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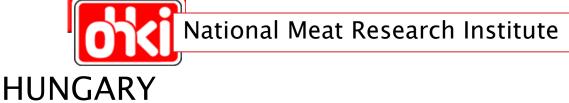for Animal Production
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Relationship of Magnetic Resonance Imaging (MRI) measurements with some meat quality data and biochemical properties of blood

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Background

▸ Besides traditional, instrumental methods, image analysis of tomographic images (CT. MRI) is becoming an important tool for prediction of meat quality

▸ Preslaughter handling has a major impact on meat quality. antemortem stress is associated with weight loss. depletion of intramuscular fat and muscle glycogen

▸ Concentrations of several blood metabolites are useful indicators of preslaughter stress

Aim

The relationship between MRI-data (T_2 relaxation time) and meat quality parameters (pH, colour, intramuscular fat-IMF, Warner-Bratzler Shear Force-WBSF) as well as blood parameters (AST, ALT, CK, Glucose, Cholesterol, Urea, Fe) was investigated.

Materials and Methods

Slaughter

30 Hungarian Simmental young fattening bulls, same fattening, keeping, slaughtering conditions
Slaughter Weight: 580 kg

MRI examination

SIEMENS MAGNETOM AVANTO
MRI scanning of rib cuts in two occasion
postmortem $\rightarrow$ T_2 relaxation map $\rightarrow$ T_{21} T_{22} time

Blood parameters

INTEGRA 400 Plus
AST, ALT, CK, Glucose, Cholesterol, Urea, Fe
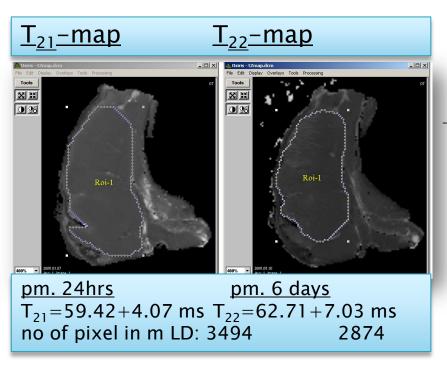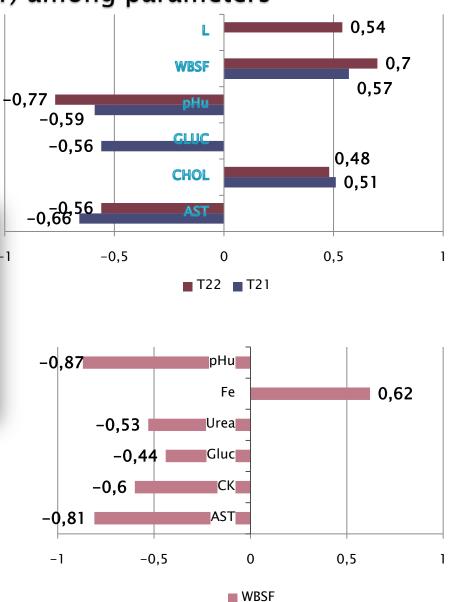
Meat quality parameters

IMF, WBSF, pH_u, colour

Results– Basic statistics of examined parameters

	Min.	Max.	Mean	SD
IMF	0.54	4.20	**1.81**	0.93
L*	24.73	33.66	**28.78**	2.35
a*	10.3	16.8	**13.84**	1.72
b*	0.14	4.33	**1.81**	0.91
pH_u	5.44	6.92	**6.02**	0.47
WBSF	3.08	20.3	**11.11**	5.03
ALT, U/I	16	69	**35.9**	12.55
AST, U/I	34	339	**151**	69.65
CK, U/I	311	7500	**2416**	1990,05
Cholest., mmol/L	1.9	3.8	**2.74**	0.48
Glucose, mmol/L	5.1	10.2	**6.45**	1.13
Urea, μmol/L	3.3	7.6	**5.42**	0.92
Fe, μmol/L	4.5	69.10	**26.65**	21.73
$T_{21,ms}$	40.14	60.27	**55.54[a]**	4.61
$T_{22,ms}$	51.01	63.8	**57.39[b]**	3.47

[a,b]$P<0.05$

Results– Relationship (r) among parameters

T$_{21}$-map   T$_{22}$-map

pm. 24hrs   pm. 6 days
T$_{21}$=59.42+4.07 ms T$_{22}$=62.71+7.03 ms
no of pixel in m LD: 3494   2874

	r
L	0,54
WBSF	0,7 / 0,57
pHu	-0,77 / -0,59
GLUC	-0,56
CHOL	0,48 / 0,51
AST	-0,56 / -0,66

T22   T21

	r (WBSF)
pHu	-0,87
Fe	0,62
Urea	-0,53
Gluc	-0,44
CK	-0,6
AST	-0,81

WBSF

Conclusion

Significant longer T_2 relaxation time was measured in rib samples at pm 6. days (T_{22}) in opposite to those measured at pm 24 hours(T_{21}). The T_{21} relaxation time correlated to AST, Cholesterol, Glucose, WBSF and pH. The T_{22} relaxation time showed positive relationship with Lightness, fat content and WBSF, whilst negative related to pH. Significant negative correlations were seen between WBSF and AST, CK, glucose, urea and a positive between WBSF and Fe.

It seems MRI can be used for the evaluation of beef quality traits; further research is needed in this area.