

A case of a lightning strike in a cow

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Summary

The article presents a case of two cows struck by lightning, one of which survived. The cows sought shelter under an old, withered willow. Clinical examination involving inspection and palpation revealed neurological signs: right-sided facial nerve palsy characterized by flabby ear droop, ptosis of the upper eyelid and forehead, drooling, palsy of the right orbicular nerve of the eye and ophthalmological signs, such as conjunctival redness, lacrimation, local corneal opacity of the right eye and optic nerve palsy (the pupil did not react to light). The cow also exhibited notable aggression, restlessness and hypersensitivity to touch. The patient was administered NSAID meloxicam twice with a 24-hour interval between doses and a preparation containing butaphosphan and cyanocobalamin. After several days, the signs disappeared, except for a slight right ear droop, which persisted for a long time. The article also discusses the risk of such cases occurring in temperate climate areas. Lightning strikes pose a threat, killing many people and animals worldwide every year.

Keywords: lightning strike, cows

Progressive climate change increases the likelihood of violent storms associated with intense lightning discharges (2, 12, 14). Lightning strikes can result in death or lead to temporary or permanent health disorders in humans and animals. Cattle kept outdoors are particularly vulnerable to lightning strikes. That risk is increased by the presence in pastures of elevated objects that could attract lightning, such as trees.

Although the cases of cows dying as a result of lightning strikes all over the world are numerous, they are not often described by the literature.

Every year, dozens of people and thousands of cows, goats and sheep are killed by lightning strikes (7, 9). For instance, in the United States, according to the National Weather Service, approximately 20 people and about 1,000 cows perish from lightning strikes

each year (7). In Brazil, apart from increased storm activity in natural forest areas, an important risk factor is the clearing of forests for breeding areas and the continuous growth in the number of cow herds (11).

The majority of storms in the world are recorded in the intertropical zone, where there are 30 flashes per 1 km² (Fig. 1). In contrast, in Poland, this number is almost 90% smaller. The storm season in Poland is short, lasting from June

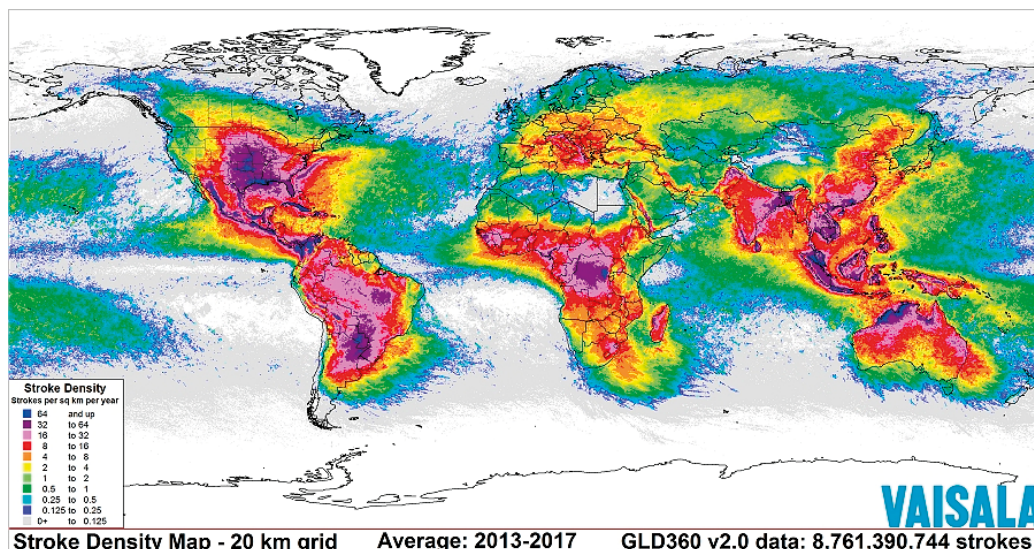


Fig. 1. Frequency of lightning strikes worldwide



Fig. 2. The area where the two cows were struck by lightning is marked in red. The tree under which it happened was removed from the pasture after the incident

to the end of August. The number of storms during this period, recorded at selected stations of the Institute of Meteorology and Water Management, ranged from 32 in Gdańsk-Swibno to 91 in Kraków-Balice, the latter being most elevated among the stations (3).

Case report

On July 7, 2022, a veterinarian was summoned to a large farm of Limousine beef cattle in the Nakło district of the Kuyavian-Pomeranian Voivodeship. The purpose of the visit was to examine a two-year-old cow suspected of unilateral blindness. The cow was in good condition (BCS 5 on a scale from 1 to 9) with a body weight of about 500 kg. The animal did not show any disturbing signs and had not been treated before. The herd consisted of more than 800 cattle, with approximately 300 cows among them. All animals were reared outdoors and had access to several pastures equipped with sheds for seeking shelter during adverse weather conditions. The pastures were situated on brown soils in a remote vicinity of peat and peat-silt soils that are characteristic of the Noteć area. On the farm, there was a hall designated for animals in the perinatal period. During the interview, it was determined that, during a severe storm on the previous day, two cows wandered away from the herd and sought shelter under an old, withered willow tree (the only one in the area), where they were struck by lightning (Fig. 2). An essential piece of evidence confirming this fact was a camera recording, which captured the moment of the lightning strike and the subsequent death of one of the cows. The second cow was in close proximity to the incident, but survived the lightning strike. The other cows were at a considerable distance from the accident site and were not affected by the storm. As described by a farm worker (who went to the place of the accident after about one hour) the deceased animal's eyes appeared to have 'exploded'.

We do not know much about the cow that was directly hit by lightning. The dead cow was found lying on its side

with unnaturally straightened limbs. However, an autopsy was not conducted due to the prompt disposal of the carcass.

The moment of the lightning strike was recorded according to the farm manager's testimony, who watched the video footage.

The 2-year-old cow that survived the lightning strike was clinically diagnosed with palsy of the right facial nerve, which manifested as flabby ear droop (ptosis) (Fig. 3) and



Fig. 3. Ptosis

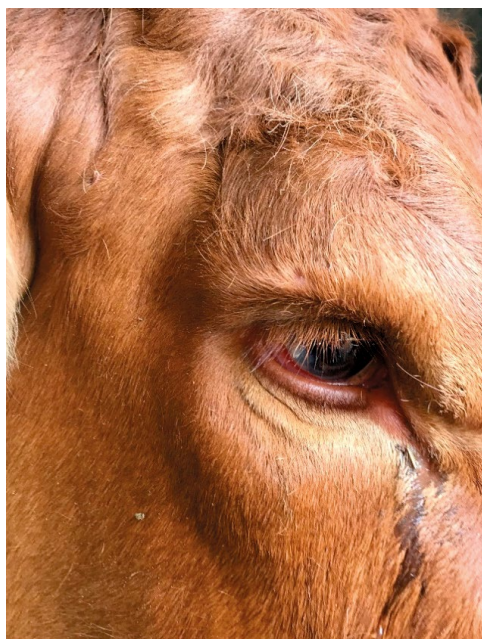


Fig. 4a. Blepharoptosis

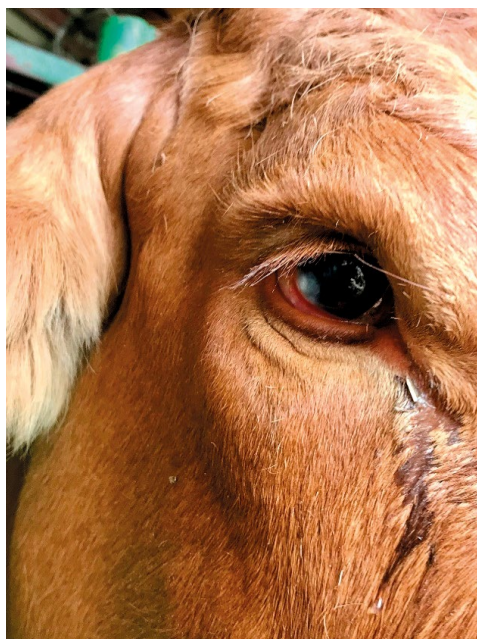


Fig. 4b. Lacrimation

upper eyelid droop (blepharoptosis) (Fig. 4a). The cow also exhibited ptosis of the forehead, drooling and palsy of the right orbicular nerve, resulting in inability to close the eyelids. Additionally, the animal displayed severe conjunctival redness, lacrimation (Fig. 4b), local corneal opacity of the right eye, and optic nerve palsy, leading to right-sided blindness and an absent menace reflex. No pathological changes in skin or hair were noted. The internal body temperature of

the cow was within the physiological range for its species and age.

In addition, the cow demonstrated pronounced aggression, anxiety and sensitivity to touch. To address these issues, the cow was administered intravenous NSAID meloxicam (Animeloxan 20 mg/ml, at a dose of 10 ml i.v.) twice with a 24-hour interval between doses and a preparation containing butaphosphan and cyanocobalamin (Catosal 10%, at a dose of 20 ml i.m.).

Further administration of Catosal was discontinued due to the aggressive behaviour of the animal, probably caused by its limited field of vision. Consequently, the cow was isolated from the herd for a proper convalescence period.

Within a few days, the animal's clinical condition improved significantly, and most of the signs disappeared, except for a slight drooping of the right ear, which persisted for a few months.

One year after the lightning strike incident, no previously recorded signs were observed (Fig. 5). The cow that died was struck by lightning in the head (that is perhaps why the eyeball tremor was observed).

Discussion

The vast majority of lightning strikes occur outside farm buildings, in the open air (5, 6). Animals are usually struck while seeking shelter under tall trees, towers or poles (4, 10). At least 31 cows were reported dead in one incident (10). In another case, Cristancho et al. (4) documented the death of 83 cows struck by lightning on the plains in Los Lonos, Colombia. The animals sought refuge in tall thickets in an area frequently affected by strong storms. Data from 2012-2016 indicated that the number of lightning discharges in the region ranged from 4 to 16 flashes per square kilometre (4).

A similar situation occurred in Rio Grande do Sul, Brazil, where four cows from two herds were killed by lightning during a violent storm. The cows took shelter under a eucalyptus tree. The presence of fresh burns on the tree trunks, along with loose bark, leaves and tree branches scattered around indicated the impact of the lightning strike. Cases of cows struck by lightning in Brazil between 2012 and 2019 were also described by Matos et al. (11).

It is worth noting that the power of lightning strikes is enormous, whereas the energy required to kill a cow is estimated at approximately 60 J/kg of body weight (8). However, in many cases, no distinct macroscopic or microscopic changes were observed in deceased animals (15).

It seems that, in our case, the impact energy was not high enough to kill both animals. The farm manager's



Fig. 5. One year after the incident

claim that the survivor cow was 'hit by a ricochet' seems probable. It is surprising that there were no changes on the skin, which may indicate that a chain lightning occurred on the wet soil. It is worth pointing out that the surviving cow moved away from the site of the accident immediately after being struck, which may confirm an indirect impact or a significant attenuation of power.

In this case, the cows sought shelter under an old, isolated tree, which is a typical behaviour observed in cows during storms. They tend to gather under tall trees or poles, or concentrate in remote parts of the pasture, often near wires separating plots of land, which further increases the risk of being struck by lightning (8). Gomez et al. (8) suggest that grazing on wet peatland can be an additional risk factor for lightning strikes. In the present case, however, the soil was different. Common peat soils were located in a depressive area, a few kilometres away from the farm. Therefore, it is difficult to determine whether their presence could have been an additional risk factor.

According to Rosenberger (13), lightning strikes can result in the paralysis of vital brain centres and the heart. Animals experiencing less severe signs may remain unconscious for some time and die within a few hours as a result of circulatory failure.

In most cases, however, the affected animals recover quite quickly. Only a small number suffer from temporary or permanent disorders, such as drowsiness, sensitivity to touch, nystagmus (involuntary eye movements), visual disturbances, facial paralysis, abnormal head or neck posture, ataxia (lack of coordination) and partial or complete paralysis of the limbs.

Brightwell et al. (1) also mention the rapid onset of rigor mortis, which subsides just as quickly. Rumen distension occurs in a similarly fast manner. The mucosa of the upper respiratory tract, sinuses and turbinates shows heavy hyperemia. Additionally, severe haemorrhages occur, with blood clotting slowly or not at all. Numerous petechiae are visible on the internal organs.

The best indicator of a violent death is the presence of hay or other forage in the animal's mouth and of normal faeces in the posterior part of the digestive tract. It is worth noting that death by lightning is often associated with a typical picture, where dead cows are found concentrated within a small area.

Due to climate change, violent weather phenomena are expected to intensify in Poland. This fact should be taken into consideration when insuring animals, especially in regions with an increased risk of storms. It is possible that miniature storm warning systems enabling breeders to react early and prevent similar cases will become necessary in the future. In the unfortunate event of animal fatalities, these systems could provide additional evidence to support insurance claims.

The case described here is a proof that not every incident of cattle being struck by lightning results in death or permanent health disorder. Along with climate

change and an increased number of lightning bolts, it might become a more common cause of economic losses among cattle breeders.

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