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Validation of a pan-European computed tomography procedure for determining the new EU lean meat content of pigs (#626)

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Introduction

A new EU regulation on carcass classification applies from July 2018. The new reference to calibrate the pig classification methods is a lean meat percentage based on total dissection (LMPtd) of a half-carcass. Manual dissection can be replaced by an unbiased computed tomography (CT) procedure. Daumas and Monziols (2018) calibrated a simple, accurate and robust CT method in order to make it useful internationally and at least in Europe. A trial for approval of grading methods in Lithuania gave the opportunity to validate this CT procedure.

Methods

The CT procedure was initially calibrated on 29 French pig half-carcasses sampled in 2008. Methods and results were described in Daumas and Monziols (2018).

The same CT procedure and the same dissection procedure were applied on 12 Lithuanian half-carcasses sampled in 2018 in the framework of the approval of new pig carcass classification methods.

Both samples were CT scanned with 3 mm slice thickness and then fully dissected according to the EU regulation. A specific procedure controlling the anatomical dissection (Nictou *et al.*, 2014; Venet, 2007) was used to ensure a high reproducibility. The CT muscle volume was calculated by thresholding in the Hounsfield range 0-120 (Fig. 1). It was converted into muscle weight by applying a density of 1.04. The weight was divided by the carcass weight to obtain the lean meat percentage from CT (LMPct), in the same way as done for the LMPtd. LMPtd was regressed on LMPct.

Results

LMP means were lower in the Lithuanian sample than in the French sample, but standard deviations were higher (Table 1).

Table 1 – Descriptive statistics of the calibration (n=29) and validation (n=12) datasets

Calibration	Mean	Std Dev.	Min	Max		Validation	Mean	Std Dev.	Min	Max
LMPtd, %	58.9	3.8	53.0	64.8		LMPtd, %	55.2	5.1	46.8	61.2
LMPct, %	61.1	3.9	54.0	67.5		LMPct, %	57.0	5.3	47.6	63.9

As expected, in the regression of LMPtd on LMPct the intercept was not significant and thus removed. On the calibration dataset the slope of the regression (Fig. 2 left) was estimated at 0.965 (s.e. = 0.002) and its 95% confidence interval (IC95) was [0.960, 0.970]. The RMSE was 0.81. On the validation dataset the slope of the regression (Fig. 2 right) was estimated at 0.967 (s.e. = 0.007) and its 95% confidence interval (IC95) was [0.954, 0.980]. The RMSE was 1.39.

The IC95 of the validation dataset contained the IC95 of the calibration dataset, showing no statistical difference between the two slopes.

Conclusion

The CT procedure developed by IFIP in France was successfully used in Lithuania for the approval of new national pig carcass classification methods. It validates this CT procedure, of which the pan-European feature has been highlighted by the European Commission at the annual meeting of the expert group "Pig carcass classification" in April 2019 in Brussels. Henceforth, this unbiased CT procedure should be able to be used in any EU Member State without any additional national dissection. This will allow to reduce the expenses and to simplify the approval process of classification methods. It should also increase the degree of harmonisation within the EU, by using a more reproducible reference method than the dissection.

Moreover, this CT procedure can be efficiently used for comparison of breeds, genotypes, feeding diets, etc. without any risk of bias intra modality.

References

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- Nictou, A., Guintard, C., Betti, E. & Daumas, G. (2014). Anatomical dissection of the four main primal cuts. In: Ifip, Mémento viandes et charcuteries (pp. 1-24). Paris: IFIP.
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Notes

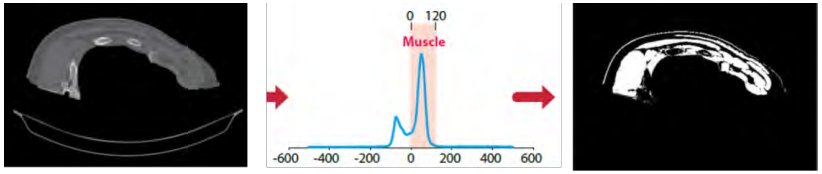

Figure 1. Thresholding of muscle volume on Hounsfield histogram: transversal slice in the middle

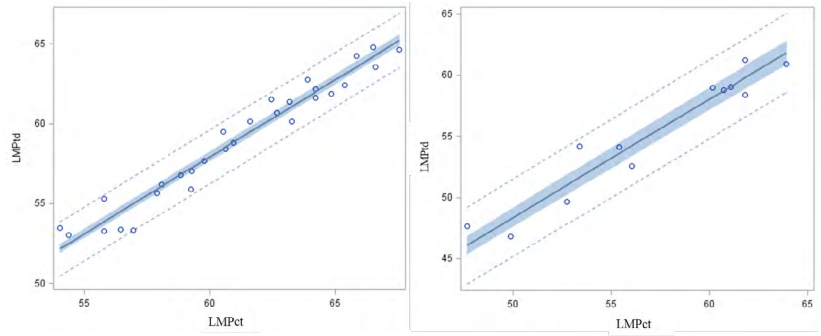

Figure 2. Regression line of LMP from dissection (LMPtd) on LMP from CT (LMPct) Calibration dataset on the left side and validation dataset on the right side. Blue area: 95% confidence interval of the slope.

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