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Study and Diagnosis of Some Physiological Parameters and Hormones in Female White Rats with Induced Abortion by B. *Abortus*

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Annotation: This research set out to examine the effects of Brucella abortus infection on pregnant and nonpregnant female rats, along with a few other physiological characteristics. Infected female rats (n = 15), infected pregnant female rats (n = 15), and a control group. The rats came from the animal facility at Al-Qadisiyah University's College of Veterinary Medicine. The findings of this investigation demonstrated Within 24 hours of infection with B. abortus biotype 1, all of the rats exhibited symptoms of lethargy, loss of appetite, and fever. Within the span of 7 days of monitoring, the greatest rectal temperature was 38.5 degrees Celsius at hour 72. Throughout the study, no clinical abnormalities were noted in the control rats. Compared to the control group, the levels of LH and FSH were significantly lower in the brucellosis-infected and nonpregnant participants as well as the brucellosis-infected and pregnant participants (P0.05; Fig. 1 and 2). In comparison to the first group and the placebo group, the second group had the most improvement. The current study's findings are depicted in Fig. 3 at the (P0.05) level of significance. The levels of the IgG were a substantial rising in the group that was infected with brucellosis and was not pregnant, as well as in the group that was infected with brucellosis and was pregnant compared to the control group. In comparison to the first group and the placebo group, the second group had the most improvement. The current study's findings are depicted in Fig. 4 at the (P0.05) level of significance. When compared to the control group, the MDA levels were significantly higher in both the brucellosis-infected and -pregnant and -infected and pregnant groups. In comparison to the first group and the placebo group, the second group had the most improvement. In contrast, as depicted in Fig. 5 at (P0.05), GSH levels were significantly lower in the brucellosis-infected and non-pregnant group and the brucellosis-infected and pregnant group when compared to the control group. In comparison to the first group and the placebo group, the second group had the most improvement.

Key words: B. abortus LH, FSH, MDA, GSH, IgG.

Introduction

Many species of the genus Brucella produce brucellosis, a zoonotic disease that may infect people as well as domestic and wild animals (Whatmore et al., 2006; Macedo et al., 2008). The reproductive system of cows is vulnerable to the harmful effects of the pathogenic bacterium Brucella abortus. Both sexual contact with an infected male and the use of sperm for artificial insemination can introduce the virus into the uterus (Crawford et al., 1990; Lim et al., 2005). The bacterium Brucellae is present in the reproductive systems of several host species and, in the majority of instances, causes abortion and decreased fertility (Robison et al., 1998). Abortion, reduced fertility, and placenta retention are the main clinical signs of brucellosis in wildlife and cattle (Yaeger and Holler, 1997; Rhyan et al., 1994). The abortion fetus's uterine secretions pose a serious threat of infection to other animals. Humans contracted brucellosis either coming into touch with diseased animals or drinking milk that was tainted (Pappas et al., 2006). Reduced fertility, longer calving intervals, fewer

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offspring, and the necessity to remove infected animals from the herd all contribute to brucellosis's substantial economic effect on the cattle sector (Radostits et al., 2007). A number of developing nations, notably Korea, have begun to see brucellosis as a major animal and human health problem (Park et al., 2005; Pappas et al., 2005). According to Park et al. (2005) and Wee et al. (2008), the most common kind of Brucella infection in cattle and people in Korea is caused by B. abortus biotype 1. Baek et al. (2005) used rats as a model to evaluate the vertical transmission of biotype 1 B. abortus.

Materials and Methods

Experimental rats:

For this study, we utilized a total of 57 rats, consisting of 10 male rats and 45 female rats. The male rats had an average weight of 250-300 g. The rats were acquired from the Veterinary Medical College's Animals Housing Unit. The rats were housed in a hygienic, temperature-regulated environment, where they had unrestricted access to commercially formulated food and water. Prior to the experimental infection, standard bacteriological and serological examinations verified that the animals exhibited no signs of Brucella infection (as evidenced by a negative culture) and also lacked antibodies against B. abortus.

Experimental inoculations: The experimental groups consisted of 15 female rats infected with the virus, 15 pregnant female rats infected with the virus, and a control group of 15 rats. The infected group of rats received an intraperitoneal injection of 0.1 mL of normal saline solution containing 1x10 CFU mL of the B. abortus biotype 1. The control rats received an intraperitoneal injection of 0.1 mL of pyrogenic saline.

Results

Clinical findings:

Within 24 hours, all rats infected with B. abortus biotype 1 exhibited symptoms of lethargy, loss of appetite, and fever. The maximum recorded rectal temperature reached 38.5°C after 72 hours over the 7-day monitoring period. Control rats had no aberrant clinical manifestations for the whole duration of the investigation.

Hormonal profile

The results of the current study are shown at (P0.05) in the Fig. 1; 2, The levels of the hormones LH and FSH were a significant decreasing in the group that was infected with brucellosis and was not pregnant, as well as in the group that was infected with brucellosis and was pregnant compared to the control group. The greatest effect was in the second group compared to the first group and the control group.

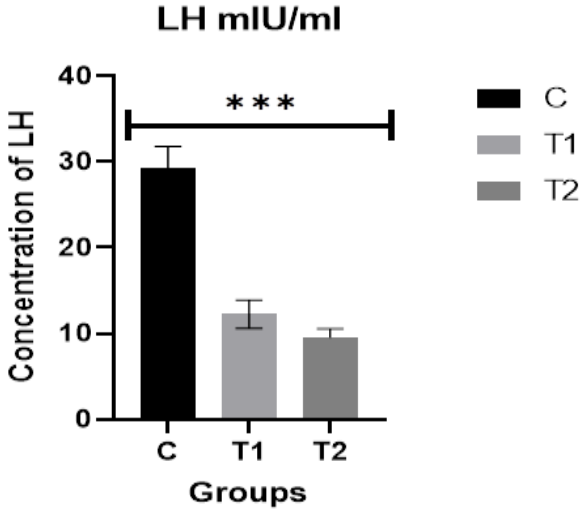

Fig 1: Effect of infection of *B. abortus* on LH hormone in female rats

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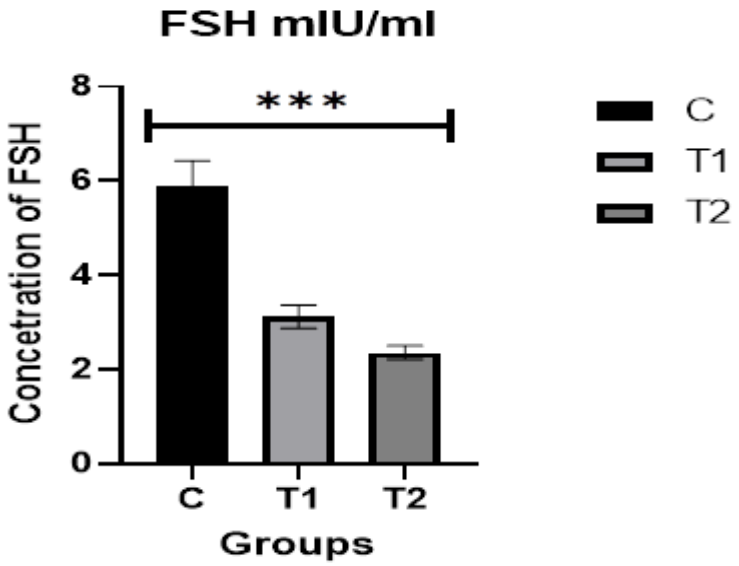

Fig 2: Effect of infection of *B. abortus* on FSH hormone in female rats IgG level

The results of the current study are shown at (P0.05) in the Fig. 3, The levels of the IgG were a significant increasing in the group that was infected with brucellosis and was not pregnant, as well as in the group that was infected with brucellosis and was pregnant compared to the control group. The greatest effect was in the second group compared to the first group and the control group.

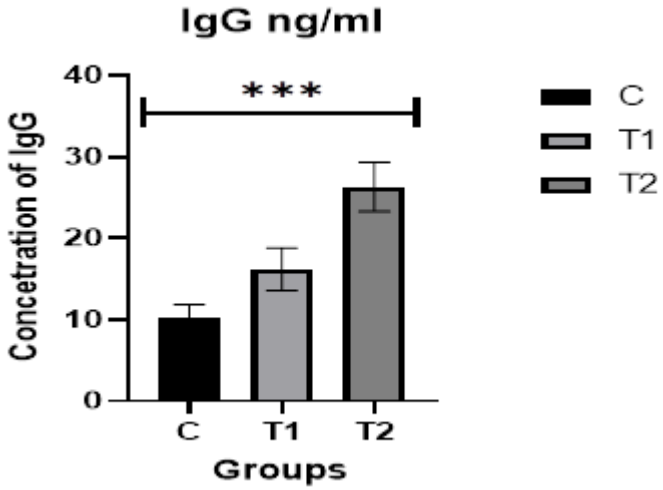

Fig 3: Effect of infection of *B. abortus* on IgG in female rats

Oxidative Stress-Antioxidant status

The results of the current study are shown at (P0.05) in the Fig. 4; The levels of the MDA were a significant increasing in the group that was infected with brucellosis and was not pregnant, as well as in the group that was infected with brucellosis and was pregnant compared to the control group. The greatest effect was in the second group compared to the first group and the control group. Whereas, the results of the current study are shown at (P0.05) in the Fig. 5; The levels of the GSH were a significant decreasing in the group that was infected with brucellosis and was not pregnant, as well as in the group that was infected with brucellosis and was pregnant compared to the control group. The greatest effect was in the second group compared to the first group and the control group.

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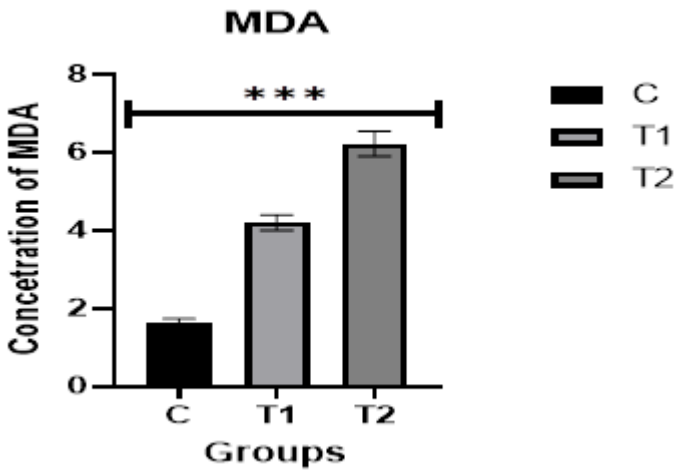

Fig 4: Effect of infection of *B. abortus* on MDA in female rats

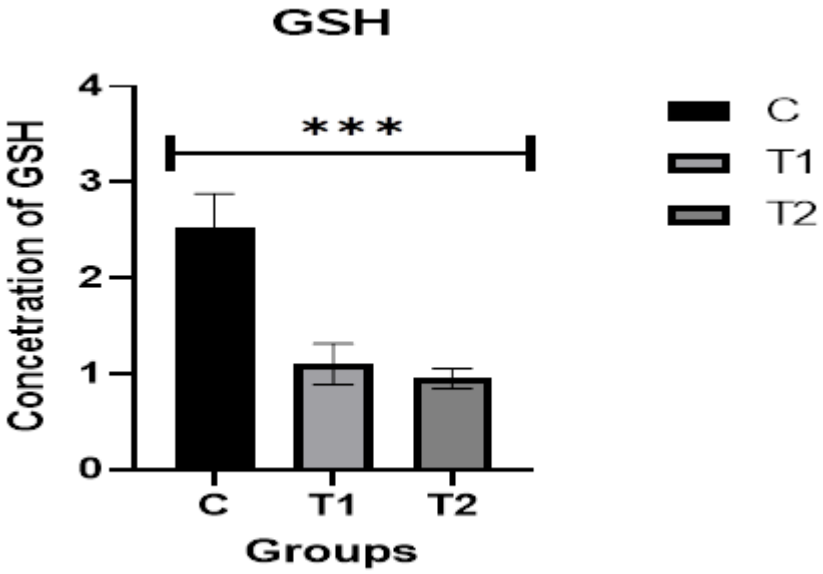

Fig 5: Effect of infection of *B. abortus* on GSH in female rats

Discussion

According to "Study and diagnosis of some physiological parameters and hormones in female white rats with induced abortion by B. abortus" (2022), the researchers examined the impact of Brucella abortus (B. abortus) on these parameters and hormones in the rabbits. Multiple physiological indicators and hormone levels were found to be altered in abortions caused by Bacillus abortus. These changes may have been caused by the stress of the abortion process or by the impact of B. abortus on the endocrine system, according to the experts. The research also showed that the rats' ovaries and uterus had significant histological abnormalities as a result of B. abortus-induced abortion. When it comes to diagnosing and treating abortions caused by B. abortus, the findings of this study are highly relevant. To start, this study's findings lend some credence to the idea that hormonal and physiological measurements might be useful biomarkers for the identification of abortions caused by B. abortus. Secondly, the research highlights the need of addressing the stress- and hormone-related factors that lead to abortions caused by B. abortus. Subfertility and changes in the ovarian hormone profile can occur in as many as 44% of animals due to uterine infections (Royal et al., 2000). Additionally, germs have the ability to interfere with uterine function. Herath et al. (2006) found that endometrial and ovarian cells' activity were changed when exposed to bacteria or bacterial products such LPS or proinflammatory cytokines. Lipopolysaccharide (LPS), the pathogen-

causing component of Bacillus abortus, is contained within the cell wall (Lapaque, 2005). Deyoe (1980) states that the most devastating lesions of brucellosis, which harm the uterine tissue and endometrium in cattle, manifest in the gravid uterus as changes in the interstitiala tissue and accumulations of lymphocytes, macrophages, and neutrophils. Infectious agents have been associated with decreased rates of ovulation, fertilization, and embryonic survival (Givens, 2006). Uterine infections hinder fertilization and embryonic survival, according to Semambo et al. (1991). Colonization of the maternal reproductive system by B. abortus in mice has been demonstrated to induce placental injury, fetal infection, and foetal mortality (Bosseray, 1982; Tobias et al., 1993). According to Kirkbride (1993), stillbirths were documented in cattle infected with B. abortus. Bartonella birtless infection is associated with fetal discomfort and a reduction in viable foetal weight (Boulouis et al., 2001). There was not a single sick rat that underwent an abortion during our examination. Cattle with preexisting infections were very unlikely to have an abortion (Deyoe, 1980). The immunological response and the success or failure of a pregnancy are related. According to Golding et al. (2001), when it comes to combating Brucella infections, the cellular immune response takes precedence over the humoral response. Pregnancy outcomes are negatively impacted by the cellular immune response that is mostly driven by the Th1 type of immune response in response to B. abortus infection (Krishnan et al., 1996). A well-executed and illuminating investigation was undertaken by Al-Shammari and colleagues (2022) on the effects of B. abortus-induced abortion on hormonal and physiological parameters in female white rats. When it comes to diagnosing and treating abortions caused by B. abortus, the findings of this study are highly relevant. Significant changes in several physiological parameters and hormones, such as body weight, food and water consumption, respiratory and heart rates, prolactin and progesterone levels, and estradiol levels, are linked to abortions caused by Bacillus abortus. Both the stress of the abortion procedure and the effects of Bacillus abortus on the endocrine system are thought to be the culprits for these changes. This study's findings suggest that hormone levels and physiological indicators, among other biological markers, might be useful in diagnosing abortions caused by B. abortus. The difficulty in diagnosing a B. abortus-induced abortion, especially during the first trimester, makes this finding all the more important. The research also shows that addressing the underlying stress-and hormone-related factors in B. abortus-induced abortion is necessary. The research found that following an abortion caused by B. abortus, there are significant histological alterations in the uterus and ovaries of rats. Among these changes include necrosis, inflammation, and hemorrhage. It is believed that the observed abnormalities are caused by B. abortus-induced abortion, which may have direct and indirect effects on the endocrine system. This study found that B. abortus abortion can severely impact the reproductive health of female rats. To understand the long-term effects of B. abortus-induced abortions on reproductive health in female rats and other animals, more research is necessary.

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