**Application** Computerised tomography **(**CT) scanning of live animals can be used to compare the response of livestock to different nutritional treatments, and can be an alternative to comparative slaughter techniques for estimating carcase weight and tissue proportions in the carcase.

**Introduction** Researchers often rely on growth rates to compare the response of livestock to different nutritional treatments, however differences in liveweight gain may not result in marked differences in carcase yield if the dietary effect is mainly on visceral mass (Keogh et al. 2023). CT scanning can be an important research tool for livestock production experiments, providing estimations of carcase fat, muscle, visceral fat, organ size, estimated maturity and allows repeat measurements on the same animal at different time-points, making CT scans a superior methodology to comparative slaughter (Keogh et al. 2024). The derived information can better inform predictive models for animal growth and improve models through more detailed energy transactions than measures of liveweight gain or comparative slaughter data (Oddy et al. 2019, Oddy et al. 2024). Some abattoirs in Australia now provide individual carcase feedback on sheep, including estimates of carcase muscle, fat and bone derived from DEXA, providing similar information to that derived from CT scanning. An advantage of post-slaughter DEXA scans compared with CT-scanning of live animals is that carcases are measured directly and therefore the mass of the animal’s visceral tissues, skin, head and feet do not need to be estimated, resulting in lower risk of estimation errors compounding (Keogh et al. 2023). This paper reports a comparison between carcase weight and composition derived from CT scanning of live lambs and carcase feedback from a commercial abattoir.

**Materials and Methods** Composite breed lambs (n=48) were drafted to one of three treatments for a 59 day feeding period: Treatment 1. Confined to individual pens and offered ad libitum feeding of either a barley grain-based pellet with a 30% inclusion of lucerne chaff; Treatment 2. Confined and offered a similar pellet without the inclusion of lucerne chaff, but with lucerne hay offered separately; Treatment 3. Grazing lucerne pasture as a group in a paddock.

At the conclusion of the feeding period lambs were weighed and CT scanned after an overnight curfew. They were then put in a paddock as a single group with volunteer grasses and access to straw and water for 4 days before being trucked to a commercial abattoir and slaughtered after an overnight curfew. Empty body weight and hot carcase weights (HCW) were estimated using actual liveweight, stomach volume and viscera tissue weights derived from CT scans and estimated weight of fleece, head and feet (Keogh et al. 2023). Measurements at abattoir included the percentage bone, muscle and fat (via hot carcase DEXA scans) and HCW.

Data from the end of the feeding period and post-slaughter was analysed by generalised linear models using ASRemL. Lamb weights and empty body composition were modelled using a linear univariate model with fixed effect treatment.

**Results** Lambs in Treatment 1 were heavier than lambs grazing lucerne at the conclusion of the feeding period and were fatter than other treatments; however treatments did not differ in non-visceral empty body mass (Table 1). Lambs grazing lucerne had greater visceral lean than lambs in Treatment 1 (Table 1).

The estimation of HCW from CT scans showed general agreement with slaughter data (R2 = 0.80). Fat and lean from CT scanning were well correlated with DEXA data, with estimates closest when fat content was higher or carcase lean was lower. (Fig. 1).

**Table 1. Liveweight and estimated empty body (EB) component mass (kg) treatment means (± SE) of lambs at end of experimental period and hot carcase weights (HCW) derived from computerised tomography (estimated) of live lambs or weighed post-slaughter (actual). Different superscripts indicate treatment means differed significantly (P<0.05).** (NV = non-viscera)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Pelleted ration 1 | Pelleted ration 2 + grain | Grazing Lucerne | p-value |
| Liveweight | 51.9 ± 1.1a | 50.1 ± 1.1ab | 48.1 ± 1.1b | 0.041 |
| EB weight | 44.6 ± 1.0 | 43.0 ± 1.0 | 41.8 ± 1.0 | 0.145 |
| Fat mass | 14.7 ± 0.7a | 13.4 ± 0.7ab | 12.2 ± 0.7b | 0.039 |
| Lean mass | 25.5 ± 0.5 | 25.3 ± 0.5 | 25.0 ± 0.5 | 0.817 |
| NVEB lean mass | 20.2 ± 0.5 | 20.0 ± 0.5 | 19.3 ± 0.5 | 0.379 |
| Viscera lean mass | 5.3 ± 0.1a | 5.4 ± 0.1ab | 5.7 ± 0.1b | 0.042 |
| HCW (estimated) | 27.8 ± 0.7 | 26.7 ± 0.7 | 25.8 ± 0.7 | 0.108 |
| HCW (actual) | 27.1 ± 0.7 a | 26.2 ± 0.7 ab | 24.7 ± 0.7 b | 0.041 |

**Figure 2. Comparison of the CT scan estimated proportion of fat and lean tissue in the lamb carcase and tissue proportions determined by DEXA scans of carcases after slaughter**

**Conclusions** Heavier liveweight at slaughter does not always result in greater non-visceral lean mass. Estimates of body composition on live lambs from CT scanning correlate well with DEXA measurements on carcasses post-slaughter. CT scanning may therefore be a useful method for comparing treatments in lamb production experiments as it enables the prediction of carcase weights at multiple timepoints whilst accounting for the effects of diverse nutritional treatments on gut fill and visceral organ mass.

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