

Animal based indicators to assess Pig Welfare

OIE seminar – The Hague, 18 June 2019

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Wageningen Livestock Research

Just ask the pig



OIE criteria and indicators compared to WQ

OIE - Criteria:

Behaviour

Morbidity

Mortality and culling

Changes in body weight and condition

Reproductive efficiency

Physical appearance

Handling response

Lameness

Complications from common procedures

OIE - Indicators:

	Welfare criteria		Measures
Good feeding	1	Absence of prolonged hunger	Body condition score
	2	Absence of prolonged thirst	Water supply
Good housing	3	Comfort around resting	Bursitis, absence of manure on the body
	4	Thermal comfort	Shivering, panting, huddling
	5	Ease of movement	Space allowance
Good health	6	Absence of injuries	Lameness, wounds on the body, tail biting
	7	Absence of disease	Mortality, coughing, sneezing, pumping, twisted snouts, rectal prolapse, scouring, skin condition, ruptures and hernias
	8	Absence of pain induced by management procedures	Castration, tail docking
Appropriate behaviour	9	Expression of social behaviours	Social behaviour
	10	Expression of other behaviours	Exploratory behaviour
	11	Good human–animal relationship	Fear of humans
	12	Positive emotional state	Qualitative Behaviour Assessment (QBA)

On farm

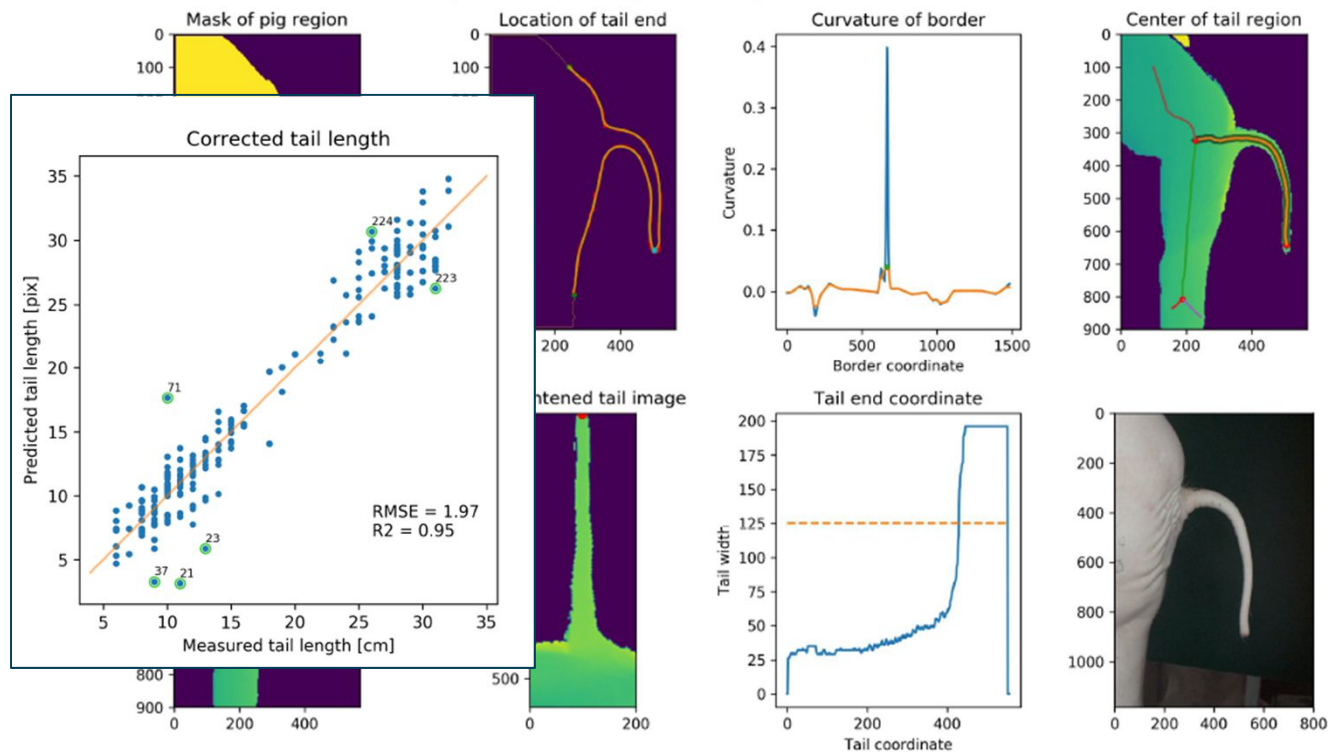
examples:

- Housing
- Water supply
- Lesions & lameness
- Behaviour



Automatic scoring tail length and lesions (from DMRI in PigWatch)

Steps in tail length analysis for cowlid = 120



Application of animal based indicators in practice

- Attempts to reduce full WQ protocol not successful
- WQ protocol now used as a toolkit
- Tools internationally accepted
- Examples: Assessment of enrichment materials
 Risk assessment tail biting
 1-Piglet assessment by farmer
 2-Air quality in pig houses



1-Welfare app for weaners with traffic light model

SCHEM 1: Startscherm

Eerste scherm in de applicatie



Longen/hoesten



Hart/huidskleur/hijgen



Darmen/diarree/oedeem



Hersenen/slingerziekte



Oor necrose/bijten



staartbijten



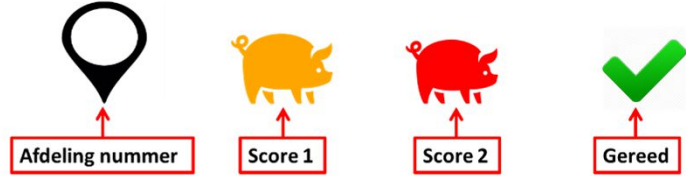
Beenwerk/kreupel



bevuiling

SCHEM 2: Specificatiescherm

Verdere specificatie van het waargenomen gezondheidsprobleem en score om de registratie compleet te maken.



SCHEM 2: Swipen voor Logboek

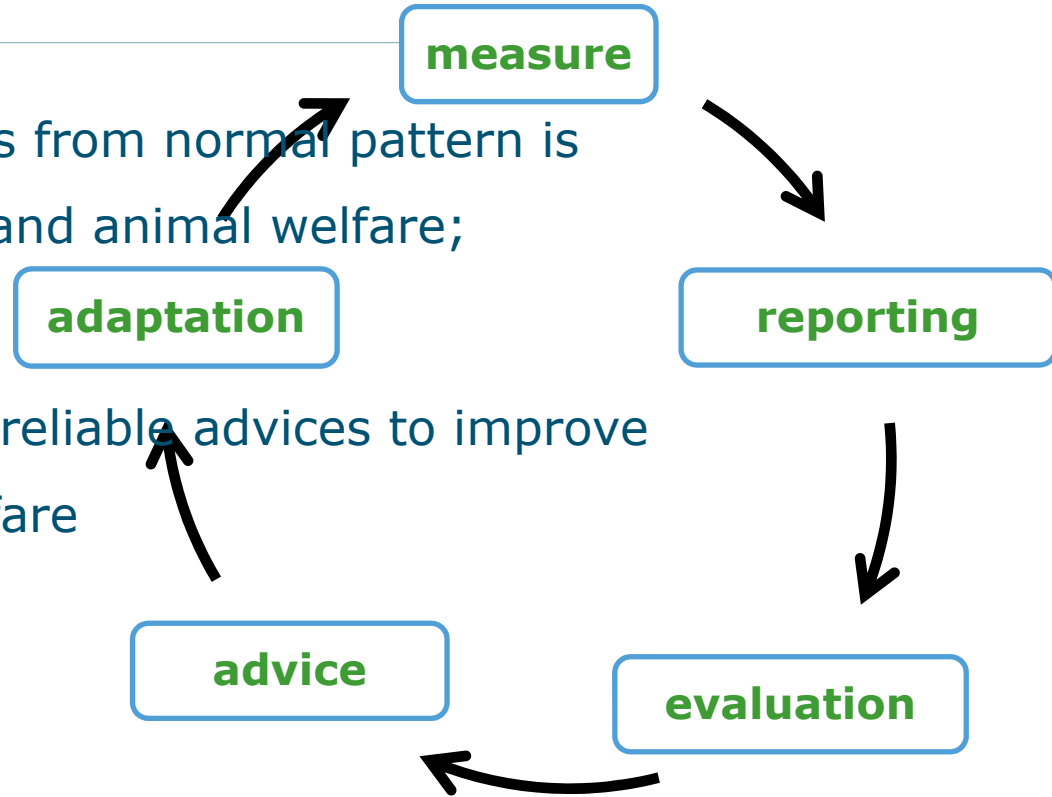
Je kan in hetzelfde scherm verder swipen voor het logboek. Als je het afdelingsnummer al hebt ingevuld krijg je ook alleen een lijst van dat afdelingsnummer. Heb je nog niets ingevuld dan krijg je het complete logboek op chronologische volgorde vanaf vandaag steeds verder terug.



DATUM	AFD.NR.	WAARNEMING	SCORE 1	SCORE 2
26-01-17	31	staartbijten	3	1
23-01-17	31	Sdhjkbgrhkbdrvjnhkcfl	1	
23-01-17	31	Fhgfbvhasdj, bjkrbhgc m	1	
22-01-17	31	Wdvhfukargywerilacnmk da		1
14-01-17	31	sdjlhfbvaweklfhawJSD BCVK.DNM		

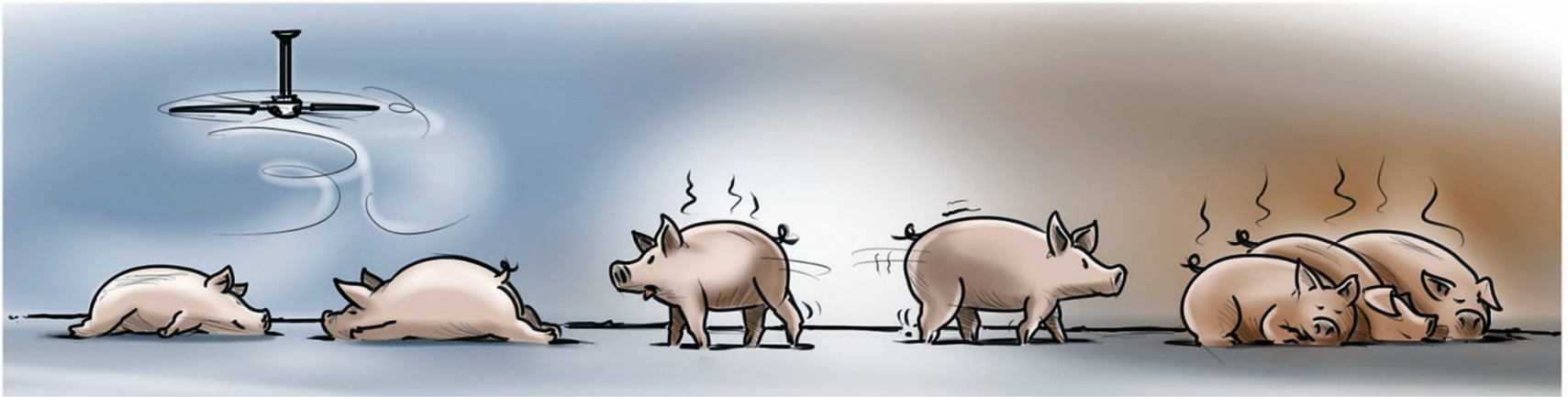
Conclusion

- Daily registration of deviations from normal pattern is useful for farm management and animal welfare;
- Observations can be used for reliable advices to improve management, health and welfare
- 2019: More animal categories



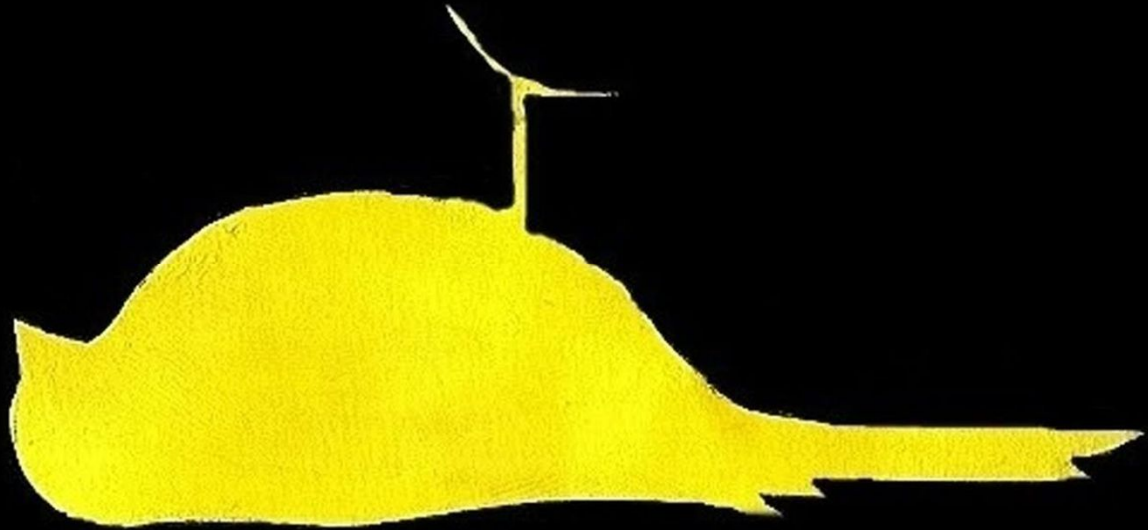
2 - Air Quality in Pig Houses

- Concern about effect of air quality on pig welfare
- Air scrubbers: just output based, indoor climate worse
- Open standard (Principle based regulation)
- Combi of Resource based and Animal based indicators



Canary In A Coal Mine

a digital canary as a sensor



Legal aspects CO₂ and NH₃

- For NL pigs no legal threshold values for CO₂ and NH₃
- For poultry values up to a max of 3000 ppm and 20 ppm NH₃ are legally permitted in the Netherlands and Germany
- Employees in NL should not be exposed for more than 8 h at 20 ppm NH₃ or 15 min at 50 ppm NH₃ or more
- In the German pig welfare law the upper limit for NH₃ is 20 ppm
- OIE recommendation < 25 ppm NH₃

- Pigs prefer 10 ppm NH₃ or lower (Jones et al, 1994)

	Ammonia concentration (p.p.m.)			
	0	10	20	40
Time spent (%)	53.4	26.9	7.1	5.1
Visit number	46.2	37.1	21.7	17.5
Visit duration	101.4	72.0	39.6	32.1

- Up to 50 ppm NH₃ no health problems (Review Wathes, 2002)
- More aggression 20 vs 5 ppm NH₃ (Parker, 2010)

Data collection

- Data collected in 96 farm visits (trained inspectors)
- 64 farms rearing piglets and 32 farms finishing pigs
 - 6 pens per farm for detailed observations
 - Selection of “worst pens”
- Mainly animal directed observations (39 parameters)
 - Temperatures, CO₂, NH₃
 - Fouling, skin-ear-tail-eye scores
 - Behaviour: activity and lying posture
 - Shivering, coughing/sneezing, pumping
 - Mortality and slaughterhouse data (1year)



Data analysis

- Selection of most important features
 - Signal (alarm) indicators
- Simple correlations
- Principle Components Analysis
- Thresholds (limits) partly based on WQ protocol
- N of exceedances of predefined thresholds
- Rank correlation of sums of exceedances per farm

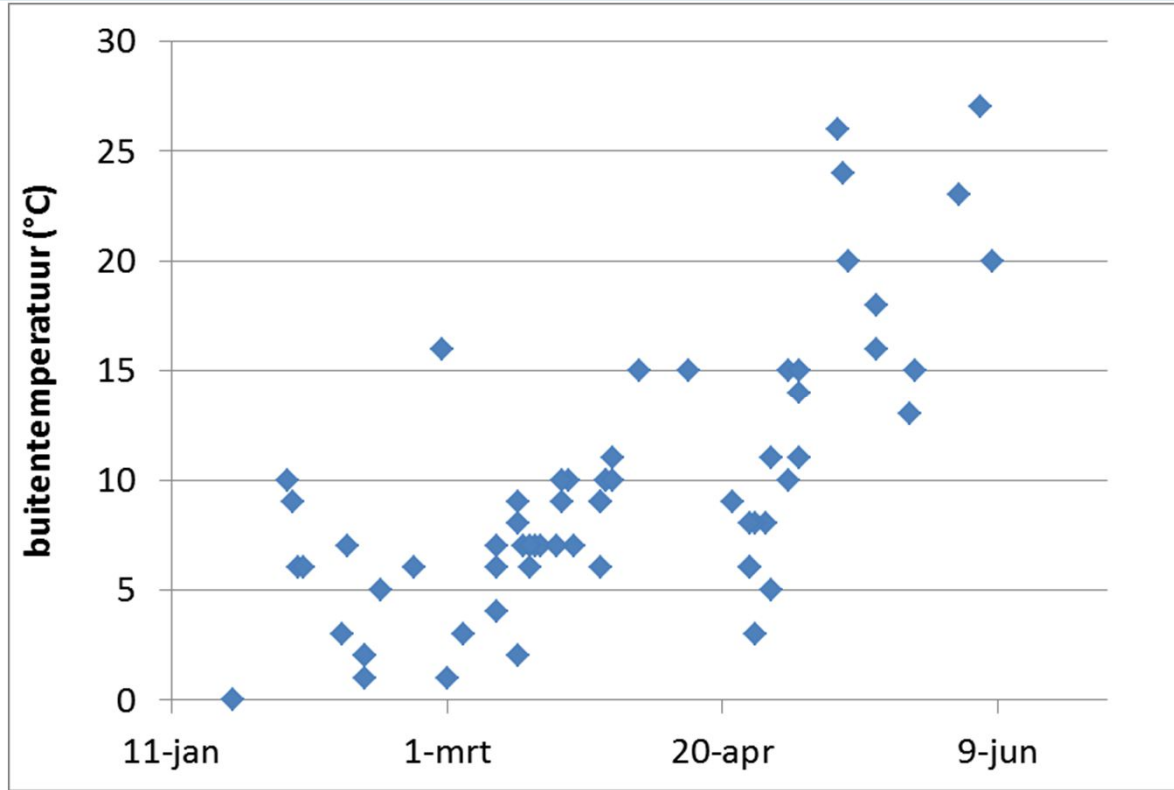


Measured features + limits

	Limit Values	Piglets (7-25 kg)	Growing finishing pigs (25-120 kg)	Source
0	Outdoor temperature (°C)	-	-	-
1	Room temperature (°C)	20-31°C (LCT + UCT* at 20 kg)	13-23°C (LCT + UCT* >60 kg)	Klimaatplatform, 2014
2	CO ₂ pig level (ppm)	3000	3000	Wathes, 2003
3	NH ₃ pig level (ppm)	20	20	Wathes, 2003
4	Pig fouling (0-2)	1	1	WQ, 2009
5	Pen fouling (0-2)	1	1	WQ, 2009
6	Eye score (0-4)	1	1	Telkänranta, 2016
7	Tail score (0-2)	1	1	WQ, 2009
8	Ear score (0-2)	1	1	WQ, 2009
9	Panting (n)	-	-	WQ, 2009
10	Pumping (n)	-	-	WQ, 2009
11	Coughing-sneezing (n)	-	-	WQ, 2009
12	Huddling (0-2)	1	1	WQ, 2009
13	Shivering (0-2)	1	1	WQ, 2009
14	Lying isolated (0-2)	1	1	-
15	Posture (0-2)	1	1	-
16	Standing pigs (n)	-	-	-
17	Mortality incl euthanasia (%)	>5%	>6%	-
18	AB (doses/pig/year)	>22	>10	SDA, 2016
19	Pleurisy (%)	n.a.	>25%	-
20	Pneumonia (%)	n.a.	>10%	-
21	Space allowance (m ² /pig)	0.2	0.8	-
22	Room volume (m ³ /pig)	0.8	2.5	-

*LCT + UCT = lower and upper critical temperature; - = no limit value available

Date of piglet farm visits vs outdoor temperature

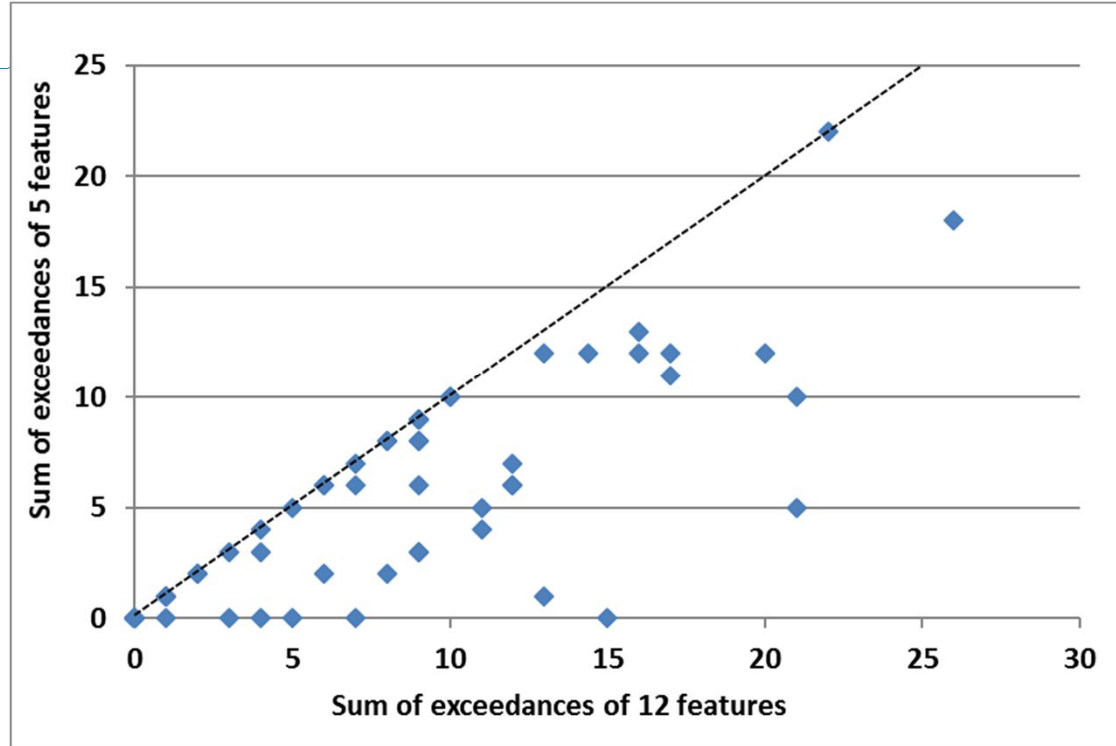


Basic and limited dataset, limit values and exceedances piglet farms

Features	Basic dataset (n=12)	Limited dataset (n=5)	Limit value	Exceedances
CO ₂ level	X	X	3000 ppm	38.8%
NH ₃ level	X	X	20 ppm	23.6%
Eye score	X	X	1	7.5%
Tail score	X	X	1	3.4%
Ear score	X	X	1	13.5%
Pig fouling	X		1	6.6%
Pen fouling	X		1	10.1%
Panting	X		0.2	2.3%
Pumping	X		0.2	1.4%
Coughing/sneezing	X		1	6.9%
Huddling	X		1	17.8%
Shivering	X		1	2.0%

Relation exceedances of 12 and of 5 features

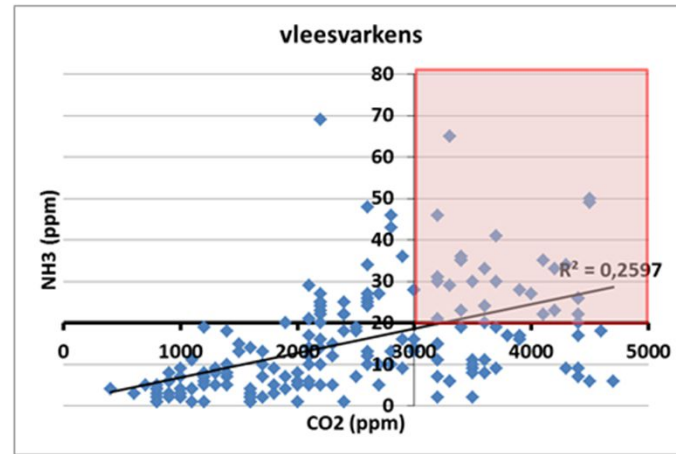
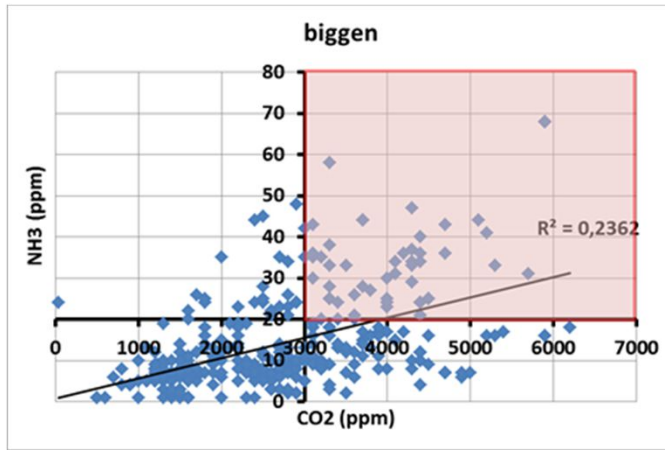
($r_s=0.81$; $t\text{-prob}=0.000$) in piglets;
dashed line indicates identical sums



Basic and limited dataset, limit values and exceedances grow-fin farms

Features	Basic dataset (n=12)	Limited dataset (n=5)	Limit value	Exceedances
CO ₂ level	X	X	3000 ppm	33.3%
NH ₃ level	X	X	20 ppm	31.7%
Eye score	X	X	1	21.3%
Tail score	X	X	1	6.6%
Ear score	X		1	10.4%
Pig fouling	X	X	1	31.1%
Pen fouling	X		1	29.5%
Panting	X		0.2	5.5%
Pumping	X		0.2	0.5%
Coughing/sneezing	X		1	1.1%
Huddling	X		1	16.4%
Shivering	X		1	1.1%

If exceedances (pig) are not linked to high CO_2 + NH_3 levels than it's unlikely that climate is to blame:



But what if CO_2 + NH_3 levels are high and animal based measures don't exceed limits?

The human factor

- Importance of training for inspectors:
 - Animal based observations require more training
 - Simple standardized protocol, preferably international

- Awareness among farmers
 - Collecting data and “experimenting” with settings climate computer
 - Losing money (performance)

Media attention

Varkenshouderij

Nieuws | 4 jan 2018 | 11 reacties

NVWA gaat stalklimaat varkens controleren

De Nederlandse Voedsel- en Warenautoriteit (NVWA) begint vanaf volgende week met inspecties van het klimaat in varkensstallen.

De controles zijn gericht op gespeende biggen en vleesvarkens. De inspecteurs oordelen of het stalklimaat niet schadelijk is voor de dieren. Eerder hebben ze ook niet-functionerende apparatuur en/of op extreme gevolgen van een slecht stalklimaat, zoals vocht en schimmel op muren.

Vanaf volgende week beoordelen de NVWA-inspecteurs het stalklimaat aan de hand van vijf indicatoren die Wageningen Livestock Research vorig jaar heeft be-

Varkens.nl

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Vijf indicatoren voor kwaliteit stalklimaat



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Inspectie vindt geen problemen met stalklimaat

Inspectie vindt geen problemen met stalklimaat

Type

NIEUWS

Datum

2018-01-04

Reacties

Onderwijs & Opleidingen

Onderzoek & Resultaten

Waar Sam



Stel uw vraag o experts:

Stalklimaat op bijna 60 bedrijven heeft de inspectie daartoe de vijf signaalindicatoren in 2016. Het lijkt er op dat het

PIGBUSINESS

10,3°



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Varkens in Nood reageert op commotie over persbericht stalklimaat

27 november 2018 | Diergezondheid | 1.927 keer gelezen | 2 reacties

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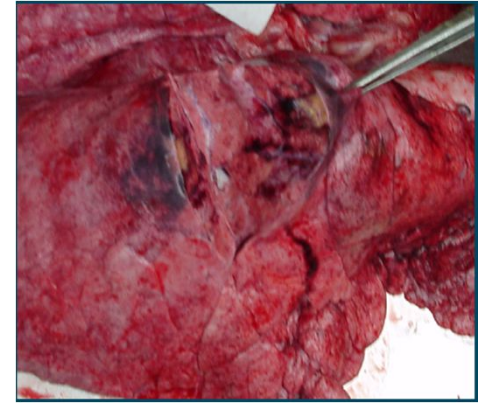
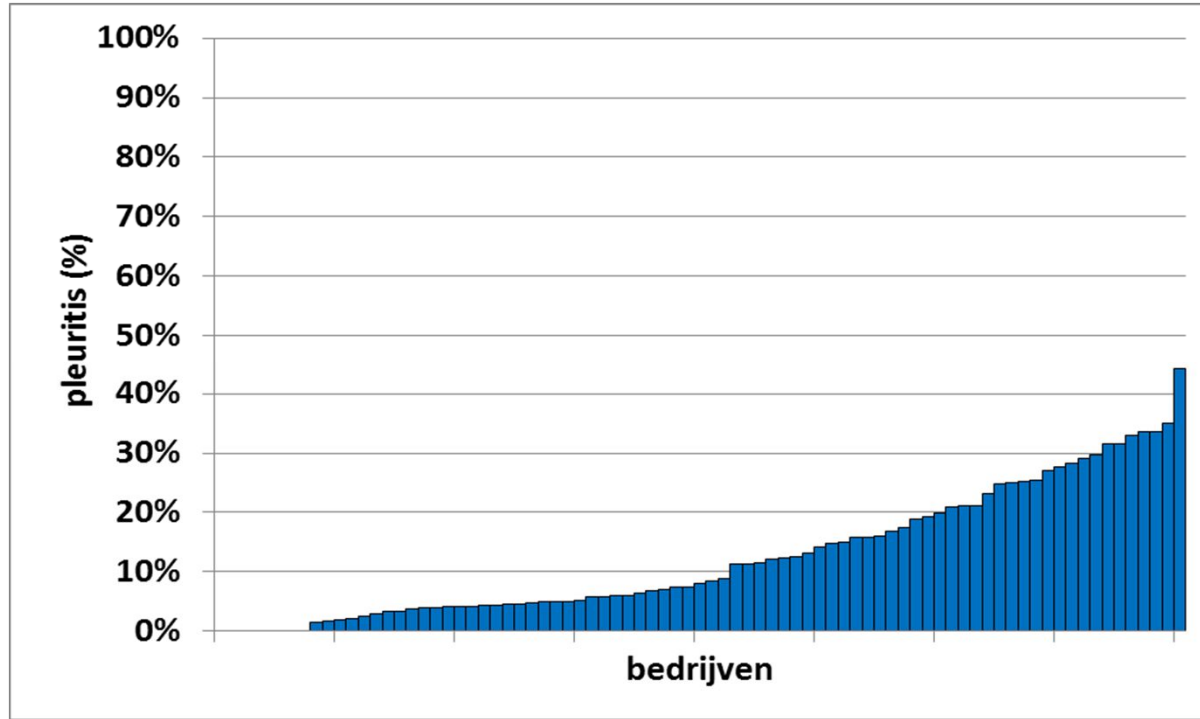
Stalklimaat ongezond voor varkens

Stallucht bevat te veel NH3, CO2 en fijnstof. Dat is schadelijk voor de gezondheid. Om varkens met staarten zonder antibiotica te produceren, moet het roer om.

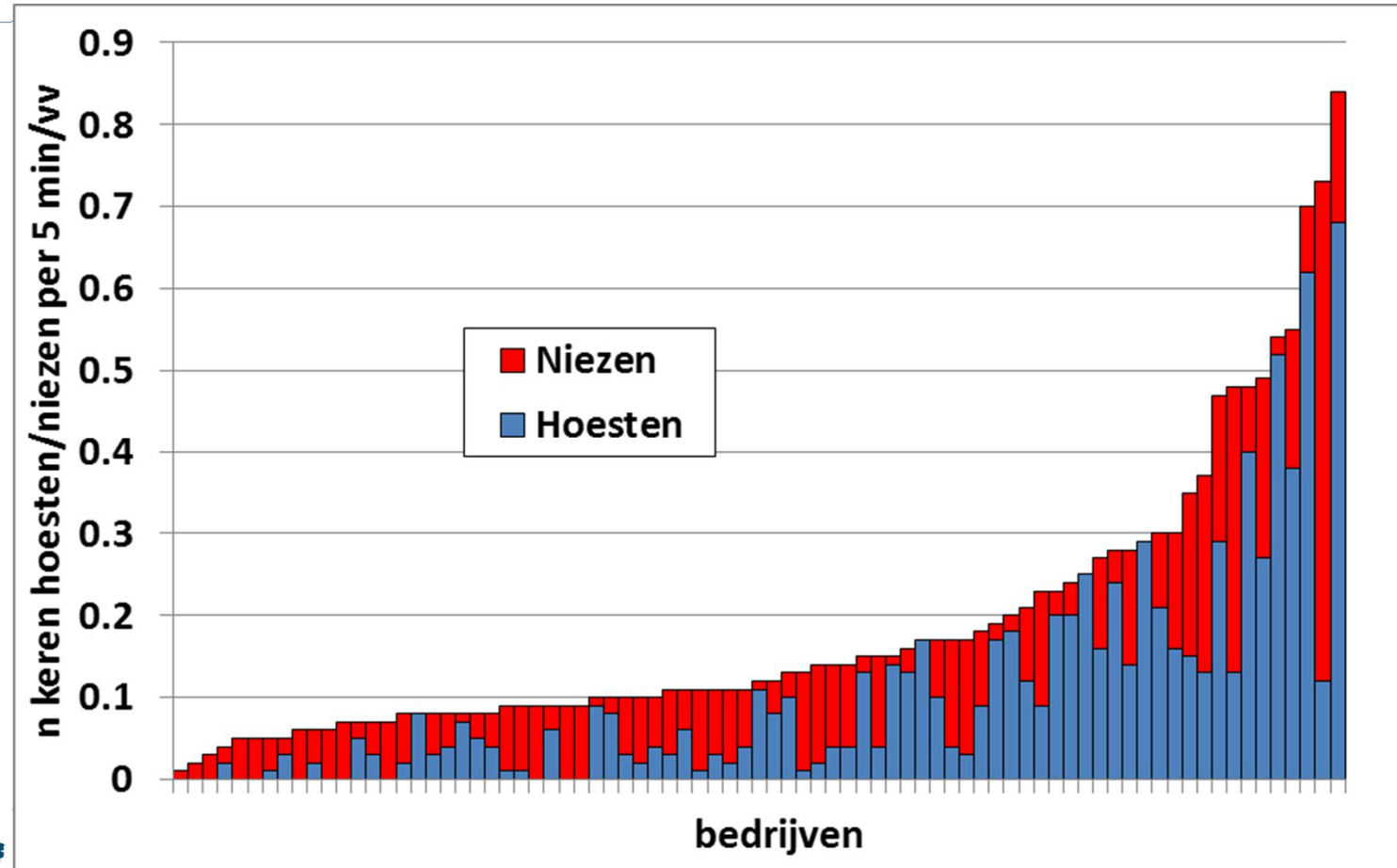
Slaughter remarks

- Most farmers can access their data, but with limited progress
- Not very well standardized, digital techniques are promising
- Benchmark within chains/integrations available
- Often only analysis on farm level
- Analysis on a national or EU level useful (Big Data benefits)
- Link to specific conditions of the batch (like in veal)
- Learn from other species

Variation in pleuritis % on 80 Dutch farms



Variation coughing and sneezing (80 farms)



Classical NH₃ concentration reduction methods

Started with emission reduction to outside world, now for indoor climate:

- Reduction of emitting surface
- Separation of manure and urine
- Cooling: Air and slurry pit
- Lower pH of slurry
- Nutrition, fermentable fibres
- Frequent slurry removal, no indoor storage
- In winter increase both ventilation and heating

To summarize assessment of air quality:

- **NH₃ and CO₂** relate to some animal features and are very useful as signal indicators
- For piglets as well as growing-finishing pigs **tail- and eye scores** are suitable signal indicators.
- For piglets also **ear score**, for grow-fin pigs **pig fouling**
- Not fulfilling the open standard for climate can be easily detected with a limited set of 5 features.
- In our measuring period we didn't observe heat stress; no measures >30 °C (pilot!)
- The conclusions are based on instantaneous observations, so no relation with annual data like slaughter data, antibiotics and mortality

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Open Access Article

Operationalizing Principle-Based Standards for Animal Welfare—Indicators for Climate Problems in Pig Houses

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 [Full-Text](#) |  PDF [11271 KB, uploaded 3 May 2018] |  [Figures](#)

Simple Summary

Dutch farms that probably do not comply with the legal principle-based standard for climate in pig houses can be identified based on a limited set of measurements. The results may encourage pig farmers to improve climatic conditions, but can also justify subsequent investigation to substantiate noncompliance with the legal animal welfare standards. This was concluded after farm data collection by inspectors on 96 farms with weaners or growing–finishing pigs. Analysis of the data revealed that CO₂ and NH₃ concentrations; pig fouling; and ear, tail, and eye scores can be used as indicators of suboptimal climatic conditions.

Concluding remarks for animal based welfare assessment

- Behaviour is time consuming and difficult to quantify
- Indicators with some “history”: lesions, lameness, hygiene, eyes
 - these are “indirect” behavioural observations
- Slaughter remarks promising
- Training and periodically “calibrating” observers is crucial
- More data to create “benchmark” would be helpful
- Future: Digital scoring techniques on farm and at the abattoir

Best indicator to assess welfare: **Pig tail** as weather station



Thanks for your attention