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Evidence of Coxiellosis in local Iraqi cows in Mosul city, Iraq

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Abstract

Preliminary investigations are vital for establishing the necessary steps for more extensive studies. This study aimed to investigate the evidence of immune responses to Coxiella burnetii in cattle (Bos taurus) found in Mosul City, Iraq. To achieve this objective, we examined serum samples from 46 cattle collected from different regions in Mosul using a bovine IgG sandwich-ELISA kit. The study identified 2/46 (4.3 %) positive samples and 31/46 (67.4 %) equivocal. In conclusion, *C. burnetii* infection is evident in cattle in Mosul City. Future studies must thoroughly examine the epidemiological factors associated with coxiellosis in cattle in Mosul.

Keywords: *Coxiella burnetii*, Cattle, ELISA

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Introduction

Coxiellosis is a global disease known as Q fever caused by *Coxiella burnetii*. The causative pathogen is a gram-negative bacterium with a unique biphasic lifecycle characterized by environmentally stable and inside-the-host replicative phases (1). The disease can affect humans and animals without clinical findings in animals other than reproductive disorders, making the diagnosis difficult (2; 3). Airborne transmission is the primary method of *C. burnetii* spread among animals (2). The infection becomes latent in non-pregnant animals, while relapses happen during pregnancy when the pathogen invades the placenta, the uterus, and the fetus (4). The vaginal secretions of aborted animals become a source of infection, although the pathogen is also present in the milk and feces of infected animals (5). Abortion in cattle is usually sporadic. While the highest shedding rate happens for up to two weeks from parturition, affected cows can shed the pathogen in the milk for months (4).

Evidence of coxiellosis in cattle in Iraq is limited. In Thi-Qar governorate, investigating 172 cows by ELISA revealed 9.3% seropositive animals (6). In a more recent study from Wasit governorate, 130 cows. The indirect ELISA detected 16% of animals as seropositive, while the PCR technique identified 10% and 18.5% of milk samples as positive for the IS1111A transposase gene and 16S rRNA (7), respectively. In the Karbala governorate, 14% of seropositive cows had positive milk for the IS1111 gene (8).

Investigating the disease in cattle in Mosul City is important, particularly because the evidence of the infection using indirect ELISA has been reported in sheep in the city (9). In that study, 68/330 (20%) of the examined sheep were seropositive for antibodies against the *C. burnetii*. Therefore, we aimed to investigate evidence of the infection in cattle in Mosul, Iraq. Mosul city has over 100,000 heads of cattle, according to Nineveh's Animal Resource Department, mainly raised by private owners as scattered herds, which increases the risk of spreading the infection. Such a preliminary investigation is necessary to identify the required steps for further comprehensive studies, particularly the previous efforts focused on brucellosis as the cause of abortion in cattle (10).

Materials and Methods

Ethical Approval

Under registration number 8 on 28-8-2022, the ethical approval for conducting the current investigation was obtained from the Scientific Committee of the College of Veterinary Medicine, University of Mosul. We handled study cattle and collected the required samples according to the standard procedures outlined by (11).

Study Animals and Blood Collection

The study included 46 dual-purpose local Iraqi breed cows (*Bos taurus*) admitted to the University Veterinary Hospital, University of Mosul, between September and December 2023. The study cows were 2 to 7 years old and were raised in different regions in Mosul City. We collected 8 mL of blood for each study cow from the jugular vein in clot activator-containing tubes. Subsequently, we stored the collected serum at -20° C until conducting the ELISA.

Evidence of coxiellosis

The evidence of coxiellosis in this study represented *C. burnetii* antibodies identified by the Bovine-specific IgG Sandwich ELISA kit that included a *C. burnetii* antigen pre-coated ELISA plate (REF: SL0200Bo, Sunlong Biotech Co., Ltd, China). We conducted the test procedures, including adding solutions, mixing, incubating, and washing, according to the manufacturer's instructions. We used a microtiter reader to measure the optical density at a wavelength of 450 nm. According to the manufacturer's instructions, the average value of the positive control was ≥ 1, the negative control was ≤ 0.10, and the cut-off value was the average value of the negative control + 0.15. The optical density greater than the cut-off value represented the positive samples.

Results

The mean and median ages of animals included in this investigation were 4.7 and 5 years old, respectively. According to the manufacturer's instructions, the critical value of the test was 0.24. There were 2/46 (4.3 %) positive samples and 31/46 (67.4 %) equivocal (Fig. 1), without a significant correlation between animal age and optical density (*r* P-value = 0.30).

Discussion

This work is considered the first study in Mosul to investigate the immune reaction in cattle sera against *C. burnetii*. Although the percentage of positive results was low, which is considered favorable, the equivocal results reported here should not be neglected and suggest underreported exposure. Studies in different Iraqi regions have reported higher percentages, such as 9.3% in Thi-Qar (6) and 16% in Wasit (7). Most equivocal results reported in our study were potentially positive. The serological investigation of *C. burnetii* is challenging because the bacteria can evade the immune system of the host through several mechanisms (12), explaining the lack of body response (13). In addition, the nature of animal husbandry in the city suggests that cows could become infected by local sheep, as several families raise both cows and sheep together. The infection rate in sheep has previously been reported at 20% (9). Epidemiological studies are needed to identify the factors associated with infection in cows within the city

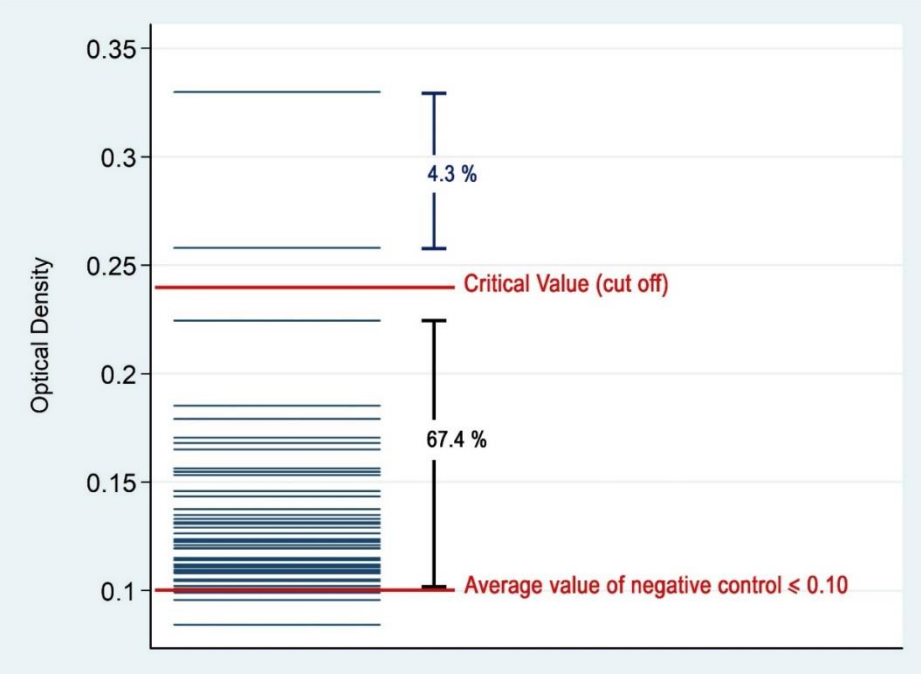

Figure 1 – The distribution of optical density obtained from Sandwich-ELISA for bovine *C. burnetii* IgG using serum samples from cattle in Mosul City, Iraq. The critical value = 0.24, the positive results > 0.24, and the equivocal results between 0.1 and 0.24.

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One limitation of the current study is that the number of study cows was low due to financial limitations. However, this preliminary study revealed the existence of coxiellosis in cattle and opened the doors for thorough investigations in the future; particularly, abortion is evident in local cows. The most suspected causes of abortion in the city are brucellosis and toxoplasmosis. In a previous meta-analysis, the prevalence of brucellosis in cows in Mosul was 11.69% (14). On the other hand, toxoplasmosis was detected in 23% of cattle serum slaughtered in the city (15). The presence of antibodies against Toxoplasma gondii and Neospora caninum has been previously reported in cattle in Mosul, with prevalence rates of 30% and 20%, respectively (16). Consequently, this investigation highlights the necessity to examine whether C. burnetii plays a role in abortion among cows and to consider its potential zoonotic implications.

Conclusion

Coxiella burnetii infection in cattle in Mosul, Iraq, is not negligible. Further studies are needed to investigate the epidemiological factors associated with the infection, to assess the contribution of the bacteria to the abortion in cows, and to evaluate the potential zoonotic burden of the bacteria.

Acknowledgements

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Conflict of interest

The author reported no potential conflict of interest.

Ethical Clearance

This work is approved by The Research Ethical Committee.

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أدلة على وجود داء الكوكسيلا في الأبقار المحلية العراقية في مدينة الموصل، العراق

اسامة موفق العراقي.

فرع الطب الباطني والوقائي، كلية الطب البيطري، جامعة الموصل.

الخلاصة

تُعدّ التحقيقات الأولية حول الامراض ضرورية لتحديد الخطوات اللازمة لإجراء دراسات شاملة أخرى. هدفنا في هذا البحث هو التحقق من وجود رد فعل مناعي تجاه بكتيريا الكوكسيلا البورنيتية لدى الأبقار (Bos taurus) في مدينة الموصل، العراق. ولتحقيق هذا الهدف، فحصنا عينات مصل من 46 رأس ماشية جُمعت من مناطق مختلفة في الموصل باستخدام اختبار الإليزا. حددت الدراسة وجود 2 من أصل 46 عينة (4.3%) إيجابية، و31 من أصل 46 عينة (67.4%) غير مؤكدة. وفي الختام، تُشير النتائج إلى وجود إصابة واضحة ببكتيريا الكوكسيلا البورنيتية لدى الأبقار في مدينة الموصل. يجب أن تدرس البحوث المستقبلية بدقة العوامل الوبائية المرتبطة بداء الكوكسيلا لدى الأبقار في الموصل.

الكلمات المفتاحية: الكوكسيلا البورنيتية, الماشية, احتبار الاليازا.