Quantifying Drivers of Welfare Risk in Cattle During Preslaughter Handling

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INTRODUCTION & AIM

Pre-slaughter is a critical period that leads to multiple stressors. Although Handling receives the most attention, the true impact on welfare in slaughter operations is rarely measured. There is an absence of quantification combining both stress intensity and duration [1].

This study aims to identify the main drivers of cumulative welfare burden during preslaughter handling.

METHOD

Welfare Footprint Framework

Applied to estimate cattle welfare impacts across mains pre-slaughter stages:

✓ Unloading   ✓ Handling
✓ Lairage   ✓ Restraint

Inputs

✓ Duration of stressful circumstances
✓ Severity of stressful circumstances

Climate Data [2]

✓ 636 locations

Daily Thermal Intensity (CCI) + Chronic Exposure (ATL Risk)

Outputs

✓ Cumulative welfare impact
✓ Mitigation opportunities

Cumulative Welfare Burden

Hunger ➡ Behavioral feed-seeking, vocalizations and surface licking.

Exhaustion ➡ Generalized muscle fatigue, lethargy and panting.

Thirst ➡ Accelerated breathing, dry mouth, shade-seeking behaviour, increased vocalizations and dilated pupils.

Fear ➡ Shallow breathing, muscle tremors, vocalizations and reluctance to move.

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Measured impact on negative affective states during **pre-slaughter stages**

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Cumulative Welfare impact measurement (in hours)

RESULTS & DISCUSSION

Drivers of Welfare Impacts Under Moderate Heat

- Hunger 39%
- Fear 29%
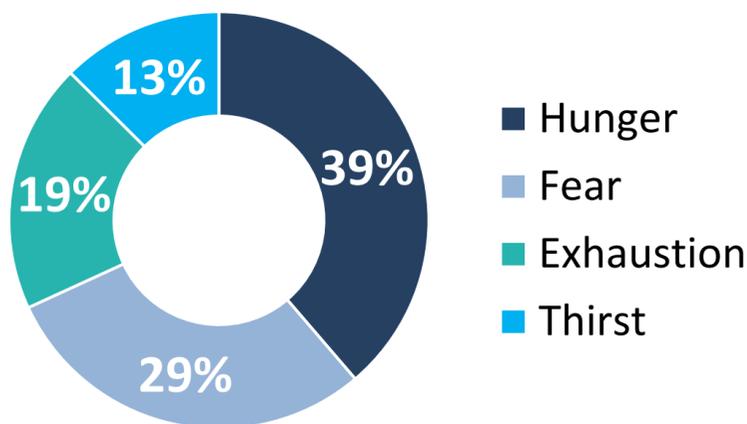- Exhaustion 19%
- Thirst 13%

Figure 1. Hunger and fear are the primary drivers of welfare impacts under moderate heat.

Interacting synergistically with other stressors, heat stress accounts for ~19-33% of moderate-to-intense impacts, emerging as the main harm (~24-25%) during extreme heat.

Where Cumulative Welfare Impacts Occur

A – Moderate-intense
B - Intense

■ Lairage   ■ Other stages

A: 96% / 4%
B: 88% / 12%

Figure 3. Lairage dominated cumulative welfare impact across all scenarios: 96 - 97% of moderate-to-intense and 87 - 90% of intense impacts, due to its long duration (12-14h h) when compared to other pre-slaughter stages.

CONCLUSION

Improving lairage conditions is critical to reduce cumulative welfare burden in preslaughter cattle handling.

Priority actions: reduce waiting time; ensure water; improve ventilation and shade; manage stocking density.

FUTURE WORK / REFERENCES

- Evaluate mitigation strategies in lairage management;
- How to implement mitigation strategies in large scale;
- Assess welfare improvements under reduced waiting times;
- Expand modelling to other production systems.

[1] Schuck-Paim C., Alonso W.J. et al. 2025. The Welfare Footprint Framework can help balance animal welfare with other food system priorities. **Nature Food.**
[2] NASA's Prediction of Worldwide Energy Resources (POWER) database at 0.5º x 0.5º spacial resolution (2019-2023).

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