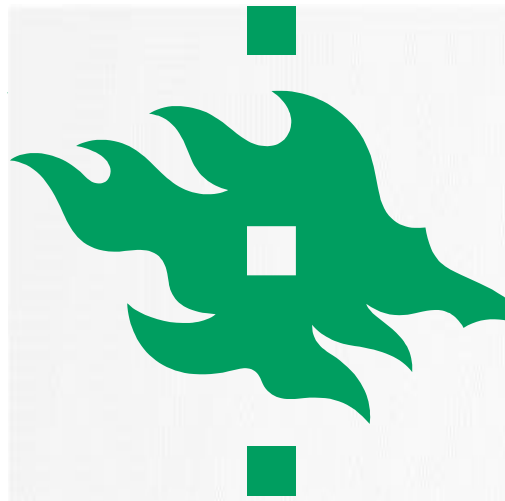
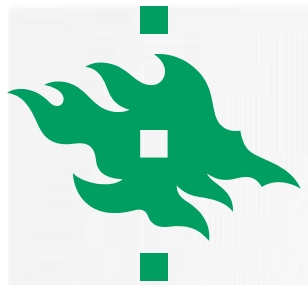




Sow mortality, Finnish research and experiences

Mari Heinonen
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November 4, 2021
Denmark DVHS



This presentation

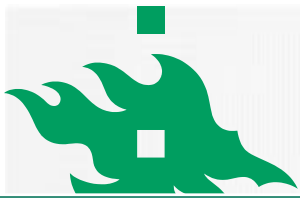
- Sow mortality, figures
- Finnish postmortem study
- Results from other studies
- Finnish study about removal patterns and herd characteristics
- Association of mortality and meat inspection findings



Sow removal – Sow welfare

- VOLUNTARY
 - Culling
- INVOLUNTARY
 - Euthanasia
 - Death





Literature, mortality of sows

Author	Country	Culling %	Mortality, %	Mean parity
Dagorn & Aumaitre 1979	France		6.5	4.2
D'Allaire et al. 1987	USA	53	12	4.7
Stein et al. 1990	USA and Canada	50	10.7	4.2
Chagnon et al. 1991	Canada		3.3	4.2
Lucia et al. 2000	USA and Canada	46.9	7.4	3.3
Koketsu 2000	USA		5.7	
Anil et al. 2005	Canada	23-50	4.7-9.5	
Engblom et al. 2007	Sweden	49.5	5.2 Eut, 2.1 Died	4.4
Sasaki & Koketsu 2008	Japan	37.7	0.4 Eut, 8.3 Died	3.2 (Died)
Mote et al. 2009	USA	51	9	
Haltia 2010	Finland		0.6 Eut, 8.3 Died	4.1
Jensen et al. 2012	Denmark		3 (follow-up time 3 months)	
Masaka et al. 2014	Zimbabwe	52.8	15.6	
Iida & Koketsu 2014	Japan		8.9	
Knage-Rasmussen et al. 2015	Denmark		14	
Antunes et al. 2017	Denmark		0.8 (follow-up time 1 month)	
Heinonen et al. 2018	Finland		9	
Bergman et al. 2019	Finland	38	9.7	4



Reasons for mortality: Post-mortem study of sows in Finland

Ala-Kurikka et al. 2019

- Aim:
 - Determine causes of on-farm deaths (Sows died / euthanized)
 - Analyse to what degree farmer's perceptions of the causes agree with pathological-anatomical diagnoses
- Collection of dead animals to autopsy and interview of the owners
 - 15 farms
 - 65 sows
 - Voluntary herds, 2 years
 - Difficulties in recruitment

Ala-Kurikka et al. Porcine Health Management
<https://doi.org/10.1186/s40813-019-0132-y>

(2019) 5:25

Porcine Health Management

RESEARCH

Open Access

Pathological findings in spontaneously dead and euthanized sows – a descriptive study



Eve Ala-Kurikka^{1*}, Camilla Munsterhjelm^{1*}, Paula Bergman², Taina Laine³, Henna Pekkarinen⁴, Olli Peltoniemi², Anna Valros¹ and Mari Heinonen²



Autopsied sows

	Found dead, n=27	Euthanized, n=38
Parity, median (range)	2 (0-9)	3 (0-10)
Body condition, mean (sd)	2.9 (0.8)*	2.5 (0.9)*
Clinical signs <30 days before death, n (%)***		
- Yes	14 (52 %)	38 (100 %)
- No	13 (48 %)	0
Treated <30 days before death, n (%)*		
- Yes	10 (37 %)	24 (63 %)
- No	17 (63 %)	14 (37 %)

* P< 0.05
*** P<0.01



Definition of the cause of death varies considerably in different studied

- Ala-Kurikka et al. 2019
 - Main cause of death = Primary pathological anatomical diagnosis. In cases with evidence of more than one contributing cause, this event was assumed to have occurred latest
 - Secondary pathological-anatomical diagnosis
 - Preceding the primary reason
 - Incidental findings
 - Having an effect on the health status of the sow



Pathological-anatomical diagnoses

	PRIMARY			SECONDARY		
	% of all sows	Died, 27 sows	Euthanised, 38 sows	% of all sows	Died, 27 sows	Euthanised, 38 sows
Inflammatory, other than locomotor	30.8 %	11	9	9.2 %	3	3
Locomotor, inflammatory	16.9 %	0	11	1.5 %	0	1
Locomotor, non-inflammatory	12.3 %	1	7	7.7 %	0	5
Cardiogenic	4.6 %	2	1	0	0	0
Miscellaneous	12.3 %	3	5	12.3 %	5	3
Unknown, suspected cardiogenic	9.2 %	6	0	0	0	0
Unknown	13.8 %	4	5	0	0	0

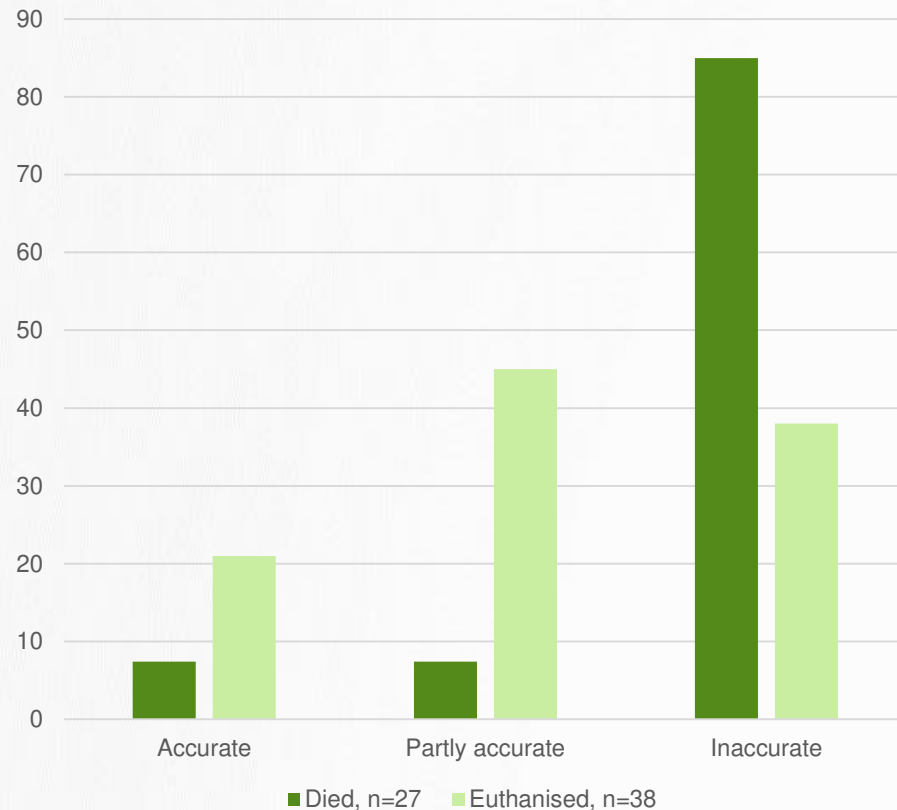


Pathology and clinical signs of 65 sows observed by the farmer 30 days before death / euthanasia

Primary pathological-anatomical diagnosis	Lameness	Unable to stand	Inappetence	Fever	Uterine discharge	Respiratory	No signs
Inflammatory, other than locomotor (n=20)	0	2 (10%)	6 (30%)	2 (10%)	2 (10%)	1 (5%)	7 (35%)
Locomotor, inflammatory (n=11)	9 (82%)	5 (46%)	4 (36%)	0	0	0	0
Locomotor, non-inflammatory (n=8)	7 (88%)	3 (38%)	2 (25%)	0	0	0	1 (13%)
Cardiogenic (n=3)	1 (33%)	1 (33%)	2 (66%)	0	0	0	0
Miscellaneous (n=8)	1 (13%)	0	2 (25%)	0	0	0	2 (25%)
Unknown, suspected cardiogenic n=6)	1 (17%)	1 (17%)	1 (17%)	0	0	2 (33%)	1 (17%)
Unknown (n=9)	3 (33%)	5 (56%)	1 (11%)	0	0	1 (11%)	2 (22%)
TOTAL number of sows, n=65	22 (34%)	17 (26%)	18 (28%)	2 (3%)	2 (3%)	4 (6%)	13 (20%)



Accuracy of sow culling classifications by the farmers



Ala-Kurikka et al. 2019

- Thomsen et al. 2012 studied postmortem dairy cows
 - Accurate in about 50% of the cases

CONCLUSION:
Causes of sow mortality are poorly understood by farmers



Other findings

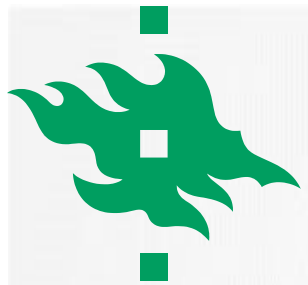
	Died, 27 sows	Euthanised, 38 sows %	% of all sows
Tooth wear	19	27	70.8 %
Degenerative joint disease	18	23	63.1 %
Skin lesions	9	20	44.6 %
Decubital ulcers	18	14	35.4 %
Periodontal disease	9	8	26.2 %
Pneumonia /pleuritis (chronic)	2	15	26.2 %
Tooth fracture	7	9	24.6 %
Cystitis	3	11	21.5 %
Other joint disease	6	5	16.9 %
Miscellaneous	6	5	16.9 %
Tooth calculus	2	5	10.8 %



Other findings

	Died, 27 sows	Euthanised, 38 sows %	% of all sows
Tooth wear	19	27	70.8 %
Degenerative joint disease	18	23	63.1 %
Skin lesions	9	20	44.6 %
Decubital ulcers	18	14	35.4 %
Periodontal disease	9	8	26.2 %
Pneumonia /pleuritis	2	15	26.2 %
Tooth fracture	7	9	24.6 %
Cystitis	3	11	21.5 %
Other joint disease	6	5	16.9 %
Miscellaneous	6	5	16.9 %
Tooth calculus	2	5	10.8 %





Other studies (Chagnon et al. 1991, D'Allaire et al. 1991, Kirk et al. 2005, Christensen et al. 1995, Sanz et al. 2007, Engblom et al. 2008, Kongstedt et al. 2021)

- Difficult to compare
- Different postmortem protocols, sometimes not sufficiently described
- Small numbers of sows included
- Herd information not collected similarly
- Sows found dead:
 - Heart failure, pathologies involving abdominal organs (**torsions**), ruptures, perforations, retained fetuses
- Sows euthanised:
 - locomotor problems



Characteristics of sow farms and sow removal patterns (Bergman et al. 2019)

- Aims of the study
 - Characterization of piglet producing farms (n=43)
 - The association of farm profiles and sow culling and mortality
- Herd visit, collection of detailed info, interview, data collection from records
- Average mortality 9.7% (95%CI 7.9-11.5) and culling **38%** (95%CI 34-42)

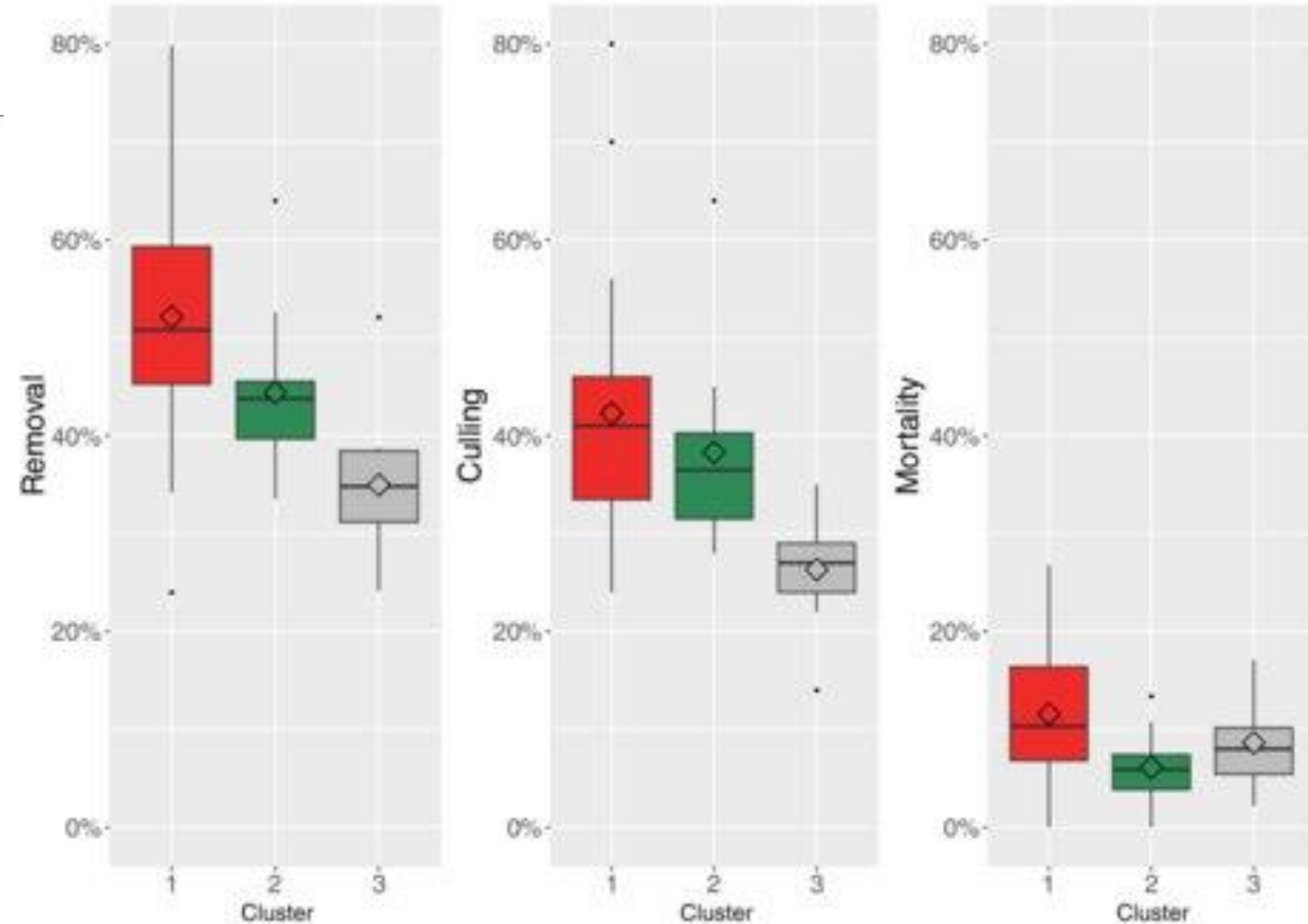
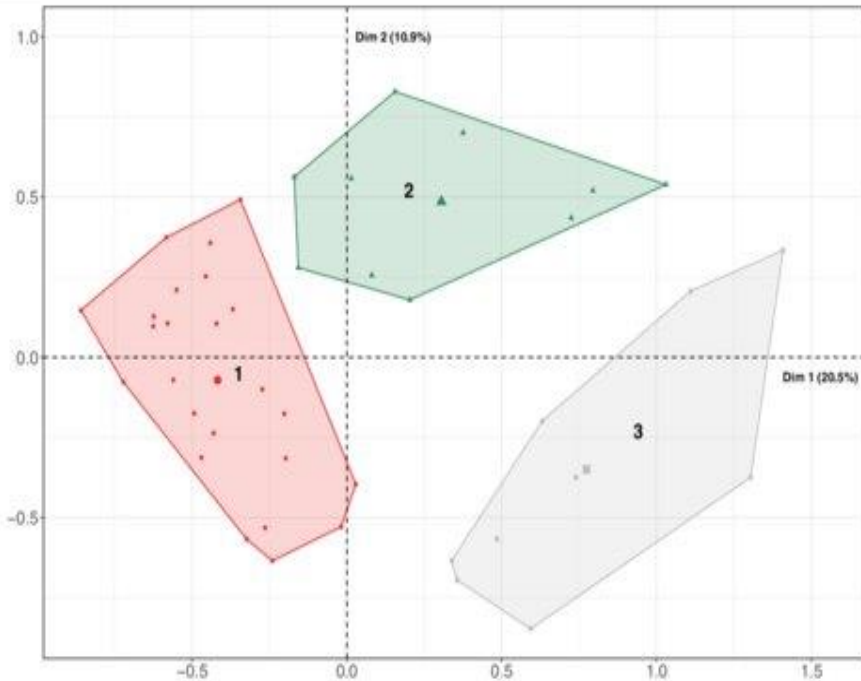
- MCA, Multiple correspondence analysis and HCA, Hierarchical cluster analysis:

THREE CLUSTERS

- 1. Semi intensive/intensive
 - Large herds and rooms, high stocking density, more sows per caretaker
- 2. Animal welfare type farms
 - Bedding, rooting material, space allowance, cleanliness
- 3. Non-intensified farms
 - Small herds, low stocking density, less sows per caretaker, combined breeding+pregnancy rooms, rare farrowing induction

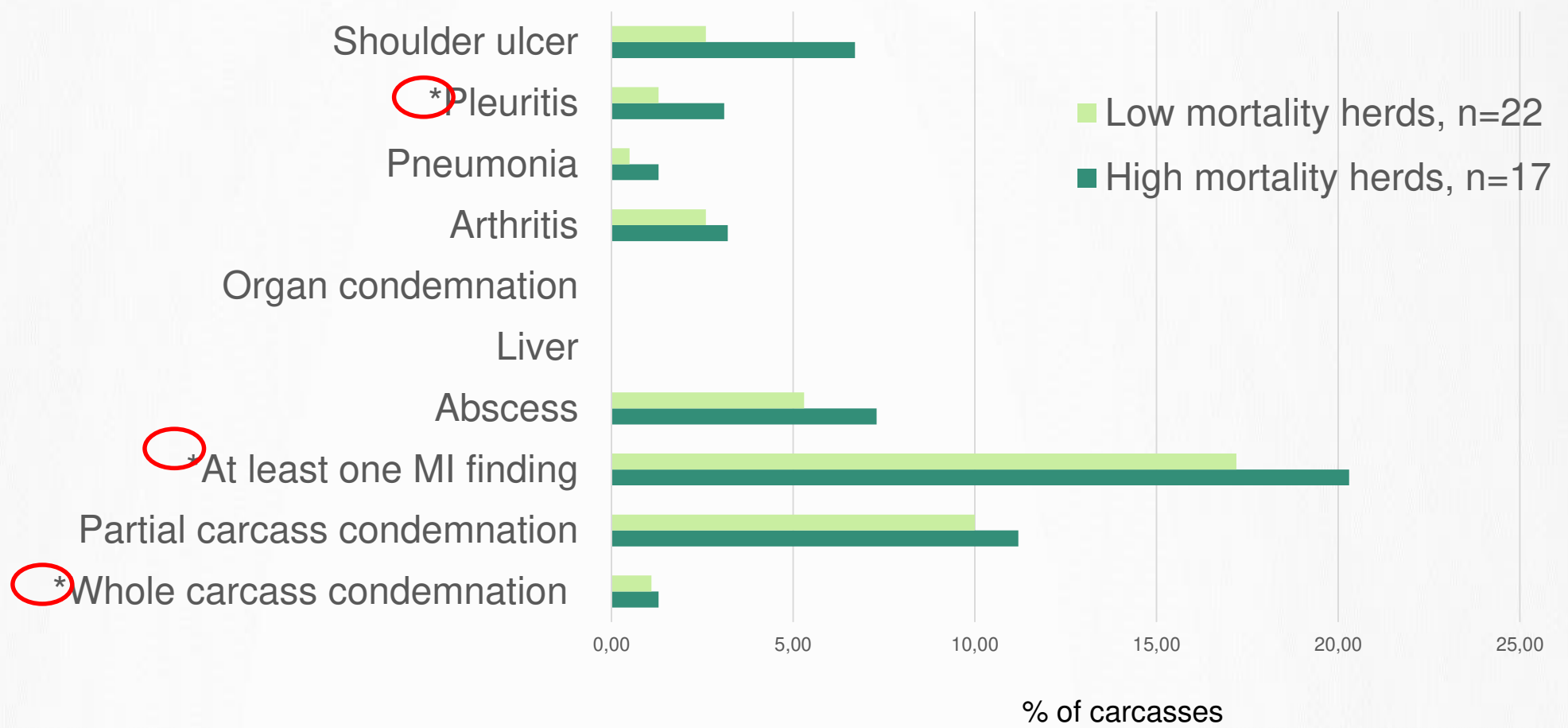


MCA and HCA analysis results





Association of sow in-herd mortality (higher or lower than the herd average 9 %) with meat inspection (MI) findings in 37 herds

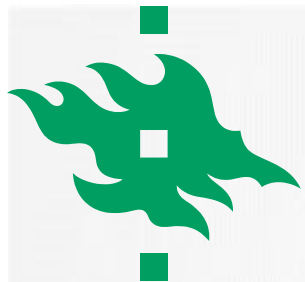


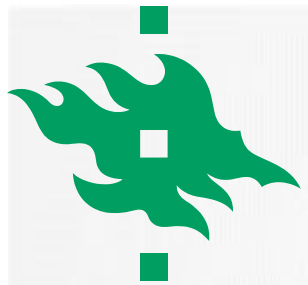


Could we do more post-mortems in herds?

- Farmers are not very willing to transport dead sows to lab, but would they be willing to pay for post-mortems done in the herd?
- Most macroscopical findings reasonably easy to interpret
- Laborious but very educative
- Possibility to take samples
 - Histology, bacteriology







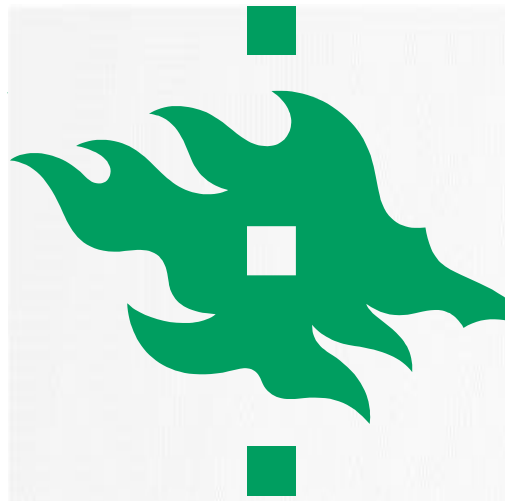
Summary

- Sow mortality is high
- It would be beneficial to record separately dead and euthanised sows and do more postmortems to increase understanding about the causes
- There are some clinical conditions that we have very little knowledge of (e.g. teeth, torsions)
- Sow mortality is associated with intensification of production and some meat inspection findings
- We could utilize sow mortality and meat inspection data better in herd health work
- Are we doing enough for the high-producing sows nowadays?





Thanks, any questions?



Lameness in sows, Finnish research and experiences

Mari Heinonen
Professor in swine medicine
University of Helsinki



Today

Prevalence

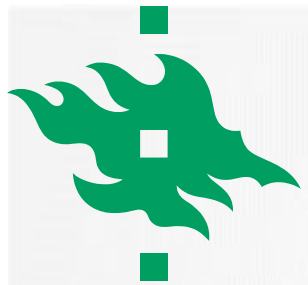
Economy

Risk factors

Evaluation of lameness

Treatment



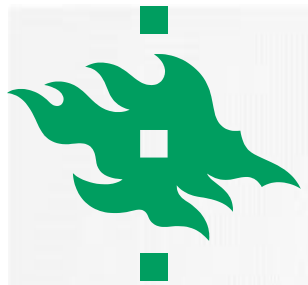


Sow lameness

- Departure from normal gait
- A clinical sign associated with a range of conditions
- Used as a general diagnosis both in veterinary practice and in scientific research
 - For example most journals do not define the exact cause of lameness
- Major health and welfare issue in SOWS

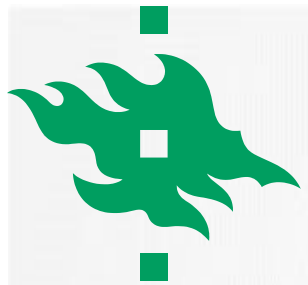
- Prevalence 8.8-16.9 %
 - Gjein & Larsen 1995, Bonde et al. 2004, Heinonen et al. 2006, Kilbride et al. 2009), Jensen et al. 2010, Pluym et al. 2011





Costs associated with lameness

- Loss due to lameness 37-133 € per lame sow (Deen et al. 2008)
- The estimated magnitude of losses was 290-330 € per affected sow (Niemi et al. 2017)
 - For an averaged size herd (469 sows per herd in the 2014 dataset) this meant losses about 11 000 € annually
- Lameness is thought to impair reproduction indirectly, however, difficult to prove
 - Estrus behaviour, detection, crushing of piglets, uterine infections because of sitting?
 - No association between lameness pregnancy rate (Heinonen et al. 2006, Pluym et al. 2013)
 - However, some claw lesions were associated with farrowing performance. Presence of skin lesions and heel erosions were associated with increase of crushed piglets (Pluym et al. 2013).



Risk factors, environmental related, two studies

- 108 farms in France, Cador et al. 2014
 - Visual examination of claws, lameness scoring, breeding records
 - Risk factors, unadjusted relative risk, RR (95% CI)
 - Concrete slatted floor 9.9 (4.4-34.5)
 - Housing in large groups 1.5 (1.1-2.4)
 - Dirty floors 1.6 (1.0-2.9)
 - High ammonia level 1.5 (1.1-2.1)
 - Restrict feeding 1.5 (1.0-2.1), especially in late pregnancy
 - High, sows/caretaker 1.5 (1.0-2.4)
- 15 farms, Belgium, Pluym et al 2013
 - Visual examination, lameness scoring, questionnaire
 - Increased risk factors:
 - Dirty sow OR 2.33
 - Decreased risk
 - Increased space from 1.67 to 3 m², OR 0.4
 - Larger herd size from 144 to 750, OR 0.71



Sow factors

- Body condition
- Conformation
- Breed
- Parity





Evaluation of lameness

- Usually visual observation
 - Moving vs. standing
 - On solid floor vs. on slatted floor
 - Scores ranging from 3 to 10
 - Clearly lame animals

We do not find lameness early enough

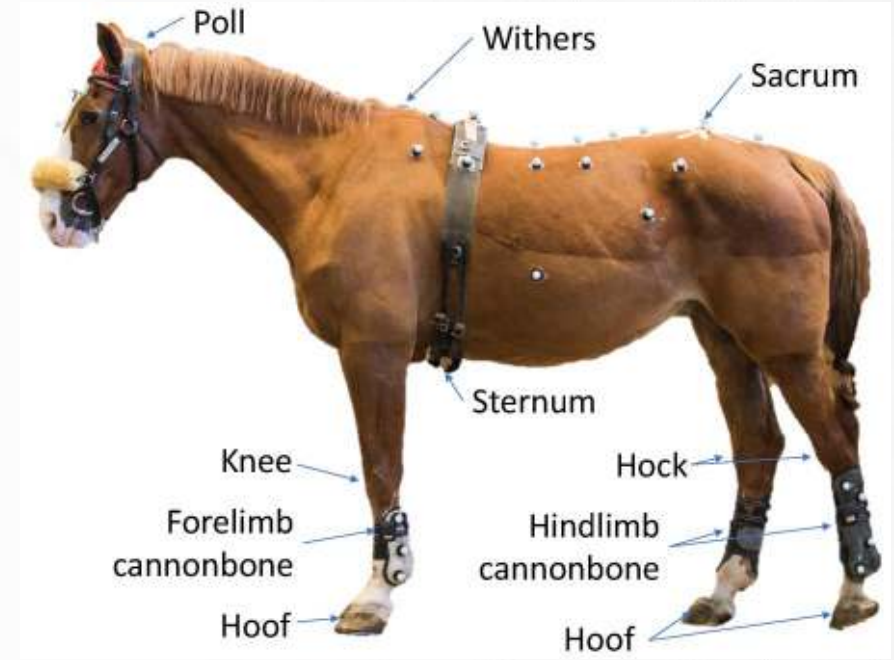




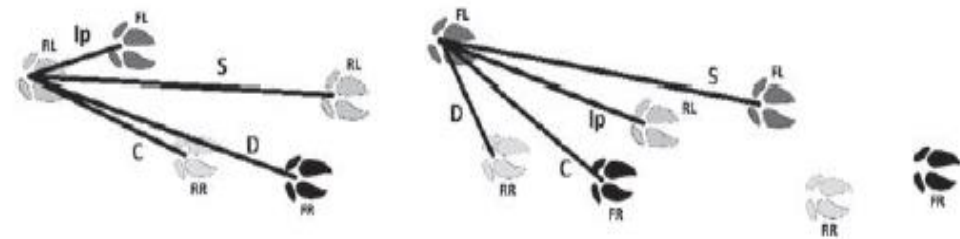
Alternatives to visual scoring (1)

- Kinematics

- Analysis of gait and posture: stride length and stance time, no measurement of forces
- Video motion analysis
- Footprint track analysis (pressure sensitive mat or material on floor)
- Accelerometer
 - Attached to the ear, neck, limbs
 - Feeding, rooting, lying behaviour, distance walked during a day



Bosch et al. 2018



Gregoire et al. 2013

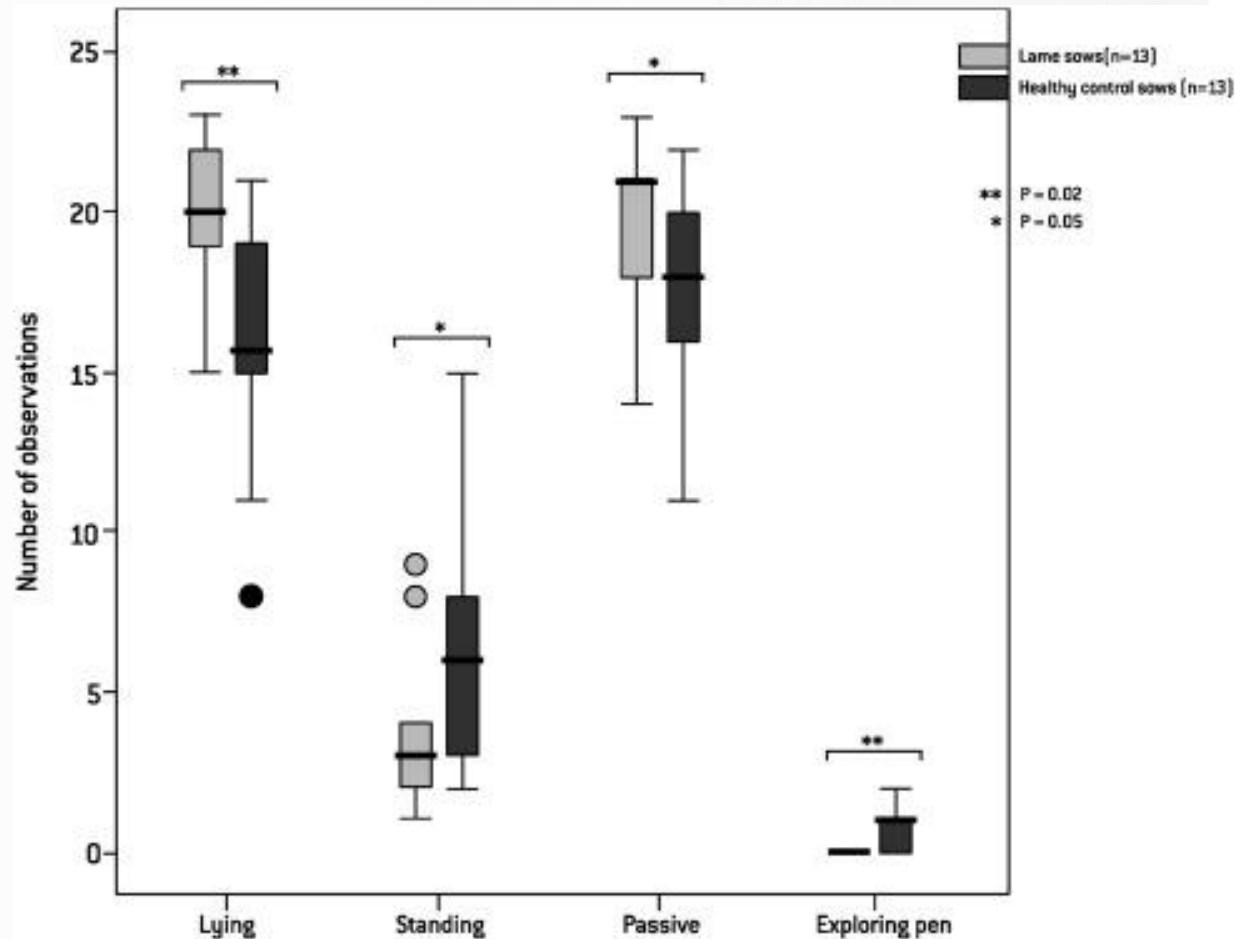




Behaviour of lame sows

Ala-Kurikka et al. 2017

- 13 mildly lame and 13 healthy-legged sows, 0-100 days pregnant
- Two veterinarians evaluated lameness, clinical examination, body temperature $< 39.5^{\circ}\text{C}$
- Straight observation 2 hours, recording 5 min interval
 - Position in the pen
 - Posture
 - Activity





Alternatives to visual scoring (2)

- Kinetics: evaluation of the forces producing movement
 - Force plates
 - Pressure-sensitive walkways
- Both dynamic movement and standing = static examination



<https://www.qualisys.com/software/integrations/force-plates/>



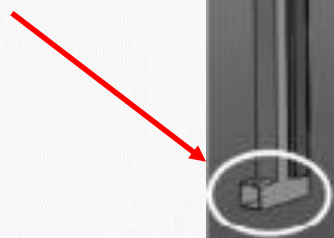
Pastell et al. 2006



SowSIS (Sow Stance Information System)

Pluym 2013

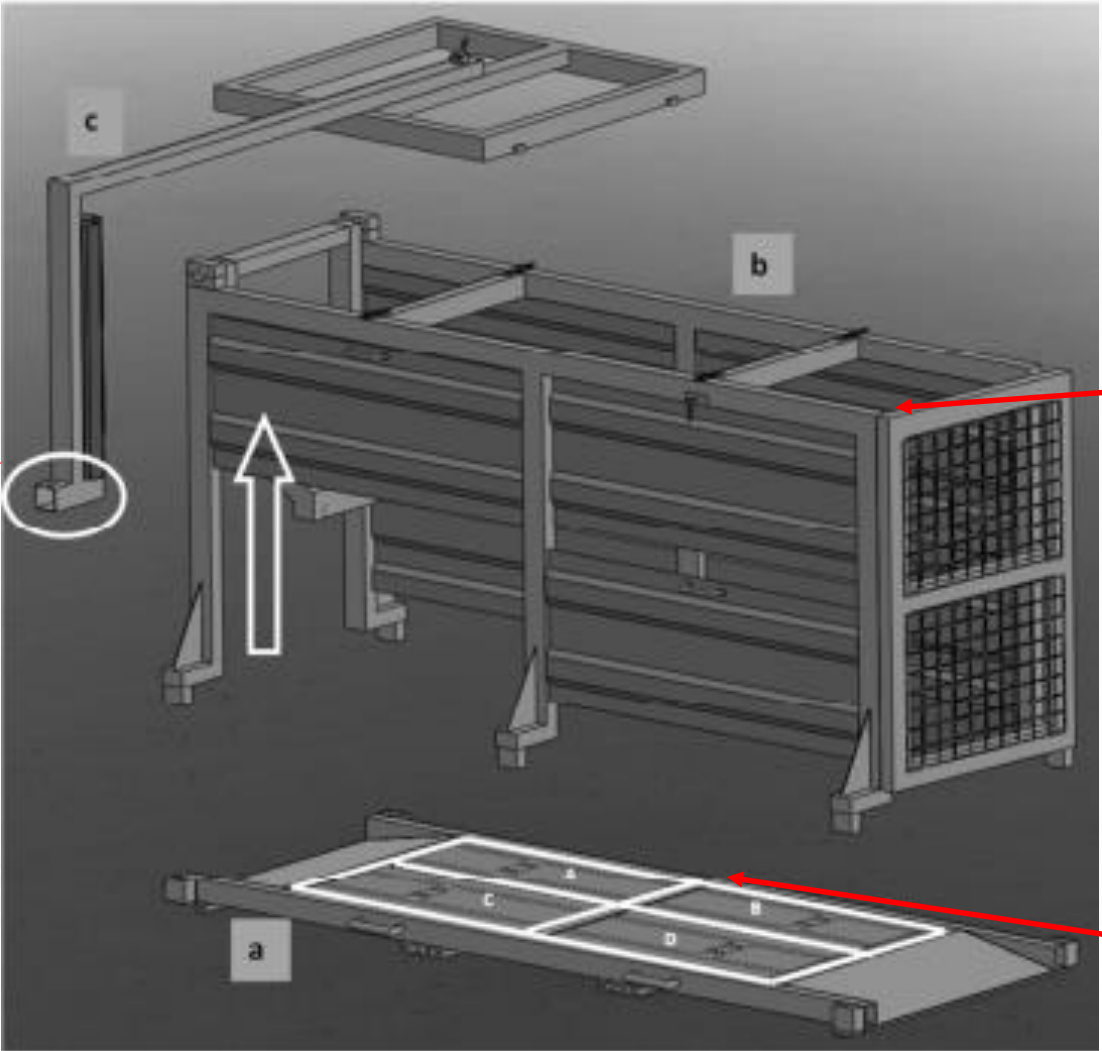
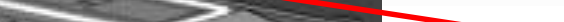
Camera

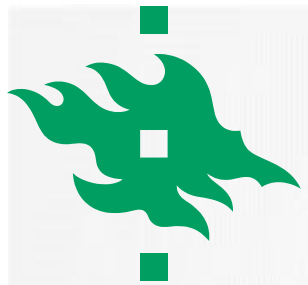


Cage, one leg visible by lifting the side



Four scales





Other examination methods

- X-rays
- Ultrasound
- Nerve blocks
- Bacterial samples
- Post mortem examinations

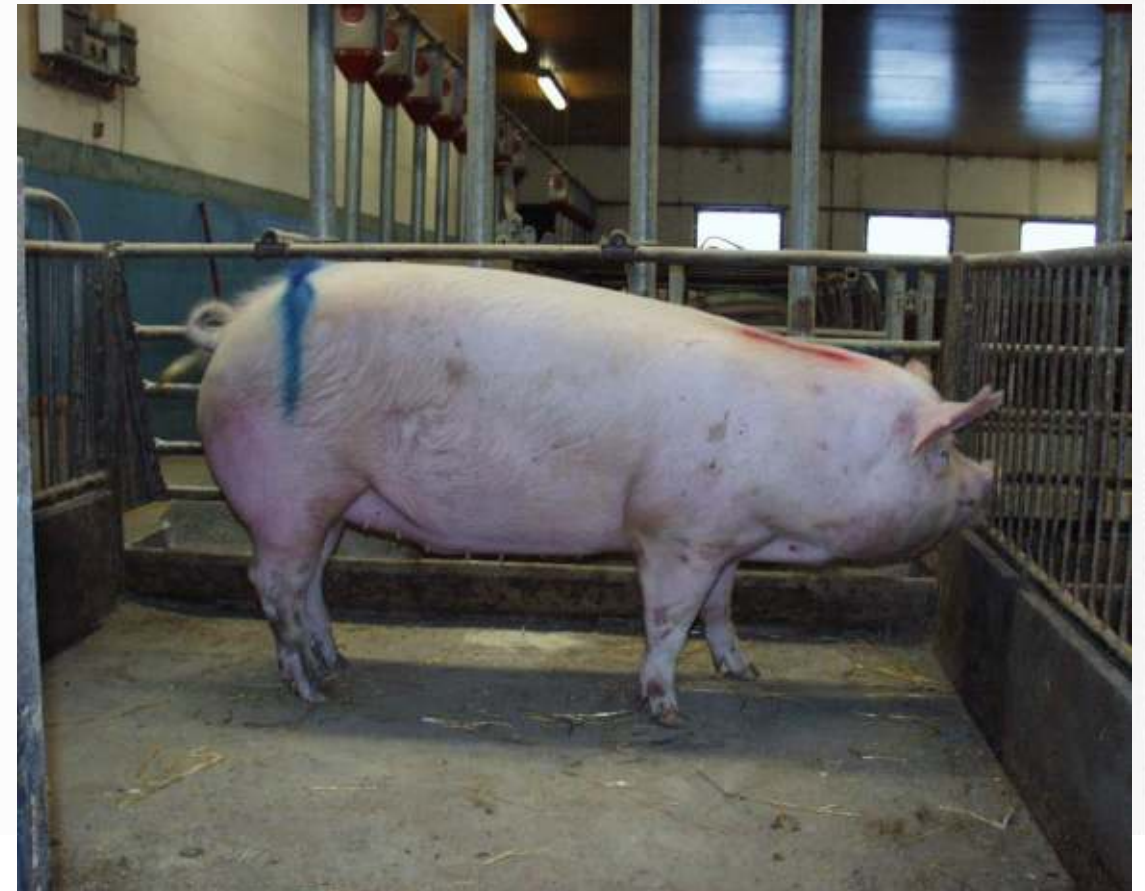
Used in research or only to some valuable individuals

Future?



Clinical examination, reaching the diagnosis

- Anamnesis: production stage, appetite, production
- Visual assesment of the sow:
 - Behaviour, dirtiness, body condition, skin, claws
- Body temperature
- Lameness scoring, gait and posture
- Palpation of affected limb, claws





Old research results from Finland, 57 mildly lame animals

Heinonen et al. 2006

Clinical diagnosis	n	%
Osteochondrosis	27	47
Skin wound, infected	8	14
Arthritis	6	11
Claw lesion	6	11
Claw lesion, infected	4	7
Claw overgrowth	4	7
Neurological symptoms	2	4

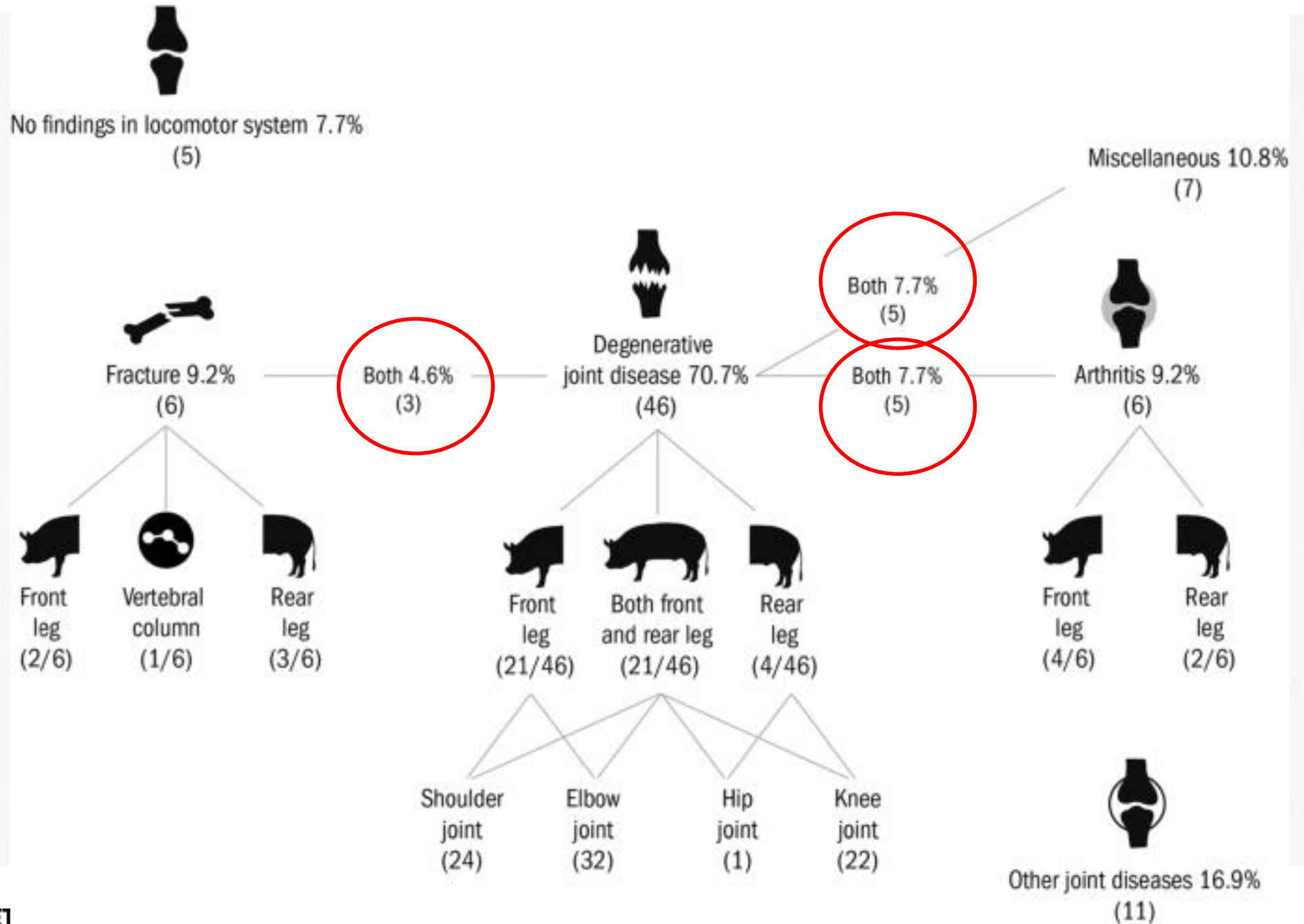


Locomotor system related pathological-anatomical diagnoses in removed sows in some studies

	Arthritis	Fracture	Osteo- chondrosis	Arthrosis, also as secondary	Osteo- myelitis	N
Dewey et al. 1993	22 %	2 %	34 %	12 %		50
Kirk et al. 2005	24 %	16 %		96 %	18 %	172
Sanz et al. 2007	17 %		3 %			107
Engblom et al. 2008	36 %	10 %	14 %			96
Ala-Kurikka et al. 2019	9 %	9 %	71 %			65



- 65 sows post-mortem
- Ala-Kurikka et al. 2019



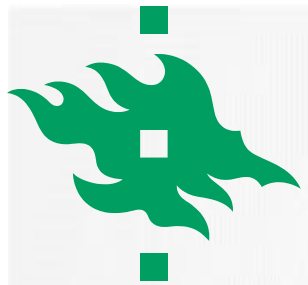


Treatment

- DIAGNOSIS
- No treatment
- Euthanasia
- Treatment
 - NSAID
 - Antibiotics
 - Sick pen
- Very few studies available
 - Ketoprofen is effective in pain alleviation of lame sows (Mustonen et al. 2011)



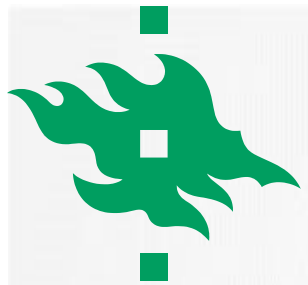
- SICK PEN
- Clean, soft, warm and dry, where the sow can eat, drink and rest without disturbance



Antibiotics?

- Average use of antibiotics (mg/population corrected unit) for sows (one year) was high in a Finnish study (Sali et al. 2021)
 - Sows **93.7** (47.3) mg/PCU
 - Suckling piglets 13.9 (15.6) mg/PCU
 - Weaners 4.9 (4.3) mg/PCU
 - Finishers 5.1 (9.1) mg/PCU

- How do you advice your client herd to treat lame animals
- **Give Antibiotic XX 20 ml intramuscularly for lame sows, 3-5 days**



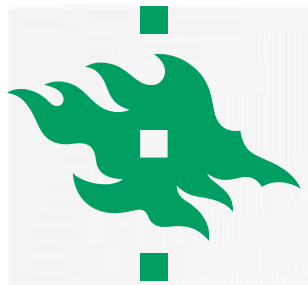
How do you advise your client herd to treat lame animals? An example

- Antibiotic XX 20 ml im for 3-5 days
- XX includes 150 mg/ml
- You aim to give 15 mg/kg
- Sows weight for example 180-300 kg

- If you give 20 ml
 - 180 kg sow receives 17 mg/kg
 - 200 kg sow receives 15 mg/kg
 - 250 kg sow receives 12 mg/kg
 - 290 kg sow receives 10 mg/kg

Give antibiotic XX 10 ml/100 kg im for 3-5 days.

- Explain the symptoms, when you think antibiotic needs to be given
- Advice the use of NSAID and mention the sick pen



Summary

- Lameness is very common
- It is difficult to find lame sows early
- We do not react early enough
- Methods to diagnose more accurately are available for research, hopefully in herd health work in the near future
- Very little research is available about lameness treatments
- Farmers need detailed advice and follow-up in lameness treatments



Thanks to my colleagues in University of Helsinki

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