Large Human *Brucella melitensis* Outbreak in Israel, 2014

Armon, L.,[1] Hadani, Y.,[2] Chechik, C.[1] and Bardenstein, S.[1]

[1] Kimron Veterinary Institute, Bet Dagan, Israel.
[2] Veterinary Services, Israel.

* **Corresponding Author:** Dr. Svetlana Bardenstein, Department of Bacteriology, Brucella OIE, FAO Reference laboratory, Kimron Veterinary Institute, POB 12, Bet Dagan, 50250, Israel. Tel: +972-3-9681715. E-mail: svetab@moag.gov.il

ABSTRACT

A case study is presented of a large *Brucella melitensis* outbreak in the North of Israel presumably due to the consumption of infected goat cheese. Over a period of six months a total number of 41 isolates were tested and all of them were confirmed to be *B. melitensis* biovar 1, field strain, by standard bacteriological methods. Fourteen goat herds in the region were tested for brucellosis of which 10 were found serologically positive out of which *B. melitensis* was isolated from 5 herds. Four herds had *B. melitensis* biovar 1 and one herd *B. melitensis* biovar 2. The intra-herd prevalence of seropositive animals did not appear to be a factor determining the number of sick family members. Additionally, the major route of infection in humans was found to be the consumption of contaminated dairy products.

Keywords: Human brucellosis; Outbreak; *Brucella melitensis*, Goat cheese; Israel

INTRODUCTION

Brucella melitensis, the cause of Malta fever, Mediterranean fever, or undulant fever is a zoonotic disease endemic in many areas of the world including Israel (1). It is mostly acquired by consumption of contaminated unpasteurized dairy products or by a close contact with infected animals. The greatest risk of *Brucella melitensis* transmission is considered to be associated with the products derived from sheep and goats (2). In humans brucellosis causes non-specific 'flu-like symptoms often together with joint pain, but may cause severe complications when treated inappropriately (3). *Brucella melitensis* is intracellular gram-negative, facultative bacteria of the *Brucella* species (4). In Israel *Brucella melitensis* may be present in sheep, goats and humans. Sometimes it was also found in cattle (5) and camels (6). The control of brucellosis in Israel is carried out by the Veterinary Services using Rev1 vaccination of the young females and annual serological testing of unvaccinated males. In cases where human brucellosis is reported, herds suspected to be the source of the disease are extensively tested and sick and seropositive animals eradicated.

This report describes an outbreak of brucellosis caused by *Brucella melitensis* in the North of Israel with a description of the epidemiological investigation and bacteriological findings.

CASE REPORT

Here we describe a large human brucellosis outbreak due to *Brucella melitensis* in a small town (about 15,000 residents) at the north of Israel. This town is composed of a relatively isolated population with close contacts between the families. Many of the town's people have sheep or goat herds as small milk production units mainly for domestic usage. For many years there have been infrequent cases of human brucellosis (up to two cases per year), although occasionally some of the herds were found to be serologically positive. In April 2014 a number of *Brucella* isolates from hospitalized patients from this town were sent to the Brucellosis Reference

Table 1: Infected herds and related human infections

Herd number	Animal type	Total number of animals	Serologically positive	Prevalence (%)	Brucella isolation	Sick family members
1	Goat	177	3	2		1
2	Sheep	177	13	7	Biovar 2	1
3	Goat	98	0	0		0
4	Goat	97	19	20		1
5	Goat	31	13	42	Biovar 1	9
6	Goat	22	4	18	Biovar 1	0
7	Sheep, goat	185	49	26		0
8	Goat	132	24	18		0
9	Goat	100	0	0		1
10	Goat	200	62	31	Biovar 1	0
11	Goat	79	6	8		1
12	Goat	122	47	39	Biovar 1	0
13	Goat	18	0	0		0
14	Goat	10	0	0		0

Laboratory for confirmation. During a period of six months a total number of 41 isolates were received. All of them were confirmed to be *B.melitensis* biovar 1, field strain, by standard bacteriological methods (7).

It was suspected that the actual number of brucellosis patients was probably higher than the number of submitted isolates. The disproportionate number of infected people over a short time period suggested a single source of the disease outbreak and therefore, an intensive epidemiological investigation was initiated in order to determine the source of the outbreak. All of the patients mentioned were found to be purchasing goat cheese from a certain family's herd of goats. All of the goats in this herd together with additional 13 herds were tested for brucellosis. As shown in Table 1, out of the 14 herds, 10 were found serologically positive using the agglutination (SAT) and complement (CFT) tests. Out of the positive herds we were able to isolate *Brucella melitensis* from 5 herds (using milk pools of up to 5 serologically positive animals). Four herds had *B. melitensis* biovar 1 and one herd *B. melitensis* biovar 2. All of the positive animals were slaughtered and the *Brucella* infection in the herds was controlled by the "test and slaughter" paradigm.

DISCUSSION

When analyzing brucellosis distribution between the patients, it was notable that most of them were not in a direct contact with infected animals, but rather acquired the disease via consumption of the contaminated goat cheese. The family with the highest number of infected family members (9 members) was in fact the distributor of the contaminated cheese (herd number 5). Furthermore the intra-herd prevalence of seropositive animals did not appear to be a factor determining the number of sick family members: i.e. herd number 12 had an incidence of 39% of animals infected and showed the same infection prevalence among goats as that in herd 5 with 42% of goats infected without any human isolates obtained from this family. Additionally, there did not appear to be any age or gender specific preference for infection by *B.melitensis*.

In conclusion, we describe a large brucellosis outbreak occurring in Israel in 2014. This outbreak is a typical example of a brucellosis outbreak, apparently from a single source. Our data suggests that in this case the highest risk factor for brucellosis infection was consumption of contaminated unpasteurized dairy products rather than direct contact with infected animals due to the multiplicity character of such

an infection route, goat cheese being consumed by many associated individuals.

REFERENCES

1. Pappas, G., Papadimitriou, P., Akritidis, N., Christou, L. and Tsianos, E.V.: The new global map of human brucellosis. Lancet Infect. Dis. 6: 91-99, 2006.
2. Cooper, C.: Risk factors in transmission of brucellosis from animals to humans in Saudi Arabia. Trans. R. Soc. Trop. Med. Hyg. 86: 206-209, 1992.
3. Pappas, G., Akritidis, N., Bosilkovski, M. and Tsianos, E.: Brucellosis. N. Engl. J. Med. 352: 2325-2336, 2005.
4. Banai, M. and Corbel, M.: Taxonomy of Brucella. Open Vet. Sci. J. 30: 85-101, 2010.
5. Bardenstein, S. and Banai, M.: Brucella Species Synchronize Their Life Cycle to the Gestation Cycle of their Ruminant Hosts. In: Shafferman, A., Ordentlich, A., and Velan, B. editors. The Challenge of Highly Pathogenic Microorganisms – Mechanisms of Virulence and Novel Medical Countermeasures. Dordrecht: Springer Netherlands. pp. 135-146, 2010.
6. Shimol, S., Dukhan, L., Belmaker, I., Bardenstein, S., Sibirsky, D., Barrett, C. and Grenberg, D.: Human brucellosis outbreak acquired through camel milk ingestion in southern Israel. Isr. J. Med. Assoc. 14: 475-478, 2012.
7. Alton, G.G., Jones, L.M., Angus, R.D. and Verger, J.M.: Techniques for the brucellosis laboratory. Paris: INRA. pp. 39-61, 1988.