north of Laos: the occurrence and implications of the *Plasmodium falciparum* chloroquine resistance transporter (pfcrt) gene haplotype SVMNT. Trop Med Int Health. 2005;10:1267–70. DOI: 10.1111/j.1365-3156.2005.01514.x

8. Miller RL, Ikram S, Armelagos GJ, Walker R, Harer WB, Schiff CJ, et al. Diagnosis of *Plasmodium falciparum* infections in mummies using the rapid manual ParaSight-F test. Trans R Soc Trop Med Hyg. 1994;88:31–2. DOI: 10.1016/0035-9203(94)90484-7

9. Rabino Massa E, Cerutti N, Savoia D. Malaria in ancient Egypt: paleoimmunological investigations in predynastic mummified remains. Chungara. 2000;32:7–9.

10. Nerlich A, Zink A, Hagedorn HG, Szeimies U, Weyss C. Anthropological and palaeopathological analysis of the human remains from three "Tombs of the Nobles" of the necropolis of Thebes-west, upper Egypt. Anthropol Anz. 2000;58:321–43.

Address for correspondence: Andreas G. Nerlich, Division of Paleopathology, Institute of Pathology, Academic-Teaching Hospital München-Bogenhausen, Englschalkingerstr 77 D-81925, Munich, Germany; email: andreas.nerlich@extern.lrz-muenchen.de

# Brucellosis in Infant after Familial Outbreak

**To the Editor:** Brucellosis is a known cause of small household outbreaks (*1,2*), usually attributed to exposure of all infected family members to the animal/animal product pathogen source. Although the means of disease transmission is well delineated (*3*), in certain cases the pathogen's entry into the human body cannot be clearly defined; this has led to suggestions of direct human-to-human transmission and also to the increasing recognition of airborne brucellosis, which is important in the context of the role of *Brucella* spp. as potential biological weapons (*4*). Another understudied transmission route is entry by direct contact through skin and mucosal abrasions. We report a case of infantile brucellosis in which airborne transmission in the context of familial brucellosis or indirect contact with the animal source through other family members was considered the only possible means of infant infection.

In 2006, a 2.5-month-old girl was admitted to the Pediatric Department of the University Hospital of Ioannina, in a region of northwestern Greece where animal and human infection from *Brucella melitensis* is still common (*5,6*). She had a 2-week history of poor feeding and a 5-day history of swelling of the right wrist. She was born after 38 weeks' gestation with a birthweight of 3,050 g and was fed formula milk exclusively. Results of the physical examination were normal except the finding of a tender swelling of the right wrist. The infant came from a family of shepherds, and her father and paternal grandfather had been treated for brucellosis 10 and 22 months ago, respectively. At that time, the whole family was screened for additional cases; screening was also often repeated at the patients' followup examinations. On admission, laboratory tests showed characteristic relative lymphocytosis (leukocytes 10.5 × 10⁹/L, 65.3% lymphocytes) and an increase in inflammatory markers (C-reactive protein, 22 mg/L, and erythrocyte sedimentation rate, 47 mm/h). Results of a wrist x-ray were normal. Because brucellosis was suspected, serum agglutination test, ELISA, and blood PCR for *B. melitensis* were performed. Agglutination titer was 640; ELISA immunoglobulin M (IgM) antibodies and PCR results were positive. No organisms were grown in blood culture.

All family members were rescreened. The father and paternal grandfather had negative serum agglutination and ELISA IgM and positive IgG serologic results, indicating past infection. The mother and paternal grandmother were again negative.

Veterinary investigation showed active disease in a few sheep of the family's herd. The infant was treated with a combination of oral trimethoprim-sulfamethoxazole and rifampin for 6 weeks. The course of the illness was uneventful, and she recovered completely. Followup PCR results were negative for *B. melitensis*. Six months later, only an ELISA IgG had positive results; IgM and IgA antibody and agglutination test results were negative. The patient remains without relapse 2 years after treatment.

Awareness of brucellosis is low in disease-endemic areas, including knowledge of its transmission potential and its medical consequences.. As a consequence, familial clusters of brucellosis are the norm. Recognition of a human case should prompt investigation of other family members so that early recognition and treatment for other household case-patients are possible. However, limitations in eradicating the initial animal disease source may lead to continuous exposure and appearance of new cases after a protracted period, or to infection of new household members.

Our case raises the need for awareness of the transmission dynamics of *Brucella* spp. because the disease emerged in a household member who did not have any direct contact with the animal source or any related products. The baby was not breastfed and had not digested raw milk. Her feeding bottle was specifically used for formulated milk and for feeding her only. Ingestion of breast milk from an infected mother (*7*) and vertical transmission transplacentally or during delivery are acknowledged means of transmission (*8*), but in this case the mother had never had brucellosis (she had been repeatedly screened during her husband's initial disease and followup). Neither previously infected household member had any clinical or laboratory sign of relapse or residual disease. The infant was never in contact with the infected animals and

never carried to the sites where they were housed or taken out for grazing. Thus, the only way for the infant patient to be infected would be environmental exposure. Since the infant had not been carried to the animal sites, the pathogen must have been transmitted to the household by the clothes or skin of the father or grandfather, who had been shepherding the infected animals. Subsequently, the baby became infected either by inhaling infected aerosolized particles or by direct transmission of the pathogen through minor skin abrasions (which were specifically looked for on admission but were not seen) or mucosal surfaces.

This case suggests that *B. melitensis* may even affect persons who are not directly exposed to infected animals, through direct contact with contaminated persons or the environment. In this context, brucellosis can be considered as not simply a household disease but as a disease of the house.

**Alexandros C. Makis,***
**Georgios Pappas,†**
**Emmanouel Galanakis,‡**
**Nikolaos Haliasos,***
**and Antigoni Siamopoulou***

*University of Ioannina, Ioannina, Greece; †Institute of Continuing Medical Education of Ioannina, Ioannina; and ‡University of Crete, Heraklion, Greece

### References

1. Celebi G, Kulah C, Kilic S, Ustundag G. Asymptomatic *Brucella* bacteraemia and isolation of *Brucella melitensis* biovar 3 from human breast milk. Scand J Infect Dis. 2007;39:205–8. DOI: 10.1080/00365540600978898
2. Almuneef MA, Memish ZA, Balkhy HH, Alotaibi B, Algoda S, Abbas M, et al. Importance of screening household members of acute brucellosis cases in endemic areas. Epidemiol Infect. 2004;132:533–40. DOI: 10.1017/S0950268803001857
3. Pappas G, Akritidis N, Bosilkovski M, Tsianos E. Brucellosis. N Engl J Med. 2005;352:2325–36. DOI: 10.1056/NEJMra050570
4. Pappas G, Panagopoulou P, Christou L, Akritidis N. *Brucella* as a biological weapon. Cell Mol Life Sci. 2006;63:2229–36. DOI: 10.1007/s00018-006-6311-4
5. Galanakis E, Bourantas KL, Leveidiotou S, Lapatsanis PD. Childhood brucellosis in north-western Greece: a retrospective analysis. Eur J Pediatr. 1996;155:1–6.
6. Galanakis E, Makis A, Bourantas KL, Papadopoulou ZL. Interleukin-3 and interleukin-4 in childhood brucellosis. Infection. 2002;30:33–4. DOI: 10.1007/s15010-002-2039-8
7. Sarafidis K, Agakidis C, Diamanti E, Karantaglis N, Roilides E. Congenital brucellosis: a rare cause of respiratory distress in neonates. Am J Perinatol. 2007;24:409–12. DOI: 10.1055/s-2007-984407
8. Arroyo Carrera I, Lopez Rodriguez MJ, Sapina AM, Lopez Lafuente A, Sacristan AR. Probable transmission of brucellosis by breast milk. J Trop Pediatr. 2006;52:380–1. DOI: 10.1093/tropej/fml029

Address for correspondence: Georgios Pappas, Institute of Continuing Medical Education of Ioannina, H. Trikoupi 10, 45333, Ioannina, Greece; email: gpele@otenet.gr

# Hepatitis E Virus Genotype 1, Cuba

**To the Editor:** Hepatitis E virus (HEV) causes acute viral hepatitis, which in rare cases leads to fulminant hepatitis with high death rates, especially among women in their third trimester of pregnancy (*1*). Sporadic infections and epidemics have been reported from all parts of the world, especially Asia, Africa, and Latin America. Although indigenous hepatitis E has rarely been observed in industrialized countries, higher than expected anti-HEV prevalence has been detected in these areas (*1*). In the Caribbean region, many countries including Cuba, Haiti, Guatemala, and Honduras have reported hepatitis E (*2,3*), but the viruses have not been characterized.

The transmission of HEV is primarily fecal–oral, through contaminated drinking water; limited zoonotic transmission has also been reported. Despite only 1 serotype, 4 major genotypes of HEV have been reported (*1*). Genotype 1 is mainly responsible for sporadic infections and large outbreaks in Asia and Africa. Genotype 2 was first found in Mexico and later on the African continent. Genotypes 3 and 4 have been reported from the United States, Europe, China, Japan, and Taiwan; this group also includes the related swine HEV (*1*).

We report the phylogenetic analysis of 11 HEV isolates from 2 outbreaks and sporadic cases in Havana, Cuba. The first outbreak occurred in 1999 in a factory; 20 persons were affected (12 women, 8 men; median age 45 years, range 22–53 years). The second outbreak was in 2005 in a suburb of Havana and involved 26 persons (15 women, 11 men; median age 24 years, range 17–45 years). We also analyzed HEV in 12 sporadic clinical cases obtained from the Cuban national surveillance program for viral hepatitis. Most patients reported asthenia, epigastric pain, nausea, and vomiting. None had any history of international travel, contact with persons traveling from disease-endemic areas, or consumption of exotic foods. Serologic screening showed all patients to be negative for immunoglobulin (Ig) M against hepatitis A and hepatitis C viruses. One patient had positive results for hepatitis B surface antigen but negative results for anti-hepatitis B core antigen IgM and hepatitis B virus DNA. All patients were positive for anti-HEV IgM (Genelab Diagnostics, Singapore) according to the manufacture's criteria. A total of 22 serum samples (outbreak 1, n = 9; outbreak 2, n = 7; sporadic cases, n = 6) were tested for HEV RNA; only 2 (both from sporadic cases) were positive. A total of 31 serum samples were also tested for anti-HEV IgG (Genelab Diagnostics), of which 22 were positive