# EFFECT OF TRANSPORT AND PRE-SLAUGHTER HANDLING ON WELFARE AND MEAT QUALITY OF CATTLE IN BAUCHI STATE, NIGERIA

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## ABSTRACT

The study was conducted to assess the effect of transportation and pre-slaughter handling on welfare and meat quality of cattle. A pre-feasibility study was done to observe and record the behaviour of the animals as they are being moved by cattle handlers from the cattle market until they were slaughtered in the abattoir. Meat from 20 poorly-handled cattle were sampled for determination of pH value. Each sample was taken immediately after slaughter, placed in an air tight bag and put into an ice chest. To investigate carcass bruising, 200 carcasses were evaluated at random for bruises as they were been transported to the abattoir. Three evaluation categories that were used in this system are: "none", denoting a clean non-bruised surface; "slight" denoting a reddish area with damage on the surface and "severe", meaning the bruise is reddish, deep and bleeding damage can be observed on the surface. The result of the study showed that, prominent among the behaviours regularly exhibited by the cattle during handling were raising of tail, kicking, lying down and refusing to move and jumping. Among the inhumane methods of handling by cattle handlers, whiping ranked highest. The percentage cooking loss of meat samples from the cattle that were subjected to poor handling ranged from 19.10–34.70 with a mean of 22.51 ± 3.25. Of the 500 carcasses that were visually observed for bruises, 18% had no bruises, 60% showed slight bruises while 22% showed severe bruises. In total, 82.2% of the carcasses observed were bruised. It was concluded that, the indications of compromised welfare of the cattle were feed and water, avoidance of the use of animal rest stops, overcrowding in vehicles, non-protection against bad weather, and maltreatment of animals by handlers. It was therefore recommended that, the compromised welfare situation of slaughter animals during transport and slaughter should be brought to the attention of stakeholders in the business.

**Key words:** Transport, pre-slaughter, welfare, handling

## INTRODUCTION

Pre-slaughter transport and handling of animals are accompanied by many stressful events, which affect animal welfare and meat quality (Okeudo and Moss, 2015). Pre-slaughter handling involves a number of critical points which include loading of animals at the farm, transport from farm to abattoir, unloading of animals at the abattoir, and slaughter. A study by Costa *et al*. (2016) revealed that loading and unloading are among the main activities that cause an increase in heart rate of cattle. Stress is an invariable consequence of transporting animals destined for slaughter from the farm to the abattoir. However, stress during transport can be minimized by improving facilities, vehicle designed, and handling methods. As is also widely known, pre-slaughter stress commences during loading of animals onto a vehicle that sends them to abattoirs. Transport time is also known to have an impact on transported animals. A study by Zobil (2020) showed that concentration of plasma cortisol (stress hormone) decreased with an increase in transport time while lactate and creatine kinase (CK) increased significantly ($p < 0.001$) after 6 h of transport time. During transport and handling, animals are sometimes faced with unfavourable conditions, which compromise their welfare and meat quality (Adzitey, 2017) such as food and water deprivation, unfavourable temperature or ventilation, aggressions and physical shocks which cause hunger and thirst, heat stress and pain. To some extent, mortality of animals during transport may be an indication of their welfare and transport conditions. People occasionally hit animals and cause great pain and injury mostly because they consider the animals as commodities and not as sentient beings that feel pain and stress, or because of lack of knowledge about animals and their welfare. Inappropriate handling, improper use of sticks by handlers, violent impact of the animals against facilities or impact with other animals are potential bruising events (Zobil, 2020). Handling animals without the practice of using sticks results in

better welfare and less risk of poor carcass quality. Poor handling or a physical blow that leads to bruising or other animal injury can lead to parts of the carcass being condemned or the meat being dark. Such meat, they say, does not appeal to consumers s and spoils quickly.

## MATERIALS AND METHODS

The study was conducted at Bauchi township abattoir. Bauchi State. Data were collected by means of interviews, field measurements, and observations of activities during animal transport and slaughter operations. Preceding exploratory visits and interviews with key people at the Abattoir was made. Face-to-face interviews was conducted of dealers (merchants), middlemen (landlords), and butchers to investigate how transport and pre-slaughter could affect welfare and meat quality of cattle. A pre-feasibility study was done to observe and record the behaviour of the animals as they are being moved from the cattle market until they were slaughtered in the abattoir. The selection of the different behavioural observations was partly based on literature and partly on preceding exploratory work. By visual observation, meat from 20 poorly-handled cattle was sampled for determination of pH value. Twenty meat samples were excised from the left longissimus muscle between the 11th and 12th ribs of the sampled cattles. Each sample was taken immediately after slaughter, placed in an air tight bag. Ice blocks was placed on the meat samples and conveyed for pH readings to be taken. To investigate carcass bruising, three evaluation categories that were used in this system were: “none”, denoting a clean non-bruised surface; “slight” denoting a reddish area with damage on the surface and “severe”, meaning the bruise is reddish, deep and bleeding damage can be observed on the surface.

## RESULTS AND DISCUSSION

**Table 1: Distribution of the animals included in the current study (n = 1040).**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Journey distance (Km) | 1-50 | 374 | 36.0 |
| | 51-100 | 125 | 12.0 |
| | 101-150 | 335 | 32.2 |
| | 151-200 | 32 | 3.1 |
| Vehicle type | Small trailer (3 Tons) | 470 | 45.2 |
| | Gooseneck (10 Tons) | 225 | 24.5 |
| | Potbelly (30− 50 Tons) | 315 | 30.3 |
| Production system | Feedlot | 362 | 34.8 |
| | Free range | 414 | 39.8 |
| | Dairy | 264 | 25.4 |
| Cattle type | Steer | 88 | 8.5 |
| | Young bull | 306 | 29.4 |
| | Old bull | 149 | 14.3 |
| | Heifer | 25 | 2.4 |

| | | | |
|---|---|---|---|
| | Young cow | 74 | 7.1 |
| | Old cow | 398 | 38.3 |
| Horn size | No horns | 333 | 32.0 |
| | 1-8cm | 166 | 16.0 |
| | 9-16cm | 135 | 13.0 |
| | >16 cm | 406 | 39.0 |

In this study, Feedlot and free-range beef systems are quite common in the arid and semiarid regions of Nigeria, where there has been a long tradition of extensive systems, rather than feedlots. Yet, increased domestic demand for grain-fed beef has generated growth in the feedlot sector (Zobil, 2020).

**Table 2: Frequency of occurrence of regularly-occurring behaviours exhibited by cattle (n = 200) as they were moved from the cattle market into the abattoir.**

| Animal behaviour | Frequency | Percentage (%) |
|---|---|---|
| Resistance to be lazooed | 135 | 67.5 |
| Easily pulled | 63 | 31.5 |
| Resistance to be pulled | 138 | 69.0 |
| Charging at handlers | 108 | 54.0 |
| Defecation | 106 | 53.0 |
| Urination | 98 | 49.0 |
| Lying down and refusing to stand | 143 | 71.5 |
| Vocalization(level1) | 25 | 12.5 |
| Vocalization(level2) | 130 | 65.0 |
| Panting | 110 | 55.0 |
| Foaming | 96 | 48.0 |
| Stretching | 93 | 46.5 |
| Jumping | 142 | 71.0 |
| Running | 138 | 69.0 |
| Head swings | 115 | 57.5 |
| Stamping of feet | 90 | 45.0 |
| Raising of tail | 150 | 75.0 |
| Sniffing | 24 | 12.0 |

| | | |
|---|---|---|
| Kicking | 142 | 71.0 |
| Ear erection | 85 | 42.5 |
| Retreating | 135 | 67.5 |
| Moving without pulling | 61 | 30.5 |
| Crippled during handling | 35 | 17.5 |

Prominent among the behaviours regularly exhibited by the cattle during handling were raising of tail, kicking, lying down and refusing to move and jumping. Among the methods of handling by cattle handlers, whips ranked highest followed by tail pulling, stamping on the tail of the cattle, stoning, slapping the animals with bare hands, forcing animal to fall down, leg pulling, and horn pulling. The methods of handling were ranked by frequency of occurrence. These maltreatments could be associated with the high proportion of bruised carcasses (82.2%) in this study. According to Adzitey, (2017), inappropriate handling, improper use of sticks by handlers violent impact of the animals against facilities or impact with other animals are potential bruising events.

**Table 3: Frequency of occurrence of ways of handling cattle (n = 200) as they were being moved from the cattle market into the abattoir.**

| **Handling method** | **Frequency** | **Percentage** |
|---|---|---|
| Beatings/ Whips | 184 | 92.0 |
| Slapping | 110 | 55.0 |
| Stoning | 118 | 59.0 |
| Tailpulling | 141 | 70.5 |
| Horn pulling | 71 | 35.5 |
| Legpulling | 98 | 49.0 |
| Forcing animalto falllie down | 125 | 62.5 |
| Stamping ontail | 122 | 61.0 |

Among the inhumane methods of handling by cattle handlers, whips ranked highest followed by tail pulling, stamping on the tail of the cattle, stoning, slapping of the cattle with bare hands, forcing animal to fall down, leg pulling, and horn pulling. The study indicated that, handling animals without the practice of using sticks results in better welfare and less risk of poor carcass quality (Okeudo and Moss, 2015). The cattle in this study were difficult to handle by cattle handlers because they (the cattle) were sent into the abattoir in isolation (individually) from their groups but cattle are known to be herd animals so when one gets nearer to them, they instinctively want to rejoin their herd mates (Okeudo and Moss, 2015).

**Table 4: Mean pH of meat against time postmortem for poorly-handled cattle (PHC), non-ambulatory cattle (NAC), bruised carcasses (BRC) and unbruised carcasses (UBRC).**

| **Parameters** | **Mean pH values** |
|---|---|
| Poorly handled cattle | 6.60 |

| | |
|---|---|
| Non-ambulatory cattle | 6.50 |
| Bruised carcasses | 6.52 |
| Un-bruised carcasses | 6.55 |

The result of this study revealed that, as long as there is adequate glycogen present at slaughter, the pH of cattle will fall to within the normal range of 5.4–5.7 (Broom, 2015). If there is not enough glycogen (due to stress or poor nutrition) then pH will remain above the acceptable limit of pH 5.7 and the meat is likely to be dark in colour, with poor keeping quality. As muscle is converted to meat, a host of metabolic and structural changes occur. In the immediate postmortem period, as the muscle attempts to maintain homeostasis, muscle glycogen is metabolised through anaerobic glycolysis, thus phosphorylating ADP to ATP. Anaerobic glycolysis generates lactate that builds up, lowering the intracellular pH, so that by 24 h postmortem the pH has fallen to an ultimate pH value of about 5.4–5.7. In a study in summer on pigs by Miller, (2017), pigs that were transported for longer times had higher pH24 (5.99 ± 0.29 for 12 h; 5.79 ± 0.18 for 8 h; and 5.65 ± 0.17 for 4 h of travel According to Costa *et al*. (2016), the pH range of normal meat from an animal which is not stressed is 5.4–5.7. DFD meat will have a much higher pH of 5.9–6.5, with some meat having as high a pH as 6.8. Previous studies have found out that dark-cutting meat is more prevalent in cattle, which become agitated or excited immediately before slaughter.

**Table 5: Rate of Bruising in carcasses (n = 500)**

| Bruising Category | Minimum No. of Carcasses/Day | Maximum No. of Carcasses/Day | Mean ± SD | N | Percentage of Carcasses (%) |
|---|---|---|---|---|---|
| None [1] | 5 | 13 | 8.9 ± 2.60 | 89 | 17.8 |
| Slight [2] | 21 | 37 | 30.3 ± 4.62 | 303 | 60.6 |
| Severe [3] | 5 | 17 | 10.8 ± 4.02 | 108 | 21.6 |

[1] clean non-bruised surface of carcass; [2] reddish area with damage on the surface of carcass; [3] bruise is reddish, deep and bleeding damage can be observed on the surface of the carcass

In a study on the relationship between pre-slaughter and bull carcass bruising, bruised carcasses constituted 66.9% (Costa *et al*., 2016). This was less than what was observed in the present study because cattle in this study mostly suffered inhumane handling prior to slaughter. They reported that slightly bruised bull carcasses constituted 54.9% as against 12.0% in severely bruised bull carcasses. Although the amounts of slight and severe bruising in this study were more than those reported by Broom (2015), the trend is the same, with more slight bruises observed than severe bruises.

## CONCLUSION AND RECOMMENDATION

It was concluded that, the indications of compromised welfare of the cattle were feed and water deprivation, overcrowding in vehicles, no protection against bad weather, and maltreatment of animals by handlers. It was therefore recommended that, **t**he compromised welfare situation of slaughter animals during transport, at lairage, and slaughter should be brought to the attention of stakeholders in the business.

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