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The relationship between US and CT fat thickness of rib joints measured by Angus crossbred animals

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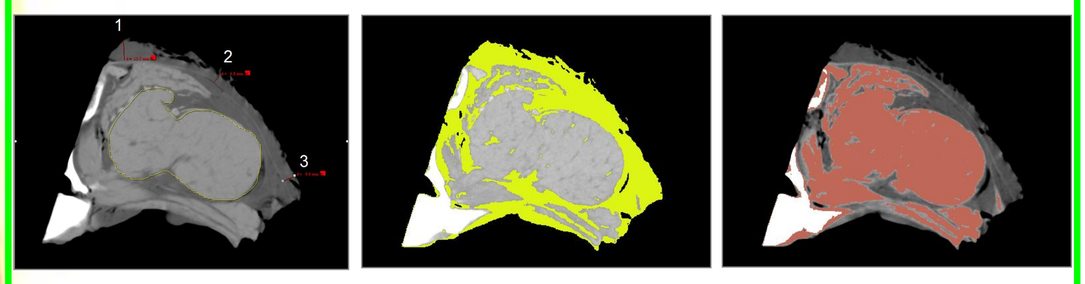
Objectives

To compare the slaughtering and boning results to ultrasound and X-ray computerized tomography data of charolais x angus crossbred bulls and heifers slaughtered in same age.

Materials and methods

10 bulls and 16 heifers separated by genders, fattened intensively in small groups
***In vivo* ultrasound fat thickness (US BF) measurements before slaughter, with Aniscan 100 device, on right side over back fat reference point**
Slaughtering: Mikofámi Ltd., Zalaszentiván, Hungary, according to the Hungarian Standard
Boning: after 24 h chilling, right carcass dissection, rib joints were taken between the 11-13th rib for Computerized Tomography (CT) evaluation
CT measurements: Kaposvár University, Institute of Diagnostic Imaging and Radiation with: Siemens Somatom Emotion 6 device
CT evaluation: with MIP 1.0, Osiris 4.0 and Slicer 3D 3.6 programs: fat thickness at spine (1), centre (2) and rib (3) Rib joint muscle and fat proportion, longissimus dorsi (LD) muscle area, fat area and fat proportion
Data were analysed with SAS 9.1

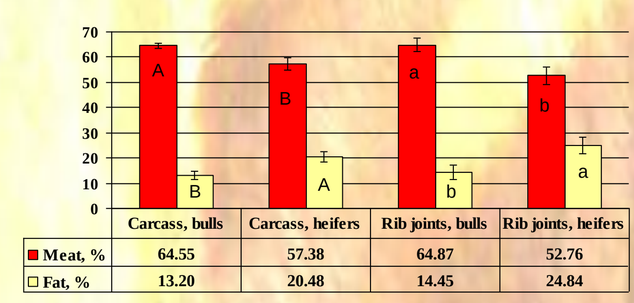


Results

Slaughter results (mean$_{SD}$)

	Bulls	Heifers	Mean
Slaughter age, day	$458.1_{40.80}$	$441.13_{25.32}$	$447.65_{32.48}$
Slaughter weight, kg	$605.70_{26.38}^{a}$	$486.94_{20.59}^{b}$	$532.62_{63.06}$
Killing out, %	$56.57_{1.64}^{a}$	$55.04_{1.43}^{b}$	$55.63_{1.67}$
EUROP conformation, point	$9.70_{0.82}^{a}$	$8.88_{1.02}^{b}$	$9.19_{1.02}$
EUROP fatness, point	$6.60_{0.96}^{b}$	$8.19_{0.65}^{a}$	$7.58_{1.102}$
Kidney fat, %	$2.69_{0.54}^{b}$	$3.89_{0.95}^{a}$	$3.43_{1.00}$
Lean, kg	$108.83_{6.60}^{a}$	$75.79_{7.00}^{b}$	$88.46_{17.77}$
Fat, kg	$22.32_{3.10}^{b}$	$26.91_{2.64}^{a}$	$25.14_{3.58}$
Bone, kg	$31.48_{1.42}^{a}$	$24.83_{1.46}^{b}$	$27.05_{3.5}$

Meat and fat proportion of dissected carcass and rib joints detected by CT



	Carcass, bulls	Carcass, heifers	Rib joints, bulls	Rib joints, heifers
Meat, %	64.55	57.38	64.87	52.76
Fat, %	13.20	20.48	14.45	24.84

CT and US measurements (mean$_{SD}$)

	Bulls	Heifers	Mean
US BF, mm	$11.71_{2.50}$	$12.50_{1.45}$	$12.21_{1.87}$
CT spine, mm	$7.24_{2.68}^{b}$	$10.82_{3.22}^{a}$	$9.53_{3.46}$
CT centre, mm	$5.12_{1.60}^{b}$	$6.58_{2.50}^{a}$	$6.02_{2.28}$
CT rib, mm	$6.43_{3.01}^{b}$	$9.81_{1.92}^{a}$	$8.51_{2.88}$
CT LD fat area	$12.75_{4.98}^{b}$	$34.62_{17.76}^{a}$	$26.21_{17.78}$
CT LD fat %	$0.95_{0.33}^{b}$	$3.05_{1.39}^{a}$	$2.24_{1.51}$
CT LD average area	$76.35_{3.08}^{a}$	$65.45_{8.63}^{b}$	$69.64_{8.80}$

Pearson correlation coefficients between US and CT fat thickness measurements

	CT spine		CT centre		CT rib	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
US BF	NS	0.62	NS	0.62	0.67	NS

Pearson correlation coefficients between US, CT data and slaughter results

	Slaughter weight	Killing out %	EUROP conformation	EUROP fatness	Kidney fat %
US back fat thickness	0.53*	-	-0.40*	0.56*	-
CT spine	-0.44*	-	-	0.53**	0.45*
CT centre	-	-	-	-	0.43*
CT rib	-0.47*	-	-	-	-
CT muscle %	0.80**	0.47*	-	-0.71**	-0.57**
CT fat %	-0.75**	-0.40*	-	0.73**	0.59**
LD fat area	-0.44*	-	-	0.50**	0.42*
LD fat %	-0.56**	-	-	0.58**	0.47*
LD average area	0.72**	0.62**	0.55**	-0.52**	-0.42*

****: P<0.01 *: P< 0.05**

Pearson correlation coefficients between US, CT data and boning results

	Right carcass lean kg	Right carcass fat kg	Right carcass lean %	Right carcass fat %
US back fat thickness	-0.44*	0.52*	-0.5*	0.65*
CT spine	-0.52**	0.66**	-0.61**	0.66**
CT centre	-	0.62**	-	0.52**
CT rib	-0.49*	0.58**	-0.53**	0.61**
CT muscle %	0.86**	-0.81**	0.90**	-0.95**
CT fat %	-0.80**	0.85**	-0.85**	0.95**
LD fat area	-0.46*	0.78**	-0.52**	0.69**
LD fat %	-0.59**	0.80**	-0.66**	0.78**
LD average area	0.78**	-	0.79**	-0.66**

****: P<0.01 *: P< 0.05**

Conclusions

The US backfat thickness showed medium positive and negative (r=0.4-0.65) with slaughtering and boning data, while CT investigation medium and high, positive and negative correlation (r= 0.42-0.95).
With the use of the results of *in vivo* ultrasound measurements and CT investigation, the slaughter value can be estimated objectively, nevertheless further research is needed in this field.