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Short Communication

Was the French clinical surveillance system of bovine brucellosis influenced by the occurrence and surveillance of other abortive diseases?

Anne Bronner[a,*], Eric Morignat[a], Anne Touratier[b], Kristel Gache[b], Carole Sala[a], Didier Calavas[a]

[a] ANSES-Lyon, Unité Epidémiologie, 31 avenue Tony Garnier, 69364 Lyon Cedex 07, France
[b] GDS France, 149, rue de Bercy, 75595 Paris Cedex 12, France

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ABSTRACT

The bovine brucellosis clinical surveillance system implemented in France aims to detect early any case of bovine brucellosis, a disease of which the country has been declared free since 2005. It relies on the mandatory notification of every bovine abortion. Following the spread of the Schmallenberg virus (SBV) in France in 2012 and 2013, and the implementation in 2012 of a clinical surveillance programme of Q fever based on abortion notifications in ten pilot *départements*, our objective was to study whether these two events influenced the brucellosis clinical surveillance system. The proportion of notifying farmers was analyzed over each semester from June 1, 2009 to June 30, 2013 according to the size and production type of herds, SBV status of *départements* and the implementation of the Q fever surveillance. Our analysis showed a slight increase in the proportion of notifying farmers as *départements* became infected by SBV, and after the implementation of Q fever surveillance (during the first semester of 2013). These variations might be explained by an increase in abortion occurrence (congenital deformities in newborns, due to SBV) and/or by an increase in farmers' and veterinarians' awareness (due to the spread of SBV and the implementation of the Q fever surveillance). These results highlight the difficulties in interpreting variations in the proportion of notifying farmers as a consequence of an increase in abortion occurrence. As bovine abortion surveillance can play an important role in the early warning for several diseases, there is a need to explore other ways to monitor abortions in cattle, such as syndromic surveillance using the dates of artificial insemination or calving data.

1. Introduction

The bovine brucellosis clinical surveillance system implemented in France aims to detect early any case of bovine brucellosis, a disease of which the country has been declared free since 2005. It relies on the mandatory notification of every bovine abortion. According to national regulations, farmers have to call their veterinarian for any bovine abortion, defined by the French "Code Rural" as the expulsion of the foetus or calf, stillborn or dying within 48 h of birth (Anonymous, 2003). The veterinarian has then to report the abortion and take a blood sample from the aborting female to test for *Brucella* spp. The veterinarian' visit and subsequent laboratory analyses are funded by veterinary services. However, the brucellosis clinical

* Corresponding author. Tel.: +33 (0)478726543; fax: +33 (0)478619145.
E-mail address: anne.bronner@anses.fr (A. Bronner).

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Table 1
Production type of cattle herds.

Production type	Definition
Beef	Herds with more than 10 calvings from beef females and less than 10 calvings from dairy females.
Dairy	Herds with more than 10 calvings from dairy females and less than 10 calvings from beef females.
Mixed	Herds with more than 10 calvings from dairy females and more than 10 calvings from beef females.
Small herd	Herds with less than 10 calvings from dairy females and less than 10 calvings from beef females, with a mean number of females over 24 months of age held per week less than 10, and from which less than 10 males were sent to slaughterhouse.
Other	Herds with less than 10 calvings from dairy females and less than 10 calvings from beef females, with a mean number of females over 24 months of age held per week above 10, and/or from which more than 10 males were sent to slaughterhouse.

surveillance system has been documented to have limited sensitivity. Besides, the proportion of notifying farmers (i.e. the ratio of the number of farmers who reported at least one abortion to the total number of farmers) and the sensitivity of the surveillance system were highly influenced by the occurrence of the bluetongue virus serotype 8 (BTV-8) in 2007/2008 in France, due to an increase in abortions occurrence and to an increase in farmers' and veterinarians' awareness of the need to detect the disease (Bronner et al., 2013). However, we wondered whether this influence was specific to BTV-8, or would also exist if other abortive diseases occurred or were monitored. Accordingly, it was worthwhile to question the influence of the emergence of the Schmallenberg virus (SBV) and the implementation of a clinical surveillance programme of Q fever on the bovine brucellosis clinical surveillance system.

SBV is caused by a novel *Orthobunyavirus* and was first identified in Germany in November 2011. The first cases of SBV virus infection were confirmed in France in deformed lambs on January 25, 2012, indicating a circulation of SBV during the second semester of 2011 (Dominguez et al., 2012a). Non-specific clinical signs such as fever, decreased milk production and diarrhoea are associated with the acute infection in cattle, while late abortions and birth defects in newborns were reported on pregnant females infected by SBV (Hoffmann et al., 2012). Since its emergence, SBV infection has been closely monitored (Dominguez et al., 2012b). Farmers were urged to contact their veterinarian when encountering cases of ruminant neonates or foetuses stillborn, malformed or showing nervous disorders to test them for SBV (Dominguez et al., 2012b; Gache et al., 2013a). During season I of SBV (from September 1, 2011 to August 31, 2012), congenital forms of SBV infection were detected in 2018 cattle herds, located in 74 *départements* (a *département* is a French administrative unit with a mean area of 5800 km^2). During season II of SBV (from September 1, 2012 to August 31, 2013), 1531 cattle herds were detected, located in 76 *départements*.

Besides the SBV surveillance, a clinical surveillance programme of Q fever has been implemented since the second semester of 2012 in ten pilot *départements* (Anonymous, 2012; Gache et al., 2013b). This surveillance relies on the brucellosis clinical surveillance system: In case of repeated abortions (i.e. two abortions within 30 days), aborting females are simultaneously tested for brucellosis and Q fever. Half the cost of laboratory tests is funded by veterinary services. The remaining cost of laboratory tests is partially or totally funded by the *Groupements de Défense Sanitaire* (GDS, a *départemental* association of stock farmers addressing health issues). Thus, in some *départements*, farmers have to contribute to the cost of Q fever analysis. In this context, stakeholders involved in the surveillance of bovine abortions raised the question of a possible influence of additional costs supported by some farmers to test aborting cows for Q fever on their willingness to participate in the brucellosis surveillance system.

Thus, our objectives were to assess if the SBV epizootic and/or the implementation of the clinical surveillance programme of Q fever influenced the proportion of notifying farmers and if they did, to quantify it.

2. Materials and methods

2.1. Data sources and study population

Abortion notification data were extracted from the French national animal health information database SIGAL (Système d'information de la Direction générale de l'alimentation), including the herd identification number and dates of veterinarian visits. For all farmers, information about farm location (*département*), animals (identification number, birth date, sex and breed), and animal movements (herd identification number, date, reason for entry and for exit) were extracted from the French National Cattle Register.

The study focused on abortions reported from July 1, 2009 to June 30, 2013 and included 77 *départements* in which at least one abortion per year since 2008 was reported, and 177,735 cattle herds where at least one calving was recorded each year over the study period. For each semester included in the study period, a cattle herd was characterized by its *département*, size, production type and the existence of an abortion notification. Herd size was calculated as the mean number of females over 24 months of age per week. Five production types were defined according to the breeds and the number of calvings (Table 1).

Départements were categorized according to their SBV status, by differentiating *départements* first infected by SBV during season I (with more than 20 reported cases during season I), *départements* first infected by SBV during season II (with less than 20 reported cases during season I but more than 20 reported cases during season II), and *départements* poorly infected by SBV whatever the season (with less than 20 reported cases during season I and season II). Indeed, the