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Short communication

A *Pasteurella multocida* strain affecting nulliparous heifers and calves in different ways

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ABSTRACT

Pasteurella multocida isolates from dairy cattle on a farm in Spain were associated with pneumonia of calves (six isolates) and mastitis of heifers (five isolates). The objective was to determine if the *P. multocida* isolates retrieved from both disease scenarios were the same strain or whether more than one strain was present. The isolates were identified by a species-specific polymerase chain (PCR) assay, serotyped by the Heddleston scheme and then typed by a number of molecular genotyping assays including multi-locus sequence typing (MLST). The 11 isolates were confirmed as *P. multocida* but failed to react with any of the 16 Heddleston antisera. The PCR targeting the genes associated with the lipopolysaccharide outer core biosynthesis locus assigned all the isolates to L3–the type that contains Heddleston serovars 3 and 4. The MLST analysis showed all isolates belonging to ST 79 within the clonal complex of ST13. Only one of the isolates showed a slight different profile by the repetitive extragenic palindromic PCR. The conclusion was that the same strain was associated with pneumonia in calves and mastitis in heifers.

1. Introduction

Pasteurella multocida is a pathogen that can affect many host species and is associated with both non-specific and specific disease syndromes (Wilson and Ho, 2013). The specific disease syndromes vary with the host species. There are five capsule serogroups (A–F), and 16 somatic serovars based on lipopolysaccharide (LPS) antigens according to the Heddleston serotyping scheme, which has recently been transferred to a polymerase chain reaction (PCR) methodology recognising eight LPS types (Harper et al., 2015).

Some of the somatic serovars have been associated with certain diseases – haemorrhagic septicaemia in cattle is associated with Heddleston serovars 2 and 5 (St Michael et al., 2009), while shipping fever and enzootic calf pneumonia in cattle has been reported to be associated with Heddleston serovar 3 (Dabo et al., 2007). In addition, studies have shown that the same strain can occur in different host species, such as cats and broilers during a fowl cholera outbreak (Singh et al., 2014). Overall, there is convincing evidence that the same serovar can cause different diseases in different host species, but there is little evidence on whether the same serovar/genotype can be associated with different disease expressions in the same host species. One example was the spread of a *P. multocida* strain via artificial insemination in turkeys causing mortalities with suppurative lesions in the cloaca and vagina and at a later relapse additional purulent pneumoniae (Cariou et al., 2013).

This study reports on the characterisation of *P. multocida* isolates retrieved from two distinct disease scenarios on a single dairy farm to determine if one strain of *P. multocida* is contributing to the two different disease conditions of pneumonia and mastitis.

2. Materials and methods

2.1. Farm details

The farm in question is a dairy heifer replacement farm in Spain. Female calves from different dairy herds are sent to this farm. At an

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Table 1
Disease observed in 11 animals on the dairy farm in Spain and results from the analysis of *P. multocida* isolates from nasal swabs and udder secretion by serotyping and genotyping methods.

Disease observation on farm											Diagnostic in the laboratory							
Animal no	Arrival	Age (days) it displayed mastitis	Affected quarter with Mastitis	Number of times it had pneumonia	Date it had pneumonia	Age (days) it displayed pneumonia	Diagnostic results	Severe Diarrhoea	Haemoraghic diarrhoea	Other symptoms	Origin	Sample No	Isolate	LPS multiplex PCR	rep PCR profile	Heddleston serotyping tested for seorvar 3 and 4	ST	clonal complex
39684	03-10-2013			6	11/11/2013; 21/11/2013; 02/12/2013; 16/12/2013; 23/12/2013; 06/01/2014	45; 55; 66; 80; 87; 101	*P. multocida; Mycoplasma bovirhinis, Mannheimia haemolytica*	11/10/2013; 13/10/2013; 19/10/2013; 21/10/2013			Nasal exudate	140134	*Pasteurella multocida*	L3	1	no reaction	79	ST13
38160	22-10-2013			3	05/12/2013; 06/01/2014; 13/01/2014	66; 98; 105	*P. multocida; M. bovirhinis*	01–11-2013			Nasal exudate	140134	*Pasteurella multocida*	L3	1	no reaction	79	ST13
41725	17-09-2013			3	09/12/2013; 09/01/2014; 30/01/2014	89; 120; 141	*P. multocida*	19/09/13; 17/10/13			Nasal exudate	140134	*Pasteurella multocida*	L3	1	no reaction	79	ST13
44053	14-10-2013			3	09/01/2014; 20/01/2014; 16/04/2014	100; 111; 197	*P. multocida; M. bovirhinis*				Nasal exudate	140135	*Pasteurella multocida*	L3	1	no reaction	79	ST13
41976	22-10-2013			1	09-01-2014	100	*P. multocida; M. bovirhinis*				Nasal exudate	140135	*Pasteurella multocida*	L3	1	no reaction	79	ST13
47019	02-07-2014			3	04/09/2014; 22/09/2014; 21/11/2014	78; 96; 157	*P. multocida*				Nasal exudate	144203	*Pasteurella multocida*	L3	1	no reaction	79	ST13
33323	11-09-2012	539	left back	1	03-12-2012	97	*P. multocida*	14-09-2012			Udder secretion	140655	*Pasteurella multocida*	L3	1	no reaction	79	ST13
35352	27-03-2012	731	right back	0			*P. multocida*	29/03/2012; 10/8/2012	19/5/2012; 4/6/2012; 25/7/2012		Udder secretion	141287	*Pasteurella multocida*	L3	1	no reaction	79	ST13
37265	07-08-2012	677	right front	1	20-03-2013	239	*P. multocida*	27-08-2012		fever 29/06/2014	Udder secretion	142573	*Pasteurella multocida*	L3	1	no reaction	79	ST13
42764	16-07-2013	610	right front	0			*P. multocida*	18-07-2013			Udder secretion	151102	*Pasteurella multocida*	L3	2	no reaction	79	ST13
39591	17-06-2013	615	left front	2	29/8/2013; 02/12/2013	87; 182	*P. multocida*	20-06-2013			Udder secretion	150563	*Pasteurella multocida*	L3	1	no reaction	79	ST13