J. Appl. Environ. Biol. Sci., 6(7)1-6, 2016

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Epidemiology and Spatial Distribution of Brucellosis in Cattle and Sheep in West Algerian Regions from 2002-2014

Maghdouri Khaldi N[1]., Tir touil A[1]., El Kebir Ahmed[2], Bendahmane M[3].

[1]Bioconversion Laboratory, Engineering Microbiological Safety and Health, Faculty of Natural Sciences and Life, University of Mascara-29000-Algeria.
[2]Regional Veterinary Laboratory- Mostaganem- 27000-Algeria.
[3]Research Laboratory Environment and Health, Faculty of Medicine, University of Sidi Bel abbes, Algeria.

Received: April 3, 2016
Accepted: May 30, 2016

ABSTRACT

Brucellosis remains a major worldwide zoonosis, caused by *Brucella* and is still a serious problem of public health for some regions. The objective of the current study was to determine the sero-prevalence of brucellosis in 418773 cattle and 6050363 Sheep in eleven west Algeria regions over 12 years (2002-2014). Serological samples were tested for *Brucella* using the Rose Bengal Test Plate Agglutination (RBPA) and ELISA assays. Results of the present study revealed that the sero-prevalence of brucellosis in west Algerian locality remains higher. The overall prevalence of brucellosis in cattle was 1.1%, ranging between 0.53-1.22%, and Sidi Bel abbes region was the most infected locality with 2.4%. In the sheep, the prevalence was very increased from 6.06 % varied between 3.08 and 17.9%. However, Saida represented the higher locality infected by the disease with 27%. For effective control and irradiation of the disease, require vaccination of flocks and establishment of surveillance program will allow an evaluation an actual brucellosis sero-prevalence.
KEYWORDS: Brucellosis, cattle, Elisa, RBPT, sheep, Sero-prevalence, west Algeria.

1. INTRODUCTION

Brucellosis remains a major worldwide zoonosis, caused by *Brucella spp*, and is still a serious problem of public health for some regions as Mediterranean countries, Asia and Latin America [1]. These pathogenic bacteria can infect humans as well as sheep, goats. *B. melitensis* (sheep and goats) is the most important causative agent for human brucellosis and is followed by *B. ovis* (sheep), *B. abortus* (cattle), *B. suis* (pigs), and *B. canis* (dogs). [2]. In most host species, the disease primarily affects the reproductive system with concomitant loss in productivity of animals affected. The genus *Brucella* is composed by six species: namely, *B. abortus*, *B. melitensis, B. suis, B. ovis, B. canis* and *B. neotomae*. *Brucella melitensis* (biovars 1, 2 or 3) is the main causative agent of caprine and ovine brucellosis and it is highly pathogenic for humans causing one of the most serious zoonoses [3]. In the world, humans are principally infected by the handling of parturient animals and the consumption of raw milk and milk products, especially fresh soft cheeses [4-5]. Brucellosis is public health problem and has grave economic impacts in the local population and can also cause serious problems in the national agricultural economy.

Therefore, the epidemiology of the Brucellosis in west Algeria locality is unknown and its determination is need for planning of any intervention for its control. The present study was aimed to determine the sero-prevalence of brucellosis infection from 2002 to 2014, using two serological diagnostic methods in cattle, sheep in West Algeria regions for the establishment of an effective control program for health against this disease.

2. MATERIAL AND METHOD

2.1. The study area

The study zone is located in the northern part of the west Algeria and was composed of 11 regions: Ain Temouchent, El bayedh, Mascara, Mostaganem, Naâma, Oran, Relizane, Saida, Sidi Bellabes , Tiaret, Tlemcen. The regions were purposively selected because the epidemiological situation of the *Brucella* infection is not known.

2.2. Characterization of Study animals

Retrospective study was conducted on 12 years from 2002 to 2014. A monthly epidemiological report about annual assessment reports (Institut National de la Santé Publique) of the number of cases of brucellosis reported in each region was used. A total of adult's animals; 418773 cattle and 6050363 sheep of both sexes were used in this study. The individual animal details such as the identity of the animal, sex, age, flock size and source of animals were registered.

***Corresponding Author**: Maghdouri Khaldi Nacéra1, Bioconversion Laboratory, Engineering Microbiological Safety and Health, Faculty of Natural Sciences and Life, University of Mascara-29000-Algeria.
Tel/fax: 00.213.45707014, e-mail: khaldinm@yahoo.fr

2.3. Blood sample collection and Serological analysis

Serological studies were conducted after blood sample from the jugular vein of each animal. The collected samples about 10 ml from each animal were immediately transferred to the laboratory and allowed to clot for 2 hours at room temperature, stored overnight at +4°C, and then the serum was separated from the clot by centrifugation at 2000-3000 rpm for 10-15 minutes. The separated serum was labeled and kept under refrigeration (-80°C) until tested.

Brucellosis testing in animals was based on serologic diagnostic tests. The Rose Bengal Plate Test (RBPT) was used for screening *Brucella* antibodies in animals by the presence of *Brucella* agglutinins as described previously [6] and the indirect immuno-enzymatic reaction by the ELISA (Enzyme-Linked Immuno-Sorbent assay) to detection of different classes of antibodies (IgG, IgM and Ig A) as confirmatory method [7].

2.4. Data and Statistical analysis

The Microsoft excel spread sheet program was used for data analyzed using STATA 8.0. Version software program. The prevalence for *Brucella* infection was calculated by number of positive specimens divided by total number of collected specimens and presented as percentages.

3. RESULTS AND DISCUSSION

3.1. Sero-prevalence of brucellosis in Cattle

The study demonstrated that from 2002 to 2014, the global prevalence of Brucella in west Algeria in Cattle screened was higher of 1.1% and ranged from 0.53 to 1.22% with a lower level in year 2008; 0.53% (Fig.1). The numbers of animals infected stared to increase from 2011 despite vaccination program that began in 2009. Some reasons demonstrated these results, B. melitensis and B. abortis are two pathogens isolated frequently in cattle *and* sheep in Algeria, and B. melitensis is the most virulent specie. A previously study reported that the bacteria was isolated from vaginal and genital secretion in cattle but persist without serological immune response [8]. It mains that a higher risk of latent Brucella infection exist. In our study, B. melitensis Rev.1 vaccine was used in 2009, but demonstrate low efficacy and kept brucellosis highly after 2011. Blasco [9] recommended vaccination program implementation for 5 to 7 years for life-long immunity for minimize post-vaccinal diagnostic problems and to prevent abortion. This vaccine strategy protects all animals against brucellosis.

Others factors may be responsible for these observations the absence of coordination program poor management of animal flocks, grave sanitary deficiencies, infrequent veterinary control within refuse in the detection of infected animals after the vaccination program [10]. None preventive or curative measures were applied including identification of infected animals, period examinations of flocks, quarantine, control of animals imported to farms and eradication of infected animals. The breeders did not involve in sanitation program without reimbursement for their animals losses.

The herders directly conducted their cow's milk collected to the mini dairy because their only preoccupation is that the milk must be pasteurized and represented effective protecting measure. They refuse to avow the veterinary services of infection detection in the cattle. The transmission is also facilitating by the movement and/or when cattle and sheep when were kept specially and temporally together [9, 11]. This is particularly true in our study.

However the higher prevalence is showed in year 2014 with 1.22% (Fig. 1). This results were similar to those found in central region of the country; 0.81-3% [12], but slightly lower than to in East area; 0.65 and 3.64 % [13]. Comparing with the studies conducted in others country, the prevalence was 1.54% in Spain [14]. However, Argentina reported high prevalence of bovine brucellosis estimated between 1.0 to 5.1% [15], but more reduced in some regions from Iran; 0.01-1.2% [16].

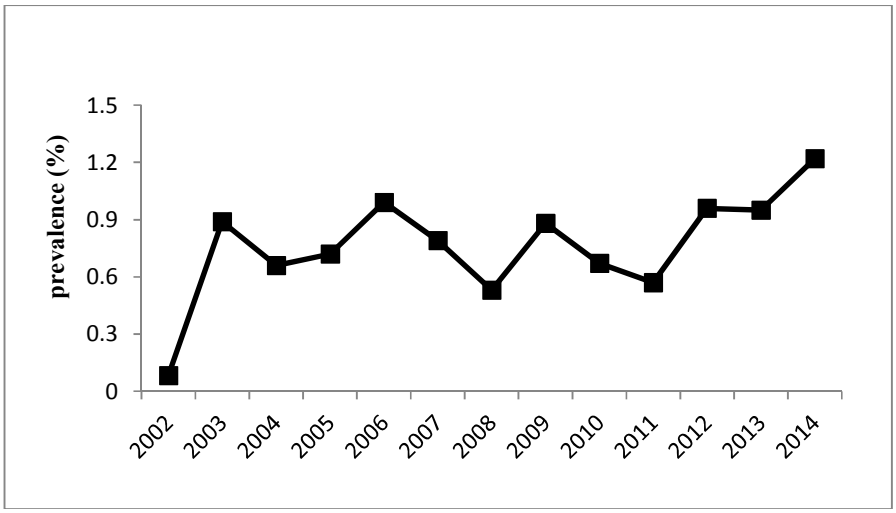

Figure 1: Prevalence of brucellosis in cattle from 2002-2014

The difference in prevalence observed between our results and those obtained in other studies may be partly explained by the methodology used in developing the study protocol. In this work two complimentary serological tests were used the Rose Bengal Plate Test (RBPT) and high sensitivity and specificity test such as the ELISA. The variations noted in the prevalence are mainly due to climate and to the differences in geographical location, sample size and management systems [23].

Several study related to influence of seasonal brucellosis indicated that the higher incidence is in temperate or cold climate rather than tropical and subtropical [10]. The incidence increased from May to August [17]. The lowest occurrence was shown in winter which means infection is favorite on hot and sec climate [18]. Our study was conducted in west Algeria which represented the Mediterranean and temperate region frequently affected by Brucella in small ruminant [19]. The study area was divided into the coasts as Temouchent, Oran, and Mostagnem, semi arid, as Tlemcen, Sidi bellabes, Relizane and Mascara and arid regions as Saida, Tiaret, El bayedh, and Naâma. As described in Fig.2 and Fig 4, the prevalence of brucellosis in cattle and sheep were higher in arid and semi arid regions than in the coasts.

The geographic distant area affects pathogens transmission and evolution. In arid and semi arid regions raising animals is often practiced under semi-nomadic or nomadic movements witch increased risk to infection [10]. Since, the west Algeria regions, particularly Tlemcen and Naâma are sharing in specific border with Morocco. Uncontrolled animal movements across borders facilitate transmission of infection between animals [11]. However, the geographic situations need a strategic planning of control measures [20].

Sample size and management system contribute also to increase in brucellosis infection. Therefore higher densities in animals and mixing them in farm can conduct to higher risk to infection to free herds. The exchange or contact between different farms and the ingestion of food or water contaminated with fecal, secretion or aborted fetuses, vaginal secretions, genitals from infected animals contributed to *Brucella* increase [10]. However, the movement of infected animals can contaminate pastures and spread emergence brucellosis to others animals [20]. In our study, the majorities of cattle and sheep flocks in arid and semi arid regions are mobile and represent also a reservoir of the infection to another small ruminant. It is much difficult to control the movement of animals kept under nomadic or semi nomadic conditions [10].

Among the region studies, Sidi Bellabes was region that contains the highest number of cattle infected with *Brucella* 2.45%, monitoring by Ain Temouchent; 1.99%, Relizane; 1.50%, Oran; 1.24%, Tiaret and Tlemcen; 1.07%, Mascara; 0.98%, Saida; 0.93%, El bayedh; 0.89%, Naâma; 0.68%, and the lower prevalence was observed in Mostaganem; 0.13%. The Figure 2 demonstrated the special geographic distribution of number of cattle infected by *Brucella* in each locality from 2002-2014.

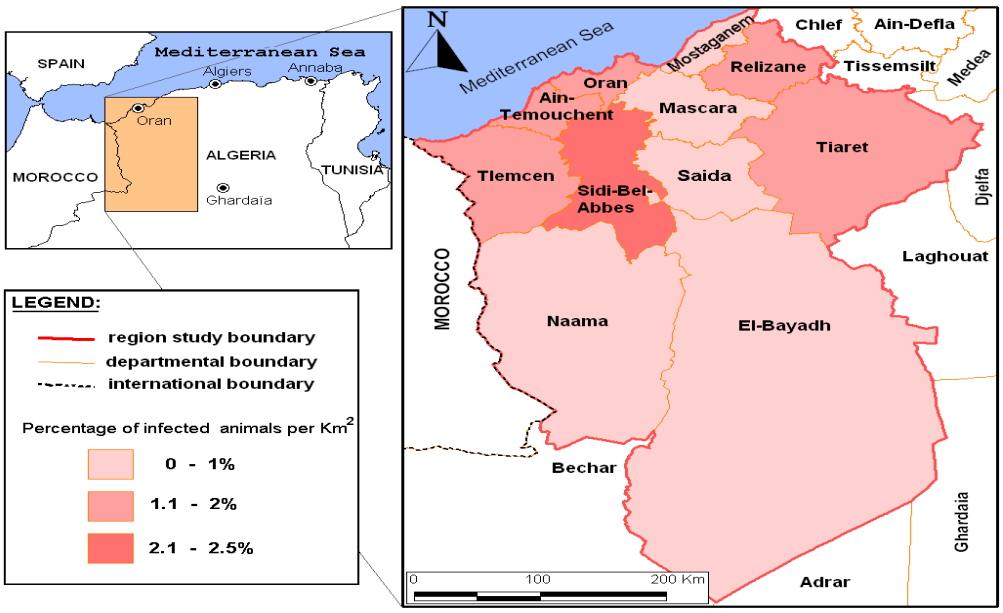

Figure 2: The Spatial geographic distribution of *Brucella* in Cattle in each region from West Algerian (expressed as % of animals infected)

Therefore, the observed differences between regions were relevant in terms of control of the disease, raise animals with substandard hygienic conditions, and no respect of vaccination control. The climatically and geography locality was also associated with spread emergence of brucellosis [24].

As described above, the season and the geographic locality were attributed to a rapid transmission of brucellosis infection. Seasonal exchange can affect pathogen, the marked season for transmission and emergence of brucellosis is between spring and summer [21]. In this study, the climate was temperate and in the year the temperature varied between 10°C to 30°C in the coasts, 11°C to 35°C in semi arid and 11°C to 42°C in arid regions respectively [22]. The other factor, such as the geographic situation between study regions and the specific border with Morocco may increase the risk and contributed to spread emergence of Brucellosis. Another circumstance for spread emergence of Brucellosis is observed in the sheep passage between the plains and the mountains according to season. A nomadic in semi arid or arid region may be also a real risk in the increase of the infection [10].

3.2. Sero-prevalence of brucellosis in sheep

Contrary to what we observed in cattle, the risk of global infection with brucellosis in sheep screened was much higher with 6.06% in the period of study. The infection rate is 6 times higher in sheep (Fig 2).This results in agreement with those found by several authors within the higher prevalence of brucellosis in sheep [12, 25].

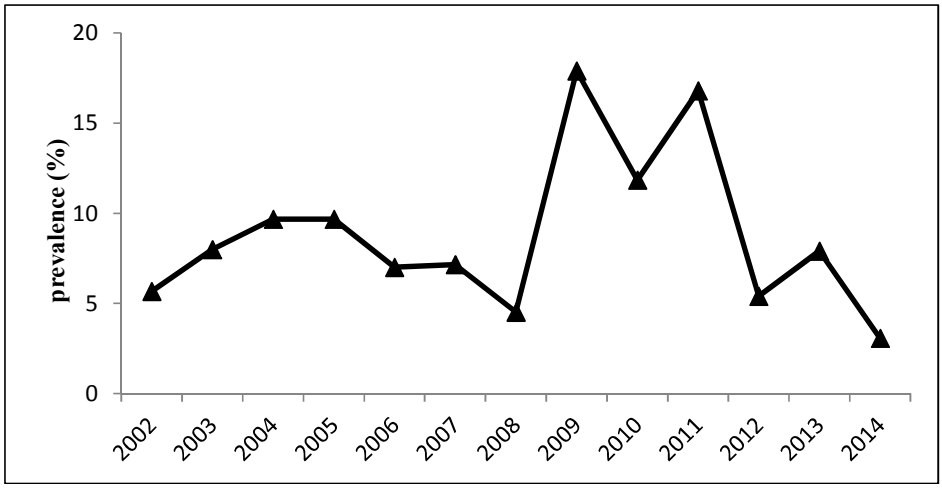

Figure 2: Prevalence of brucellosis in sheep from 2002-2014

Overall, regarding the prevalence of brucellosis in sheep was varied from 3.08 to 17.9% between 2002-2014.The higher infection was noted in period 2009 and 2011; 17.9% and 16.8%, then the lower prevalence was observed in 2014 with 3.08 % (Fig 3).

The occurrence of sheep brucellosis by region indicated that Saida is the most important locality infected with a rate prevalence; 27% followed by Tlemcen; 23%, Sidi Bellabes; 18.4% and Tiaret; 12.9 % respectively. However, in other regions the rate is lower between 2.7 and 6% (Fig 2). From 2002 to 2014, the special geographic distribution of number of sheep infected by Brucella in each locality is shown in Figure 4.

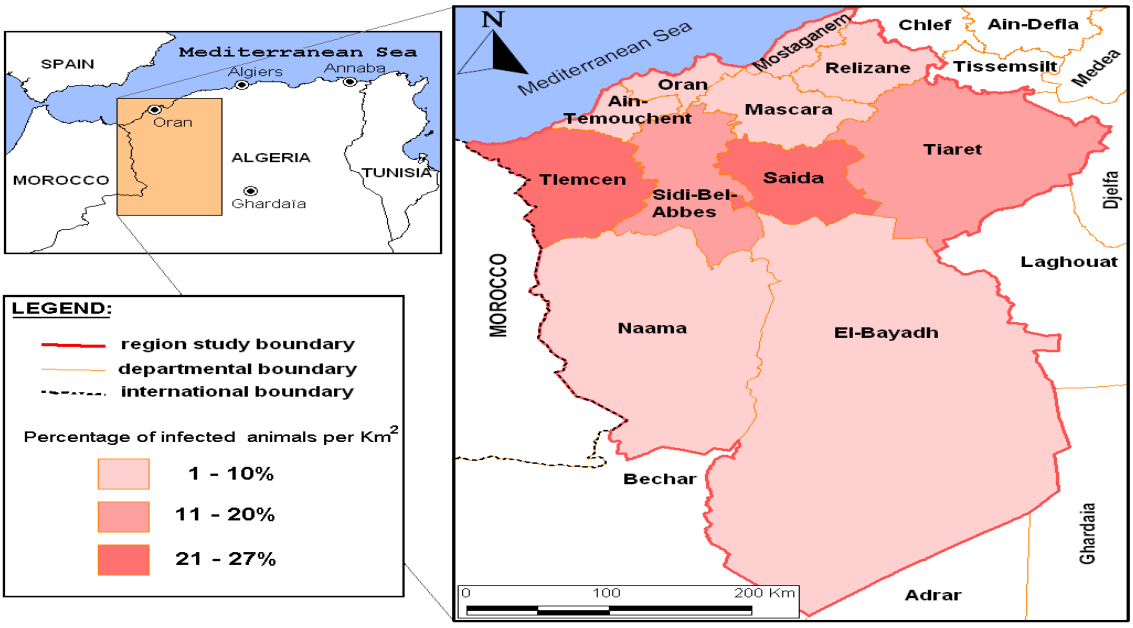

Figure 4: The Spatial geographic distribution of *Brucella* in Sheep in each region from West Algerian (expressed as % of animals infected)

As indicated in this study, the prevalence of brucellosis was higher in some highland region, this is might be attributed to the differences in geographical location, sample size, management systems, or to poor sanitary conditions of the herds, the instabilities of livestock movement in the four seasons of the year and therefore more exposed to infection by *Brucella* [8]. Whereas for other regions the situation is well controlled and the prevalence are in agreement with other studies that control brucellosis requires elimination of infected animals and vaccination of healthy ones in order to reduce risk for those in regular contact with animals [16].

4. CONCLUSION

Eradiation of brucellosis has been a goal for many countries. The current study showed that the sero-prevalence of cattle and sheep brucellosis from 2002 to 2014 remains remarkably high despite the vaccination program. For effective control and prevent this disease, establishment of program of the hygiene's conditions, require vaccination of flocks, and disposal of infected animals are more necessary. Nerveless an improved surveillance program will allow an evaluation an actual brucellosis sero-prevalence and economic impact should be implemented.

Acknowledgments

We acknowledge the Ministry for Agriculture and Fisheries of and Rural Development from republic of Algeria for Data.

REFERENCES

1. Cutler S., Whatmore A.M., Commander N. J., 2005. Brucellosis – new aspects of an old disease. Journal of Applied Microbiology 98: 1270–1281.
2. Memish Z., A., Balkhy H. H., 2004. Brucellosis and international travel J Trav Med 11: 49-55.
3. Blancou J., Belotto A., Meslin F.X., 2005. Emerging or re-emerging bacterial zoonoses: factors of emergence, surveillance and control. Vet. Res.: 36: 507–522.

4. OIE, 2004. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. 5th ed., Office International des Epizootics, Paris, p. 419-20, pp. 409-438.
5. Capparelli R., Parlato M., Iannaccone M., Roperto S., Marabelli R., Roperto F., Iannelli D, 2009. Heterogeneous shedding of Brucella abortus in milk and its effect on the control of animal brucellosis. Journal of Applied Microbiology 106: 2041–2047.
6. Alton G.G., Maw J., Rogerson B.A., McPherson G.G., 1975. The serological diagnosis of bovine brucellosis: An evaluation of the complement fixation, serum agglutination and rose bengal tests. Aust Vet J 51(2):57-63.
7. Araj G., Lulu A., Khalil M., Saadah M., Shakir R., 1992. Elisa versus routine test in the diagnosis of patient with systematic and neurobrucellosis. Acta Pathologica Microbiologica Immun-ologica Scandinavica 96:213–5.
8. Aznar M., Linares F.J., Cosentino B., Sago A., La Sala L., León E., Duffy S., Perez A., 2015. Prevalence and spatial distribution of bovine brucellosis in San Luis and La Pampa, Argentina. BMC Veterinary Research 11: 1-7.
9. Blasco J.M., 1997. A review of the use of *B. melitentis* Rev 1 vaccine in adult sheep and goats., Prev Vet Med 31(3-4):275-83.
10. Corbel, M.,J., 2006. Brucellosis in humans and animals . II.World Health Organization. III.Food and Agriculture Organization of the United Nations. IV.World Organisation for Animal Health, pp1-86.
11. Lounes N., , Moulay-Ali C., Le Carrou G., , Abdellah Bouyoucef A., Jay M., Garin-Bastuji B., Mic, V., 2014.H uman Brucellosis in Maghreb: Existence of a Lineage Related to Socio-Historical Connections with Europe. PLOS, 17, 1-14.
12. Pacha M. B., Kechih S., Berber A., Trikiyamani R., 2009. An Inquiry About Ruminants Epidemiologic Brucellosis in Some Algerian Departments. Bulletin UASVM, Veterinary Medicine 66 (2) 2-8.
13. Kabouia R., Khaled H., Kerrour M., Bouazziz O., Belmerzoug M., 2014. Epidemiological study of bovine Brucellosis in area Constantine. Annals of Biological Research 5 (3):38-41.
14. OIE, 2005. Manual terrestrial de l'OIE, *Maladie bovine de la liste B*, Chapitre 1, 2 et 3. Brucellose bovine: http://web,oie.int/fr/normes/manual/pdf _BovBrucellosis.pdf.
15. Lopes L.B., Nicolino R., Haddad J.P.A., 2010. Brucellosis-Risk factors and Prevalence: a Review. The open Veterinary Science Journal 4: 72-84.
16. Bokaie S., Shrifi L., Alizadeh H., 2008. Epidemiological survery of Brucellosis in human and animals in Birjand, East of Iran. J of Animal and Veterinary Advances 7 (4): 460-63.
17. Engy M., El-Ghitan. S., Sherif R., Amany M. , Abaza, Ezzat M. , Hassa, Ekram W., Abd El- Wahab W., 2014. Trends in the epidemiology of brucellosis in a highly afflicted region in Egypt: A 16 year experience (1997-2012). International Journal of TROPICAL DISEASE & Health 4(2): 250-271.
18. Cross P.C., Edwards W.H., Scurlock B.M., Maichak E.J., Rogerson J.D. 2007. Effects of management and climate on elk brucellosis in the Greater Yellowstone Ecosystem., Ecol Appl Jun; 17(4):957-64.
19. Díaz Aparicio E., 2013. Epidemiology of brucellosis in domestic animals caused by Brucella melitensis Brucella suisand Brucella abortus. Rev sci tech 32 (1): 53-60.
20. Gwida M., Melzer F., Rösler U., Neubauer H., Tomaso H., 2010. Brucellosis - regionally emerging zoonotic disease? Croat Med J 51(4):289-95.
21. Samaha H., Al-Rowaily M., Khoudair R.M., Ashour H.M., 2008. Multicenter study of brucellosis in Egypt. Emerg Infect Dis. 14(12):1916-8.
22. Climat de l'Algérie :https://fr.wikipedia.org/wiki/Climat_de_l'Algérie.
23. Yeshwas F., Desalegne M., Gebreyesus M., and Mussie H., 2011. Study on the seroprevalence of small ruminant brucellosis in and around Bahir Dar, North West Ethiopia. Ethiop Vet J 15(2): 35-44.
24. Hachung Y., Un-Kyong M., Soo-H., Won-Chang L., Moon H., Wooseog J., Suk-Chan J., Do-Soon K., 2014. Epidemiology of brucellosis among cattle in Korea from 2001 to 2011. J Vet Sci 15(4): 537-543.
25. Mohammed Al-Sekait, 2000. Epidemiology of Brucellosis in al Medina region, Saudi Arabia. J of Family community Medicine 7(1): 47-53.