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An Outbreak of Tetanus in a Sheep Flock Following Insanitary Ear Tagging in Mazandaran Province, Iran

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ABSTRACT

Background: *Clostridium tetani* is the etiologic agent of tetanus which is a hyper acute disease affecting various animal species. Tetanus distributes worldwide However its occurrence highly depends on the vaccination programs and the level of hygiene in a flock. There are a lot of flocks in Iran which have not been received vaccine**.** The aim of the present study is to illustrate the importance of tetanus as a cause of high mortality in small ruminants.

Methods: In a flock consisting 600 sheep, all the animal's ears were tagged. A total of 50 animals showed clinical signs of tetanus. The wound exudates were collected from deep parts of the injured ears. The samples were stained by gram staining and were cultured on blood agar media. Then biochemical tests were conducted on the suspected colonies.

Results: The animal's symptoms included limb stiffness, spasticity, trismus, sternal recumbency, lateral recumbency and opisthotonus were observed. The laboratory results confirmed the presence of *Clostridium tetani*.

Conclusion: According to the present study, consideration should be given to the tetanus vaccination which is crucial in high susceptible species and flocks managed base on traditional methods. Using ear tags in a clean and hygienic manner and spraying antibiotics on the wounds during the process may also decrease the probability of tetanus.

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Introduction

Clostridium tetani is the etiologic agent of tetanus which is a hyper acute disease affecting various animal species. Horses and small ruminants are the most susceptible animals respectively (1, 2). The incidence of the disease is rare in cattle and avian species are considered to be resistant (1).

The spore of the bacterium is a soil inhabitant which is very resistant and can survive in soil for many years (3). The spore is introduced to animal's tissue through wounds particularly deep ones. Then *C.tetani* desporulates and produces neurotoxin which can induces signs such as twitching, tremors, lockjaw, convulsion and protrusion of the third eyelid especially in young animals due to the insufficient homeostatic mechanisms in their body (1, 4, 5).

Tetanus distribution is global but its occurrence highly depends on the vaccination programs and the level of animal housing hygiene in a flock (3). Moreover, the disease is also related to the weather condition. The soil of warm and humid regions prepares more suitable environment for *C.tetani*, so the prevalence of the disease is lower in cooler regions of the world (6).

Tetanus is a sporadic life-threatening disease, Although outbreaks have been reported which are mostly associated with unhygienic injections, dehorning and ear tagging (7). Most outbreaks of the disease occur in small ruminants but there are reports of high mortality in cattle herds too (7, 8). Driemeier et al., in 2007 reported an outbreak of tetanus in Brazil in which 297 cattle were affected and died (8). There is another report of tetanus outbreak in sheep following vaccination against enterotoxemia (9).

Although tetanus is not a transmissible disease, it can infect human which is characterized by symptoms such as muscle spasm, trismus, neck stiffness, and dysphagia following wound contamination (10). Vaccination is the only way of controlling tetanus in both human and animals. Despite vaccination, according to world health organization (WHO), the annual case fatality of tetanus is 20000 in developing countries (11).

Tetanus toxoid vaccine is available for ruminants in combination with other clostridial diseases in Iran. However, there are a lot of flocks which have not been received vaccine. The present study describes an outbreak of tetanus in a sheep flock following ear tagging in Mazandaran province, Iran.

Materials and Methods

The animals

In a flock consisting 600 sheep, all the animal's ears were tagged. A total of 50 animals which their ears got injured and bled showed clinical signs of tetanus 10 days after ear tagging. Penicillin (20mg/kg) was injected for 5 days to 15 animals which showed sternal recumbency, although the administration of penicillin leades the disease coarse longer, the sheep finally died. Other sheep which their ears were not injured after tagging, were completely healthy.

Collection of samples

The wound exudates were collected from deep parts of the injured ear of the sheep using sterile swabs. The samples were carried to the laboratory in the Carry-Blair transport medium.

Diagnosis procedures

The samples were inoculated directly into the thioglyclate broth and were incubated anaerobically at 37°C for 24h. After incubation, smears from the thioglyclate broth were prepared for gram staining and the examination of the

presence of *C.tetani* drumstick -like appearance of *C.tetani*. Then the samples were obtained from the thioglyclate broth and cultured on blood agar with 3% agar. The grown bacteria on the blood agar media were examined for morphology of the colonies and swarming. Other biochemical tests including gelatin hydrolysis, nitrate reduction and starch hydrolysis were also conducted on the suspected colonies.

Results

Clinical signs of the animals

The clinical signs of tetanus started ten days after ear tagging.. In the early stages of the disease, the infected sheep retarded from the flock and the lamb had difficulties in following their dams, then gradually other symptoms including limb stiffness, spasticity, trismus, sternal recumbency, lateral recumbency and opisthotonus were seen (Figure 1). None of the 15 animals responded to the treatment with penicillin.

Post-mortem finding

Any post-mortem signs have not been seen in the ship except of one which in that were showed bile enlargement. This sign is not a pathognomonic finding in tetanus.

Laboratory results

Clostridium tetani was isolated from all the 50 swab samples. Gram staining showed typical morphology of *C. tetani* which were gram positive bacilli with terminal spores. Swarming colonies were visible on the blood agar media. The isolates were gelatinase positive, nitrate negative and couldn't hydrolyze starch. All the mentioned results indicated the presence of *C.tetani*.

Figure 1. The infected sheep showed clinical signs of tetanus including stiffness, spasticity, trismus, recumbency and opisthotonus.

Discussion

Based on the clinical signs, the history of unhygienic ear tagging and the laboratory results, the outbreak of tetanus was confirmed in the present study. The flock wasn't vaccinated against *C.tetani* so it causes a huge mortality and economic losses to the farmer. Although tetanus has controlled in human as a result of timely vaccination, in small ruminants it has been ignored. Moreover, most of the sheep and goat population in Iran are kept in traditional condition and. Consequently, the diseases including tetanus occur easily following management errors and unhygienic practices. Nevertheless, a few studies have addressed this issue in small ruminants in our country. There are just two studies that report the outbreak of the disease and one of them reffered to 1998 (12). Lotfollahzadeh et al. in 2019 described a tetanus outbreak in Iran due to ear tagging in 70 sheep which died with progressive tetanus signs (13). The route of the infection in this report was similar to our study.

Tetanus had also reported in other countries throughout the world (3, 4, 7, 14) but its frequency is lower in well-managed sheep flocks (3). In a study in 2007, 50 sheep in Brazil were infected with *C.tetani* following the injection of contaminated disophenol and the treatment approach was ineffective like our study (8). In 2011, two different cases of tetanus were studied. In the first report the goats showed clinical signs of the disease 7 days after ear tagging and in the second report tetanus occurred as an outbreak in calves following dehorning (7).

According to our knowledge the present study is the second outbreak report of tetanus in sheep and the infected animals died soon after ear tagging. The incubation period of tetanus is between 7-14 days according to the site of injuries because the bacterial toxin transportation from peripheral nerves to CNS takes time (1, 5). In the present flock, the site of the wounds was close to brain, so the symptoms were visible just 10 days after the wounds infection.

Most of tetanus cases are sporadic but outbreaks had been reported particularly in small ruminants (14). Lack of vaccination along with unhygienic practices such as dehorning, using contaminated needles or drugs, castration and ear tagging are the most prodominant causes of outbreak of tetanus in sheep and goats (1). In UK, 20% of farmers don't vaccinate their sheep against tetanus (3) and in Iran the situation is worse.

Conclusion

Consideration should be given to the tetanus vaccination which is crucial in high susceptible species and flocks managed should be based on traditional methods. Using ear tags in a clean and hygienic manner and spraying antibiotics on the wounds during the process may also decrease the probability of tetanus. The incidence of tetanus in Iranian sheep and goats is high and our results illustrated the importance of tetanus as a cause of high mortality in sheep. So it is necessary to educate farmers and provide commercial vaccines in this population.

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Ethics approval and consent to participate

This study did not require an ethics license.

Conflict of interest

None of the authors has any financial or personal relationships that could influence or bias the content of the paper.

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