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Pre-Slaughter Stunning: Why it is important

Certified Animal Welfare Approved by A Greener World (AGW) has the most rigorous standards for farm animal welfare currently in use by any organization in North America. Its standards have been developed in collaboration with scientists, veterinarians, researchers and farmers across the globe to maximize practicable, high-welfare farm management.

The aim of the Certified Animal Welfare Approved by AGW slaughter standards is to ensure that animals are killed quickly, painlessly and without any suffering.

Minimizing pain and stress at slaughter

A number of factors can help to contribute to the minimizing of pain and stress for animals at slaughter. The animal must be transported to the place of slaughter with the minimum stress; the animal must be unloaded and handled carefully; the facilities must avoid potential injury or distress – for example, the floors must have a non-slip surface; the person carrying out the slaughter must be properly trained and skilled; the method of slaughter must be appropriate to the species being killed; and the method chosen must be effective at the first attempt.

Death can be defined as the cessation of the vital functions of an animal. In order to make death as stress-free and painless as possible, this point must be reached either instantaneously or after the animal has first been rendered unconscious by another means. If the method of slaughter used means loss of consciousness is not immediate – for example, when using gas stunning – then the induction of unconsciousness should be non-aversive – in other words it should not be unpleasant - and should not cause anxiety, pain, distress or suffering in conscious animals. Evaluation of the effectiveness or otherwise of different stunning, slaughter or killing methods can be assessed by a range of different indicators – for example, the time taken to induce unconsciousness, the duration of unconsciousness, and the time to death.

An example of instantaneous death would include a beef animal shot using a free bullet to the brain. Examples of techniques for rendering an animal unconscious include the use of an electric stun, a non-penetrating bolt gun, or anoxic gases such as argon. Electric stunning and

use of captive bolts meet the requirement of an immediate (less than one second) loss of consciousness. Gases such as argon can be used to provide a non-immediate loss of consciousness that is non-aversive and does not cause distress to the animal.

It is important to note that stunning without immediately bleeding the animal may be reversible – in other words, without being bled the stunned animal has the potential to regain normal functions. Therefore it is important that the stun lasts long enough for the animal to be bled to the point of death without regaining consciousness. This means an effective stun, followed quickly by a cut to bleed the animal. The sticking or bleeding cut must sever the major blood vessels supplying oxygenated blood to the brain to ensure rapid onset of death.

Pain from the bleed cut

All animals have pain systems that have evolved to protect them from harm. Research shows that bleeding the animal without prior stunning can result in considerable pain. When a very large cut is made across the neck a number of vital tissues are severed, including skin, muscle, trachea, esophagus, carotid arteries, jugular veins, major nerves plus numerous minor nerves. An animal that is conscious when this cut is carried out will receive a barrage of sensory information to the brain. While wounds which involve the tearing of tissue – or multiple cuts – will affect a higher number of pain receptors than a clean cut, a long cut across the throat or a deep cut to sever blood vessels will still provide an input to pain centers in the brain is made – no matter how sharp the knife. This kind of massive injury will result in very significant pain and distress in the period before sufficient blood loss occurs for the animal to become insensible.

Cutting the throat of an animal without prior stunning will also significantly affect the ability of the animal to show some of the key responses which are used to evaluate the extent of pain. While an animal which is in pain as a result of an injury will often vocalize, the cutting of the throat can often limit or prevent the ability to vocalize and express pain. Difficulty in movement may occur because of the effect of blood loss on muscles and blood pressure. Also, many animals which perceive that they are in extreme danger show a freezing response. All of these factors – combined with the actual shock of the cut being made – mean that observations of low levels of behavioral response following throat-cutting cannot be held to show that the animal was not feeling pain.

After the blood vessels in the throat are cut, the resulting blood loss will lead to deficiencies of nutrients and oxygen in the brain, causing the gradual loss of consciousness. Further blood loss will damage the brain to the point that vital functions cease and death occurs. However, during the period when the animal is still conscious after the throat-cutting, serious welfare problems are highly likely to occur since the animal can feel anxiety, pain, distress and other suffering.

The duration of this period depends on how the animal is restrained during the cut and the subsequent blood loss, how extensive the cut was, and also the species of animal.

Time to lose consciousness

Looking at the main red meat species, adult cattle and calves appear to lose consciousness relatively slowly after throat cutting or sticking. Research shows that, after neck cutting without pre-stunning, the animal may not lose consciousness until anywhere from 19 to 113 seconds later, with an average of 75 seconds. In calves, one study identified brain activity in one calf 680 seconds after the cut was made. The concern is that while unconsciousness might indeed start at 19 seconds after the neck cut in some animals, in a significant proportion of others it could be delayed well beyond this time if stunning is not carried out first.

This finding may be explained by a particular issue found in bovine animals. When a bovine animal is cut for bleeding the carotid arteries and the jugular veins are severed, yet the vertebral artery is usually left intact, allowing these arteries to continue to supply the blood to the brain. Research has shown that because of this the animal continues to have brain impulses – as shown on an electroencephalogram (EEG) – and that the animal has some capability for coordinated movement for some time after a cut without pre-stunning. The conclusion is that the sensation of pain continues for this time.

Occlusion of the arteries

For calves, a possible explanation for the extremely long delay before some individual lose consciousness could be occlusion of the arteries. Severing the common carotid arteries would be expected to cause a constriction and narrowing of these arteries, commonly referred to as 'carotid occlusion.' This has been known to retard bleeding and prolong the time to loss of consciousness in calves and some older cattle. Occlusion could therefore have the effect of increasing the time during which an animal may experience severe pain and distress where stunning is not carried out first.

Suffocation

Cutting the neck without pre-stunning can also cause poor welfare by suffocation. When the cut is performed properly, veins, arteries, muscles, trachea and esophagus are opened so that blood and liquid from the stomach can be aspirated (breathed in) which could cause severe distress. The animals react strongly by movements that can be interpreted as signs of suffocation. Receptors in the airways and the lungs detect these liquid substances, resulting in a reflex desire to cough in an effort to remove the liquids from the respiratory system. Animals may become distressed by the feeling that they cannot breathe and develop fear for as long as the brain is still functioning and the nerves remain intact. However, the severance of one of the

major nerves (the vagus nerve) which occurs during throat cutting prevents the animal from being physically able to cough and expel irritants from the upper respiratory tract and lungs. This probably explains why animals subjected to slaughter without stunning are seldom reported to show any actual signs of distress due to inhalation or choking with blood – even though this distress may still be occurring. In other words the animal may feel like it is suffocating, but because the vagus nerve is severed it cannot physically react to remove the fluids in its respiratory tract.

What happens when an animal is stunned?

Stunning seeks to obliterate the waking or aware state. In the unconscious state there is no experience of pain. Stunning renders the animal insensible and therefore insensible to pain and distress. Stunning also has the effect of making it possible to bleed the animal without placing it in a restraint for a prolonged period of time. The primary methods of stunning employed during the slaughter process involve either electrical or percussive techniques.

Electrical stunning causes insensibility by disrupting the generation and transmission of electrical impulses in nerve cells. As long as the stunner is correctly placed, and the correct current is applied, the stunning electrodes will induce a current of sufficient intensity to disrupt all coherent processing by the brain of incoming sensory signals before any discomfort from the electrical current is sensed. If the stunning current is maintained for a given time the nerve cells become unable to respond to any stimulus. The animal will then remain insensible after the current is removed until normal brain activity resumes. This insensibility can be measured on an EEG. When the EEG shows a trace like that of a grand mal epileptic seizure the animal is insensible. The state of brain that accompanies such a seizure is physiologically incompatible with consciousness. Research shows that effective electrical stunning produces consistent and immediate insensibility in all animals. As long as the animal is bled without delay the state of insensibility will persist until death from blood loss occurs. For example, an electrical stun of at least 200 milliseconds will render a sheep insensible (assuming the correct current is used). Once this state is induced, as long as the bleed cut is made within 15 seconds of the stun the animal will die from blood loss before it recovers consciousness.

Percussive stunning is carried out with either non-penetrating or penetrating captive bolts. When fired, these devices cause shockwaves of kinetic energy to pass through the brain, producing immediate insensibility from cerebral concussion. Again, this damage to the brain occurs faster than the transmission time for the sensation of pain and, assuming the bleed cut is made promptly after the stun, will lead to a sufficient period of unconsciousness that will persist until the animal is dead from blood loss.

Stunning with gas is different, in that it is not instantaneous. The design of any gas stunning system must take into account the advice of a qualified expert who will also be able to advise on the type of gas used and flow rate at which it is delivered. There is now a lot of information on the use of non-aversive gas mixtures. Such gas mixtures may include argon and nitrogen. Animals do not have receptors that recognize argon or nitrogen so even though induction of unconsciousness may take minutes the animal is not in any pain or distress during this time.

Summary

From the information above it is clear that neck cutting without stunning poses the highest risk to animal welfare. Instead of immediate insensibility, which occurs with stunning, the animal will pass through consciousness, to stupor, to semi-consciousness, unconsciousness and, finally, death. Pain, suffering and distress during the cut and bleeding process are highly likely. Rather than the milliseconds to unconsciousness that are a feature of an effective electrical or percussive stun, the time for the animal to become unconscious when no stun is applied and the major blood vessels in the neck are cut can be up to 20 seconds in sheep, 25 seconds in pigs and 2 minutes in cattle.

Although stunning methods themselves involve risks to animal welfare which must be carefully managed through appropriate training and facilities, stunning before neck cutting represents the lowest potential risk for the overall compromise of animal welfare in the slaughter process.

References and further information

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Pre-Slaughter Stunning: Why it is important is one of A Greener World's Technical Advice Fact Sheet range, designed to provide practical advice and support to farmers and ranchers. For more information, visit agreenerworld.org.

KEYWORDS

Stunning, pain, consciousness, slaughter, bleeding, insensibility