

Pre-Harvest Management of Meat Animals and Poultry: Care and Transportation

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Abstract

Preslaughter handling emphasize the importance of proper animal handling techniques before slaughter, suggesting ways to improve handling practices to protect animal welfare, enhance carcass and meat quality, and ultimately maximize profits for meat processors. During marketing and transportation, cattle are exposed to various stressors that trigger specific behavioral and physiological responses, including increased heart rate, body temperature, and corticosteroid levels. These stress responses can lead to losses in carcass yield due to tissue mobilization and dehydration, resulting in losses ranging from 1% to 8% after a 48-hour fast. Improper handling can cause bruising, leading to trimmed tissue, reduced yield, and downgrading. Moreover, pre-slaughter handling can significantly impact lean meat quality by affecting muscle glycogen stores. Chronic stress can deplete glycogen stores, resulting in reduced postmortem acidification and the production of dark cutting beef (DCB), which is prone to spoilage. Therefore, it is crucial to adopt proper animal handling techniques to minimize stress, prevent bruising, and maintain optimal carcass and meat quality.

Keywords: Stressors, space allowance, thermal neutral zone, bruise, crate, death on arrival, bruise, relative humidity, loading density, stocking density.

INTRODUCTION

Preslaughter handling refers to the interaction between humans and animals during phases of preparation for transport, loading, transportation, lairage and moving to the place of stunning and slaughter. Principle for Preslaughter care, handling and transport of meat animals include avoiding unnecessary suffering of animals during transport, ensuring minimum hygienic standards

and preventing spread of diseases. The 4 basic requirements for animal welfare defined by *welfare quality* include good housing (comfort during resting, ease of movement, thermal comfort), good health (absence of injury, disease and pain induced by management procedures), appropriate behavior (expression of social behavior, good human animal relationship and absence of fear). Personnel engaged in the unloading, moving, lairaging, care, restraining, stunning, slaughter and bleeding of

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animals play an important role in the welfare of those animals. For this reason, there should be a sufficient number of personnel, who should be patient, considerate, competent and familiar with the guidelines in this document and their application within the national context. The management of the slaughterhouse and the Veterinary Services should ensure that slaughterhouse staff perform their tasks in accordance with the principles of animal welfare.

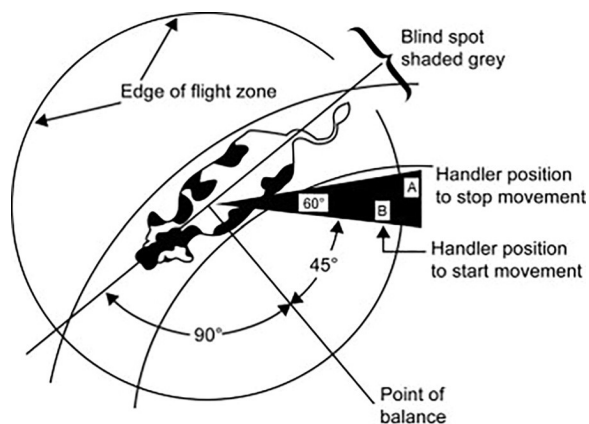
Essence of transportation Management

Transportation is important the whole process of loading animals into truck, transporting them to various distances impact animal's senses of well being and hence it's physiology and hemostasis which will directly affect the meat quality. Various methods of transporting animals includedriving of animal by hoof. Animal reared within 8-10 km from point of slaughter can be driven on hoof and this distance can be covered in 4-5 hours. Time to drive animal on hoof should be early in morning or late morning during winter. This also allow grazing animals to graze enroute and take water which causes minimum weight loss due to travelling. When transportation is done by road truckdistance up to 500 km can be covered in 12-15 hours. During transportation by truck important parameters to take care of are relative humidity, ventilation, flooring, spaceallowance. Thedriver of the truck vehicle should have journey log and animal transport certificate. Also, themotion of vehicle and vibration can produce motion sickness in pigs which also increase body temperature and causes vomition in pig because pigs are monogastric animal which can cause death due to asphyxiation or aspiration pneumonia.Trucks used for transportation must be covered, well equipped, should have non skid floors to prevent animal from falling and slipping. Vehicle design should be in this way that that animal does not touch the ceiling. Air temperature inside vehicle i.e., if environment temperature is high (more than 10°C) then there should be additional ventilation and minimum bedding to avoid heat stress. Contact with animals be avoided as it leads to overheating. If low temperature (-10°C) during winter animal should be kept dry as wind chills can lead to cold stress. At this temperature pigs need heavy bedding and minimum ventilation.

Other methods of transportation include transportation by rail wagons for distance over 500 km. Water trough should be provided with roofed rail wagons and wagons should have non slip floors and free flow of air for ventilation. Animal should be unloaded every 1000km and offered

feed and water before reloading. Transportation by sea can also be used for international transport of animal. Transportation by air is rarely done. If done then done for expensive animals like horse.

Various Factors affecting transportation of animal include Livestock weather safety Index which is a curvilinear relationship between temperature, humidity and livestock comfort. As a thumb rule livestock should not be moved between 11 am to 4 pm during summer because the heat Index which is a combination of temperature and humidity is more or equal to 100°F or 38°C. Similarly, the Thermal neutral zone for poultry



is 13°-24°C. Thermal neutral zone is a range in ambient temperature where animal does not need to alter its basal metabolic rate or change its behavior to remain comfortable. If ambient temperature is more than thermoneutral zone then movement of air during transport should be done. Pigs must be transported for maximum 24 hours. Cattle, sheep, goat must travel for 14 hrs. Horses can be transported for maximum period of 24 hours. If during this time the horse doesn't reach destination then should be unloaded, fed, watered, given rest for 24 hours. After rest of 24 hours horses can be again transported. If animal fall sick during transportation, they should be separated from other animals and provide d adequate space and bedding to lie down. In general Stocking density in trucks for pigs should be between 0.35-0.50 m square per 100 kg live weight of pig. For 115 kg stocking density should be 0.4-meter square and for the loading densities should be decreased. For temperature less than 16°C loading density is 294kg per metersquare, for temperature between 16-23°C loading density is 263 kg per meter square, for temperature above 23°C loading density is 244 kg per meter square. For cattle with horns space allowance is 7% higher than dehorned cattle. Pigs must be transported for maximum 24 hours. Cattle, sheep, goat must travel for 14 hours before giving

rest of 1 hour during which they are given water and after rest again transported for 14 hours. Horses are transported for maximum period of 24 hours. If, during this time the horse doesn't reach destination then should be unloaded, fed, watered, given rest for 24 hours. After rest again transported. If animal fall sick during transport, they should be separated from other animals and provided adequate space and bedding to lie down. Withdrawal of feed should be done 12-24 hours prior to transport. It is done to reduce overall weight being transported. Thus, reduces animal weight by reducing weight of gastrointestinal tract of animal. Feed withdrawal reduces ingest movement through digestive track which can reduce excreta during transport. This is done to decrease contamination of carcass with microbes. Defecation during transportation, also causes weight loss. The weight of animal changes during transportation which is called as shrink. Shrink is defined as fraction of weight loss between the time of loading at production site and unloading at destination. Loss of weight is maximum in pigs than sheep then cattle. Pigs' loss 2.2-5.4 kg of live weight i.e., 4-6 % of body weight during 24 hours transport. In 90 kg pig weight loss is 1.35 kg per 24 hours. Sheep loses up to 3.6 kg during transport. In a calf of 149.6 kg live weight loss 4kg during its first day of travel and 1.8 kg on second day. a bullock weighing 610 kg will lose 30-40 kg during first day travel. In bacon pig loss in actual carcass weight is .9kg per day and overexertion can cause 6-7% loss of weight of liver.



Non ambulatory animal (downers) is animal not capable of moving on their own. US meat Inspection regulation specify that all non ambulatory cattle arriving at a processing plant should be condemned and destroyed. This is to prevent cattle infected with BSE (bovine Spongiform encephalitis) to enter the food supply because cattle normally are downers. Abusive act like dragging of non ambulatory animals, throwing of animal, dropping animal off truck, beating the animal, poking sensitive areas like nose, ears, rectum are banned according to many international standards.

Pre slaughter care at abattoir

On arrival at abattoir animal should be inspected while they are still on vehicle. Animal with injury, severe pain, should be killed humanely. Unloading areas for all species should have unloading pens that hold an entire truck load before they go to the main lairage stockyard pens. Holding pens of pigs are long and narrow and distance between 2 rails should not be more than 15 cm. Animal should not be held on ramps. If holding pens are limited then the truck arrival should be scheduled precisely, otherwise animal has to wait in truck on arrival at plant and it will increase Preslaughter stress. Unloading areas should be well illuminated and slope free. Corridors should be wide enough to allow pigs to walk. For 40-70 kg live weight pigs ramp angle up to 20° is optimum. Steeped floors should be of concrete with 100 mm rises and 500 mm treads. Cleats on wooden or concrete floors should be 50 mm wide, 50 mm high, 300 mm apart.

Stressors effect on meat quality

Stressors are the environmental stimuli that lead to imbalance of homeostasis of the animal and these stressors give rise to stress response which is corresponding physiological and behavioral defense reaction to stressors. Increased stress before slaughter tends to accelerate muscle metabolism and increase muscle temperature which gives rise to accelerated post mortem muscle acidification which favor PSE meat in pigs. When animal perceives danger or stress anxiety animal release hormone that activate fight and flight response. Epinephrine and nor epinephrine show effect on cardiovascular system and mobilize energy substrate which affects meat quality. Parameters to measure stress are heart rate, respiration rate, cortisol concentration in blood. Stress indicator in pigs is open mouth breathing, bloatchy skin stiffness, squealing, reluctance to move. High level of vocalization indicates high level of cortisol, lactate, glucose in blood. In cattle – bellowing, tail switch and raising tail. Facilitate movement of animals in lairage animals are reluctant to move in new areas. In past time electric prods with high volt were uses, which make animal more aggressive and furious. According to US division of Agriculture, prods are not allowed to have more than 50 volts. Ratte/ shaker paddle target audio stimuli. Nylon flags target visual stimuli. Since, animals have wider angle vision, hence they refuse to enter a dark room. Livestock is attracted more towards bright light areas, hence sunbeam from any hole in lairage roof. Also, animal should be avoided to see moving humans or moving equipments. No

yelling, whistling, or banging on side of race should be done. No novel odour like that of paint should be present. Excessive noise is very stressful to pigs. Noise level in lairage Pen is 75 decibels.

The attitude of lairage attended is very important to calm animal. Person involved in this work knows very well where to stand when the stock is moving. Each animal is considered to be surrounded by an imaginary flight zone. When animal enter the flight zone the animal will move away and will try to reestablish space between itself and handler. If handler enter's zone in front of animal's shoulder then animal will move backwards. If a person enter's from behind the shoulder animal move forward. Movement of sheep facilitated by use of a decoy or Judas in sheep. By this sheep will follow one another. Mixing of animal should be avoided as they may fight to establish new social order hierarchy and lead to development of social stress. Aggressive animal and female in estrus should be separated. Horned animal should be separated from polled animal. Breeding bulls and boars should be penned separately. Mixing young bull is contraindicated because they rapidly become exhausted through constant mounting and should be slaughtered as soon as possible. In lairage pigs should be given rest for minimum 2-3 hours. If slaughter immediately after transport, then lairage should not be too hot not too cold. There should be enough space for animal to move in lairage as high stocking density in lairage also increase aggression, fighting, physical damage to other animals. If lairage time exceeds 12 hours then animal must be fed. Sufficient quantity of water should be available at lairage. Cleaning of lairage should be done so that the water doesn't become contaminated with urine or feces. Lairage capacity should be six times more than number of pigs killed per hour. During hot weather, spraying pigs with cold water (10-12°C) at lairage decrease the risk of hyperthermia and decrease mortality rate. The shower should be given one at arrival and one at just before moving to stunning. In order to maintain adequate pre slaughter levels of glycogen in muscle easily digestible carbohydrates like sugar molasses can be fed before slaughtering. Rough handling, loading, unloading can lead to severe bruising in animals which is undesirable. At slaughter bruise may be dated by a test which utilizes formation of bilirubin in form of haemoglobin in area of bruise. The sample of bruised meat is soaked in Fouchet's reagent. If bruise is 50 hours old then there will be no reaction. If it is 60- 72 hours old then turns solution light blue. If it is 4-5 days old then give dark green reaction. If the bruise is 0-10 hour old then it

is red and hemorrhagic. If the bruise is 24 hours old then it is dark colored and if it is 24-38 hours old then it has watery consistency. If the bruise is over 3 days, then rusty orange color bilirubin and soapy in touch.

Transport and pre slaughter management of poultry

Rough handling during catching, poor transport will lead to high number of DOA (death on arrival) birds at processing plant which lead to loss of yield. Birds are caught and loaded into different type of transport units such as plastic crates with solid floors as these are cheap and prevent dropping from upper layer to the lower layer and prevent further contamination. Plastic crate with perforated floors is preferred because it provide better ventilation of birds. Respiratory moisturize from birds are discharged so that the birds can remain dry throughout journey. Nowadays modular system is used as they save labor.



CONCLUSION

The slaughter of animals for human consumption has been a long-standing practice since the domestication of food animals in prehistoric times. Given the growing ethical concerns of society and the recognition that animals are capable of experiencing pain, it is essential to minimize animal suffering throughout all stages of their lives. Assessing animal welfare concerns is crucial, and it is vital to acknowledge the need to avoid stress during each stage preceding an animal's death. These stages include unloading, lairizing, moving, restraining, stunning, and bleeding. The proposed guidelines aim to provide a framework for improving animal welfare by allowing variations to certain steps in the process. Achieving this objective requires training workers and handlers, eliminating stress-inducing factors, and continuously striving to improve methods and systems using available

knowledge and technology. The meat industry and related animal industries must work together to achieve desirable animal welfare outcomes within commercial slaughter processes. The ultimate animal welfare outcome depends on the commitment of all stakeholders, including producers, marketers, technicians, and animal handlers, guided by regulators, veterinarians, and other expert professionals.

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