Genetic analyses of carcass, meat and fat quality traits measured by computed tomography (CT) and near-infrared spectroscopy (NIRS) in Norwegian Landrace and Duroc pigs

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OBJECTIVE

Sustainable breeding for carcass and pig meat quality

MATERIALS AND METHODS

- Data period: 2005 and 2011
- Part of an ongoing testing programme at Norsvin's boar test station
- Body composition in live boars (selection candidates) was analysed with Computed tomography (CT) technology
- Intramuscular fat in *M. longissimus dorsi* (LD) was analysed with Near-infrared spectroscopy (NIRS)
- Drip loss in LD was analysed with EZ-DripLoss
- Fatty acid composition in subcutaneous fat was analysed with NIRS
- Genetic parameters analysed with multi-trait animal model, AI-REML methodology, DMU 6.7 software package

RESULTS

Table 1 - Mean and heritabilities (h^2) for carcass, meat and fat quality traits

Trait	Abbreviations	Number of animals		Mean		h^2	
		Norwegian Landrace	Norwegian Duroc	Norwegian Landrace	Norwegian Duroc	Norwegian Landrace	Norwegian Duroc
Lean meat percentage analysed from CT data	**CT-LMP**	4525	3624	65.30	58.60	0.50	0.57
NIRS predicted Intramuscular fat	**IMF**	6565	7213	1.32	3.17	0.50	0.62
Drip loss measured with the EZ-DripLoss method	**EZ-DripLoss**	6565	4345	6.77	3.70	0.23	0.33
NIRS predicted Oleic acid	**C18:1n-9**	3220	1764	44.31	43.46	0.67	0.57
NIRS predicted Linoleic acid	**C18:2n-6**	3220	1764	14.26	13.01	0.44	0.46

Photo: Jens Erik Jensrud

Table 2 - Genetic correlations between carcass, meat and fat quality traits

	CT-LMP	IMF	EZ-DripLoss	C18:1n-9
	Norwegian Landrace			
CT-LMP	~			
IMF	-0.72	~		
EZ-DripLoss	0.33	-0.40	~	
C18:1n-9	-0.09	0.14	-0.23	~
C18:2n-6	0.57	-0.47	0.28	-0.52
	Norwegian Duroc			
CT-LMP	~			
IMF	-0.82	~		
EZ-DripLoss	0.32	-0.39	~	
C18:1n-9	0.03	0.06	0.05	~
C18:2n-6	0.37	-0.37	-0.02	-0.27

Red colour = unfavourable correlations;
Green colour = favourable correlations;
Black colour = not significant

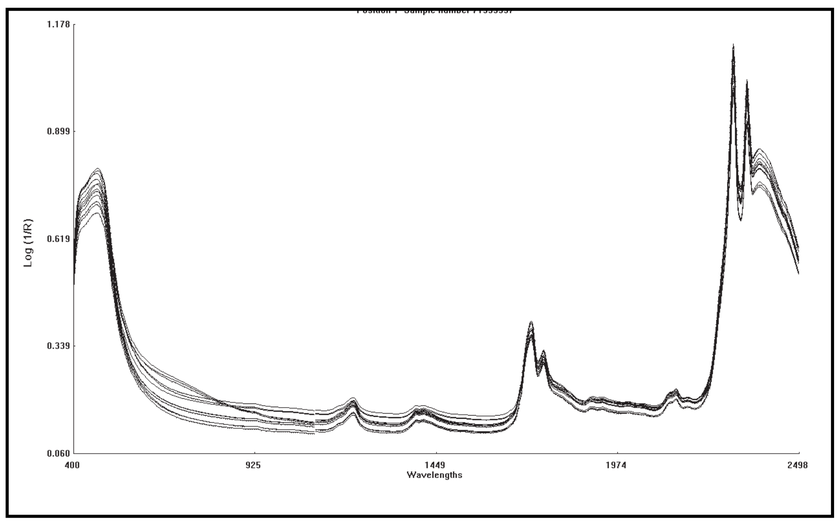

Figure 1 - Fatty acid composition were predicted from NIR spectrum
Instrument: XDS near infrared rapid content analyser, Foss

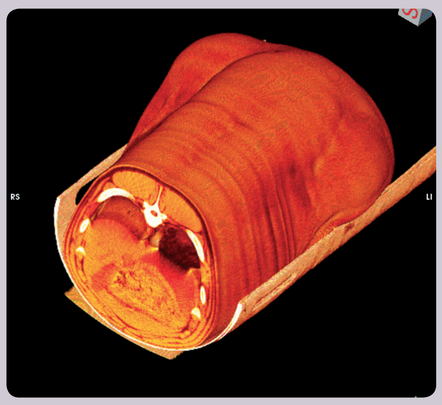

Figure 2 - Spiral scan of a boar, 1100 slices

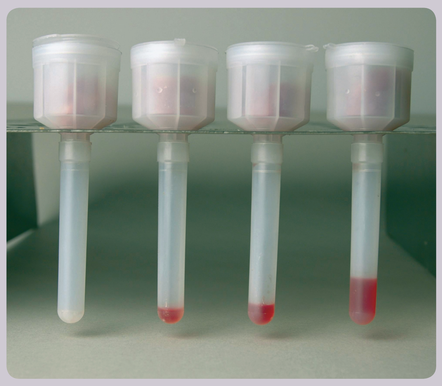

Figure 3 -The EZ-DripLoss method is used for the determination of drip loss in LD muscle.
Photo: Danish Meat Research Institute

CONCLUSIONS

- CT technology exhibits a high accuracy for the selection of body composition in live boars
- Meat and fat quality traits measured with rapid methods demonstrate a high genetic variation
- The genetic correlations between meat and fat quality traits were favourable
- A sustainable breeding for carcass traits needs meat and fat quality traits in the breeding goal
- It is possible to select for efficient, lean pigs with improved sensory, technological and nutritional qualities

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