Brucellosis is also known as Bang's disease, Malta fever, Mediterranean fever, or undulant fever, and is the most common zoonotic infection worldwide. This bacterial disease affects a variety of animals and is transmitted to humans by three main routes: direct contact with tissue and body fluids from infected animals, inhalation of infectious aerosols, and ingestion of contaminated food such as unpasteurized dairy products. Four species of *Brucella* can infect humans, *Brucella melitensis* the most severe pathogen followed by *Brucella suis*, *Brucella abortus*, and *Brucella canis*.2

In Azerbaijan, brucellosis is endemic with 400–500 human cases per year.3 *Brucella melitensis* is the main cause of human brucellosis (Ismayilova R, personal communication). Occupational hygiene and laboratory safety procedures are the basis for prevention of human brucellosis. Vaccination and removal of infected animals controls brucellosis in livestock animals. Despite these control measures, brucellosis remains an important public health and economic concern. Previous studies have documented that a practical and cost-effective approach for identifying unrecognized cases is to screen the household members of index cases and neighboring community members of brucellosis index cases in Azerbaijan. Twenty-one household members of 8 index brucellosis cases and 27 community neighbors were serologically tested for evidence of exposure by the serum agglutination test. Of these, the brucellosis seropositivity rate was 9.5% and 7.4%, respectively. Screening of household members of index cases and individuals who live in proximity to infected household members is a practical approach to increase the detection of brucellosis exposure.

Brucellosis is an endemic zoonotic disease in Azerbaijan. The first human brucellosis case reported in 1922 was in Pardabil village of a region currently named Shabran. Household members of brucellosis index cases are a population at risk for brucellosis infection. The purpose of this study was to determine the rate of seropositivity of brucellosis among household and neighboring community members of brucellosis index cases in Azerbaijan. Twenty-one household members of 8 index brucellosis cases and 27 community neighbors were serologically tested for evidence of exposure by the serum agglutination test. Of these, the brucellosis seropositivity rate was 9.5% and 7.4%, respectively. Screening of household members of index cases and individuals who live in proximity to infected household members is a practical approach to increase the detection of brucellosis exposure.

**Abstract.** Brucellosis is an endemic zoonotic disease in Azerbaijan. The first human brucellosis case reported in 1922 was in Pardabil village of a region currently named Shabran. Household members of brucellosis index cases are a population at risk for brucellosis infection. The purpose of this study was to determine the rate of seropositivity of brucellosis among household and neighboring community members of brucellosis index cases in Azerbaijan. Twenty-one household members of 8 index brucellosis cases and 27 community neighbors were serologically tested for evidence of exposure by the serum agglutination test. Of these, the brucellosis seropositivity rate was 9.5% and 7.4%, respectively. Screening of household members of index cases and individuals who live in proximity to infected household members is a practical approach to increase the detection of brucellosis exposure.
brucellosis (53%). Moreover, only 38% of them reported washing hands after handling animals, 25% participated in animal birth, and 12% in shearing sheep.

Among household members, the median age was 32 years, 62% were females, 71% had secondary education, and 48% were unemployed. Over 5% of them consumed unpasteurized dairy products and 14% consumed undercooked meat. They also reported always boiling milk and washing hands after handling animals and that only 40% had contact with animals. Sixty-two percent of them practiced no self-protection method against brucellosis and 74% had no knowledge about the disease. At the enrollment visit, two male participants without any clinical manifestations had serological titers ≥1:200 for Brucella spp. These same participants had high titers at the follow-up visit (Table 1). The brucellosis rate was 9.5% (95% confidence interval [CI] = 1.6–28%). No risk factor was significantly associated with seropositivity.

Among neighboring participants, the median age was 21 years, 61% were females, 50% had secondary education, and 33% were unemployed. Only 5% of them consumed unpasteurized dairy products, unboiled milk, and undercooked meat. Sixty-two percent reported having livestock in the household, 64% had not practiced any protection against brucellosis, and 88% had no knowledge about the disease. At the enrollment visit, one asymptomatic participant was seropositive for Brucella spp. This same participant, along with a second participant, was seropositive for Brucella spp. at the follow-up visit (Table 1). The brucellosis rate was 7.4% (95% CI = 1.3–22.4%). There were no significant differences regarding risk factors for brucellosis between household members and neighboring participants.

In this study, we found evidence of Brucella infection among household members of brucellosis index cases and neighboring participants. The rate of asymptomatic infection for brucellosis in our study was similar to that reported in Saudi Arabia and Turkey (8–10%). The screening of household members helps detect additional asymptomatic cases for early diagnosis and symptomatic individuals who might not be aware of the disease symptoms. Several of the symptoms of brucellosis are similar to other diseases, such as influenza. Our findings are consistent with previous studies that showed the importance and benefits of screening household members as a public health effort to reduce the burden of brucellosis. In Iran, the presence of an infected household member was found to be a risk factor for brucellosis acquisition.

In our study, all brucellosis cases were adult males. Worldwide, brucellosis is more likely to occur in males rather than females; the cause of this disparity is occupational exposure differences. In Azerbaijan, males are more involved in the care and management of farm and domestic animals and for this reason they may acquire the infection because of contact with infected animals; additionally, the brucellosis rate was similar for household members and neighboring participants. This suggests that common modes of acquisition may exist within communities. However, possibly the geographical proximity of both groups may have influenced these rates. In rural northern Tanzania, the closer the household members have contact with animals, the greater the chance of contracting brucellosis.

This study has some limitations. First, there was no collection of specific questions regarding the consumption of unpasteurized products, such as fresh cheese. Second, the small sample in this study may have limited the power to detect risk factors associated with exposure to Brucella. Finally, three of four household members and community controls did not show evidence of a 4-fold or greater rise in titers between acute and convalescent samples. Reports indicate that in patients with high titers at the time of clinical presentation, a 4-fold rise in titers may not occur.

One of the main preventive measures for brucellosis control along with animal vaccination and occupational regulations is to educate the public about the causes, treatment, and prevention of brucellosis. High-risk occupational groups such as farmers, slaughterhouse workers, butchers, and veterinarians commonly receive education and training on brucellosis risk. In our study, a high percentage of the participants reported no knowledge of brucellosis transmission and one-third of them did not practice self-protective methods against infection. In response to this concern, epidemiologists from the Republican Anti-Plague Station developed a set of lectures and brochures that were widely distributed in the study areas. The aim was to increase awareness of disease knowledge in an effort to reduce the risk for transmission of brucellosis.

In summary, we found evidence of Brucella infection among household members of brucellosis index cases and neighboring participants. The screening approach along with public health education enhances the detection rate and reduces the incidence of human brucellosis. Additional efforts are also required between medical and veterinary authorities to control this zoonotic disease in Azerbaijan.

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**Table 1**

<table>
<thead>
<tr>
<th>Group</th>
<th>Age (yrs)</th>
<th>Gender</th>
<th>Area</th>
<th>Consumption of unpasteurized dairy products</th>
<th>Livestock in household</th>
<th>Brucellosis knowledge</th>
<th>Initial SAT (Wright)</th>
<th>Follow-up SAT (Wright)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM-1</td>
<td>43</td>
<td>Male</td>
<td>Rural</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1:200</td>
<td>1:200</td>
</tr>
<tr>
<td>FM-2</td>
<td>20</td>
<td>Male</td>
<td>Unknown</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1:800</td>
<td>1:400</td>
</tr>
<tr>
<td>NC-1</td>
<td>18</td>
<td>Male</td>
<td>Rural</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Negative</td>
<td>1:400</td>
</tr>
<tr>
<td>NC-2</td>
<td>69</td>
<td>Male</td>
<td>Urban</td>
<td>No data</td>
<td>No</td>
<td>No data</td>
<td>1:3200</td>
<td>1:3200</td>
</tr>
</tbody>
</table>

*FM = family member of brucellosis index case; NC = neighboring community control; SAT = serum agglutination test.*
Disclaimer: This study was approved by institutional review boards at the U.S. Army Medical Research Institute of Infectious Disease, Ft. Detrick, MD (HP-08-26), Walter Reed Army Institute of Research, Silver Spring, MD (WRAIR #1560), and at the Republican Anti-Plague Station, Baku, Azerbaijan (TNK-008). The views expressed herein are those of the authors and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government. Some of the authors are employees of the U.S. Government. This work was prepared as part of their official duties and, as such, there is no copyright to be transferred.

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