New Advances in Humane Slaughter of Meat Animals

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ABSTRACT

On June 18, 1985, the U.S. Department of Agriculture approved a new method of humane slaughter for meat animals - “electrical slaughter” or deep stunning. In this method, the heart is stopped by cardiac arrest. The amount of blood loss and quality of the meat is the same as in conventional slaughter. Heart stoppage practically eliminates blood splashing and speckling.

Humane slaughter of food animals is intended to dispense animals without unnecessary suffering and to insure that bleeding is as complete as possible. Most European countries have had humane slaughter laws for many years, but humane slaughter legislation in the United States is less than 30 years old. Although many U.S. livestock slaughterers, particularly the medium and large companies, used humane slaughter methods for many years, the first legislation was passed in the United States in 1958 as the Humane Slaughter Act.

It required that livestock be rendered insensible to pain by a single blow, gunshot, or electrical, chemical or other means that was rapid and effective before shackleing, hoisting or cutting. The 1958 law was not mandatory though its provisions were followed by approximately 96-98% of U.S. livestock slaughtering plants. Kosher slaughter and other types of ritual slaughter were specifically excluded by the provisions of the law (8).

Public and scientific opinion, animal rights’ advocates and other factors caused a reassessment of humane slaughter objectives and techniques in the mid-70s. This reassessment included a lengthy and comprehensive study of humane slaughter by the U.S. Congress and resulted in passage of the Humane Methods of Slaughter Act of 1978.

This new law, passed 20 years after the first act, updated and corrected several deficiencies in the first one. Essentially, the new law made changes in two important areas. First, all livestock slaughterers—either federally or state inspected—were required to humanely slaughter livestock. And, more importantly, provisions were made to insure humane livestock handling procedures which had not been previously required.

Now, all livestock must be handled humanely when they arrive at the plant, not just at the time of slaughter, which was all that was previously required. Downer animals cannot be abused and must be moved in a humane manner which precludes unnecessary suffering. No longer can a downer be dragged through the yards or down an alley while fully conscious and suffering (9).

Irate workers are prohibited from physically abusing animals or inflicting pain. Livestock cannot be prodded with an electrical source that provides greater than 50 volts AC. Water must be provided for animals and feed must be available if they are to be held longer than 24 h until slaughter (9).

Several approved methods of stunning have been in use for a number of years. Captive bolt devices are used primarily for cattle and calves. The penetrating type produces immediate, permanent insensibility, but renders the brain unsuitable for use as food (1). The non-penetrating type (impact head) produces an immediate, but reversible insensibility, making it necessary to bleed the animal soon after stunning. Gunshot is used primarily on large, older cattle and horses and produces immediate, permanent insensibility. However, it is dangerous if the worker is not very careful.

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Head only electrical stunning is suitable for swine and sheep. It produces good bleeding and relaxation of the animals’ muscles (12). However, it is practical only for large operations due to its cost and the amount of equipment required.

The U.S. Department of Agriculture has recently approved on June 18, 1985 (Fed. Reg., Vol. 50, 6/18/85, 25199) a new method of slaughter known as electrical slaughter (preferred) or deep stunning. In this new method the heart is actually stopped by the electrical current as the animal undergoes cardiac arrest. There are two techniques that may be used—head to back and head to head.
Both methods work well, although it is important that the leg electrode maintain good contact in that method so that proper stunning occurs. This requires additional restraint of the animal. Electrical current of 50 Hz of 0.5-2.0 amps at 400 volts for 2-4 s is used which depolarizes the brain neurons.

Due to anatomical differences in circulation, the brain of calves continues to receive blood via the vertebral artery after severance of the common carotid artery so exsanguination does not result in immediate cerebral anoxia and death as it does in swine and sheep (4). Therefore, electrical slaughter is satisfactory for sheep and swine because the brain of these species does not receive blood via this vertebral artery shunt after exsanguination. However, this method is not acceptable for calves or cattle.

Recent research has shown that the pumping action of the heart is not necessary to insure complete bleeding as has long been thought (6). With the heart stopped, removal of blood from the muscle is accomplished by capillary vasoconstriction by catecholamines which are released due to the adrenergic stimulation from the stress of stunning (11). Removal of blood from the large vessels of the carcass is accomplished by drainage after exsanguination.

There is no difference in the residual blood content of muscle in animals slaughtered by this method because the volume of blood loss is the same as in conventional stunning: 60% lost by bleeding, 20-25% remains in the viscera and 15-20% remains in the carcass (12). The quality of meat from electrically slaughtered animals is the same as with conventional slaughter. An increased amount of time between stunning and exsanguination will result in an increased amount of residual blood in the muscle tissue by any other method of slaughter. Heme pigment (Fe) concentration in muscle is used as an index of retained blood (10), and an increase in heme results in oxidative rancidity of fatty tissues (12). Stoppage of the heart practically eliminates the blood "spashing" in the muscle and blood "speckling" in the fat which occurs during conventional stunning because of increased damage to the small blood vessel before elevation of the blood pressure (5).

It is anticipated that this new method of humane slaughter will become widely-used by plants which slaughter swine or sheep.

REFERENCES