Livestock Center Oberschleissheim • Veterinary Faculty
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Are testis volume and boar taint related ?

- a trial in entire and immunocastrated boars

Motivation

- piglet castration without anaesthesia banned in Germany 2018
- alternatives are needed
- boar fattening => boar taint

Aim of the study

- Is it possible to predict boar taint in entire boars by evaluating variables at the living animal ?
- Is it possible to use the same traits to detect boar taint in immunocastrated boars?

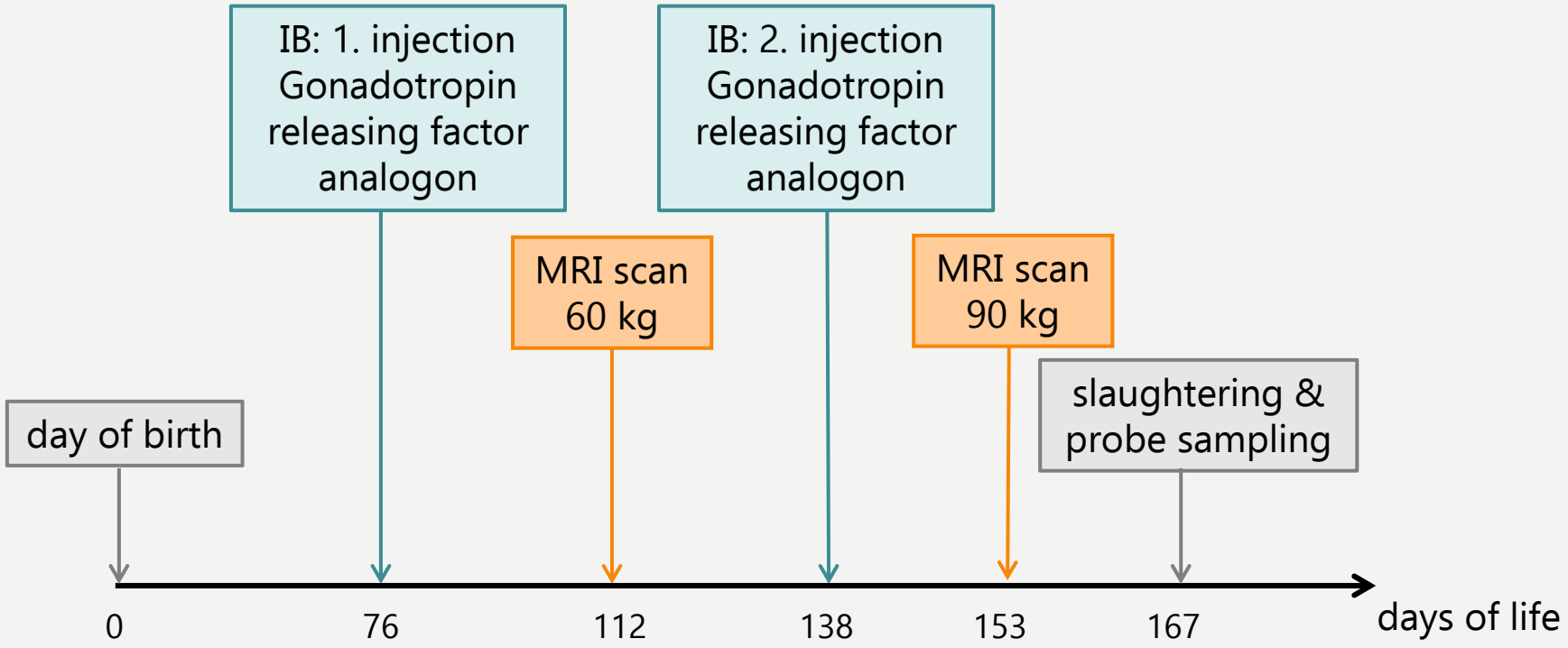
Animals & methods

Animals

- 34 entire boars (EB) & 34 immuncastrated boars (IB)
- Pi x GL
- housed with surgically castrated boars in an outdoor climate barn
- fed *ad libitum* (15 MJ ME/kg)
- IB were injected twice with a Gonadotropin releasing factor analogon at day 76 and 138 of life

Animals & methods

Experimental schedule



Animals & methods

Magnetic Resonance Imaging (MRI)

- anaesthesia:
  - Azaperone (2 mg/kg)
  - Ketamine (15 mg/kg)

- **Siemens Magnetom Open** (0.2 Tesla)
- whole body scan
- T1 weighted SE sequence
  (TR 380 ms; TE 15 ms)

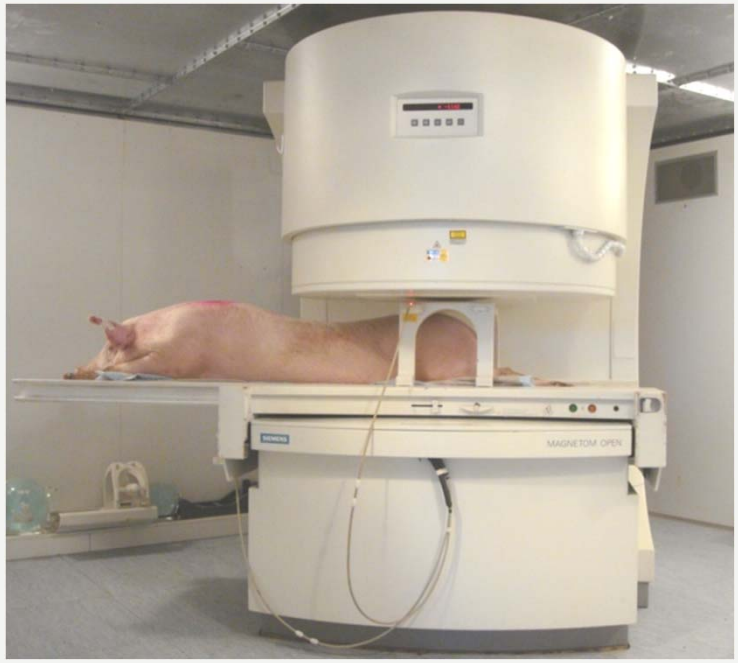
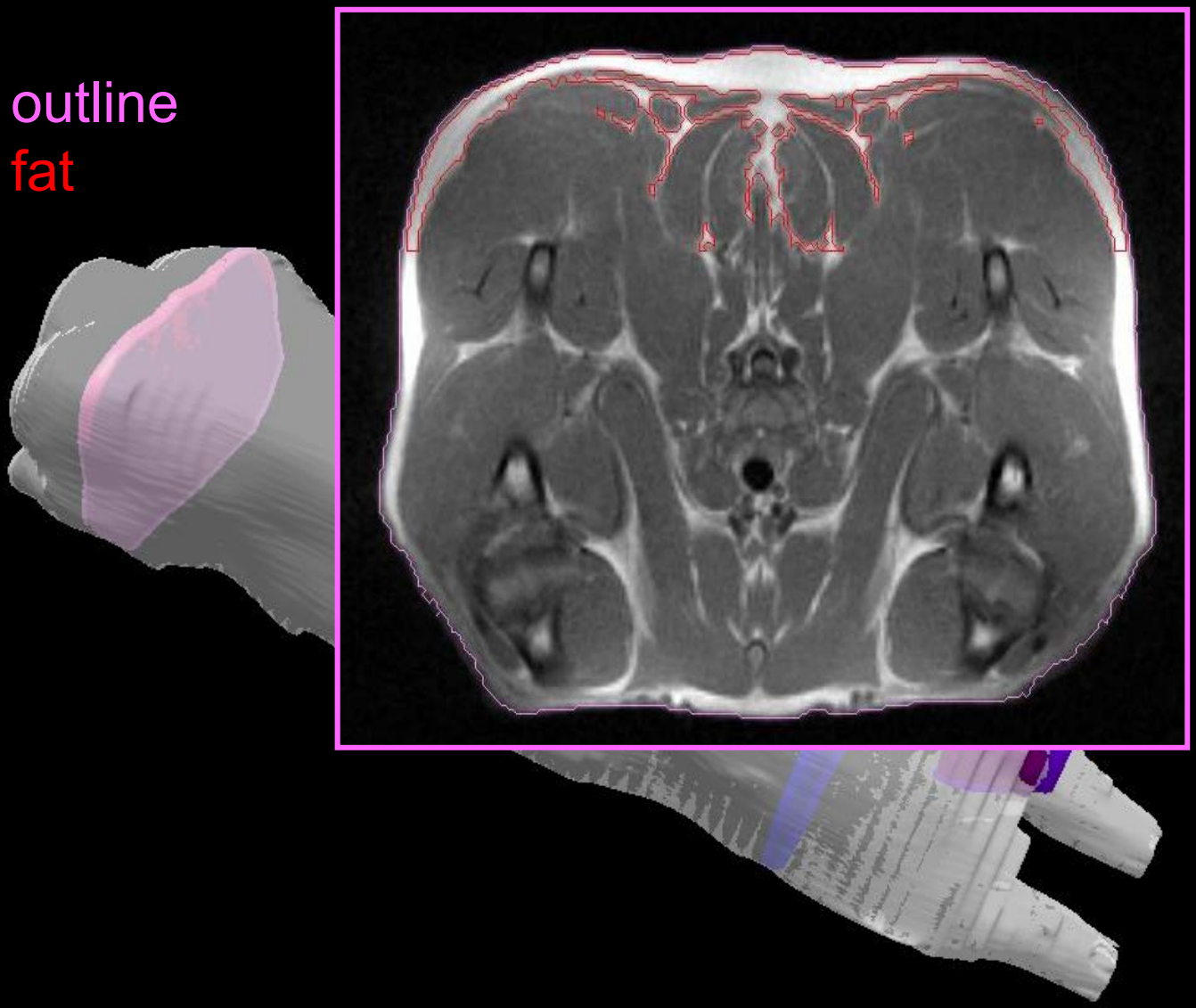


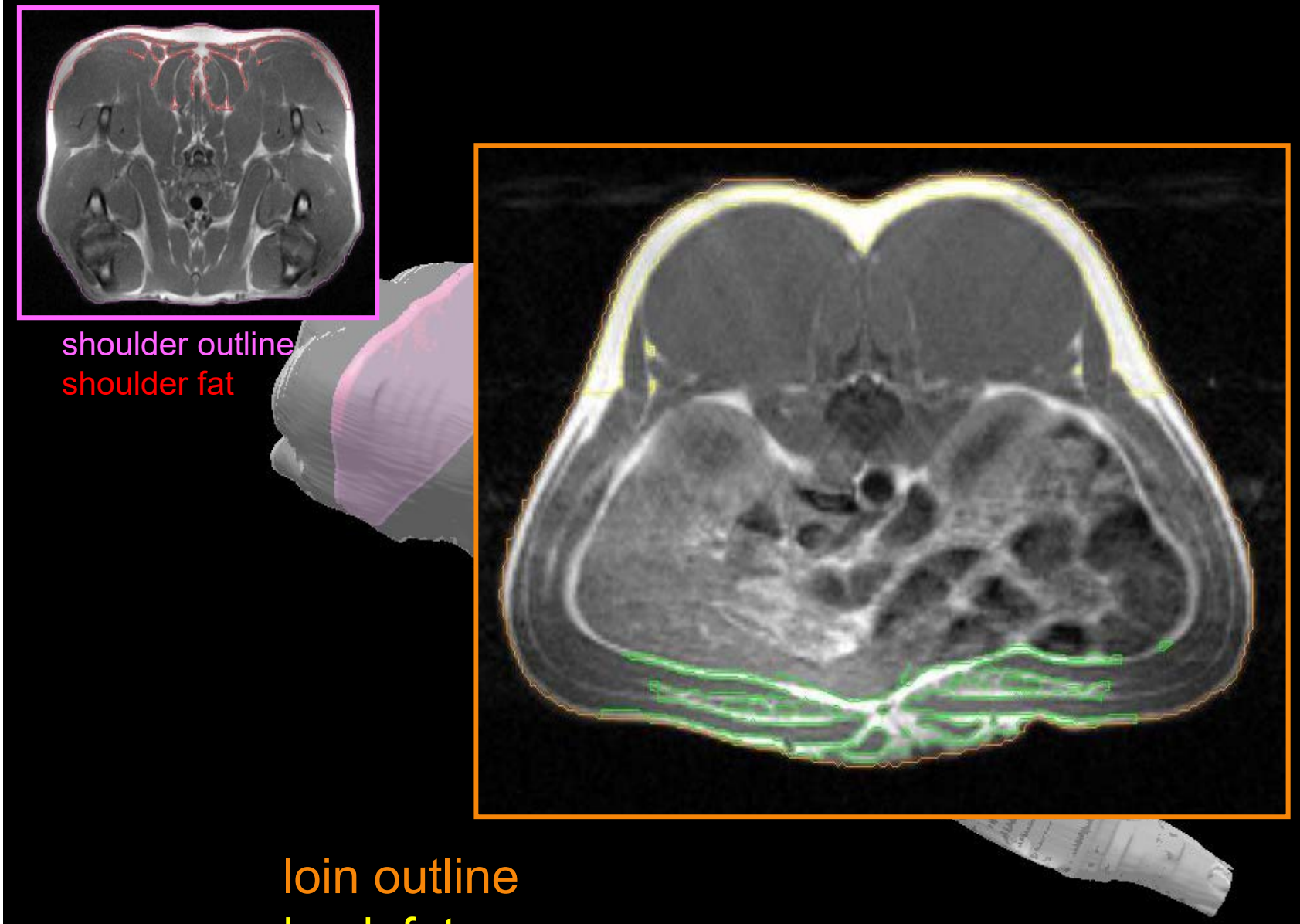
Image evaluation

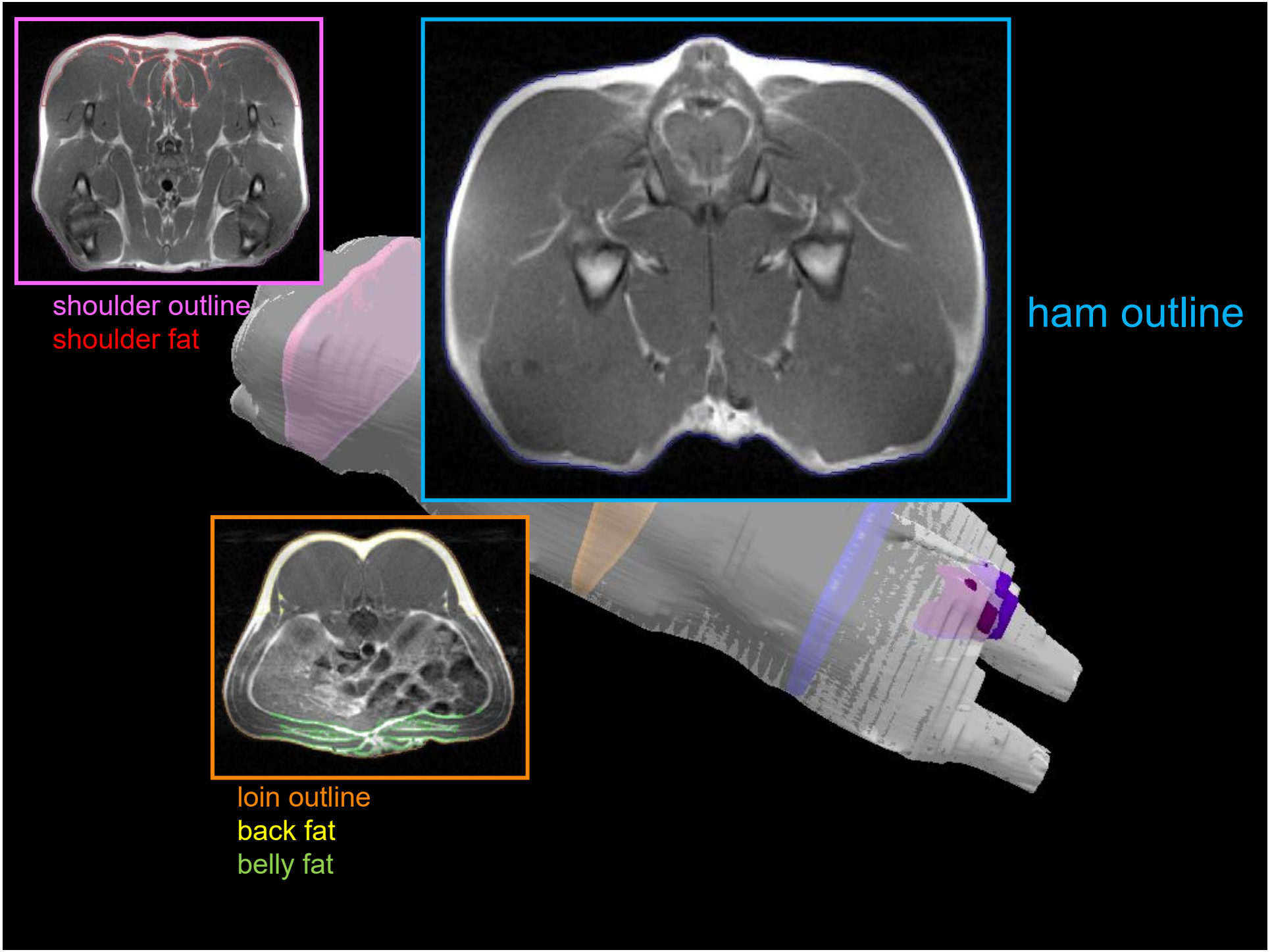
- Able 3D Doctor Software®
- semi-automatic evaluation

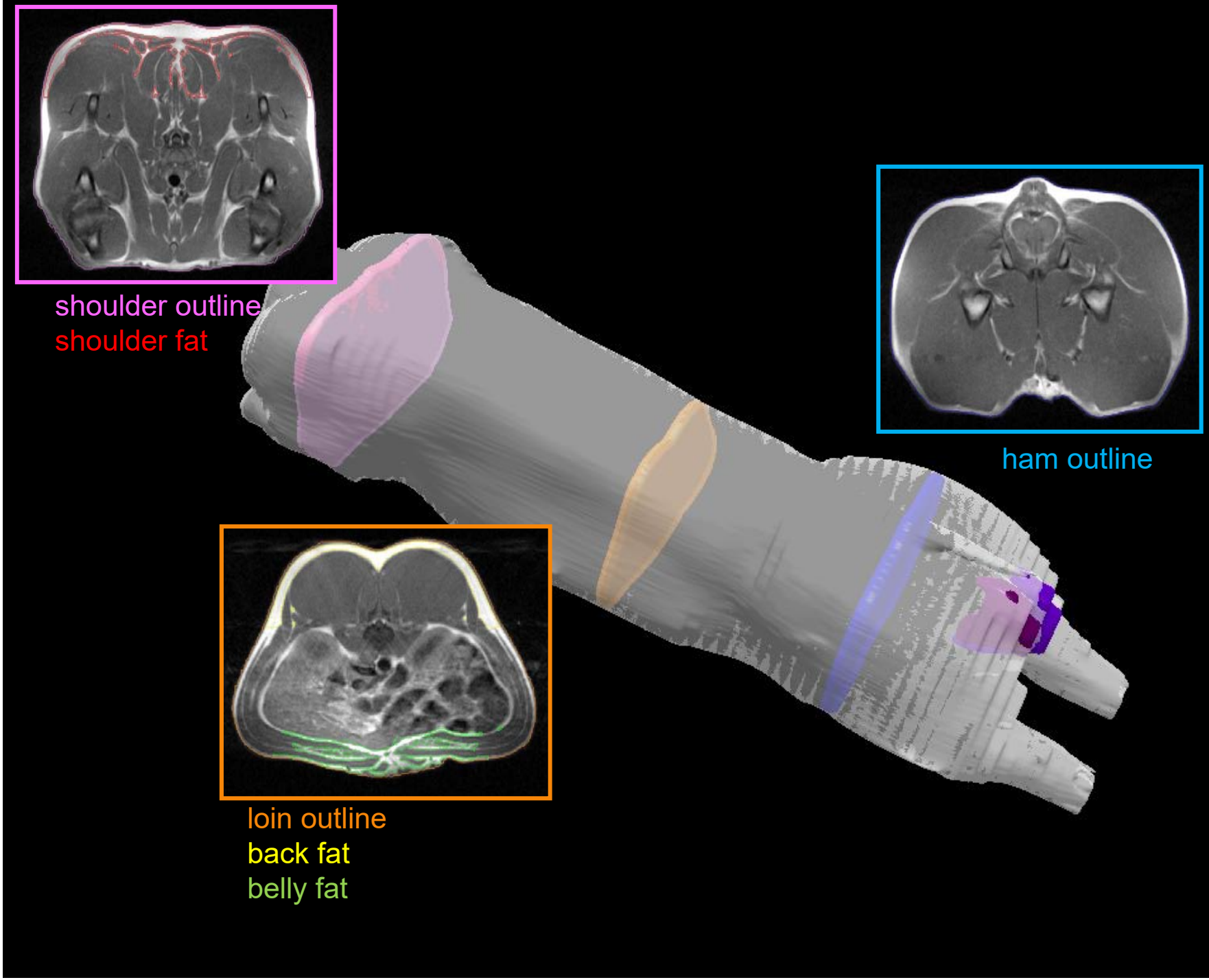
  (single slices of the shoulder, loin & ham)
- additionally testis volume by manual bordering

shoulder outline
shoulder fat

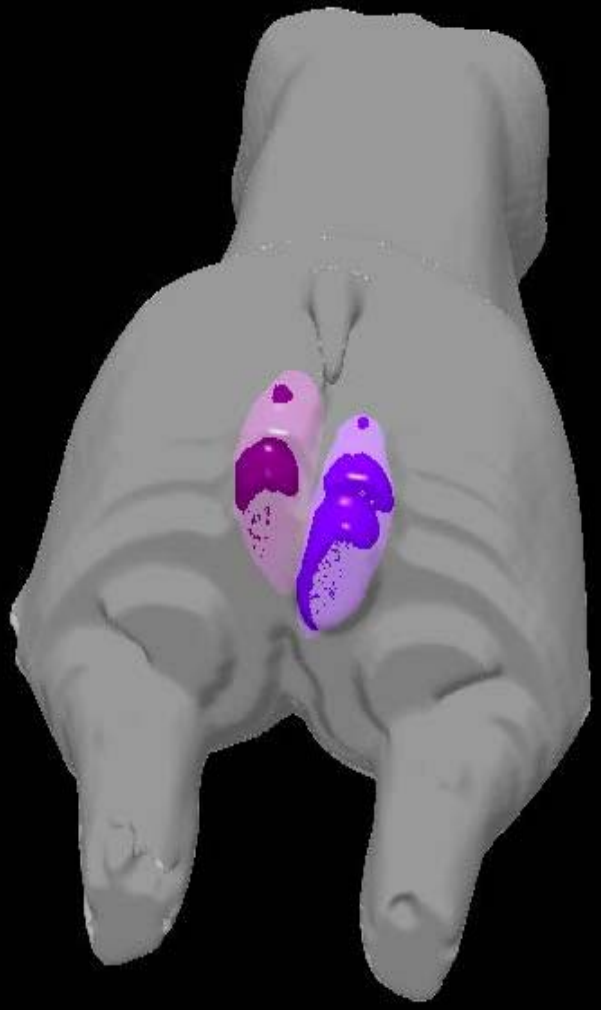


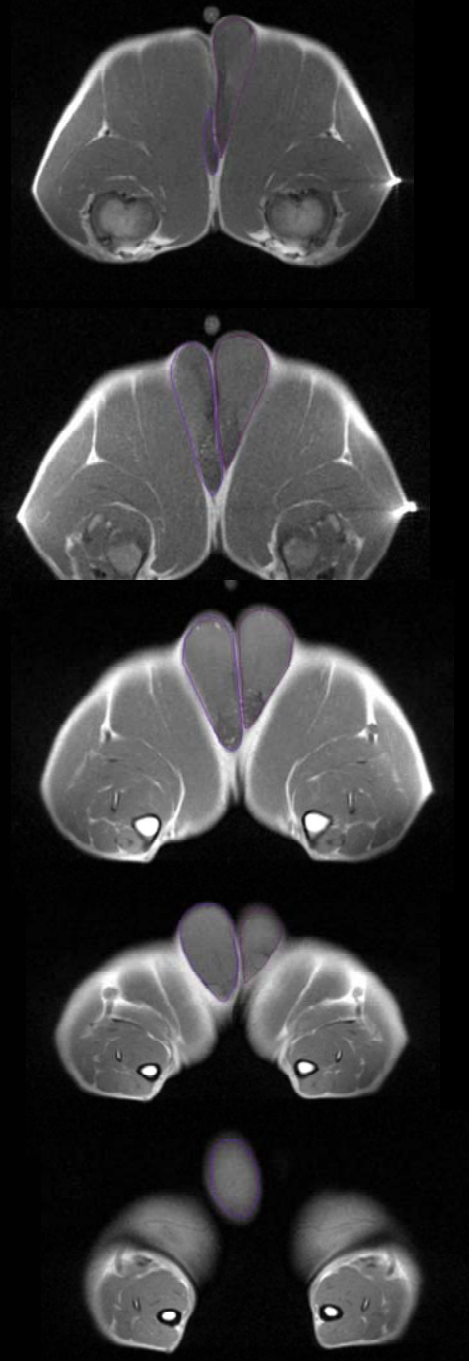

shoulder outline
shoulder fat
loin outline
back fat
belly fat


shoulder outline
shoulder fat
ham outline
loin outline
back fat
belly fat


shoulder outline
shoulder fat
ham outline
loin outline
back fat
belly fat

left & right testis volume





- Additionally after MRI, linear testis measurements were performed by a caliper

Boar taint samples

- after slaughter (165 ± 1 day)

  cheek & salivary gland sample

  for organoleptic analysis

  (AVVLmHyg)

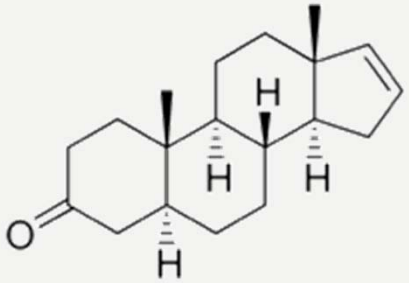
microwave heating test → **cooking test** → **melting test**

Boar taint samples II

- additionally, after slaughter (165 ± 1 day)

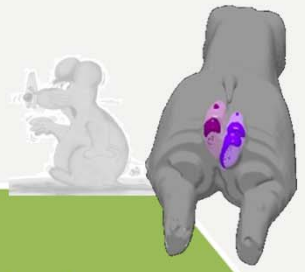
  backfat samples for stable isotope dilution assay (SIDA)

  to determine **androstenone [ng/g]** levels



Statistics

- SAS 9.3
- simple one-way variance analysis using GLM procedure
  - boar group (EB, IB), result of sensory analysis, boar group* sensory analysis as fixed effect (weight as covariable)
- simple one-way variance analysis using GLM procedure
  - androstenone group as fixed effect
- $p < 0.05$



Results I – sensory test results

microwave heating test
EB positive (19/34)
IB positive (4/34)

cooking test
EB positive (11/34)
IB positive (1/34)

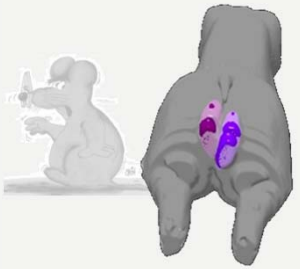
melting test
EB positive (10/34)
IB positive (1/34)

	scan	Test positive	Test negative	p-value
EB	60	163.06 cm³	139.25 cm³	0.0205*
IB	60	149.49 cm³	149.60 cm³	0.9943*
EB	90	523.10 cm³	437.82 cm³	**0.0333**
IB	90	286.36 cm³	315.22 cm³	0.6324

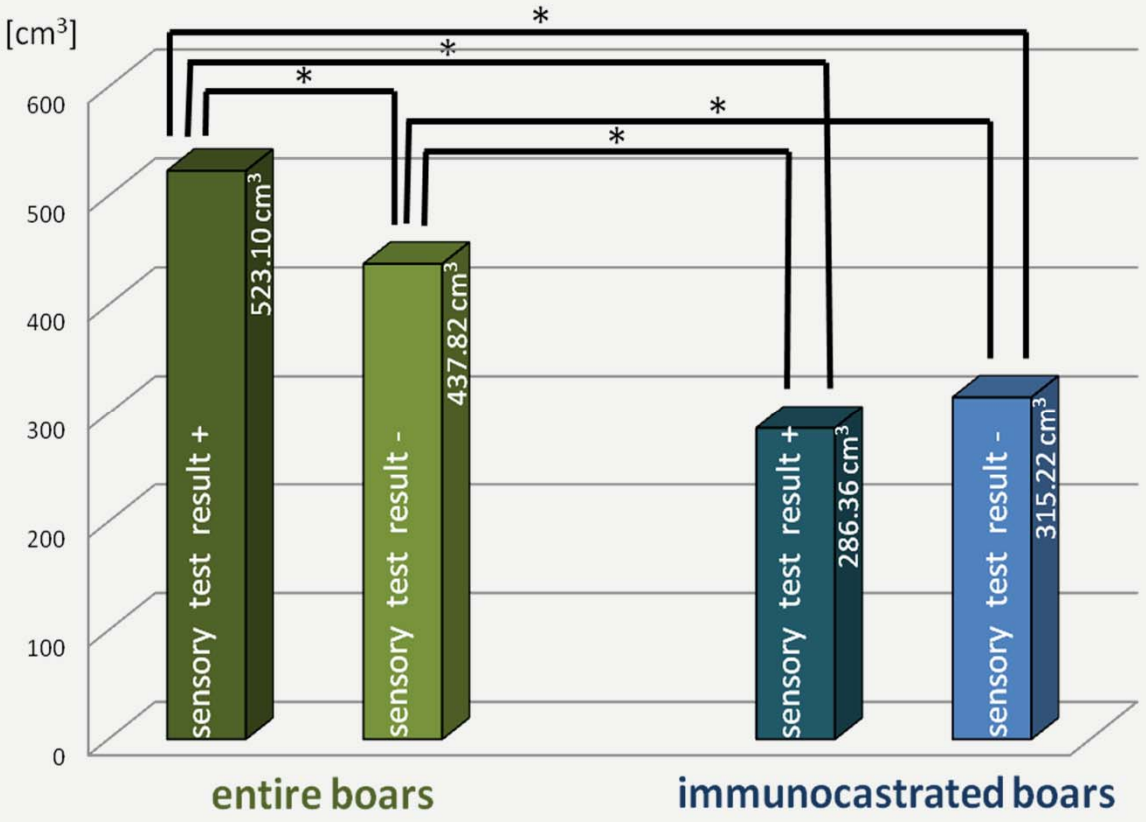
	scan	Test positive	Test negative	p-value
EB	60	167.94 cm³	146.07 cm³	0.0499*
IB	60	126.46 cm³	150.33 cm³	0.4201*
EB	90	569.58 cm³	450.47 cm³	**0.0054**
IB	90	280.81 cm³	312.74 cm³	0.7756

	scan	Test positive	Test negative	p-value
EB	60	169.37 cm³	145.50 cm³	0.0321*
IB	60	126.41 cm³	150.32 cm³	0.4167*
EB	90	535.92 cm³	464.49 cm³	0.1021
IB	90	280.81 cm³	312.74 cm³	0.7842

- sensory test results compared with testis volume measurements for scan 60 & 90
- test positive EB had higher testis volume than negative EB
- *= t-Test for comparison between EB and IB with p-value > 0.05

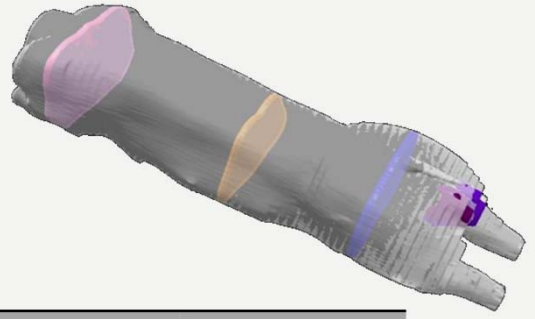


Results II – testis volume measurements (after microwave heating)



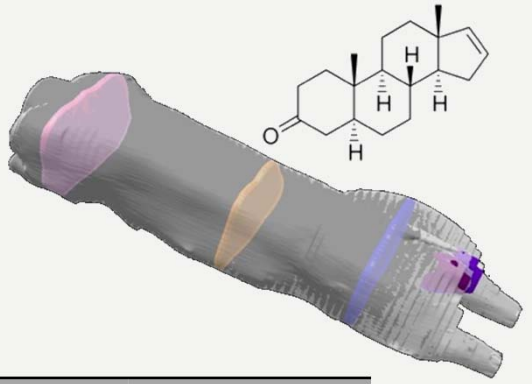
* $p < 0.05$

Results III – body composition traits

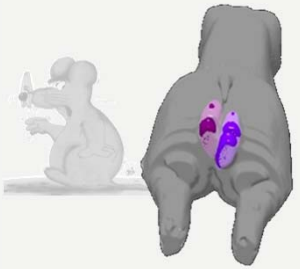


		boar group		
		EB	**IB**	**p-value**
shoulder fat	Scan 60	33.12 ± 1.35 cm^3	31.08 ± 1.37 cm^3	0.2923
	Scan 90	**59.29 ± 2.73 cm^3**	**67.32 ± 2.69 cm^3**	**0.0401**
shoulder outline	**Scan 60**	**1095.42 ± 12.87 cm^3**	**1048.84 ± 12.87 cm^3**	**0.0131**
	Scan 90	1621.92 ± 11.31 cm^3	1617.10 ± 11.31 cm^3	0.7640
testis volume	Scan 60	152.44 ± 5.08 cm^3	149.70 ± 5.08 cm^3	0.7043
	Scan 90	**485.50 ± 19.74 cm^3**	**311.80 ± 19.74 cm^3**	**<0.0001**
testis area	Scan 60	46.46 ± 2.21 cm	41.21 ± 2.16 cm	0.0966
	Scan 90	**115.39 ± 5.05 cm**	**68.13 ± 5.05 cm^3**	**<0.0001**

Results IV – Androstenone group (**EB only**)



		androstenone group		
		high (> 500ng/g fat)	**low (≤ 500 ng/g fat)**	**p-value**
belly fat	Scan 60	14.24 ± 2.11 cm^3	11.86 ± 1.35 cm^3	0.35
	Scan 90	**15.75 ± 1.35 cm^3**	**11.56 ± 0.99 cm^3**	**0.02**
testis volume	**Scan 60**	**171.37 ± 9.34 cm^3**	**138.89 ± 6.90 cm^3**	**0.01**
	Scan 90	**582.56 ± 35.75 cm^3**	**433.10 ± 26.40 cm^3**	**0.0020**
testis area	**Scan 60**	**51.04 ± 2.76 cm^2**	**40.97 ± 3.18 cm^2**	**0.03**
	Scan 90	109.10 ± 12.13 cm^2	118.98 ± 8.96 cm^2	0.52



Discussion I

- **Sensory test results:**
  - testis volume: test positive EB > test negative EB

    (Oonk et al., 1995; Aldal et al., 2005; Bekaert et al., 2012; Font-i-Furnols et al., 2016)
  - differentiation between tainted EB and not-tainted EB according to the testis volume
  - no significant difference between positive and negative IB

    => small number of animals (4/34)

Discussion II

- **Body composition traits and androstenone group (EB only):**
  - higher belly fat volume (90 kg) => >500ng/g fat androstenone

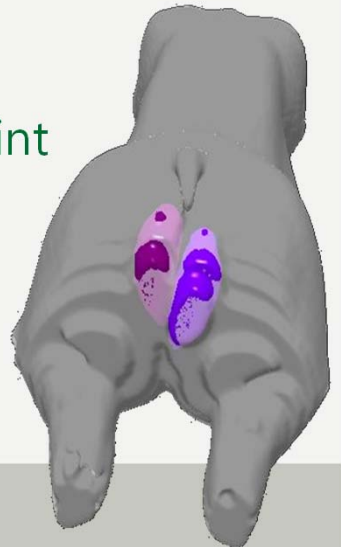
    => belly fat as a measure for boar taint?

    => performable at the slaughter line?
  - testis volume at 60 kg allows differentiation in high and low androstenone group

    => a way to detect boar taint prior to the slaughter age?

Conclusions

- ✓ testis volume can be a factor in prediciting the androstenone group prior slaughter
- ✓ differentiation between sensory positive and negative EB and between IB and EB according to the testis volume
- ✓ belly fat as a promising variable (?)
- ✓ further research by creating a sensory index using all boar taint components and the testis volume/belly fat



Thank you for your attention !

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