

Animal Welfare Issues and Their Mitigation in Meat Production

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Abstract

Food animals such as buffalo, sheep, goat, pigs, and chickens are slaughtered for the production of meat for human consumption. To minimize the suffering of animals during the process of meat production (transportation, handling, stunning, bleeding, flaying, etc.), all regulations of animal welfare and environmental protection should be followed for the production of high-quality meat. Stress during the transportation of animals may lead to unnecessary suffering to food animals, which may lead to lowered meat yield and quality. The food animals should not be subjected to cruelty during transportation from the farm to the slaughterhouses. The regulations and standard procedures should be followed during the transport. Animals should get proper space and water in the lairage. Mixing of strange animals should be prevented. Stunning of animals or to make animals unconscious before slaughter is a very important procedure in terms of animal welfare and humane slaughter. Slaughterhouse management and workers should ensure the stunning of animals before slaughter. Animal welfare issues and precautions for the production of hygienic meat should also be taken care of during the slaughtering operation of sticking, flaying, evisceration, washing, cutting, and deboning.

Keywords: Food Animals, Lairage, Meat Quality, Stunning, Transportation.

Introduction

Animal welfare during meat production refers to the ethical treatment and minimization the suffering of food animals during the entire process of meat production. This includes factors like providing adequate space, shelter, food, water, and veterinary care, as well as avoiding unnecessary pain or distress during transportation and slaughter (Faucitano *et al* 2023). Maintaining high animal welfare standards is an important ethical and regulatory concern in the meat production industry. Now a days, meat consumers, processors and animal activists are also demanding the strict compliance of animal welfare measures in meat production. Animal welfare is defined as "the avoidance of abuse and exploitation of animals by humans by maintaining appropriate standards of accommodation, feeding and general care, the prevention and treatment of disease and the assurance of freedom from harassment, and unnecessary discomfort and pain (PCA Act, 1960). Welfare of food animals is also linked to carcass characteristics and the quality of meat produced (Ijaz *et al* 2022).

Broom (1998) defined the animal welfare as its attempts to cope with its environment. If an animal can't survive in its habitat or struggles to survive, it might be claimed that its welfare has been compromised. The environment, other animals, infections, and human handling are some of the things to contend with. Their response to these circumstances will have an impact on the quality of their carcass and meat. For instance, animals will have poor growth, lower weight, or even perish when they exhibit pathogenic indications brought on by a contaminated habitat, food, or water intake (Cabral 2010). It means that animals will produce meat over a longer period of time due to the slower growth rates, produce less meat, have their carcasses rejected during the meat inspection due to low meat quality (Clinquart 2022).

The government of India has established the Animals Welfare Board of India for the promotion of animal welfare generally for the purpose of protecting animals from being subjected to unnecessary pain or suffering, under the Prevention of Cruelty to Animals Act, 1960 (PCA 1960). Mellor (2016) described that animal welfare is guided by five "Freedom" that all animal should have -

- **Freedom from thirst and hunger** - by ready access to fresh water and a diet to maintain full health and vigor.
- **Freedom from discomfort** - by providing an appropriate environment, including shelter and a comfortable resting area.
- **Freedom from pain, injury, and disease** - by prevention or rapid diagnosis and treatment.
- **Freedom to express normal behavior** - by providing sufficient space, proper facilities and accompany of the animal's own kind.
- **Freedom from fear and distress** - by ensuring conditions and treatment that avoid mental suffering.

Increasing pressure from the environmentalists about the indiscriminate use of natural resources for the production of meat has also build extra pressure on meat industry to produce the meat following all regulations of animal welfare and environment protection during all the steps of meat production i.e. animal rearing, handling, transport, stay at lairage, slaughtering operations etc. (Sinhamahapatra 2022). Concern about the welfare of animals is contingent on people believing that animals, if improperly cared for or mistreated, can experience pain and suffering and will result into the production of meat of low quality (Carrasco-Garcia *et al* 2020). Grandin and Smith, (1999) reported that most important factor determining whether a meat processing plant has good or bad animal welfare practices is the attitude of management personnel. The plants that have good handling and stunning practices have a top manager who "cares" about animal welfare.

Welfare during Loading of Animals

The unnecessary suffering to the animals for loading and unloading should be minimized (Adzitey and Nurul 2011). Loading of food animals in the transporting vehicle is very difficult due to dealing with unfamiliar animals. Experienced staff should be employed for this work. Well designed and well-constructed facilities should be available at the farm for the loading of animals into the vehicle. The availability of well-designed ramp is critical for this task. The task of loading the animals in transporting vehicle even become more difficult and labour intensive while handling aggressive, heavier and adamant animals. To cope with these problems the process of loading the animals is mechanized. New, innovative and automotive methods for the loading animals in the vehicle includes hydraulic lift decks, tailgate lifts, and stationary unloading platforms. These systems can reduce the sufferings of animals, increase efficiency along with improving the safety of handlers (McGlone and Sapkota .2014). In loading

trucks, the animals should be kept away from a state of excitement. Rushing them in with force or with violent beatings must be avoided: heavy whips often cause bruises which degrade the quality of the meat.

Welfare during the Transportation of Animals

Animals are transported from their point of rearing/production to the slaughter houses. Animals are taken to the slaughter house from the nearby areas on hoof, if the distance of slaughter houses is more than road/rail/sea transport are used. Among these modes of transport, road transport is most preferred since the loading of animals is done at the point of production i.e., farm and unloading at the slaughter house or meat processing plants (Nielsen *et al* 2022). Therefore, proper loading density ensures the animals have enough room to maintain their natural posture and avoid injury or distress during the journey.

On animal welfare grounds, whatever the means of transport are utilized, the food animals should not be subjected to cruelty. The legislation for animal transport to prevent animal cruelty and the recommended procedures must be strictly adhered to (Passantino *et al* 2006). If the animals are carried by road or rail care should be taken while loading and unloading the animals, to avoid overcrowding which may lead to suffocation and physical injuries in the form of bruises, fractures etc. (Leffert 2021). Tying or chaining of the animals in the lorries or wagons should be avoided. There are specially designed trucks and wagons available to take care of such issues and should be used as far as possible.

On the hoof system of transport is generally not followed due to the problems of weight loss, stress, exhaustion of animals and lower quality carcasses due to the utilization of reserved glycogen level in the muscles of animals (Nielsen *et al* 2022). Along with it the process is also time taking. During the road and rail transport of food animals few precautions be taken are: (a) the trucks must be specially designed or conveniently modified to convey the stock; (b) Facilities of proper ventilation and lighting; (c) if open trucks are used, the top should be covered to protect the animals from the extremes of weather; (d) It should have easy loading and unloading mechanisms to prevent injuries (Murray *et al* 2020).

Sheep and goats may be kept together during the transport but the animals from the different farms should not be mixed. The small animals (sheep, goat and pigs) should not be mixed with heavy and horned cattle and buffalo. Non-slip surfaces on animal transport ramps help prevent animals from slipping and losing their footing during loading and unloading, which is crucial for their safety and welfare. Different regulatory bodies such as OIE and FSSAI emphasizes the importance of animal welfare during transportation due to its effect on the meat quality and meat prices. Proper transportation of animals reduces the stress of animals, prevent the excessive weight loss, disease and death of animals. Animals that experience lower levels of stress may yield higher quality meat. Furthermore, consumers may show a greater willingness to pay a premium for products that are certified as high-welfare. In each of these scenarios, a factor linked to enhanced welfare contributes to increased profitability for agricultural enterprises (Dawkins 2016; Lawrence & Vigors 2020).

Welfare of Animal during Holding in the Lairage

The lairage, which is the holding area for animals before slaughter, is to provide a transition from the transportation process to the slaughter process. The lairage design should prioritize the welfare of the animals during this transition period, ensuring they are comfortable, calm, and not subjected to unnecessary stress or discomfort (Nicolaisen *et al* 2023). Key factors to consider in the lairage design include providing adequate space, proper ventilation, access to water, and minimizing noise and disturbances to help the animals adapt and recover from the transport before being moved to the slaughter area. In order to ensure animal welfare in the production of meat, the physically fit animals should be killed as soon as possible after being given access to drinking water (Velarde & Dalmau 2024). Maintaining the general well-being and hydration of livestock during the production process requires access to ad-lib clean drinking water. Supply of drinking water in lairage also facilitates the flaying and evisceration processes during slaughtering and dressing the animals.

The animals waiting their turn for slaughter are held in a kraal or pen. The construction of holding pen is important to avoid injuries and excitement to the animals during the resting period. Where animals are transported from long distance, holding of animals is mandatory and at that time they should provide sufficient feed. Some occasional sugar feeding also necessary for rapid recovery from transport stress. This is the common practice in case of pigs.

Feed should be withheld prior to slaughter of the animal in order to facilitate slaughtering process and lower contamination risks due to the more chances of rupture of filled stomach and intestine which ultimately helps to improve the overall hygienic conditions. This practice also improves the finished meat product's visual appeal and marketability (Wu *et al* 2024).

Proper facilities should be available in the lairage for the ante-mortem inspection of animals. The herding and movement of animals in the lairage should as per the animal behavior and instincts. For handling swine, it is best to move small groups of pigs (15-20) rather than single pigs. Large groups are more difficult to direct and move than several small groups. Move pigs in a slow, steady and calm manner and use paddles and sorting panels to move pigs rather than using electric prods.

Animal Welfare in Meat Processing Plant

It is very important to identifying that which processing techniques are causing the stress to animal. The common conditions such as cleanliness of the equipment's, proper lightening and ventilation, design and placement of restraining and slaughtering equipment's along with employing the trained persons for different operations including handling of animals, bleeding, deskinning, evisceration and cut up part preparation are prerequisite for not compromising the animal welfare in meat processing plant. Stunning is the operation before the bleeding of animals, which is performed to make animals insensible to pain during the slaughtering for human consumption. In scientific or human slaughtering, stunning is mandatory on the grounds of animal welfare and meat quality. (Sinclair, et al., 2023). Commonly three methods of stunning are used in the field conditions these include mechanical, electrical and chemical method.

Struggling of pigs during the stunning results in rapid anaerobic glycolysis that produces lactic acid, which results in a rapid lowering of pH, and denaturation of proteins as the temperature of muscles is still higher this is followed by high moisture loss and increased shrinkage. The final pH value (5.5) can be reached at muscle temperatures above 30°C. The meat becomes pale due to the denaturation of dissolved sarcoplasmic proteins including the meat-color-producing myoglobin. Also, proteins in membranes denature and intramuscular fluid can leak out into the extracellular space. The exudate (also termed drip loss) increases rapidly and the muscles become soft. This condition is termed as pale soft and exudative (PSE) meat that result in lower quality pork (Han *et al* 2024). Higher voltage usage during the electrical stunning may result in petechial hemorrhages in the muscles.

After stunning, the bleeding or Sticking operation should be commenced as early as possible as the animal may become conscious again if there is unnecessary delay between stunning and bleeding operations. Bleeding is done by severing the major blood vessels in the neck region of animals, this will hinder the supply of oxygenated blood to the brain and the animal died due to cerebral anoxia (Aghwan *et al* 2016). The instruments/equipments used for the operation of sticking, flaying, evisceration, washing, cutting, deboning should be clean, sterilized and in proper working condition.

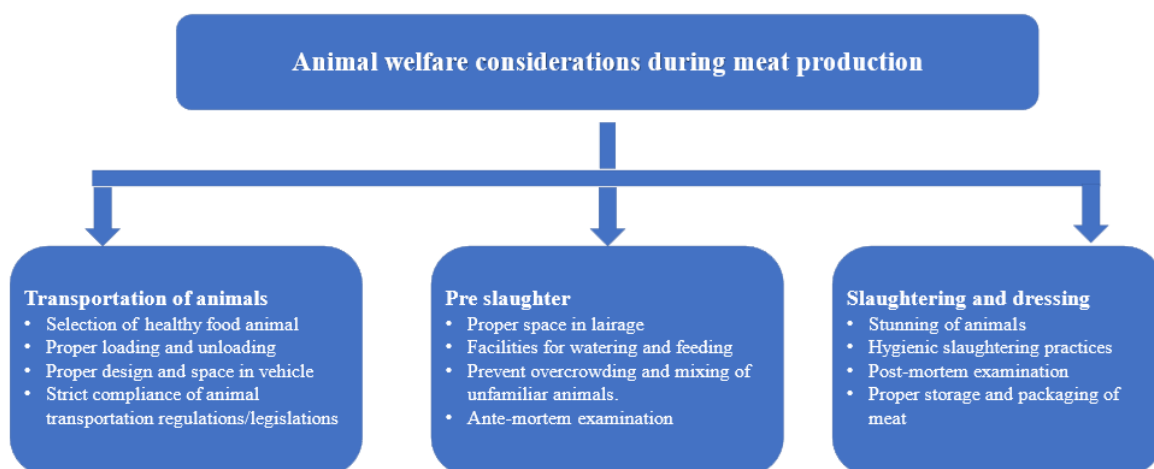


Figure 1: Animal welfare considerations at different stages of meat production process



Figure 2: Ramp for loading the food animals
(Reference- <https://www.pinterest.com/tmnorton8283/loading-ramp/>)



Figure 3: Permanent ramp construction at farm for loading animals
(Reference- <https://www.hsa.org.uk/facilities/loading-ramps>)



Figure 4: Ramp for unloading the food animals
(Reference- <https://hanjiangzhao.en.made-in-china.com/product/MNFQEciPZHkW/China-Mobile-Adjustable-Sheep-Unloading-Cattle-Yard-Loading-Ramp.html>)

Contribution by Authors

All the authors contributed equally to writing the manuscript. The final manuscript was read by all authors and

consented to publication.

Conflict of Interests

There is no conflict of interest.

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