

# Tetanus in a canine: clinical and therapeutic aspects

## Tétano em um canino: aspectos clínicos e terapêuticos

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### Abstract

Tetanus is a serious and rare disease in small animals, of an acute nature and mediated by the action of the neurotoxin tetanospasmin, from the bacillus *Clostridium tetani*. This report describes a case of tetanus in a canine, with emphasis on its clinical and therapeutic aspects, in addition to its clinical recovery. A canine, female, Pitbull breed, five months old, in *status epilepticus*, was attended at the Veterinary Hospital of the University of Passo Fundo. After stabilizing the patient, the animal was found in a trestle position, with generalized spastic paralysis, *risus sardonius*, trismus, erect tail and ears, and difficulty in expanding the thorax. The presumptive diagnosis of tetanus was established based on the anamnesis, clinical signs, and laboratory findings. The established supportive treatment included hydro electrolytic replacement, anti-tetanus serum, antibiotic therapy, analgesia, myorelaxant and anticonvulsant drugs. The patient's intensive management was carried out with urethral and gastroesophageal probing, changes of position every two hours, and reduction of environmental stimuli. Physiotherapy and acupuncture were also used to complement the treatment and accelerate recovery. The patient was discharged one month after the beginning of the treatment, presenting satisfactory evolution. In the present case, the clinical examination in association with the characteristic clinical signs of the disease, added to the detailed anamnesis, was essential for the presumptive diagnosis of tetanus. In addition, intensive management, drug treatment, physiotherapy, and acupuncture enabled the evolution of the clinical condition to cure.

**Keywords:** *Clostridium tetani*, diagnosis; spastic paralysis; tetanospasmin; treatment.

### Resumo

O tétano é uma doença grave e rara em pequenos animais, de caráter agudo e mediada pela ação da neurotoxina tetanospasmina, proveniente do bacilo *Clostridium tetani*. Neste relato descreve-se um caso de tétano em um canino, com ênfase em seus aspectos clínicos e terapêuticos, além da sua recuperação clínica. Foi atendido no Hospital Veterinário da Universidade de Passo Fundo, um canino, fêmea, da raça Pitbull, com cinco meses, em *status epilepticus*. Após a estabilização da paciente, constataram-se animal em posição de cavalete, com paralisia espástica generalizada, *risus sardonius*, trismo, cauda e orelhas eretas e dificuldade em expandir o tórax. O diagnóstico presuntivo de tétano foi firmado a partir da anamnese, sinais clínicos e achados laboratoriais. O tratamento suporte estabelecido incluiu reposição hidroeletrólítica, soro antitetânico, antibioticoterapia, analgesia, fármacos miorelaxantes e anticonvulsivantes. O manejo intensivo da paciente foi realizado com sondagem uretral e nasoesofágica, trocas de decúbito a cada duas horas e diminuição de estímulos ambientais. A fisioterapia e a acupuntura também foram utilizadas para complementar o tratamento e acelerar a recuperação. A paciente recebeu alta médica um mês após o início do tratamento, apresentando evolução satisfatória. No presente caso, o exame clínico em associação aos sinais clínicos característicos da doença, acrescidos da anamnese minuciosa foram fundamentais ao diagnóstico presuntivo de tétano. Além disso, o manejo intensivo, o tratamento medicamentoso, assim como a realização de fisioterapia e acupuntura, possibilitaram a evolução do quadro clínico à cura.

**Palavras-chaves:** *Clostridium tetani*, diagnóstico; paralisia espástica; tetanospasmina; tratamento.

## 1. Introduction

Tetanus is a neuroparalytic disease caused by the anaerobic bacterium *Clostridium tetani*, which can release the neurotoxin tetanospasmin, so named due to its action on neurons<sup>(1)</sup>. Equines, sheep, and goats are considered vulnerable to the disease; on the other hand, dogs, cats, and birds are less susceptible<sup>(2)</sup>. The generalized form of the disease is considered rare in dogs and cats due to the relative resistance to the toxin; however, the lethality rate reaches a minimum of 50% and

may be higher in young patients<sup>(3,4)</sup>. Clinical signs result from the action of tetanospasmin, and localized or generalized muscle stiffness, trismus, *risus sardonius*, erect ears and tail, diaphragmatic hernia, dysphagia, megasophagus, and seizures may occur<sup>(5)</sup>.

The definitive diagnosis of tetanus can be performed through microbial culture or bioassays, however, its growth in cultures is difficult and the inoculation of culture supernatant in mice is not commonly used<sup>(1,4)</sup>. Thus, the presumptive diagnosis is

based on the characteristic clinical signs of the disease during the clinical examination<sup>(2)</sup>. The treatment of choice is supportive and intensive, and recovery is slow and not always complete<sup>(6)</sup>. Physiotherapy and acupuncture are fundamental for the stimulation of skeletal muscles, helping with blood flow and stabilization of movement<sup>(7)</sup>. This paper presents a case of tetanus in a canine, with emphasis on its clinical and therapeutic aspects.

## 2. Case report

In emergency care at the Veterinary Hospital of the University of Passo Fundo (HV-UPF), a five-month-old Pitbull female dog, weighing 11 kg, in status epilepticus, with difficulty walking and trismus for three days, was received. Clinical signs started with spasticity in the forelimbs and rigidity of the masticatory muscles, progressing to the rigidity of the hind limbs, trismus, and seizures. The owner reported that there was recent contact between the dog and a horse diagnosed with tetanus. There are no reports of deep wounds or skin lesions that could indicate the agent's entry point.

To control status epilepticus, diazepam [Diazepam® 0.5 mg.kg IV] and propofol [Propovan® 2 mg.kg IV] were administered. After stabilization, a physical examination was performed, showing moderate dehydration, hyperthermia (40.5°C), tachycardia, tachypnea, difficulty in expanding the thorax, full urinary bladder, generalized spastic paralysis, trismus, *risus sardonicus*, and pinnae and tail erect (Figure 1A). In the body inspection, no wounds or healed lesions were identified, however, the trismus made it impossible to carry out a detailed inspection of the oral cavity. Considering the patient's history and clinical signs, the presumptive diagnosis of tetanus was established, followed by intensive treatment.

On the first day of hospitalization, a blood count and biochemical evaluation were carried out by measuring albumin, alanine aminotransferase (ALT), alkaline phosphatase (AP), creatinine, urea, creatine kinase (CK-Nac), with mild anemia (hematocrit 34%, reference 37-55), chronic stress leukogram and increased CK-Nac (1880 U/L, reference: <121). Supportive therapy was instituted for the patient, including Penicillin G Sodium [Bepeben® 40,000 IU.kg, intramuscular IM, every 72 hours], metronidazole [Metronidazole® 15mg.kg, IV, twice a day BID], vitamin complex [Citoneurin® 5,000 IU.10 kg, IV, once daily SID], interferon alfa 2b [recombinant human interferon alpha 2b® 0.2 IU.kg, IV, SID], n-acetylcysteine [n-acetylcysteine® 70 mg.kg, IV, DU], dipyrone [Dipyrone® 25 mg.kg IV, QID], methadone [Methadone® 0.3 mg.kg, SC, QID] and ketamine [Cetamin® 1 mg.kg, SC, TID]. To control seizures and muscle relaxation, diazepam [Diazepam® 0.5 mg.kg IV, QID] and sodium phenobarbital

[FENocris® 4 mg.kg, IV, three times a day TID, were added to the prescription until the seizures ceased]. In addition, lyophilized anti-tetanus serum [Lema Biologic® 100,000 IU.animal/day IV, for three days] was applied, without signs of hypersensitivity reaction or anaphylaxis.

The patient was accommodated in a dark room, without sound stimuli, and isolated from other hospitalized patients, to reduce excitement and consequent seizures. A urethral probe was performed, due to urinary retention, in addition to a nasogastric probe for feeding, and Nutralife® was provided according to the patient's daily energy needs. After feeding, the patient was kept in the standing position for 30 minutes, to avoid regurgitation.

The condition evolved satisfactorily and, after 12 days of hospitalization, new follow-up laboratory tests were performed. The blood count maintained the previous pattern and, in the biochemical evaluation, the only alteration referred to hypoalbuminemia (22g/L reference: 26-33). After 14 days of intensive care, the patient showed significant improvement, showing less sensitivity to external stimuli, ingesting water and soft foods orally with assistance, and having no seizure episodes. With that, the patient's oral cavity was verified, noting dental exchange.

From that moment on, physiotherapy and acupuncture sessions were held twice a week. In the first sessions, the patient had muscle spasms and, as a result, acupuncture was performed on points VG20 and four gentlemen, light stretching and manual therapy with lymphatic drainage, massage therapy, and joint mobilization. To avoid convulsive episodes and increase muscle relaxation, magnetotherapy was also instituted. In addition to physiotherapy, limbs were massaged daily with DM-Gel®, with flexion and extension movements, stimulating blood circulation.

After 30 days of hospitalization and intensive treatment, the patient was discharged to continue the treatment at home, being prescribed tramadol hydrochloride [Cronidor® 4mg.kg, TID], cyclobenzaprine hydrochloride [Miosan® 0, 5mg.kg, SID] and dipyrone [Sodium dipyrone® 25mg.kg, TID, for 15 days]. The physiotherapy and acupuncture sessions were also maintained, handling with changing positions, sunbathing together with light movements of extension and flexion of the limbs, in addition to the use of a support chair during feeding and at certain periods of the day, aiming at muscle strengthening. After ten days of home treatment, the patient returned to the locomotive, however, still with difficulty, normalizing the gait with 30 days of treatment. Three months after hospital admission, the animal recovered its body score (figure 1B).



**Figure 1.** (A) Canine patient, Pitbull breed, presenting generalized spastic paralysis, erect tail, *risus sardonicus*, and erect pinnae. (B) Improvement of the patient's clinical condition 90 days after the start of treatment (B).

### 3. Discussion

*Clostridium tetani* is a microorganism found mainly in the soil, transiently in the intestine of humans, and in domestic animals such as horses, and fomites (4). In the present report, the death of a horse on the property due to tetanus must be taken into account and this information becomes fundamental to the anamnesis, as the bacteria were probably present in the soil where the dog had access. Tetanus, although uncommon in puppies due to resistance to the toxin, should be considered as a differential diagnosis of convulsive and tetanus conditions, in addition to poisoning by strychnine, organophosphates and carbamate, and rabies (3, 8). Thus, it is essential to know the history associated with complementary exams. In this case, the tooth change observed in the patient was considered one of the main risk factors for the development of the disease, since the biting of various objects, a common habit among puppies, is among the possibilities of entry of the *Clostridium tetani* agent in the organism (2-4,9).

The clinical signs observed in this case are compatible with the release of tetanospasmin, which disseminates via the hematogenous route, reaches the central nervous system, and first triggers dysphagia and trismus, followed by spasms and muscle rigidity, which can extend to the facial muscles and result in the expression typical of *risus sardonicus* (6). Generalized spastic paralysis occurs when the tetanus toxin reaches the peripheral nerve endings, is internalized in the synaptic junctions, and reaches the spinal cord, migrating to the terminals of the inhibitory interneurons and blocking the muscle relaxation pathway (10). With this, there is a continuous release of acetylcholine and, consequently, exacerbated muscle contraction, causing spastic paralysis and muscle spasms (6,11). In this context, the symptomatology presented by the animal in this report is interconnected with the above, explaining the generalized and excessive muscle contraction, the convulsions, the easel position, and the difficulty in expanding the thorax, the tail, and the erect ears. It should be added that these are characteristic signs of generalized tetanus, more frequent

when compared to localized tetanus (6).

The presumptive diagnosis was based on the history, clinical signs, and response to recommended treatment. The patient in question showed characteristic signs of the condition 15 days after an equine contact was diagnosed with tetanus. Immediately after the clinical manifestation, the signs evolved rapidly, denoting a reserved to unfavorable prognosis (12). In most cases, the entry point of the agent is not defined, due to its incubation time, which can extend to 21 days (4). In dogs and cats, the presentation of the disease is usually late compared to other species, due to resistance to the toxin (3, 4). For confirmation, the inoculation of the culture supernatant in mice is indicated, by observing the signs of affection in one to four days. However, this is possible in cases where there are conditions for bacterial isolation, with the culture of material collected from patients with lesions. However, the detection rate in contaminated wounds is low. These characteristics, associated with restrictions on the use of animals and delay in obtaining the result, make the cited techniques little implemented as a diagnostic method (2).

Performing laboratory tests is essential to observe the patient's general health state and rule out other diseases that occur with neurological alterations (3,8). The slight anemia presented by the patient is justified due to the chronic inflammation (13). The observed stress leukogram occurs due to the release of cortisol related to stress, discomfort, and seizures (14). In serum biochemistry, the elevation of creatine kinase (CK) is related to muscle injury caused by muscle spasms, and hypoalbuminemia is justified by anorexia (4,15).

As a treatment for patients with tetanus, the use of anti-tetanus serum was crucial to inhibit the circulation and absorption of toxins that had not yet settled in the target tissues (16). Furthermore, its use is indicated as soon as the condition is diagnosed, to achieve the greatest therapeutic potential (6,9,15). Administration of tetanus antitoxin of equine origin at a therapeutic dose of 100,000 IU was also used by the authors' Farrow et al. (17) and Canal et al. (16). Previously, a small amount must be administered subcutaneously, as a test, to verify possible hypersensitivity reactions (18). The patient in this report did not present any clinical signs with the dose of antitoxin used.

After tetanospasmin is neutralized, antibiotic therapy is indicated to eliminate the agent and stop the production of new toxins. For this, penicillin G and metronidazole (2) were used. The use of vitamin complexes, immunostimulants, and antioxidants was used as part of the treatment to control neuralgia, and neuritis and protect against oxidative damage (19). To control convulsive crises, phenobarbital is considered the drug of choice (20). It is emphasized that the control of muscle spasms and seizures is key to the clinical improvement of

the affected patient<sup>(3)</sup>. Diazepam in this case was used to calm down, in addition to providing myorelaxation and acting to control seizures in association with phenobarbital<sup>(20)</sup>. Due to the generalized muscle spasms, it was necessary to control the pain using dipyrone, methadone, and ketamine<sup>(6)</sup>.

Associated with drug treatment and clinical stabilization, changing the position and isolating the patient in a dark environment without sound stimuli proved to be essential for her complete recovery<sup>(5,6)</sup>. Also, integrative therapies such as physiotherapy, acupuncture, and magnetotherapy are used with the aim of controlling pain and reducing the possibility of complications resulting from muscle immobility, in addition to restoring the function of musculoskeletal tissues and improving blood and lymphatic flows, resulting in relaxation. Muscle<sup>(7)</sup>.

#### 4. Conclusion

Generalized tetanus is a serious and rare disease in puppies due to its resistance to the toxin. However, when it occurs, history, clinical examination, characteristic clinical signs, and detailed anamnesis are fundamental to the presumptive diagnosis of the disease. Also, the appropriate clinical and therapeutic protocols, including intensive and drug management, and the performance of integrative therapies, such as physiotherapy and acupuncture, allow the good evolution of the clinical condition and the complete recovery of the animal.

#### Conflict of interests

The authors declare no conflict of interest.

#### Author contributions

*Methodology:* G. P. da Silva. *Research:* G. P. da Silva, C. Garcia, R. S. da Silva and B. W. Klaser. *Visualization:* G. P. da Silva, R. S. da Silva and B. W. Klaser. *Writing (original draft):* G. P. da Silva. *Writing (revision and editing):* G. P. da Silva, C. Garcia, R. S. da Silva, B. W. Klaser, S. Arenhart, Á. Menin, V. S. Padilha and A. A. de Lima.

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