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# A STUDY ON THE ROLE OF TICKS IN TRANSMITTING CERTAIN TYPES OF BACTERIA IN SHEEP IN SOME AREAS OF TIKRIT CITY

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## ABSTRACT

The present study was conducted on sheep from the beginning of August 2025 to the end of December 2025. A total of 530 sheep comprising both sexes—were examined, 320 of which were found to be infested, representing an infestation rate of 60.38%. The subjects were sampled from several areas in the city of Tikrit: Rabidha, Awainat, Al-Na'imah, and Al-Mahzam. The highest infestation rate was recorded in the Rabidha area (70%), while the lowest was in the Al-Mahzam area (37.5%). During the study, 376 hard ticks (family Ixodidae) were collected; the genus *Hyalomma* accounted for the highest proportion (74.73%), followed by the genus *Boophilus* (25.27%).

The results revealed a diversity of bacteria associated with the ticks infesting the hosts. A total of 320 bacterial isolates were obtained from various parts of the ticks, including their external exoskeleton and internal viscera. *Escherichia coli* was the most frequently isolated bacterium (47.5%), followed by *Klebsiella pneumoniae* (32.81%), and *Staphylococcus aureus* (19.69%). These findings indicate the capacity of ticks to carry and transmit bacteria.

**Keywords:** Sheep, *Hyalomma*, bacteria, *Escherichia coli,* Tikrit

## 1 INTRODUCTION

Livestock, including sheep, serve as a fundamental pillar of food security in many countries worldwide. This livestock sector faces persistent and difficult challenges, one of which is tick infestation (Al-Tikrity *et al*., 2025). The danger posed by ticks extends beyond their role as ectoparasites that feed on the host's blood—causing anemia, general weakness, and damage to hides—to their function as critical biological vectors for a wide range of pathogens, including bacteria (Garcia *et al*., 2022). Ticks possess biological and physiological characteristics that enable them to act as both vectors and natural reservoirs for pathogenic bacteria (Fu et al., 2023). They remain attached to a host for extended periods to feed on blood and often move between multiple hosts throughout their life cycle, facilitating the transmission of bacteria from an infected animal to a healthy one. Furthermore, these pathogens can even be transmitted across successive generations of the ticks themselves (Carpouron *et al*., 2024).

## 2 MATERIALS AND METHODS

### 2.1 Collection of Tick Samples

Tick samples were collected directly from sheep by hand, using blunt-tipped, pointed forceps to ensure careful removal. The ticks were grasped by their mouthparts—as close to the host's skin as possible—and then slowly pulled off in a counter-clockwise motion. This technique prevents the tick's body from tearing and ensures that the mouthparts do not break off and remain embedded in the animal's skin. Once collected, the specimens were placed into plastic tubes containing sterile cotton moistened with distilled water. The ticks were identified based on the morphological and biological characteristics established by Soulsby, (1982). This classification was confirmed by sending specimens to the Natural History Museum, and all relevant data were recorded on a dedicated form.

### 2.2 Collection of bacteria from tick-feeding sites

Skin swabs were taken from the areas on sheep where ticks had been feeding. The site was first cleaned with a 0.9% sodium chloride (NaCl) saline solution, and samples were collected using cotton swabs, which were moved in a circular motion over the skin to ensure the recovery of a significant quantity of pathogenic bacteria.

#### 2.2.1 The bacterial samples

The bacterial samples were placed in sterile tubes containing NaCl and agitated using a vortex mixer for 2 minutes to dislodge bacteria present on the ticks' external structures. Subsequently, aliquots of the resulting suspension were cultured on Nutrient agar and MacConkey agar; these same media were also used to culture the bacteria collected from the skin (Becker *et al*., 2021).

## 3 RESULTS AND DISCUSSION

In this study, 530 sheep were examined, 320 of which were found to be infested, representing an infestation rate of 60.38%. There was a clear variation in tick infestation; the highest rate was recorded in August (66.67%), as this period marks the onset of activity for adult ticks and larvae emerging from their dormant phase. September also showed a high infestation rate of 60.74%, while the lowest rate was recorded in December at 52%. These findings indicate that infestation levels are higher during the summer and spring months and begin to decline during the cold winter months. These results are consistent with those reported by Eifan and Al-Jubouri (2018), who observed similar patterns during the months covered in our study. They also align with the findings of Mohammed *et al*. (2020), as shown in Table (1).

**Table 1: Percentage of cases by month of the year**

| The month | Number of sheep examined | Number of infected sheep | Infection rate(%) |
|---|---|---|---|
| August | 150 | 100 | 66.67 |
| September | 135 | 82 | 60.74 |
| October | 110 | 64 | 58.18 |
| November | 85 | 46 | 56.47 |
| December | 50 | 26 | 52 |
| The total | 530 | 320 | 60.38 |

During the study, 376 ticks were collected. The genus *Hyalomma* accounted for the highest proportion, with 281 ticks (74.73%), while the genus *Boophilus* was represented by 95 ticks (25.27%), as shown in Figures 1 and 2. These ticks were found distributed across various parts of the host's body, such as around the ears and on the udder area. The results of this study are consistent with the findings of Al-Tikriti (2012).



**Figure 1: The tick genus *Hyalomma***



**Figure 2: The tick genus *Boophilus***

**Table 2: Percentage of tick species recorded in the study**

| Tick species | Number of infected sheep | Infection rate(%) |
|---|---|---|
| *Hyalomma* | 281 | 74.73 |
| *Boophilus* | 95 | 25.27 |
| the total | 376 | 100 |

Regarding the areas where ticks were found—namely Rabidha, Uwaynat, Al-Na'imah, and Al-Mahzam—the Rabidha area recorded the highest infestation rate at 70%, followed by the Uwaynat and Al-Na'imah areas with rates of 57.58% and 46.67%, respectively. The lowest rate was recorded in the Al-Mahzam area, at 37.5%. These findings are consistent with the study by Al-Tikriti (2023), as shown in Table (3).

**Table 3: Percentage of tick occurrence by study area**

| Region name | Number of sheep examined | Number of infected sheep | Infection rate(%) |
|---|---|---|---|
| Rabidha | 250 | 175 | 70 |
| Awainat | 165 | 95 | 57.58 |
| Al-Na'imah | 75 | 35 | 46.67 |
| Al-Mahzam | 40 | 15 | 37.5 |

Regarding the bacterial isolates, the study recorded a total of 320 bacterial isolates from the external surface and internal organs of the ticks. *Escherichia coli* accounted for the highest proportion of these isolates, at 47.5% (152 isolates), followed by *Klebsiella pneumoniae* at 32.81% (105 isolates), while *Staphylococcus aureus* showed the lowest prevalence, at 19.69% (63 isolates), as illustrated in Figures 3, 4, and 5. These findings indicate the capacity of ticks to harbor and transmit bacteria. Furthermore, these results are consistent with the study conducted by Al-Nuaimi (2026) in the city of Tikrit, as shown in Table (4).

**Table 4: Percentage of bacterial isolates present in ticks**

| Type of bacteria | From the exterior structure | Internal organs | Infection rate(%) |
|---|---|---|---|
| *Escherichia coli* | 95 | 57 | 47.5 |
| *Klebsiella pneumonia* | 60 | 45 | 32.81 |
| *Staphylococcus aureus* | 38 | 25 | 19.68 |

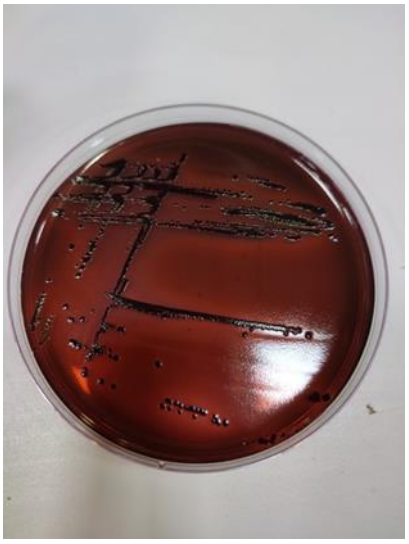


**Figure 3: *E. coli* bacteria**

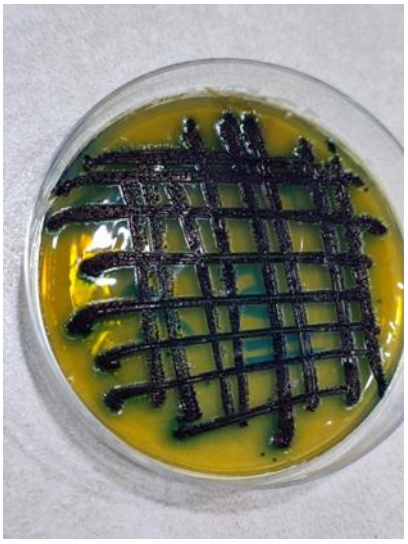


**Figure 4: *Klebsiella pneumoniae* bacteria**

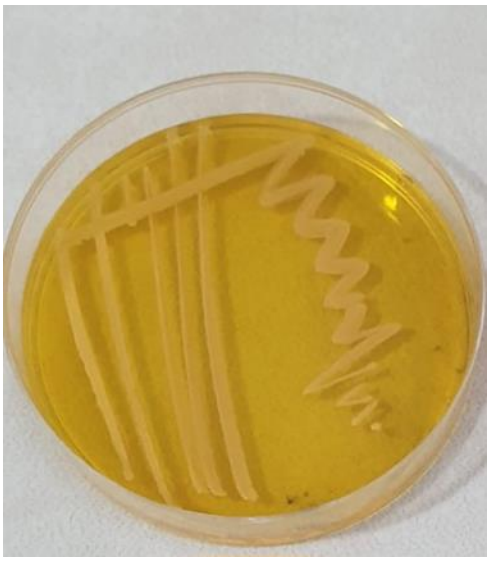


**Figure 5: *Staphylococcus aureus* bacteria**

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