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### The use of Computerized Tomography in pig breeding

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### Purpose

To give an overview to the use of Computerized Tomography (CT) in pig breeding



## **Computed Tomography**



# Pixels Voxels

### Texture









# **Computed Tomography**





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# **Norsvin Delta test station**



#### Boar test station

3.500 boars tested annually (1800 landrace and 1700 duroc)

Boars are recruited from nucleus farms across Norway

- CT

- FIRE (feed and weight)
- Exterior evaluation



### Norsvin Delta test station The CT unit

1000-1100 images per animal

10 min handling and scanning per animal

25 min image analysis time per animal

24 animals a day

72 animals a week

3.500 animals a year



### **Norsvin Delta test station The CT scanner**

GE Healthcare Lightspeed VCT Select 32

Multi-slice 32 slices per rotation (upgradable to 64)

100 kW, 800 mA X-ray tube

0.4 s rotation time0.625 mm slice thickness190 cm scan length



### **Norsvin Delta test station The CT software**

MATLAB Image processing toolbox Automating



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#### OSIRIX

Graphic workstations DICOM reader/writer Navigation Visualization













# Phenotyping



#### Meat quality





EAAP 2011

# Body composition Carcass quality





www.eupigclass.net

For body composition, it works!

A matter of reference method; what is the gold standard

Biological vs. commercial dissection

### Meat quality





#### Intramuscular fat





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### Fatty acid composition (MUFA / PUFA)



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### Scapula morphology



### Duroc

#### Landrace

### Scapula morphology





Duroc

Landrace

### Scapula morphology



Young 2006. "Function, ontogeny and canalization of shape variance in the primate scapula." *Journal of anatomy* 209(5):623-36.

### Osteochondrosis





Olstad et al. 2008. "Micro-computed tomography of early lesions of osteochondrosis in the tarsus of foals." *Bone* 43(3):574–583.

### Osteochondrosis - quantitative



Empel & Sehested 1986. "Qualitative, Semiquantitative and Quantitative Diagnosis of Osteochondrosis in Pigs by Computed Tomography (CT)." *Acta Agriculturae Scandinavica* 36(2):186-194.

# Requirements to apply CT in animal selection programs

- Handling
- Isolated units

Biosecurity

Large-scale breeding program to serve

Image analysis system for CT

Horn (1995)

### Conclusion

<u>Body composition</u>
 Harmonization of the use of CT in commercial dissection
 Prediction / estimation of cuts, saleable meat yield

<u>Meat quality</u>

Prediction of IMF and fatty acid composition

<u>Diagnostic imaging</u>
 Lameness
 Internal organs
 Hernia
 Conformation and shape
 Exterior traits



### Conclusion

What benefits do CT give to a pig breeding company like Norsvin?

Before CT, there was half-sib test...

### **Genetic improvement**:

- -> Carcass traits sampled from live animals
- -> Higher reliability
- -> Increased test capacity
- -> Multiple registrations backward in time



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