

Electrocution caused by a fallen electric wire in Korean native cattles

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Abstract : We report the electrocution of Korean native cattle by a fallen electric wire, which caused the death of thirteen animals. The owner of the cattle felt an electric shock on touching the steel pen and found a fallen 220-V wire on the roof of the barn; additionally, the roof was singed. Clinically, the animals developed spasm, difficulty breathing, and excessive salivation. Histopathologically, many visceral organs revealed severe congestion or hemorrhage, which is consistent with previous reports. This study revealed that the proper installation of electric wires on farms is essential to prevent economic loss by electrocution.

Keywords : cattle, electric wire, electrocution, histopathology

Electrocution is caused by exposure to high-voltage electric currents [1, 8]. Many animals are susceptible to electric exposure, especially cattle, horses, and pigs [2, 4-6, 10]. Animals are more susceptible to electrified ground than humans because they do not have footwear, their feet are often wet, and they have twice the ground contact that human beings have [5].

The main causes of electrocution in animals are lightening, fallen transmission wires and faulty electric wires, or chewing on electric cords [1, 8]. Fallen electric transmission wires are most dangerous when they fall into pools of water, as they are likely to do during the storms that bring the wires down [8].

Accidental electrocution of farm animals in a barn or confined pen usually results from faulty wiring [1]. The electrification of water pumps or milking machines in relation to dairy cattle can cause the widespread distribution of an electric current throughout the stable [1]. The gross and histopathological lesions of electrocution in animals are often minimal [8]. Therefore, if electrocution is suspected, it is best to ensure that possible sources of electric power are shut off before performing a necropsy [8]. Although some papers on electrocution in dairy cattle have been published, studies on beef cattle are rare [4, 5]. This

paper describes the history, clinical signs, and pathological lesions of accidental electrocution due to a fallen electric transmission wire in Korean native cattle.

The roof of the affected farm was covered with tin plate. The ceiling and pillars consisted of H-beam steel. The pens were made of steel and the floor was covered with rice straw.

The floor was wet and there was a small pool of water at the margin. Sixteen, 12- to 18-month-old, Korean native cattle were kept in the barn.

It rained heavily on March 21, 2005. The owner found three dead bullocks at 3:30 a.m. that day. Subsequently, several affected bullocks developed spasms and fell, and had high fevers (42°C) and difficult breathing. Some of the affected bullocks salivated excessively and appeared to be in pain. The bullocks that fell recovered gradually or died. In all, 13 bullocks were killed that day. The referred veterinarian felt an electric shock on touching the ears of the affected bullocks. In addition, the owner felt an electric shock when touching the steel pens. The owner found a fallen 220-V wire on the roof of the barn, and part of the roof had been singed (Fig. 1). The owner called an engineer at Korea Electric Power Corporation

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Fig. 1. The roof of the affected barn. The fallen wire was fixed with black tape after the accidental electrocution and the nearby margin of the roof was singed (arrow).



Fig. 2. Rumen of an electrocuted bullock. Note the severe reddening of the mucosa.

(KEPC) and confirmed the electricity leakage, and had the faulty wire repaired. KEPC compensated the owner for the damage due to electrocution.

Two dead bullocks were necropsied. Parenchymal tissues were taken and fixed in 10% buffered neutral formalin, sectioned at 3 μ l, and stained with hematoxylin and eosin using routine procedures. Specimens of the spleen, liver, and blood of two dead bullocks were cultured for *Bacillus anthracis* and *Clostridium chauvoei* using sheep blood agar under aerobic and anaerobic conditions. To differentiate sudden death by poisoning, the grain feed, straw, and ruminal contents of two bullocks were assayed for six organophosphorus compounds: monocrotophos, diazinon, phospamidon, parathion, edifenphos, and ethyl (p-nitrophenyl) phenylphosphothioate (EPN).

Grossly, moderate to severe reddening of the lungs, epicardium (one bullock), superficial lymph nodes, spleen, liver, kidneys, and the mucosa of the rumen, abomasums, and small intestine were detected (Fig. 2). No single marks were found on the skin. Histopathologically, severe diffuse pulmonary congestion and edema, and severe epicardial and myocardial hemorrhage were observed. In addition, congestion or hemorrhage in the medulla of the lymph nodes, red pulp of the spleen, portal vein of the liver, medulla of the kidney, and mucosa, submucosa, and muscular layers of the rumen, abomasums, and small intestine were found. *Bacillus anthracis* and *Clostridium chauvoei* were not isolated from any clinical sample and none of the six organophosphorus compounds were detected in any specimen.

Since there are few case reports on electrocution in beef cattle, the history, clinical signs, and pathological lesions in this case are valuable for field veterinarians or diagnosticians [9]. We speculated that the high humidity in the barn caused by the heavy rain and the presence of a pool of water in the barn contributed to the electric injuries in this case [1, 5, 8]. The clinical signs of the electrocuted bullocks were consistent with previous studies describing sudden death, excessive salivation, and colonic convulsions of dairy cattle [5, 8].

The severe congestion or hemorrhage seen in various organs concurred with reports on electrocution [1, 8]. By contrast, Shaw (1998) found no gross lesions in the internal organs of electrocuted bullocks [9]. We postulate that this difference could be caused by differences in the kind of electric current (direct vs. alternating), amperage, voltage, path of the current, duration of exposure, area of current flow, resistance of the intervening tissues, and wetness of the skin [2, 3, 7]. In a previous report, the most common gross lesions in the hearts of electrocuted dairy cattle were hemorrhage of the epicardium, myocardium, and endocardium [7]. Moreover, that paper described the fragmentation of myocardial cells and mononuclear cell infiltration in the hearts of some electrocuted cattle. The severe epicardial and myocardial hemorrhage observed in our case concurred with a previous report in dairy cattle, although those lesions were detected in one of two dead animals. However, we did not observe fragmentation of myocardial cells or mononuclear cell infiltration in the heart. Although the cause of death in electrocuted animals is cardiac or respiratory arrest, we

postulate that the severe shock induced instantaneously by an electric current could contribute to death [3, 8].

Based on the history of the fallen wire, the electric shock felt on touching the ears of affected bullocks and the steel pens, and the clinical signs of the electrocuted bullocks, we concluded that the sudden death of the Korean native cattle was caused by electrocution. Electrocution caused by faulty wiring should be considered when sudden death occurs in animals confined in pens or stanchions [8].

Our result also demonstrated that bullocks are very vulnerable to electric shock resulting from a fallen wire and subsequent electrification of the barn. Carelessness with electric wires could induce death. The proper installation of all electric wiring and electric machines on a farm is essential to prevent economic losses caused by electrocution [8].

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