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Short Communication

First report of *Enterocytozoon bieneusi* from dairy cattle in Argentina

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ABSTRACT

Fecal specimens were obtained from a total of 70 dairy calves less than two months old on 11 municipalities in Buenos Aires, Argentina. After removal of fecal debris by sieving and sucrose flotation, specimens were subjected to PCR to detect the presence of *Enterocytozoon bieneusi*. PCR revealed a 14.3% of prevalence for *E. bieneusi* with 10 positive calves from 7 municipalities. Gene sequence analysis conducted in all samples positives by PCR revealed the presence of six genotypes; four previously reported in cattle as well as humans (D, I, J, and BEB4), one never reported in cattle before but previously reported in humans (EbpC), and one novel genotype (BEB10). These results constitute the first molecular characterization of *E. bieneusi* in Argentina, and suggest a potential risk of zoonotic transmission in this area.

1. Introduction

Microsporidia constitutes a group of emerging opportunistic pathogens that has a wide range of vertebrates and invertebrate as hosts. Most of the species infect invertebrates and fish, but 14 species in 8 genera infect humans (Didier and Weiss, 2006). In humans, two species are the most commonly identified, *Enterocytozoon bieneusi* and *Encephalitozoon intestinalis*. Of those, *E. bieneusi* is the most frequently reported worldwide mainly associated with chronic diarrhea and wasting syndrome (Didier and Weiss, 2011). It is considered as an opportunistic pathogen in HIV patients and other immunosupressed individuals (Nissapatorn and Sawangjaroen, 2011). *E. bieneusi* has been identified in water sources as well as in wild, domestic, and food-producing farm animals, raising concerns of water-borne, food-borne, and zoonotic transmission. The genotyping of *E. bieneusi* using sequencing analysis of the ribosomal internal transcriber spacer (ITS) has shown more than 100 genotypes, some *E. bieneusi* genotypes are host-adapted while others have no host specificity and are considered zoonotic (Santín and Fayer, 2009).

Since the first report of *E. bieneusi* in cattle in 8 calves in Germany (Rinder et al., 2000), *E. bieneusi* has been identified as a common parasite of dairy and beef cattle and it has been identified in cattle from countries in Africa, Asia, Europe, and North America. In cattle, host-specific as well as zoonotic *E. bieneusi* genotypes have been reported (Table 1). It is still not clear the role that cattle play in the

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Table 1
E. bieneusi genotypes reported in humans, cattle and other hosts including findings from this study.

E. bieneusi genotype (GenBank accession number)	Synonyms (GenBank accession number)	Host	Location
Type IV (AF242478)	K (AF267141), Peru2 (AY371277), PtEBIII (DQ885579), BEB5 (AY331009), BEB5-var (AY331010)[a], CMITS1	Humans, cattle, cats, rhesus monkey, and dogs	Cameroon, China, Colombia, Gabon, England, France, Germany, Iran, Japan, Korea, Malawi, Netherlands, Niger, Nigeria, Peru, Portugal, Uganda, and USA
Peru6 (AY371281)	PtEb I (DQ425107), PtEb VII (DQ885583)	Humans, cattle, birds, and dogs	Peru, Portugal, and USA
D (AF101200)	WL8 (AY237216), PigEBITS9 (AF348477), Peru9 (AY371284), PtEb VI (DQ885582), CEbC (EF139197)	Humans, cattle, pigs, beaver, fox, muskrat, raccoon, falcon, horse, dog, mice, rhesus monkey, and baboon	Abu Dhabi, Argentina, Brazil, China, Colombia, Congo, Czech Republic, Gabon, Cameroon, England, India, Iran, Japan, Kenya, Korea, Malawi, Netherlands, Niger, Nigeria, Peru, Portugal, Russia, South Africa, Spain, Thailand, Tunisia, USA, Vietnam
BEB4 (AY331008)	CHN1 (HM992509)	Humans, cattle, and pigs	Argentina, China, Czech Republic, South Africa, and USA
EbpA (AF076040)	F (AF132833)	Humans, cattle, pigs, horses, and mice	Czech Republic, Germany, Japan, Nigeria, Switzerland, and USA
I (AF135836)	BEB2 (AY331006), CEbE (AF139199)	Humans and cattle	Argentina, China, Czech Republic, Germany, Korea, South Africa, and USA
J (AF135837)	BEB1 (AY331005), PtEb X (DQ885586), CEbB (EF139196)	Humans, cattle, and birds	Argentina, China, Germany, Korea, Portugal, and USA
CHN3 (HM992511)		Humans and cattle	China
CHN4 (HM992512)		Humans and cattle	China
BEB3 (AY331007)		Cattle	USA
BEB3-like (JQ923448)		Cattle	South Africa
PtEb XI (DQ885587)		Cattle	Portugal
BEB6 (EU153584)		Cattle and goats	Peru and USA
BEB7 (EU153585)		Cattle	USA
4948 FL-2 2004 (DQ154136)		Cattle	USA
CEbA (EF139195)		Cattle	Korea
CEbD (EF139198)		Cattle	Korea
BEB8 (JQ044398)		Cattle	USA
BEB9 (JQ044399)		Cattle	USA
CEbF (EF139194)		Cattle	Korea
M (AF267143)		Cattle	Germany
N (AF267144)		Cattle	Germany
CAF1 (DQ683746)	PEbE	Humans and pigs	Gabon, Niger, and Korea
EbpC (AF076042)	E (AF135832), WL13 (AY237221), Peru4 (AY371279), and WL17 (AY237225)	Humans, cattle, pigs, beavers, otters, muskrats, raccoons, and foxes	Argentina, Germany, Japan, Peru, Switzerland, Thailand, USA, and Vietnam
Peru 16 (EF014427)		Humans and guinea pigs	Peru
Peru10 (AY371285)		Humans and cats	Colombia and Peru
WL11 (AY237219)	Peru5 (AY371280)	Humans, cats, dogs, and foxes	Colombia, Peru, and USA
WL15 (AY237224)	WL16 (AY237224) and Peru14 (EF014430)[a]	Humans, beavers, foxes, raccoons, and muskrats	Peru and USA
O (AF267145)		Humans and pigs	Germany and Thailand
S6 (FJ439682)		Humans and mice	Czech Republic, Germany, and Malawi
Peru8 (AY371283)		Humans, chickens, and mice	Czech Republic, Germany, Malawi, and Peru
CZ3 (GU198951)		Humans and mice	Czech Republic and Germany
C (AF101199)	II (AF242476)	Humans and mice	Czech Republic, France, Germany, Netherlands, and Switzerland
PigITS5 (AF348173)	PEbA	Humans, pigs, and mice	Czech Republic, Germany, Japan, Korea, and USA
WL12 (AY237220)		Humans, beavers, and otters	Brazil and USA
BEB10 (KF675191)		Cattle	Argentina

Adapted from Santín et al. (2012).
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