Pre-slaughter care of animals: a step towards meat quality assurance

Animals intended for meat production are very prone to different mismanagement issues, which can affect their health and welfare conditions. The management and care of animals is important straight from birth to the age when they attain marketable size. However, it is the time prior to slaughter when the management and care of animals plays a crucial role in determining meat quality.

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To ensure the quality of the meat that the consumer gets on the plate, the role of the veterinarian is of the utmost importance and begins on the farm right up to the slaughterhouse.

In order to safeguard meat quality, animals should be handled quietly and with the least disturbance until the time of slaughter.

Fatigued and excited animals should be provided with ample rest before slaughtering, so that the depleted glycogen reserve can be restored and the desired ultimate pH can be achieved after slaughter.

Providing animals with ad lib potable water not only helps in easy flaying operations but also reduces the intestinal microbial population, thus minimising the chances of carcase contamination.

Withdrawal of feed is a recommended practice for on-farm preparation of food animals before slaughter in order to prevent animal losses and travel sickness during transport. This will reduce carcase contamination due to the lower risk of gut contents spillage during carcase processing and to improve meat quality.

Stress and fatigue lower the consumer preferability of meat in several ruminant species due to depletion of muscle glycogen which, in turn, hinders acid production. As a result of which, the ultimate pH of meat remains high, causing a condition known as dark, firm, and dry (DFD) meat. Moreover, in pigs, acute stress before slaughter triggers rapid glycolysis even when the temperature of the carcase is still high, causing a condition called PSE (Pale, Soft, Exudative meat), and this meat suffers huge drip and cooking losses. Inappropriate management practices tend to affect meat quality which ultimately becomes unsuitable for processing operations. This imposes substantial economic losses on the meat processing industry.

Pre-slaughter management of animals on the farm

To ensure that the animal is free from dirt and dung on its coat, cleaning of the animal's body should be taken care of on the farm itself. According to research findings, pigs raised in lower stocking density, straw bedding and more frequent contact with humans are easier to handle and fight less when mixed with unfamiliar members of the same species. They also have lower salivary cortisol concentration during transport.

The first principle of animal handling is to avoid getting the animal excited. It takes up to 30 minutes for an animal to calm down and its heart rate to return to normal after rough handling. Calm animals move more easily and are less likely to bunch up.

Handlers should move slowly, with deliberate movements and refrain from yelling. In order to safeguard meat quality, animals should be handled with minimum noise and disturbance up to the point of slaughter. Animals may become agitated when they are isolated from others. If an isolated animal becomes agitated, another animal should be put in with it. Electric prodders should be used as little as possible.

Transportation of meat animals

The decision to choose which mode of transport to use should be based on the ground situation. It is always advisable to slaughter animals at a nearby slaughterhouse and avoid long journeys. Long journeys tend to increase the chances of injury, bruising, shrinkage loss and mortality.

Although we can minimise these losses by following scientific techniques of animal management prior to slaughter, we cannot nullify the impact of transportation on meat animals.

Various factors should be considered before commencement of a journey. One immensely important factor is the time of day when the journey should be started.

In summer, cooler mornings and evenings are preferred over late mornings, whereas in winter late sunlit mornings are preferred over early morning to begin transportation. Temperature plays an important role in deciding the time of a journey, particularly for pigs.

Undoubtedly, transportation is regarded as the most stressful and injurious stage in the chain of operations starting from farm to slaughterhouse and contributes significantly to poor animal welfare and loss of production.

Transportation by road using trucks is preferred for distances up to 500km. Vehicles should be suitably constructed for carrying different species of animal and must safeguard careful loading and unloading of animals. The floor of the vehicle should be non-slip and the vehicle should be provided with a temporary or permanent protective overhead covering.

Overcrowding of animals in small spaces should be condemned as it causes suffocation-related mortalities. Plasma concentration of cortisol increases after loading and remains higher for longer, rough and stressful journeys.

Pigs should be kept cool by sprinkling water over them in trucks. The water misting method appears to improve thermal comfort and reduce dehydration in pigs. Before commencement of a journey, animals should be offered adequate feed and water, this should also be practiced during the journey if it is very long i.e., more than 12 hours.

It is advisable to transport animals by rail if the distance is more than 500km. After every 1,000km, arrangements should be made to unload the animals. Animals should be provided with ad lib water and feed at least one hour prior to commencement of the journey. This practice will bring down shrinkage losses to as low as 5%. Rail wagons should have non-slip floors and adequate ventilation.

Problems caused by transportation

Cattle in poor condition get fatigued due to long journeys and become susceptible to transit or shipping fever. Another important disease is transit tetany or railroad sickness which resembles milk fever and the affected animal usually responds to calcium therapy.

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The most insidious and significant production loss in the meat industry is caused because of bruising.

Acute and chronic stress during transportation leads to PSE and DFD in pork and beef respectively. Heart failure can occur in pigs when overfed prior to loading in vehicles. This is primarily due to fermentation and accumulation of gases which puts pressure on the heart ultimately leading to heart failure.

The mixing of different species is prohibited as it may cause fighting between animals, leading to injuries such as broken legs or horns.

Post transport and pre-slaughter rest

A proper rest period after transport is highly desirable as animals slaughtered without an adequate period of rest show deterioration in the keeping quality of meat. Pre-slaughter stress depletes glycogen from muscle fibres according to their nature and to its mode of inducement. Thus, mixing stress causes greater depletion from fast fibres (type 2A and 2B) than from slow fibres (type 1).

Inadequate rest in lairage leads to incomplete development of acidity in the muscles and early invasion by putrefactive bacteria, which further leads to bone tainting in cattle and ham taint in pigs.

A rest period of 6-24 hours is optimum for enhancing shelf life of the carcase with the maximum limit being 36 hours detention and rest in lairage. Animals from different farms of origin when mixed can lead to fighting in lairage. Allowances of molasses to the post-transport exhausted animals can help to reduce the incidence of PSE in pigs. Moreover, it helps to maintain the glycogen level which plays a crucial role in better acidification of the carcase for a higher shelf life.

Meat quality issues

In live animals, the energy required for muscle activity is obtained from breakdown of glycogen in muscles. After the animal has been slaughtered, glycogen in muscle is converted into lactic acid and the carcase becomes firm (onset of rigor mortis). This lactic acid plays a crucial role in giving meat its characteristic taste, tenderness and colour. Thus, lactic acid converts muscle to meat. Stress and fatigue lower the quality of meat by depleting the lactic acid level of meat. When an animal is subjected to sudden stress, a condition called PSE is evident in the pork. Owing to the rapid breakdown of muscle glycogen and fall of pH within 45 minutes of slaughter, myofibrillar proteins get denatured.

This is aggravated by the high temperature of the carcase. All these changes lead to a decrease in the water holding capacity of meat which causes higher drip and cooking loss. PSE meat is not preferred by meat processing units.

Another equally evident problem in meat quality is DFD which is found in cattle, sheep, and even in turkeys, due to the depletion of glycogen in muscle. High ultimate pH of carcase due to low acid production leads to the production of inferior taste, dark colour meat and low consumer acceptability.

High ultimate pH provides an opportunity for bacterial growth on DFD meat, hence resulting in a shorter shelf life. The quality of meat in DFD is much firmer in texture and drier than normal meat.

Conclusions

Almost all animals that are reared for meat purposes eventually have to be slaughtered for obtaining meat. The process that starts on the farm has to ultimately end on the fork of the consumers. Therefore, the end

product of these events, i.e., meat, should satisfy consumer preferences.

All the pre-slaughter management and care activities should be driven to improve the quality of meat so that it fetches a good price in the market as well as cater to the needs of processing plants. Hence, from the farm itself the utmost care should be taken starting from cleaning to housing of animals.

At each step, care should be taken not to put animals under undue stress by handlers. Pre-slaughter scientific handling practices, which ensure gentle handling and have a positive effect on muscle glycogen reserves, should be adopted. ■

References are available from the authors on request