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Abortions in Cattle on the Level of Tiaret Area (Algeria)

F.Z. Abdelhadi, S.A. Abdelhadi, A. Niar, B. Benallou, S. Meliani, N.L. Smail and D. Mahmoud

Institute of Veterinary Sciences, Ibn-Khaldoun University of Tiaret, Tiaret 14000, Algeria

Abstract: Total number of 1087 dairy cows belonging to 40 farms of different size and distributed on totality of Tiaret area were used in a study on abortion. During the first phase of our work, cows were followed over years 2011 and 2012. Average rate of abortions over this period was 5.61%. The highest rate was recorded over the last third of gestation with an average of 2.80%. This rate was 1.79% during the second third and 1.01% over the first third. Compared to months of year, the lowest average rate abortion was registered in November with only 0.04%, it has tended to remain until May at rates lower than 0.6%; thereafter, the rate began to increase until peaking in July with 1.19%, we have noted after a gradual decline to return eventually to lower values with an average rate of 0.13% in October. The second phase of our study was carried out in 2013. 92 blood samples were tested by ELISA serology, 46.81% were positive for one or more of sought abortive agents: Q fever has accounted for 23.91%, toxoplasmosis 15.21%, brucellosis 6.52%, neosporosis 2.17% and chlamydiosis 0%.

Key words: Abortion · Cattle · ELISA Technique · Brucellosis · Chlamydiosis · Toxoplasmosis · Neosporosis · Q Fever

INTRODUCTION

In spite of the considerable potential of Algeria in bovine breeding, the country still faces a huge deficit in dairy and meat production; This problem imposes each year to our state, a pretty hefty import invoice which amount to 2.045 billion dollars for milk and 0.307 billion for meat in 2014 [1].

Cattle farmers, across the world, are confronted to major problems in management where economic losses caused by abortions are cited recurrently because they not only lead to the loss of much-needed products, but also to huge costs in treatment and feeding of animals.

Abortion rates recorded in farms vary from region to other across the world; it was respectively 10.8% in 10 Holstein herds in northwest of United States [2], 1.5% in 507 Danish herds [3] and 10% of a total of 822 cows in Medea (Algeria) [4].

The main objective of our study is to make a total evaluation of abortions in our herds and to identify infectious agents that cause contamination of our farms by using ELISA tests.

MATERIALS AND METHODS

Our study involved 40 cattle farms composed of 1087 dairy cows which were distributed on totality of Tiaret area (Figure 1).

The first part of our study consisted in following up our cows over the period 2011-2012 in order to determine;

- The average rate of abortions in each farm.
- Frequency of abortions according to size of herds, age of gestation and months of the year.

The second part of our study was conducted during 2013 at the Institute of Veterinary Sciences of Tiaret, it consisted to search several abortive agents by ELISA serology, for this, we followed a simple random sampling method to select 92 cows among animals belonging to the 40 farms used in the first part of study. We have included a number of animals proportional to the size of each herd.

The collected blood was centrifuged for 10 minutes at 3000 rpm; the sera obtained were immediately poured into Eppendorf tubes. These have been properly identified and frozen at-18 ° C until needed.

Corresponding Author: F.Z. Abdelhadi, Institute of Veterinary Sciences, Ibn-Khaldoun University of Tiaret, Tiaret 14000, Algeria.

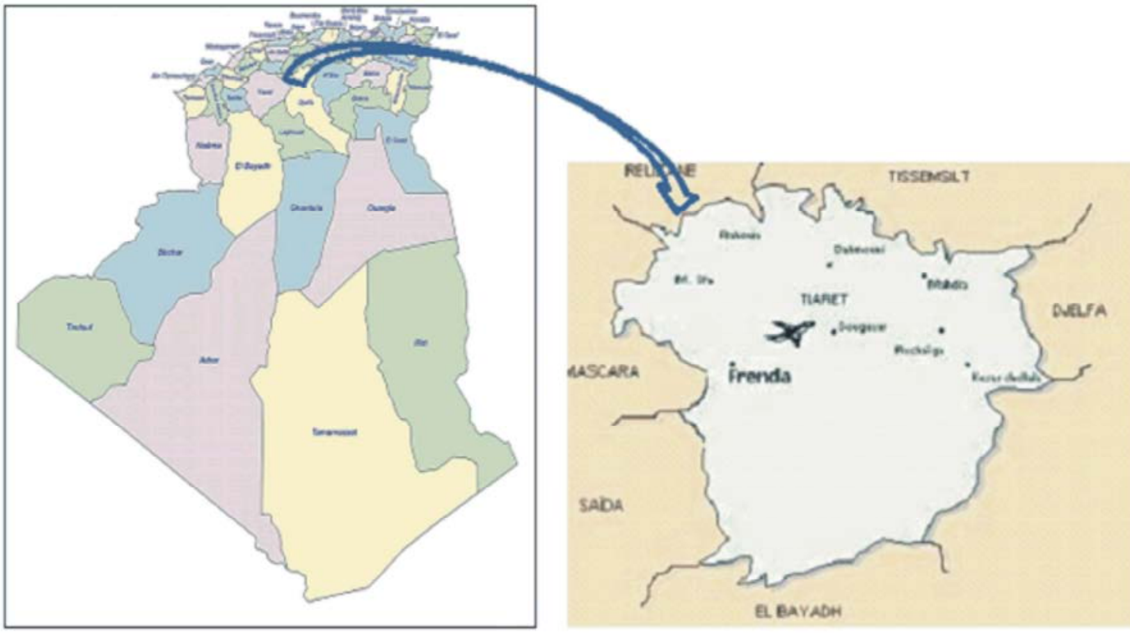

Fig. 1: Study area (Tiaret Province, Algeria)

After harvesting all samples and for more reliable results, each serum was analysed twice using specific ELISA kits for the following agents: *Brucella abortus*, *Toxoplasma gondii*, *Neospora caninum*, *Chlamydofila abortus* and *Cocxiella burnetii* (Q fever). These kits were provided by Pourquier Institute, Montpellier, France. Stages of work as well as reading and validation of tests were performed according to the manufacturer's instructions:

Brucellosis: The test is valid if;

- The average OD value of positive controls (OD_{PC}) is greater than 0.350.
- The ratio of the mean of positive controls (OD_{PC}) and the mean of negative controls (OD_{NC}) exceeds 3.

For each sample, we calculate the percentage S / P;

$$\%\frac{S}{P}=\frac{ODsample-(OD\ positivecontrol)}{OD\ positivecontrol-ODnegativeControl}\times 100$$

Samples with an S / P:

- Less than or equal to 90% are considered negative
- Greater than 90% and less than 110% are considered doubtful
- Greater than or equal to 110% are considered positive

Toxoplasmosis: The test is valid if;

- The average OD value of positive controls (OD_{PC}) is greater than 0.350.
- The ratio of the mean of positive controls (OD_{PC}) and the mean of negative controls (OD_{NC}) exceeds 3.5.

For each sample, we calculate the percentage S / P;

$$\frac{S}{P}=\frac{ODsample}{OD\ positivecontrol}\times 100$$

Samples with An S / P:

- Less than or equal to 40% are considered negative
- Between 40% and 50% are considered doubtful
- Greater than or equal to 50% and less than 200% are considered positive
- Greater than or equal to 200% are considered strongly positive

Neosporosis: The test is valid if;

- The average OD value of positive controls (OD_{PC}) is greater than 0.350.
- The ratio of the mean of positive controls (OD_{PC}) and the mean of negative controls (OD_{NC}) exceeds 3.

For each sample, we calculate the percentage S / P;

$$\frac{S}{P}=\frac{ODsample-ODnegative\,control}{OD\,positivecontrol-ODnegativeControl}\times 100$$

Samples with An S / P:

- Less than or equal to 40% are considered negative
- Between 40% and 50% are considered doubtful
- Greater than or equal to 50% are considered positive

Chlamydiosis: The test is valid if;

- The average OD value of positive controls (OD_{PC}) is greater than 0.350.
- The ratio of the mean positive controls (OD_{PC}) and the mean of negative controls (OD_{NC}) exceed 3.

For each sample, we calculate the percentage S / P:

$$\frac{S}{P}=\frac{ODsample}{OD\,positivecontrol}\times 100$$

Samples with An S / P:

- Less than or equal to 50% are considered negative
- Between 50% and 60% are considered doubtful
- Greater than or equal to 60% are considered positive

Q Fever: The test is valid if;

- The average OD value of the positive controls (OD_{PC}) is greater than 0.350.
- The ratio of the mean of positive controls (OD_{PC}) and the mean of negative controls (OD_{NC}) exceeds 3.

For each sample, we calculate the percentage S / P:

$$\frac{S}{P}=\frac{ODsample}{OD\,positivecontrol}\times 100$$

Samples with An S / P:

- Less than or equal to 40% are considered negative
- Between 40% and 50% are considered doubtful
- Greater than or equal to 50% and less than 80% are considered positive
- Greater than 80% are considered strongly positive

RESULTS

The rate of abortions recorded over the years 2011 and 2012 are shown in Table 1.

The average rate of abortions obtained for these two years was 5.61%. For the 40 farms of our study, the average rate of abortions was 5.79% with extremes of 4.93% and 9% for 2011 and 5.43% with extremes of 4.75 % and 6.09% for 2012.

Distribution of abortions according to age of gestation is shown in Figure 2.

The highest rate of abortion was recorded over the last third of gestation with an average of 2.80% during the two years of study 2011 and 2012. This rate was 1.79% over the second third and 1.01% during the first third.

Distribution of abortions by month over the years 2011 and 2012 is shown in Figure 3.

According to our results, the lowest average rate abortion was registered in November with only 0.04%, it has tended to remain until May at rates lower than 0.6%; thereafter, the rate began to increase until peaking in July with 1.19%, we have noted after a gradual decline to return eventually to lower values with an average rate of 0.13% in October.

Table 1: Abortion rate according to size of herds, over 2011 and 2012 years

Number of affected farms	Average number of cows per farm	Rate of abortions (%) Year 2011		Year 2012	
2/40	100	(18/200)	9%	(13/200)	6,5%
10/40	40	(20/402)	4,97%	(22/403)	5,45%
20/40	20	(21/404)	5,19%	(19/400)	4,75%
8/40	10	(4/81)	4,93%	(5/82)	6,09%
Total	-	(63/1087)	5,79%	(59/1085)	5,43%

(/): Number of abortions / number of cows

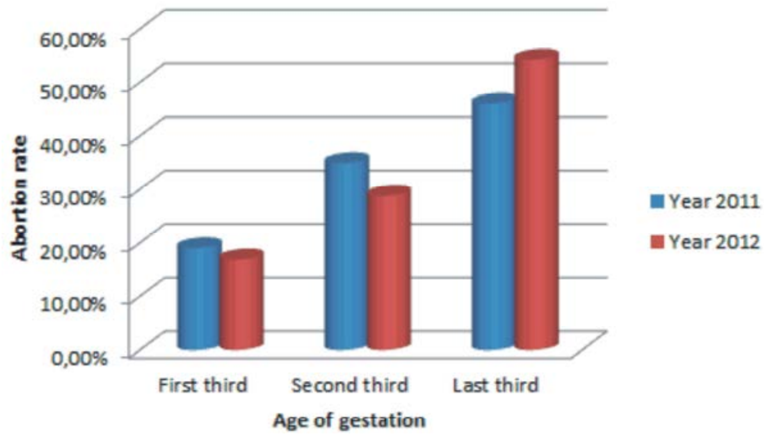

Fig. 2: Distribution of abortions according to gestational age

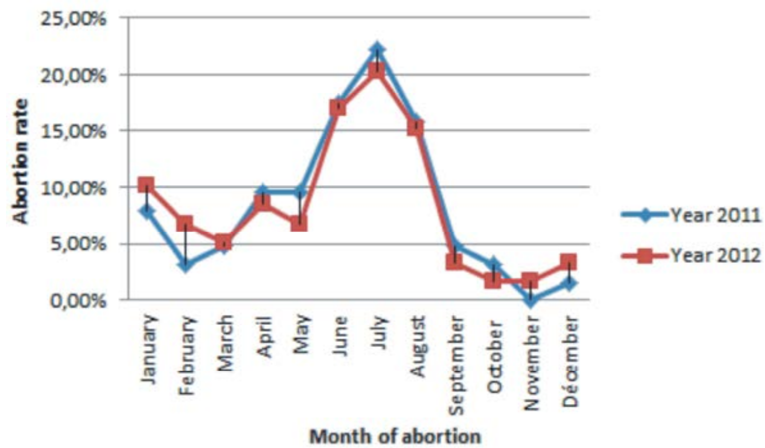

Fig. 3: Distributions of abortions by month over the years 2011 and 2012

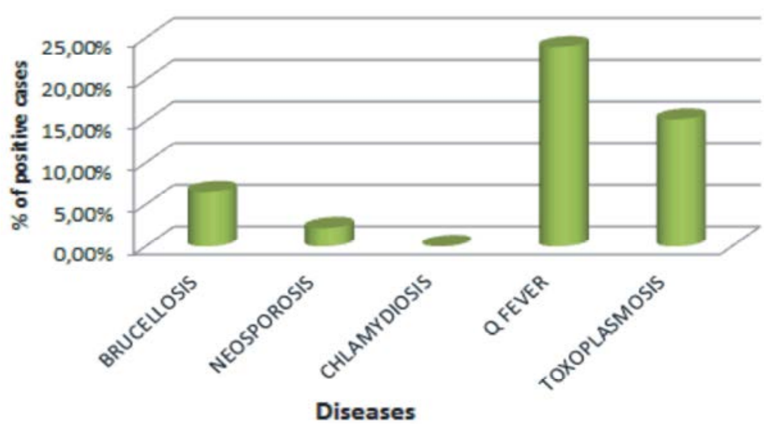

Fig. 4: Seroprevalence of abortifacient agents

Table 2: Results of blood analysis by ELISA, taken from 92 cows in 2013

Diseases	Brucellosis	Neosporosis	Chlamydiosis	Q Fever	Toxoplasmosis
% strongly positive	-	-	-	13,03 % (12)	-
% Positive	6,52 % (6)	2,17 % (2)	0,00 % (00)	10,86 % (10)	15,21 % (14)
% Doubtful	2,17 % (2)	0,00 % (00)	0,00 % (00)	17,39 % (16)	5,34 % (05)
% Négative	91,30 % (84)	97,82 % (90)	100 % (92)	58,69 % (54)	79,34 % (73)

Results of blood analysis by ELISA, taken from 92 cows in 2013 are summarized in Table 2.

According to our results, after screening by ELISA serology, the highest number of positive cases recorded has concerned Q fever with 22 positive, 12 cases were strongly positive and 16 doubtful, in second position, we registered toxoplasmosis with 14 positive and 5 doubtful, in third, brucellosis with 6 positive and 2 doubtful, in fourth, neosporosis with only 2 positive and finally, chlamydiosis with no positive case.

Seroprevalence of different abortive agents sought is shown in Figure 4.

46.81% of the 92 blood samples tested by ELISA were positive for one or more of sought abortive agents: Q fever has accounted for 23.91%, toxoplasmosis 15.21%, brucellosis 6.52%, neosporosis 2.17% and chlamydiosis 0%.

DISCUSSION

In our study, the rate of abortions in cattle farms, registered over 2011 and 2012, was 5.61%. This rate is almost similar to those reported by several authors: Srairi and Baqasse [5] reported a rate of 7.4 ± 1.3% in 130 Friesian dairy heifers imported to Morocco from Europe and Canada. Kirk [6] found a rate of 2 to 5% in California. Hovingh [7] predicted a foetal losses rate of 3 to 5% per year for females which have more than 42 days of gestation in Virginia. Ardouin [8] reported a rate of 3 to 5% in pregnant cows beyond 45 days of gestation. Bsrat *et al.* [9] revealed a prevalence of 4.1% in Ethiopia.

Our rate is higher than those reported by Carpenter *et al.* [3] who spoke about a rate of 1.5% in 507 Danish herds and Norman *et al.* [10] who announced a rate of 1.31% in pregnant females for over 151 days. This difference can be explained by the fact that these authors did not take into account the different pregnancy phases especially the first third where the abortions diagnosis is more difficult and a significant number of cases goes unnoticed.

Our rate is lower than those reported by Ettema and Santos [11] who announced a rate of 9.8%; Degefa *et al.* [12] reported a rate of 8.7% in Ethiopia. Kaouche *et al.* [4] suggested a rate of 10% of 822 cows in Medea (Algeria); Benallou *et al*. [13], in a study conducted in Tiaret area (Algeria), spoke about a rate which varies according to the rank of lactation from 9 to 12%. This difference can be explained by many factors that may lead to abortions, in particular the importance that each breeder gives to his animals especially in hygiene, sufficient capacity of stables and employment of a skilled workforce.

Concerning distribution of abortions according to age of pregnancy, in our study, the highest rate was recorded over the last third of gestation with an average of 2.80%. This rate was 1.79% during the second third and 1.01% over the first third.

Our results are similar to those reported by Forar *et al.* [2] and Norman *et al.* [10] who think that the most important abortion rates happened beyond the third month of gestation. All authors agree that the diagnosis of abortions during the first third is more difficult and lowest levels are recorded during this phase.

Concerning distribution of abortions by month of year, According to our results, the lowest average rate abortion was registered in November with only 0.04%, it has tended to remain until May at rates lower than 0.6%; thereafter, the rate began to increase until peaking in July with 1.19%, we have noted after a gradual decline to return eventually to lower values with an average rate of 0.13% in October.

Our results are similar to those reported by Carpenter *et al.* [3] who spoke that frequency of abortions in July was almost twice the average rate. Norman *et al.* [10], in United States, claim that abortion rates increase from May to August (1.42% to 1.53%) and decrease from October to February (1.09% to 1.21%) with no known cause, although they argue that temperature and humidity are likely to affect the spread of infectious agents.

Concerning the 92 samples of blood tested by ELISA serology in 2013, 46.81% were positive for one or more of sought abortive agents: Q fever has accounted for 23.91%, toxoplasmosis 15.21%, brucellosis 6.52%, neosporosis 2.17% and chlamydiosis 0%.

Regarding studies on incidence of Q fever in farms around the world, in Italy, Parisi *et al.* [14] reported a rate of 17.2% identified by PCR, Cabassi *et al.* [15] spoke about a rate of 44.9% tested by ELISA. In Portugal, Clemente *et al*. [16] reported a rate of 11.6% identified by PCR. In Tunisia, Barkallah *et al*. [17] found no cases of Q fever in 22 farms using PCR technique. In Indonesia, Setiyono [18] showed that *C. burnetii* antigen detected immunohistochemically in 14% of 100 random cattle slaughtered at Bogor Slaughterhouses.

About toxoplasmosis, in Switzerland, Gottstein *et al.* [19] reported a rate of 5% identified on abortions. Ellis [20] reported a similar rate of 5% in Australian farms. In Malaysia, Rahman *et al.* [21] showed a positive of 2.6% on 116 adults sera randomly selected and tested by Flourescent Antibody Test (IFAT). In Egypt, Hassanain *et al.* [22] reported 17 cases (19.3%) out of 88 cows tested by ELISA IgG assay including 5 cases (29.4%) identified positive by PCR. In Pakistan, Tasawar *et al.* [23] reported a rate of 43.5% by using Latex Agglutination Test (LAT), 47% were female. Several authors [24-25-26] have all identified no cases of toxoplasmosis in their respective countries Brazil, Argentina and Austria.

Regarding brucellosis, in Côte d'ivoire, Thys [27] reported rates of 3.57% in intensive breeding and 4.29% in traditional farms. In Tanzania, Schoonman [28] spoke about 12% for cull cattle. In Algeria, Lounes *et al.* [29] reported a rate of 0.81% in Blida, Akkou *et al*. [30] reported a rate of 4.56% for cull cows and 5.55% in pregnant cows. In China, Ning *et al*. [31] reported that of 816 cows investigated, 25 were diagnosed positive by PCR. In Ethiopia, Alemu *et al.* [32] revealed an overall 2.0% Seroprevalence of bovine brucellosis in the study area.

About neosporosis, In Netherlands, Wouda *et al*. [33] reported a rate of 26%. In Argentina, Moore *et al.* [25] spoke about a rate of 9.9%. In Brazil, Cabral *et al.* [24] reported a rate of 24.8%. In Algeria, Achour and *al*. [34] reported a rate of 12.37% diagnosed by ELISA. In Iran, Youssefi *et al*. [35] reported Seroprevalences of 7%, 45.2% and 57.3% observed for cattle herds that had abortion history from Ardebil, Garmsar and Babol regions, respectively, Ahmad *et al.* [36] showed that 7 of 32 (20%) sera from aborted cows tested by ELISA had a positive reaction.

Regarding Chlamydia, in Austria, Nicollet *et al.* [26] reported a seroprevalence of 10%. In Switzerland, Borel *et al.* [37] reported a rate of 5.1% diagnosed by PCR. In Tunisia, Barkallah *et al*. [17] spoke about a rate of 4.66% diagnosed by PCR.

The variability of test results obtained through studies conducted across the world can be attributed to various factors such as region, climate, stock raising and means of investigation. We also include the sensitivity and reliability of the various tests.

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