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Full Length Research Paper

Evolution of biochemical parameters in post partum cows affected with brucella, in the wilaya of Relizane

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This study was conducted to determine the biochemical parameters of brucella cows during the four months post partum at some farms in Sidi Mhamed Benali (Algeria). We followed and analyzed the blood biochemical profile of 77 dairy cows in year 2009 to 2010. One farm had 26 brucella cows. During the four months, we observed that the cows had brucella serum cholesterol, serum calcium, phosphorus and a normal creatinine at a rate of 1.09 to 1.33 g/l, 87.05 to 94.52 mg/l, 58.52 to 65.57 mg/l and 9.60 to 10.99 g/l, respectively. However, these cows showed hypertriglyceridemia in parallel during the four months of the study, and ranged on average between 0.71 and 0.92 g/l. Regarding blood glucose we observed hyperglycemia around calving at a rate of 0.79 g/l, which stabilized during the four months after calving. In conclusion, hypertriglyceridemia is common in brucellosis. These results could eventually be used for more extensive studies in this area.

Keywords: Dairy cow, biochemical profile, brucellosis.

INTRODUCTION

Bovine brucellosis is considered as an endemic infectious disease that is widespread at all the Algerian territory. It is a highly contagious disease, whose economic impact on the development of animal industries is considerable. Moreover, being considered as the most common major zoonosis worldwide, it represents a serious threat to human health (OMS, 1986). The various control programs implemented by the Algerian Veterinary Services have not yet paid off, for not being applied, because of the many constraints (Lounes, 2009).

The etiological agents of the disease are members of the genus *Brucella* (Rajashekara et al., 2006). Previously, six species *Br. melitensis*, *Br. abortus*, *Br. suis*, *Br. ovis*, *Br. canis* and *Br. neotomae* were identified in the genus *Brucellae* (Rajashekara et al., 2006). Animals are infected after either an abortion or full term parturition. (Aqasthya et al., 2007). During the post partum biochemical parameters in dairy cows undergo significant changes caused by high milk production (Brugère-Picoux, 1995). The main objective of this study was to determine the biochemical parameters of affected cows with brucella, during the four first months of the post partum period.

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Abbreviation : TNF, Tumor necrosis factor.

MATERIALS AND METHODS

This study was conducted at the farms located in the town of Sidi Mhamed Benali, wilaya of Relizane (North-West of Algeria) during the year 2009 to 2010. The study was done on four farms; one farm contained 26 infected cows with brucella, after confirmation by the laboratory "Kharoubi" of Mostaganem. We collected our blood samples during the peri partum period: at calving, 1 month, 2 months, 3 months and 4 months later, in order to assess the following blood parameters: blood glucose, creatinine, phosphate, calcium, cholesterol and triglycerides. Plasma were obtained by centrifuging heparinized blood immediately, and were placed at a temperature of 4°C. Assays were performed after 24 h of collection enzymatically with an automatic spectrophotometer multi analyzer. The blood glucose testing was performed on site, using a glucometer of ACCU-CHEK type. Statistical analysis of collected data was performed using the software "XL stat", applying the student test (comparison of two means).

Table 1. Comparison of the average triglyceridemia (g/l) of cows affected with brucella and cows not affected with brucella.

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=28 x=0.59 v=0.027 E=0.164	n=24 x=0.52 v=0.033 E=0.183	n=37 x=0.49 v=0.033 E=0.181	n=27 x=0.56 v=0.045 E=0.211	n=14 x=0.53 v=0.025 E=0.158	0.60-0.65 (Laizeau, 2003)
Cow B	n=25 x=0.78 v=0.104 E=0.322	n=10 x=0.92 v=0.013 E=0.115	n=5 x=0.71 v=0.131 E=0.362	n=4 x=0.87 v=0.022 E=0.148	n=5 x=0.89 v=0.087 E=0.295	
P	0.008	<0.0001	0.031	0.009	0.003	
t o	2.778	6.419	2.237	2.807	3.92	
t c	2.008	2.037	2.021	2.045	2.110	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation; to = value observed by Student test; tc = Student critical value.

Table 2. Comparison of the average blood cholesterol (g/l) of cows affected with brucella and cows not affected with brucella.

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=45 x=0.99 v=0.044 E=0.211	n=41 x=0.94 v=0.031 E=0.176	n=54 x=1.04 v=0.112 E=0.334	n=27 x=1 v=0.034 E=0.184	n=13 x=0.95 v=0.028 E=0.167	
Cow B	n=25 x=1.11 v=0.045 E=0.213	n=10 x=1.33 v=0.076 E=0.275	n=5 x=1.32 v=0.139 E=0.373	n=4 x=1.09 v=0.009 E=0.093	n=5 x=1.26 v=0.132 E=0.363	0.5 - 1.35 (Gautier , 1979)
P	0.022	<0.0001	0.086	0.341	0.023	
t o	2.346	5.557	1.747	0.969	2.521	
t c	1.995	2.010	2.002	2.045	2.120	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation; to = value observed by Student test; tc = Student critical value.

RESULTS

The obtained results of biochemical parameters are summarized in Tables 1 to 6. Their statistical analysis yielded an estimate of the true mean with a credible interval of 95%.

Our results show that cows affected with brucella presented at calving hypertriglyceridemia, which extended into the fourth first months of the postpartum period compared with healthy cows; 0.78, 0.92, 0.71, 0.87, and 0.89 g/l respectively, with p-value less than the significance level $\alpha = 0.05$. This means that there was a significant difference between the rates of blood triglycerides in affected cows with brucella compared with healthy cows.

With regard to serum calcium, creatinine and phosphate, they showed no significant difference between the two samples with a t-observed below the

Table 3. Comparison of the average blood glucose (g/l) of cows affected with brucella and cows not affected with brucella.

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=51 x=0.70 v= 0.009 E=0.092	n=41 x=0.64 v=0.010 E=0.101	n=54 x=0.64 v=0.008 E=0.087	n=28 x=0.66 v=0.006 E=0.079	n=13 x=0.68 v=0.006 E=0.075	0.5 - 0.7 Verriel and Bedouet (1999)
Cow B	n=26 x=0.79 v=0.044 E=0.209	n=12 x=0.66 v=0.010 E=0.101	n=5 x=0.7 v=0.007 E=0.081	n=4 x=0.65 v=0.014 E=0.118	n=5 x=0.71 v=0.004 E=0.062	
P	0.018	0.544	0.146	0.688	0.435	
t o	2.416	0.610	1.473	-0.405	0.800	
t c	1.992	2.008	2.002	2.042	2.120	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation, to = value observed by Student test; tc = Student critical value.

Table 4. Comparison of the average blood creatinine (mg/l) of cows affected with brucella and cows not affected with brucella.

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=29 x=10.11 v=4.205 E=2.051	n=24 x=10.10 v=2.647 E=1.627	n=38 x=10.33 v=4.278 E=2.068	n=27 x=10.60 v=5.683 E=2.384	n=13 x=9.74 v=4.247 E=2.061	
Cow B	n=21 x=10.60 v=2.941 E=1.715	n=10 x=10.99 v=3.985 E=1.996	n=4 x=10.95 v=7.074 E=2.660	n=4 x=9.60 v=1.187 E=1.089	n=5 x=9.82 v=2.718 E=1.649	10 - 15 Lorin (et al. 2009)
P	0.370	0.182	0.579	0.423	0.940	
t o	0.905	1.363	0.559	-0.813	0.077	
t c	2.011	2.037	2.021	2.045	2.120	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation; to = value observed by Student test; tc = Student critical value.

t-critical, except for phosphate in the first month of calving, which presented a p-value less than the significance level α = 0.05, without exceeding the normal value of blood phosphorus levels.

We also noted an hyperglycemia at calving in affected cows with brucella (0.79 g/l), which was stabilized in the following months, with p = 0.018, and this value was below the significance level of α = 0.05.

For cholesterolemia, we observed that it did not exceed the normal values at calving up to four months later. However, we noted a significant difference between the averages in brucellic cows compared with healthy ones at calving during the first and the fourth postpartum months, with a t-t-observed above the critical one.

DISCUSSION

Postpartum period is under the control of physiological, metabolic and endocrine changes accompanying a process of adaptation developed by dairy cows in response to nutritional needs, essentially growing energy.

Table 5. Comparison of the average blood phosphorus (mg/l) of cows affected with brucella and cows not affected with brucella.

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=27	n=25	n=38	n=27	n=14	40 - 86 Verriel and Bedouet (1999), Brugère and picoux (1995)
	x=64.93	x=60.87	x=61.26	x=59.59	x=60.09	
	v=140.218	v=20.052	v=32.812	v=27.931	v=13.408	
	E=11.841	E=4.478	E=5.728	E=5.285	E=3.662	
Cow B	n=25	n=10	n=5	n=4	n=5	
	x=61.24	x=65.57	x=59.92	x=58.52	x=61.36	
	v=93.691	v=34.585	v=19.874	v=11.036	v=50.98	
	E=9.679	E=5.881	E=4.458	E=3.322	E=7.140	
P	0.226	0.015	0.619	0.700	0.610	
t o	-1.225	2.561	-0.502	-0.389	0.519	
t c	2.009	2.035	2.020	2.045	2.110	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation; to = value observed by Student test; tc = Student critical value.

Table 6. Comparison of the average blood calcium (mg/l) of cows affected with brucella and cows no affected with brucella**.**

Parameter	Calving time					Standard
	At calving	1 month	2 months	3 months	4 months	
Cow N	n=31	n=40	n=53	n=27	n=14	80 - 120 Verriel et Bedouet (1999), Brugère picoux (1995)
	x=87.75	x=94.84	x=99.04	x=100.16	x=95.16	
	v=300.866	v=101.412	v=118.469	v=68.209	v=90.654	
	E=17.346	E=10.070	E=10.884	E=8.259	E=9.521	
Cow B	n=11	n=10	n=4	n=4	n=5	
	x=90.63	x=94.52	x=90.51	x=87.05	x=92.40	
	v=45.887	v=25.715	v=9.309	v=10.671	v=54.887	
	E=6.774	E=5.071	E=3.051	E=3.267	E=7.409	
P	0.597	0.924	0.127	0.004	0.567	
t o	0.533	-0.096	-1.550	-3.102	0.584	
t c	2.021	2.011	2.004	2.045	2.110	

N = cow not affected with brucella; B = cow affected with brucella; n = number; x = mean; v = variance; E = standard deviation; to = value observed by Student test; tc = Student critical value.

These changes are necessary to maintain the constancy of the internal environment (homeostasis) and to properly conduct a new round of dairy production metabolically more advantaged (Chilliard et al., 1980; Bauman and Currie, 1980). The carrying out of this study during this period and on brucella cows allowed us to note interesting data on bovine brucellosis.

The characteristics that differentiate brucella cows and the other cows revolve around the level of triglyceride in the blood. We found that the cows affected with brucella had very high levels of blood triglyceride from the first to the 4th postpartum month, compared with healthy cows, based on research conducted on human beings (Apostolou et al., 2009). The authors found that Brucella infection is associated with an atherogenic lipid profile, which is not fully restored after four months of treatment. Hypertriglyceridemia was found in a child with brucellosis (Erduran et al., 2010). This is explained by the fact that *Brucella abortus* is a gram-negative intracellular bacterium; it induces the production of tumor necrosis factor (TNF) (Bruce et al., 200; Huang et al., 2003) and the production of TNF inhibits lipoprotein lipase, which results in elevated plasma triglycerides (Feingold et al., 1989; Creput et al., 2005).

Glycemia was highest at calving and then declines during the first two months after calving (Miettinen, 1991). This confirms our result on the hyperglycemia observed at calving, and this is explained by the fact that dairy

cows around this period present a very important energy metabolism for the synthesis of lactose to increase milk production (Vagneur, 1992).

Conclusion

Evaluation of these various biochemical parameters in brucellic cows allowed us to conclude that brucellosis is associated with a hypertriglyceridemia that is not fully restored during the four months after calving. This change in blood triglyceride levels requires further studies even more specific in this area.

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