

## FORMS OF TREATMENT AND PREVENTIVE MEASURES OF PUERPERAL PARESIS ON SOME FARMS

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### **Abstract**

Cow's milk fever (puerperal paresis or calving hypocalcemia) is an acute disorder of mineral metabolism. It occurs at the beginning of lactation, which is followed by hypocalcemia and hypophosphatemia. Animals with a genetic predisposition for high milk production are most at risk, immediately before calving and up to 72 hours after calving. It occurs in approximately 6% of dairy cows. In diseased cows, the hormonal mechanism that naturally maintains the calcium concentration in the blood plasma within normal limits (9 to 10 mg/dl) does not function. Clinical symptoms of milk fever appear when the calcium concentration in the blood plasma drops to 4 mg/dl. Predisposing factors that affect the occurrence of the disease are: nutrition, housing conditions, breed and age of the animals. Based on clinical signs, the disease manifests itself with clinical or subclinical signs. High-yielding dairy cows are more susceptible to puerperal paresis during the pre- and post-calving period. Milk yield, parity, age, breed, and diet composition of the cows are the most common factors contributing to the occurrence, incidence, and severity of milk taint. It is usually treated with oral calcium solutions and intravenous (I/V) calcium borogluconate. During the treatment of puerperal paresis, the primary focus should be on therapeutic treatment to restore blood calcium levels. Prevention of puerperal paresis is economically important to dairy producers to minimize production losses, mortality losses, and veterinary costs associated with the disease. Multiple strategies have been used to prevent hypocalcemia, including feeding anionic salts, low-calcium diets, vitamin D supplementation, dietary magnesium supplementation, and management of cow body condition during the calving period.

**Keywords:** calving paresis, milk fever, hypocalcemia, prevention.

### **Introduction**

Milk fever (paresis puerperalis), the clinical manifestation of calving hypocalcemia, is one of the most common mineral-related metabolic diseases in dairy cows that occurs shortly before or immediately after calving as a result of low blood calcium levels. Although treatment with intravenous infusion of calcium salt solutions cures most clinical cases of hypocalcemia, such cows are later more susceptible to other metabolic and infectious diseases (Curtis et al. 1983, Curtis et al. 1984). In many countries, the prevention of hypocalcemia during calving is given high priority.

During the dry period, the demand for calcium is relatively low. Therefore, intestinal absorption and bone resorption of calcium are relatively inactive during this time. The onset of lactation results in a sudden loss of calcium through milk. When the calcium homeostatic mechanism is unable to meet the calcium demand for milk production, hypocalcemia occurs (Tsioulpas A, et al., 2007). About 50% of dairy cows in their second lactation and above have blood calcium concentrations that fall below the threshold for subclinical hypocalcemia after calving (Reinhardt T, et al., 2011).

Milk fever can be clinical or subclinical based on whether or not an animal can show clinical signs. Clinical signs include ataxia, poor appetite, reduced rumen movement, low body temperature, slow respiration, rapid and weak heart rate, paresis due to decreased muscle function that can progress to complete paralysis and coma (Goff J., 2008). It can be diagnosed based on the animal's history at the time of calving, clinical signs, maternal age, and response to intravenous calcium borogluconate solution (Radostits O., et al., 2007). Treatment of puerperal paresis should be done as soon as possible for a good recovery and to avoid

complications. Calcium borogluconate is most commonly used for the treatment of puerperal paresis (Oetzel G., 2011).

Milk fever is a common metabolic disease of dairy cows worldwide, affecting cows most distinguished by the amount of milk secreted. Risk factors for hypocalcemia can be divided into intrinsic risk factors, which are related to genetic factors, condition, and constitution of the animal itself, and extrinsic risk factors, which are related to breeding, care, welfare, and usually environmental factors.

The key to preventing puerperal paresis is close dry cow management or management during late pregnancy. Multiple strategies should be developed to manage hypocalcemia and increase calcium mobilization in dairy cows, especially in the peri-parturient period (Amaral-Phillips D., 2017).

**General characteristics of milk fever.** Milk fever is a non-febrile disease of adult dairy cows caused by acute calcium deficiency (Oetzel G., 2011). Low blood calcium levels can lead to the cow's inability to lift her feet off the ground, as calcium is vital for muscle and nerve function, resulting in a metabolic disorder called milk fever. This disease has been known by a number of names, including milk fever, postpartum paresis, puerperal paresis, and calving apoplexy. It generally affects high-yielding breeds in their productive phase and older dairy cows that have a reduced ability to mobilize calcium from their bones.

**Treatment.** Animals affected by the most severe form of puerperal paresis should be treated as soon as possible. Puerperal paresis is usually treated with oral calcium solutions and intravenous calcium borogluconate (Goff J., 2008). Oral calcium borogluconate supplementation is the best approach for hypocalcemic cows that are still standing, such as cows in stage I hypocalcemia or those with undetected subclinical hypocalcemia (Oetzel G., 2011). Cows in later stages (II and III) of milk fever should be treated immediately with a slow intravenous administration of 500 ml of 23% calcium borogluconate (Melendez P., et al., 2008.). Extremely high doses of calcium can cause fatal cardiac complications (Doze J., et al., 2008.). Subcutaneous calcium administration can also be used to support blood calcium concentrations around calving (Goff J., 2008).

Intravenous calcium borogluconate, administered early in the course of severe cases, is generally the treatment of choice. The solution should be given slowly because rapid infusion of calcium can result in cardiac arrest. The combined use of calcium borogluconate, initially intravenously, then subcutaneously, may prevent recurrence by slowly releasing biologically available calcium from the tissues into the bloodstream (Bhanugopan MS, Lievaart J., 2014).

**Prevention and control of puerperal paresis.** Many programs are used to prevent hypocalcemia and mobilize calcium ions in dairy cows. We can mention nutritional management, including: feeding with anionic salts, low calcium ion feeds, low potassium forages and vitamin D supplements (Boda J., Cole H., 2003). A large body of literature suggests that when the incidence of milk fever increases above 10% in their third or subsequent lactations, attention should be paid to a specific control program (Oetzel G., 2011). Several principles and factors of milk fever control are applied today in commercial dairy farms. These include oral calcium feeding during parturition with easily absorbed calcium supplements, feeding acidifying rations with anionic salt supplements during the last weeks of pregnancy, feeding low calcium rations during the last weeks of pregnancy, and management practices such as body condition monitoring and shortening the dry period (Goff J., 2008).

Providing adequate magnesium supplementation is vital for the prevention of milk fever. This is because magnesium (Mg) plays a very important role in Ca metabolism, as it is a key mediator in the resorption of Ca from bone by parathyroid hormone. In a recent review, increasing Mg supplementation was found to have the greatest impact among nutritional programs for the prevention of milk fever (Jesse PG, Nicholas JK., 2018). A common preventive strategy is to add anionic salts to reduce the cation-anion difference in the diet (Patel

VR, et al., 2011). Since diets high in potassium are commonly associated with milk fever, pre-calving potassium levels should be kept as low as possible. Since dry feed contains more potassium, feeding dairy animals higher amounts of dry feed should be discouraged to prevent milk fever.

## Material and methods

The aim of this study is to present the forms of treatment and preventive measures of the disease of cows with the diagnosis of puerperal paresis. In our ten-year practice, from 2016 to 2025, in different farms in the area we have treated a total of 40 dairy cows with clinical signs of puerperal paresis and stretching before and after calving (Table 1).

Table 1. Number of cows treated during the 10-year period

| Year of treatment   | Number of cows |
|---------------------|----------------|
| 2016                | 3              |
| 2017                | 3              |
| 2018                | 5              |
| 2019                | 5              |
| 2020                | 7              |
| 2021                | 5              |
| 2022                | 4              |
| 2023                | 2              |
| 2024                | 2              |
| 2025                | 4              |
| Total cows treated: | = 40           |

In the treatment of cows diagnosed with milk fever, we used 3 forms of application of calcium preparations (Table 2). In the first form, we treated cows intravenously with puerperal paresis with more severe clinical signs resulting in gradual loss of consciousness to the point of coma. In the second form, cows treated in two ways: intravenously and subcutaneously were restless and sensitive to external stimuli, with slight tremors in the muscles of the back, neck and limbs, with difficulty in standing and unsteady while walking. In the third form, we treated cows subcutaneously, with signs of subclinical hypocalcemia resulting in less severe Ca disorders, animals that cannot stand up, apathetic and do not respond to external stimuli, with their head tilted to the side and resting on their chest. These animals may also experience slight tremors in the muscles of the back, neck, and limbs. They have difficulty standing up and are unsteady when walking.

Cows lying down with more severe clinical signs, those that cannot stand up, were treated intravenously with slow intravenous administration of 500 ml of 23% calcium borogluconate, while cows with clinical signs of paresis to the point that they cannot stand up were treated with calcium preparations (Calciject 40%, containing calcium borogluconate and Calci-kel 300, containing calcium gluconate, magnesium chloride). Of the cows that were treated intravenously, there were 21, of which 15 cows stood up within 8 hours after the start of treatment and 3 cows did not stand up. After the second treatment, 6 stood up on the second day, while 3 cows remained lying down in the following days. Of the cows that were treated subcutaneously, there were 13 cows, of which after applying subcutaneous calcium, 12 cows stood up within 2 to 4 hours, while one cow did not stand up, as it was physically weaker, so one of them recovered, while one did not stand up for 4 days, but remained in a lying position for up to 13 days and then stood up and recovered completely. Two cows with severe paralysis

and one cow with paresis were recommended to the owner to eliminate from the herd, and another died of cardiac insufficiency during treatment. Cows with mild tremors in the muscles of the back, neck and limbs, with difficulty in standing and unsteadiness while walking were treated subcutaneously. All cases treated in this way stood up and recovered completely, without any recurrence.

*Table 2. Forms of treatment of cows with milk fever and number of animals treated*

| Treatment form         | Number of cows | Cows That Stood Up | Cows That Didn't Stand Up |
|------------------------|----------------|--------------------|---------------------------|
| Intravenous            | 21             | 18                 | 3                         |
| Subcutaneous           | 13             | 12                 | 1                         |
| Combined (i/v and s/c) | 6              | 6                  | 0                         |

In all treated cases of cows with milk fever, the following preventive measures for post-calving paresis were recommended to farmers: low-calcium feed (< 20g per day), oral feeding around calving with easily absorbed calcium supplements, feeding acidifying rations with anionic salt supplements during the last weeks of pregnancy, feeding low-calcium rations during the last weeks of pregnancy, and pre-calving administration of vitamin D, vitamin D metabolites, and its analogues. There is another possibility to prevent hypocalcemia, and by limiting calcium intake during the dry period, calcium deficiency in the blood can be prevented. As already mentioned, the entire calcium regulation system in the body is regulated by the parathyroid glands, which secrete two hormones: parathyroid hormone (PTH) and calcitonin. PTH and calcitonin act in different ways. When there is not enough calcium in the blood, the parathyroid glands secrete PTH, which participates in the extraction of calcium from the bones and intestinal contents and stimulates the production of vitamin D, which is a calcium transporter. When there is too much calcium, the glands secrete calcitonin, which prevents the production of vitamin D and the breakdown of bone tissue, and all excess calcium is excreted from the body. It is especially important that PTH acts immediately before calving, because then the need for calcium increases drastically.

## Results and discussions

From the results of the treatment, it can be seen that in the 10 years of field work, there were fluctuations in the incidence of milk fever. There were more cases of this disease in 2020, while fewer in 2023 and 2024. This is an indication that the occurrence of milk fever is also affected by the dry climate, in particular the alfalfa growing season, because alfalfa contains twice as much calcium as all forage crops, so it would be advisable to avoid feeding cows during the drying period. Only corn silage has very little potassium, so it is a good food for cows in the drying season. From the results of the forms of treatment, we can conclude that the intravenous application of calcium preparations in severe cases, with gradual loss of consciousness, was reasonable given the fact that the applications of other forms could endanger the life of the animal. The application of calcium solutions was performed slowly in the jugular vein, but we previously performed a subcutaneous injection of caffeine, as an analeptic drug that affects the awakening of the central nervous system and the acceleration of the heartbeat (bradycardia). After the treatment, we stood next to the animal, waiting for its reaction to the applied therapy. The action of caffeine and then calcium woke the animal from its serious clinical condition, then muscle tremors began from the front of the body, continuing to the rear parts. After 8 hours of application, most of the cows stood up and stood tiredly, trying to get a little food. After standing up, we gave recommendations to the farmers that the newly recovered animals should be left calm, without disturbance, offering them a little food and water. The very

important recommendation was that the cow should not milk within the next 48 hours, because this would cause the depletion of calcium reserves in the body and the recurrence of the disease. Of course, there were cases when some farmers did not respect these recommendations, so we had cases of repeated treatment of the disease.

Combined treatment (intravenous and subcutaneous), that is, a smaller amount of the drug was applied intravenously, in order to quickly act calcium, while the rest was applied subcutaneously. This form was carried out in cows with signs of subclinical hypocalcemia that resulted in less severe Ca disorders, animals that could not stand up, but with a lighter clinical picture. The animals treated in this form were not treated with preliminary caffeine therapy, because the animals were awake, with slowed breathing, temperature within normal limits and with their heads raised. Almost all the cows treated in this form, within 2 to 4 hours, stood up, only one of them did not stand up.

Subcutaneous treatment was performed on cows that were anxious and sensitive to external stimuli, with slight tremors in the muscles of the back, neck and limbs, with difficulty in getting up and unsteady while walking. Treatment in this form gave good results, almost all treated cows got up and stood on their feet until complete recovery. Even in these cases, we recommended to farmers that the cows should not be milked within the next 48 hours, because this would cause the depletion of calcium reserves in the body and the recurrence of the disease.

## Conclusion

Metabolic diseases usually affect animals that are about to reach their maximum production potential. Milk fever or calving paresis is a common metabolic disorder in dairy cows that results from hypocalcemia that occurs in older, high-producing dairy cows in their third to sixth lactations that are about to calve or have recently calved. It is characterized primarily by progressive muscle weakness and depression that progresses to coma if not treated promptly. Calving causes a high volume of milk production and with it, a high demand for calcium from the cow's body. If the body is unable to respond quickly to this demand, the cow develops hypocalcemia. Hypocalcemic cows will begin to tremble and will no longer be able to stand. The cow will then lie down, first in a sternal position and then on its side. Calving paresis is favorable for early treatment with intravenous calcium supplements. Economically, it reduces milk yield and fertility. There are also losses due to the cost of treatment, the time the farmer spends dealing with the sick animal, and the increased risk of associated health problems. As with most diseases, prevention is key. Management practices such as body condition management and shortening the dry period are also critical to preventing the disease.

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