintana* may be present at high concentrations in louse faces and are inoculated into the skin by scratching that results from the pruritis associated with lice infestation.

The primary infection with *B quintana* is known as trench fever, which was first described in World War I and is associated with recurrent fever, headaches, and leg pains. The disease was seldom reported after 1918 but has recently re-emerged in homeless people, and has been named urban trench fever. Clinical signs usually resolve spontaneously but may be followed in the homeless by chronic bacteraemia with few definite signs. In Marseille, 5–10% of homeless people have persistent positive bacteraemia with *B quintana*. Some

<table>
<thead>
<tr>
<th>Clinical manifestation</th>
<th>First year described</th>
<th>Country</th>
<th>Reference</th>
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<td>1990</td>
<td>USA</td>
<td>73</td>
</tr>
<tr>
<td>Endocarditis</td>
<td>1995</td>
<td>France</td>
<td>61</td>
</tr>
<tr>
<td>Endocarditis and chronic febrile bacteraemia</td>
<td>1995</td>
<td>USA</td>
<td>15</td>
</tr>
<tr>
<td>Urban trench fever</td>
<td>1995</td>
<td>France</td>
<td>74</td>
</tr>
<tr>
<td>Chronic alembre bacteraemia</td>
<td>1999</td>
<td>France</td>
<td>12</td>
</tr>
</tbody>
</table>

**Table 2. Recent history of *B quintana* in the homeless**

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of these patients will later develop a chronic endocarditis, which was first reported in 1995. It is a typical clinical entity as it appears in homeless patients who have no previous heart-valve lesions (figure 5). The occurrence of *B quintana* in blood-culture-negative endocarditis patients was recently linked to homelessness and alcoholism. It has a severe prognosis with a 20% fatality rate and may contribute to the increased prevalence of endocarditis as a cause of death in the homeless. Homeless people with AIDS can also develop bacillary angiomatosis caused by *B quintana*. This newly described disease, mainly seen in youths aged 7–21 years, was first reported in 1995. It is a typical clinical entity of these patients who later develop a chronic endocarditis. Preliminary studies indicate that gentamicin given for 15 days in infection of homeless people is mainly based on positive blood culture, which requires prolonged incubation. Such a patient could be a source of infection for a large number of people. Diphtheria is now common in the newly independent states of the former Soviet Union, where migrants and homeless people who are at higher risk of infection are increasing. Algeria has also been the focus of a wide outbreak of diphtheria. Migrants and refugees from these countries could be the source of an outbreak in the homeless population of western countries. Therefore, vaccination against diphtheria is recommended for all homeless people and migrants.

There is little data on hepatitis A virus (HAV) infections in homeless people. In Goiasia city (Central Brazil), total anti-HAV antibody prevalences ranged from 80–90% in 397 street youths aged 7–21 years. In 1986, an outbreak of HAV was reported in a shelter for homeless people in Vienna where 22 people developed clinical disease over a 6-month period. 214 people were tested for HAV antibodies with 52% of homeless people having total HAV antibodies and 8% having IgM anti-HAV. 43% of 21 staff had total HAV antibodies but none had IgM anti-HAV. The 105 seronegative people were vaccinated against HAV and none developed clinical disease. Vaccination against HAV may then be appropriate for the homeless living in shelters and the staff working there.

**Conclusion**

Homeless people have specific problems that increase their risk of disease, and which should be managed to avoid serious and preventable infections. Vaccinations against tetanus, diphtheria, hepatitis B and A, and influenza should be promoted since the homeless have been shown to be specifically at risk for these infections. Condoms and syringes should be readily available to avoid the spread of sexually transmitted and blood-borne diseases. Special attention should be paid to the shoes and feet of the homeless. Shoes should be provided that fit appropriately and the feet cleaned at least weekly. A complete change of clothes each week and the routine prescription of ivermectin to all patients with suspected scabies will help to control ectoparasites. There should be a high index of suspicion of tuberculosis in the homeless, especially if there is a history of a chronic cough.

**Search strategy and selection criteria**

References for this review were identified by searches of Medline in all languages excluding Japanese. Search terms were homeless, infection, and bartonella. We found 1119 reports of physical problems in the homeless and, based on title and summary, 130 publications were reviewed. References for other infectious diseases of the homeless were carried out using the keywords, body louse, hepatitis C, and diphtheria.
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Finally, in our experience, homeless people are best treated as inpatients due to the lack of patient adherence associated with treatment as an outpatient. In any case, completion of therapy may be achieved through directly observed therapy in a monitored setting. We believe that first aid centres should be developed in shelters in large cities (table 3) as some do already. Health workers who specialise in improving the conditions of the homeless, washing facilities, clothes, shoes, condoms, and syringes should be available at these centres, and this may increase the health status of the homeless.

Acknowledgments

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References


