SLAUGHTER VALUE ESTIMATION OF CATTLE USING X-RAY COMPUTER TOMOGRAPHY

G. HOLLÓ [A], CS. ÁBRAHÁM [B], E. SZUCS [B], J. TUZSÉR [B] and I. REPA [A]

[A] Inst. of Diagnostic Imaging and Radiation Oncology, University of Kaposvár, Kaposvár H-7400, Hungary
[B] Faculty of Agricultural and Environmental Sciences, Szt. István University, Gödöll , H-2103, Hungary

For a long time cattle-breeders and animal scientists have had a strong desire to find methods for in vivo estimation of body and/or carcass composition in animals after slaughter without the need for complete dissection. Recently, various methods (ultrasonic-, NIR-technique, TOBEC) were trialed for this purpose. Their usefulness in practice and accuracy may differ largely. Digital cross-section imaging techniques such as X-ray computer tomography (CT) have been applied with success in human medicine for diagnostic purposes for decades. Hungarian animal scientists have been experimenting with CT technology in the last 12 years. The results of experiments carried out in species such as swine, sheep, poultry and rabbit reveal that, these in vivo techniques are suitable to predict body composition with high level of accuracy. Due to the size of adult cattle, this technique cannot be used for the time being. Despite of such practical limitations, research has been carried out to find ways of utilising CT technology in cattle. One obvious possibility is to estimate the tissue composition (tc) of whole carcasses by using CT on representative samples taken from the carcasses. Thus, this technique might make evaluation and qualification of cattle more objective after slaughter. The relevant scientific literature (Küchenmeister *et al.* 1990) indicates that, tc of several cuts may describe the lean meat, fat and bone content (and percentage) of intact carcasses. Rib samples are identified as the most likely candidates for predicting whole carcass composition. The aim of this trial was to determine the tc in rib samples by CT and correlate it with the composition of intact carcasses.

Altogether, 136 slaughter cattle from different breed (Holstein-Friesian, Hungarian Simmental) and sex were used in the study. After slaughter the right half carcasses were dissected and samples were taken from, between the 11-13th ribs, tc of these samples were determined by SIEMENS SOMATOM DRG CT equipment. Subsequently, tissues of the samples were separated by dissection and the chemical composition of tissue homogenates was determined using conventional procedures. Correlation coefficients were calculated between slaughter records of whole carcasses and tc of rib samples determined by the above-mentioned procedures. Based on figures obtained, tc of entire carcasses were estimated using a statistical computer package (SPSS 8.0). Results indicate that, tc of rib samples determined by CT closely correlates with the tc results obtained by dissection, as well as the results related well with the tc results of the entire carcasses (meat, bone, fat). A close three-way correlation (r=0.80-0.94) was found between the area, volume, pixel-sum of adipose tissue determined by CT, and the fat content of rib samples and the percentage of fat in the whole carcasses (*Table 1*).

Table 1. Relationships (r) between CT-data and tissue composition of carcass as well as rib samples (*P<0.001)

		CT-area (cm^2)			CT-volume (cm^3)			CT-pixel sum		
	Traits	Muscle	Fat	Bone	Muscle	Fat	Bone	Muscle	Fat	Bone
	Lean meat (kg)	0.68*			0.80***			0.64*		
Carcass	Fat (kg)		0.80*			0.82*			0.91*	
	Bone (kg)			0.65*			0.74*			0.76*
	Lean meat (g)	0.74*			0.92*			0.80*		
Rib sample	Fat (g)		0.85*			0.90*			0.94*	
	Bone (g)			0.78*			0.86*			0.85*

Estimation of tc of carcasses using equations with included only CT-data, proved to be less reliable prediction for lean meat and bone content in carcass (R^2=0.40-0.61) than for fat content (R^2=0.62-0.80). However, when cold half carcass weights were also included into the equation, the determination coefficient of regression exceeded R^2=0.90. It is concluded that using non-invasive CT-procedure for estimation of tc of entire carcass might provide good accuracy and could replace the traditional, complicated, time-consuming and expensive complete dissection technique.

KÜCHENMEISTER, U. LADEGAST, H. and ENDER, K. (1990). Forschrittsb. für die Landwirtsch. Und Nahrungsgütterwirtsch. 28. 2. Akad. Landwirtsch. Berlin.

Email: Hollo.Gabriella@ct1.atk-u.kaposvar.hu