Symposium IC-3R
Introduction to difficulty to
do pain scoring in poultry

september 2024 – versie 1

Regulatory framework for severe scoring of procedures

- Directive 2010/63/EU: "on the protection of animals used for scientific purposes"

  - Member States shall ensure that all procedures are classified as **'non-recovery', 'mild', 'moderate', or 'severe'**.

  - New scientific knowledge is available in respect of factors influencing animal welfare as well as the capacity of animals **to sense and express pain, suffering, distress and lasting harm**. It is therefore necessary to improve the welfare of animals used in scientific procedures by raising the minimum standards for their protection in line with the **latest scientific developments**.

    → This assessment shall evaluate the (real?) harm inflicted on animals
    → How do you address the real harm /severity?

▶ **Daily observations of…**

a few

vs.

field conditions

→ Feasibility of e.g. weighing, individual measurements, individual behaviour observations…
→ Extrapolation of signs in single birds to the group?

Daily observations

Complex

Individual

- Animal observations are challenging
- Welfare concerns increase
- Traditional parameters
- Scoring Systems
- Precision Livestock Farming
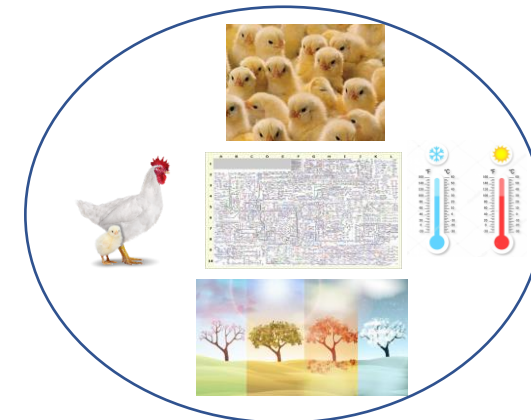 - Set of technology to automatically identify patterns
    - Sound analysis
    - Image Analysis
    - Body sensors

Time variations

Dynamic

Exadaktylos et al., 2011

Traditional parameters

Age (days)	Weight (g)	Daily Gain (g)	Average Daily Gain (g) *	Cum. Feed Conversion **	Daily Feed Intake (g)	Cum. Feed Intake (g)
0	42					
1	55	13				
2	71	16				
3	90	19				
4	112	22				
5	138	26				
6	168	30				
7	202	34	22.9	0.891		180
8	240	38	24.8	0.917	40	220
9	283	43	26.8	0.933	44	264
10	330	47	28.8	0.952	50	314
11	382	52	30.9	0.971	57	371
12	440	58	33.2	0.991	64	435
13	503	63	35.5	1.012	73	508
14	570	67	37.7	1.029	80	588
15	639	69	39.8	1.050	84	672
16	711	72	41.8	1.072	91	763
17	786	75	43.8	1.094	98	861
18	864	78	45.7	1.116	105	966
19	945	81	47.5	1.138	111	1077
20	1029	84	49.4	1.160	118	1195
21	1116	87	51.1	1.182	125	1320
22	1205	89	52.9	1.203	131	1451

C500 Broiler Performance Objectives (Metric) - As Hatched

Performance parameters
Body weight

Feed intake

Water intake

Feed conversion ratio

Physiological and Clinical Measurements
Health and immune system status

Changes in hormone levels (corticosterone)

Hock burn score

**Score 0:** **No lesion**/s or very small (<1 mm) and superficial.

Score 1: **Mild.** Area affected does not extend over hock, substantial discoloration, dark papillae, superficial lesion, no ulceration.

Score 2: **Severe.** Greater surface of hock usually affected. Deeper lesion/s with ulceration, sometimes haemorrhage, scabs of significant size, severely swollen area.
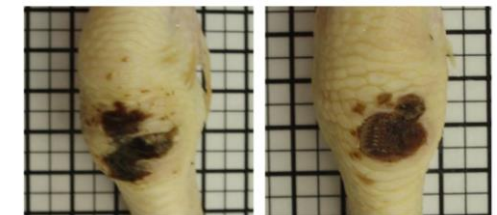
Footpad lesions score

Score: 0	Score: 1	Score: 2
(0 points each for score of 0)	**(1 point each for a score of 1)**	**(2 points each for a score of 2)**
• No lesions or very small • No discoloration or slight on a limited area • No hyperkeratosis or mild • Old or no scars	• Mild and/or superficial lesions • Substantial discoloration on the footpad • Dark papillae, no ulceration	• Severe and significant lesions • Ulceration • Dark papillae and ulceration • Abscesses and/or swollen feet (bumble foot)

Score 0   Score 1   Score 2a   Score 2b
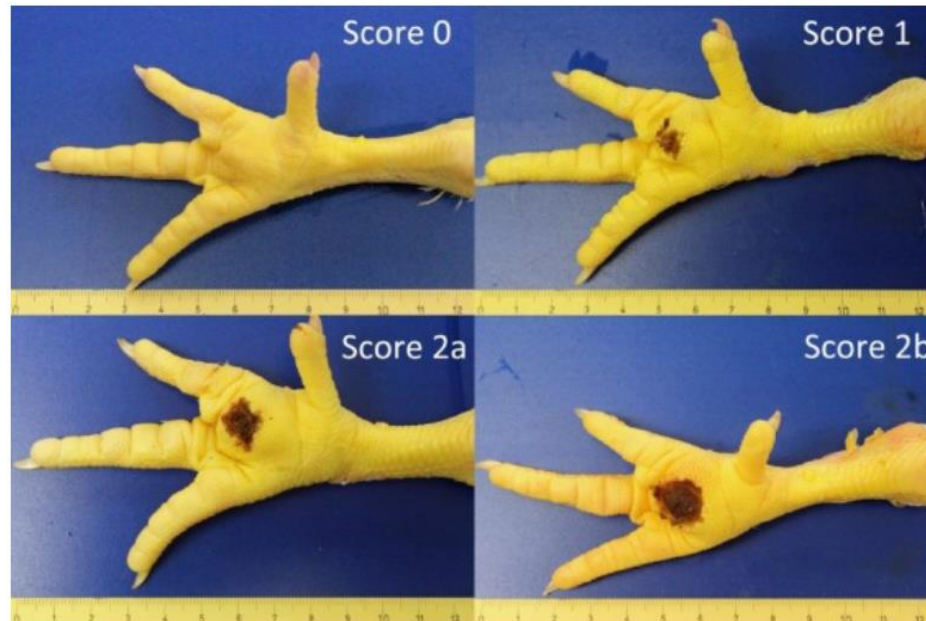
Gait score

Gait score	Description
0	Bird moves fluidly.
1	Bird has an unsteady, wobbling walk. Problem leg cannot be detected.
2	Bird walks for more than 10s. Problem leg can be detected.
3	Bird walks away spontaneously but squats within 10s.
4	Bird only walks away when approached or nudged.
5	Bird cannot walk.

Gait score 2

Gait score 3

Gait score 4

Gait score 5

poul pharm

8

Litter scoring

Plumage clealiness
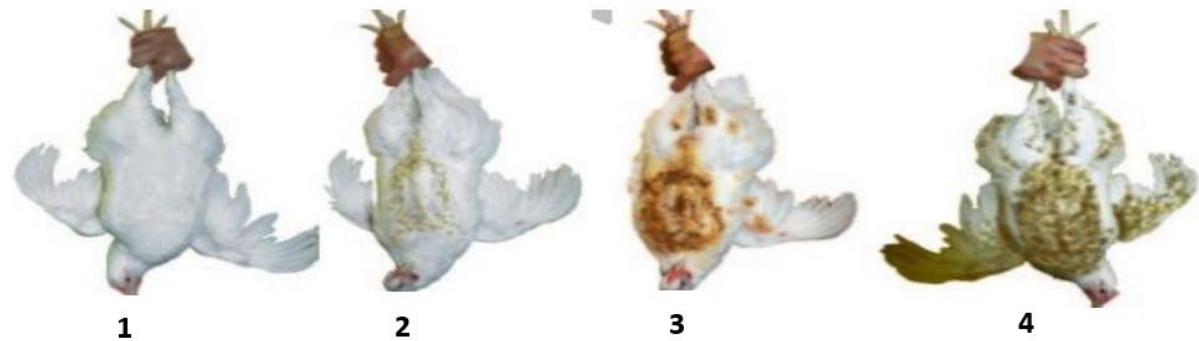
Ordinal rating scales and tagged visual analog scales

Corticosterone

bodyweight
day 42; L: p<0.001

BW decreased with
higer levels of CORT
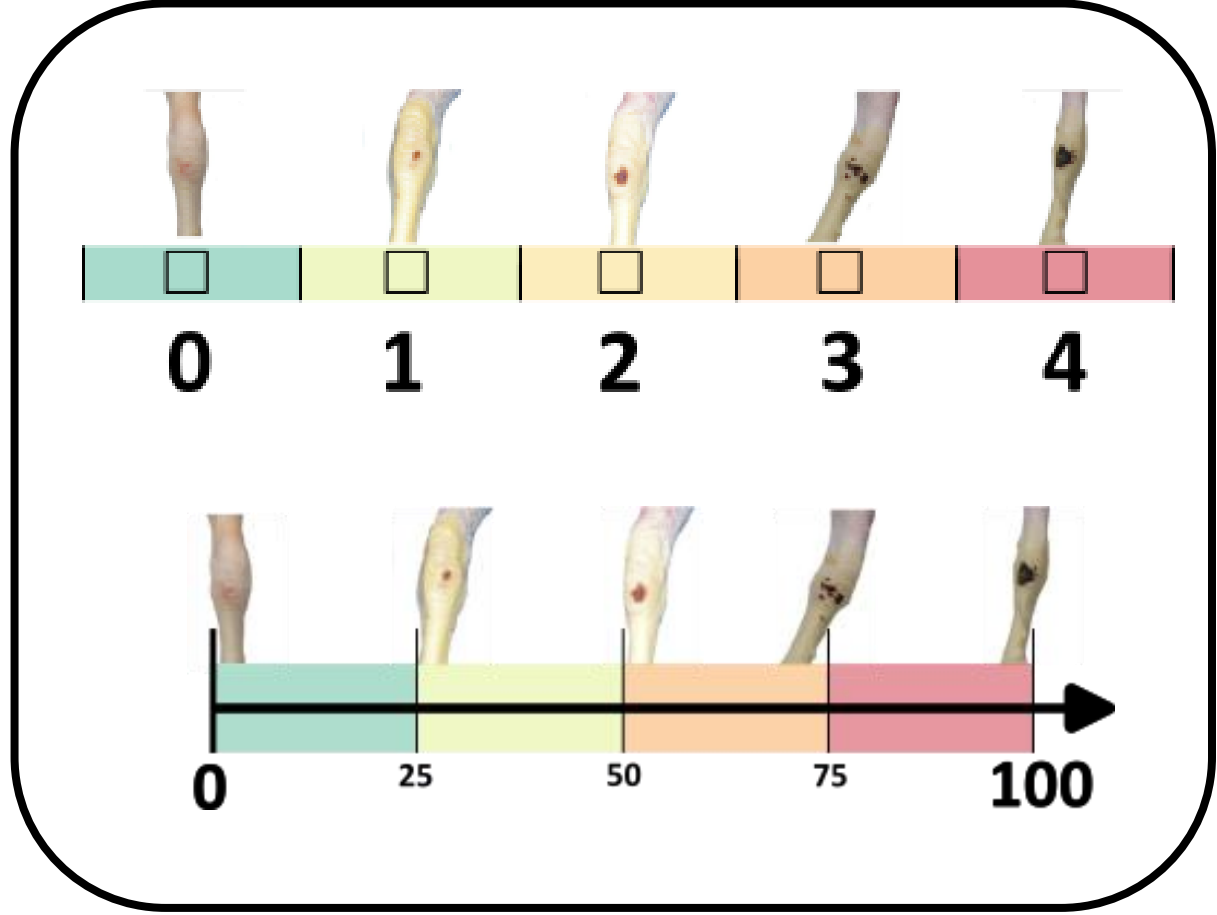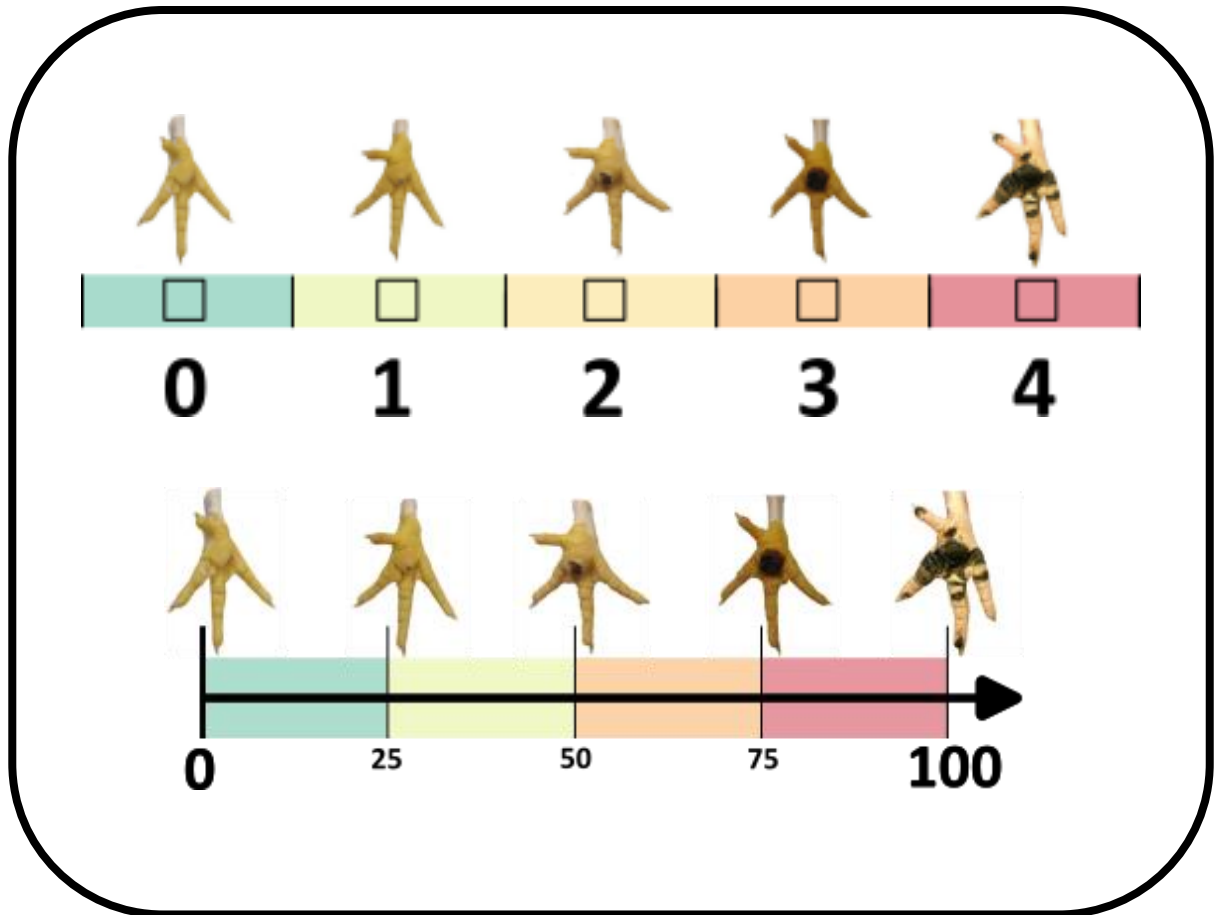
- No correlation between plasma and inscreasing levels of CORT.

dorsal feather
day 14; Q: p<0.001 R²=0.40

day 28; Q: p<0.001 R²=0.39

day 42; L: p<0.001 R²=0.41

wing feather
day 42; L: p<0.001 R²=0.36

tail feather
day 42; Q: p<0.001 R²=0.72
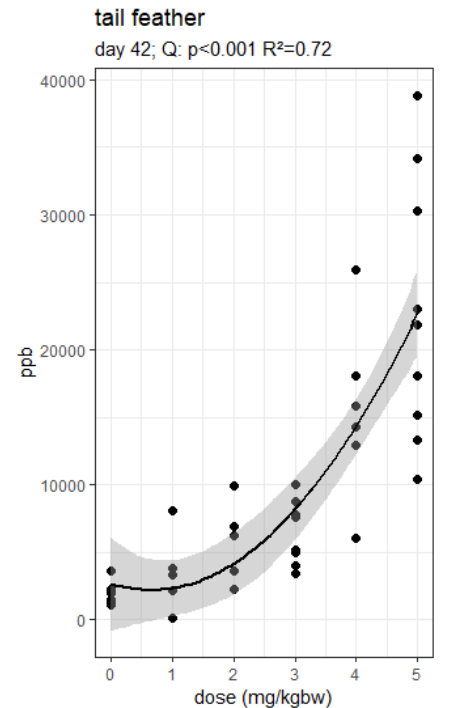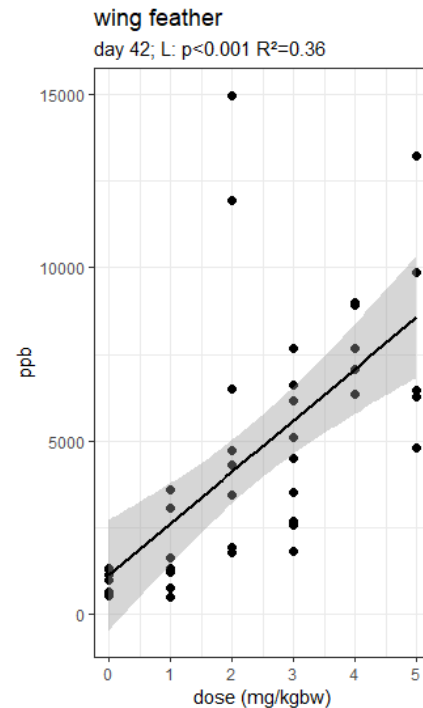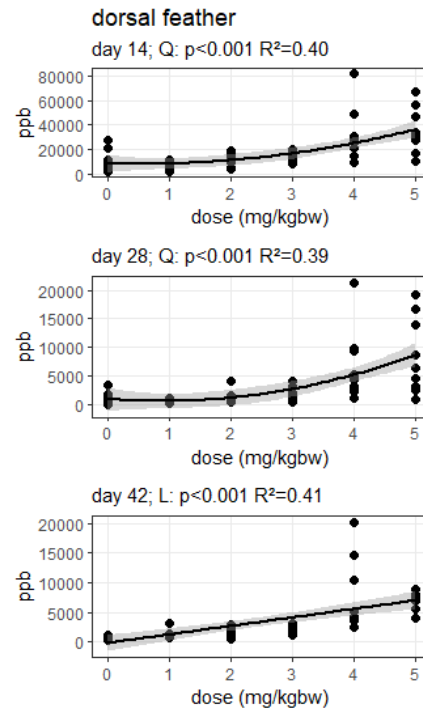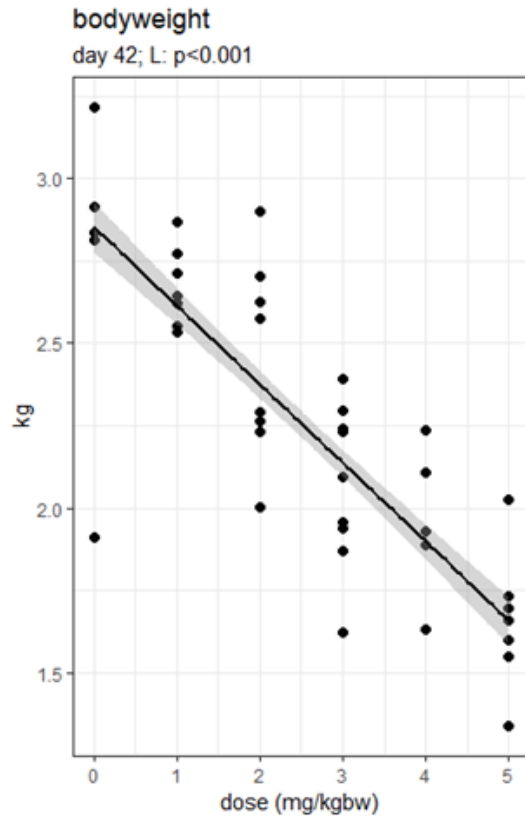
Higher CORT levels with
increasing CORT dosage

11

Sound Analysis

Thermal comfort
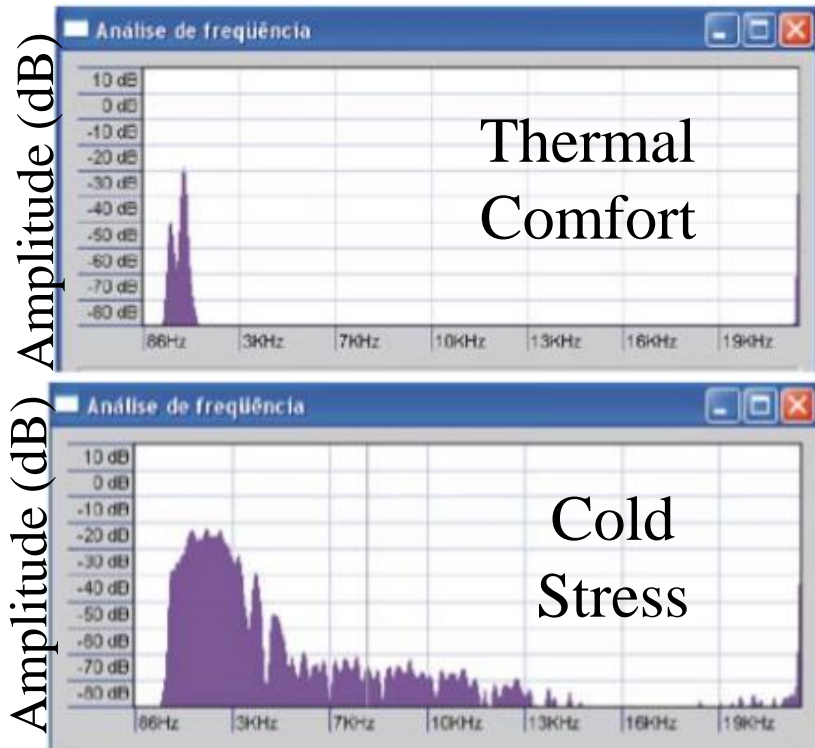
Moura et al., 2008

Development of sound-based poultry health monitoring tool for automated sneeze detection

Lenn Carpentier[a], Erik Vranken[a,b], Daniel Berckmans[a], Jan Paeshuyse[a], Tomas Norton[a,*]

[a] Division Animal and Human Health Engineering, Department of Biosystems, KU Leuven, Kasteelpark Arenberg 30, 3001 Heverlee, Belgium
[b] Fancom Research, Fancom BV, Wilhelminastraat 17, 5981 XW Panningen, the Netherlands

Using sound technology to automatically detect the short-term feeding behaviours of broiler chickens

A. Aydin[a,*], D. Berckmans[b]

[a] Department of Agricultural Machineries and Technologies Engineering, Faculty of Agriculture, Canakkale Onsekiz Mart University, 17020 Canakkale, Turkey
[b] Division Measure, Model & Manage Bioresponses, KU Leuven, Kasteelpark Arenberg 30, B-3001 Heverlee, Belgium

IDENTIFYING RALE SOUNDS IN CHICKENS USING AUDIO SIGNALS FOR EARLY DISEASE DETECTION IN POULTRY

Muhammad Rizwan[*]   Brandon T. Carroll[*]   David V. Anderson[*]   Wayne Daley[†]
Simeon Harbert[†]   Douglas F. Britton[†]   Mark W. Jackwood[‡]

Article
Energy Assessment from Broiler Chicks' Vocalization Might Help Improve Welfare and Production

Erica Pereira[1], Irenilza de Alencar Nääs[2,*], André Henrique Ivale[2], Rodrigo Garófallo Garcia[3], Nilsa Duarte da Silva Lima[4] and Danilo Florentino Pereira[5]

Vocalization Patterns in Laying Hens - An Analysis of Stress-Induced Audio Responses

Suresh Neethirajan
Mooanalytica, Department of Animal Science & Aquaculture, Faculty of Agriculture & Computer Science, Dalhousie University, Halifax, Canada B3H 4R2
Email: sneethir@gmail.com Web: https://mooanalytica.com/

Systematic Review

Respiratory Diseases	Hatchery	Eating	Negative welfare	Positive welfare
Purr	Int. pipping	Crow	Distress call	Pleasure note
Rale sound	Ext. pipping	Food call	Alarm call	Short peep
Cough		Pecking	Squark call	Warbles
Sneeze			Gakel call	
Snore				
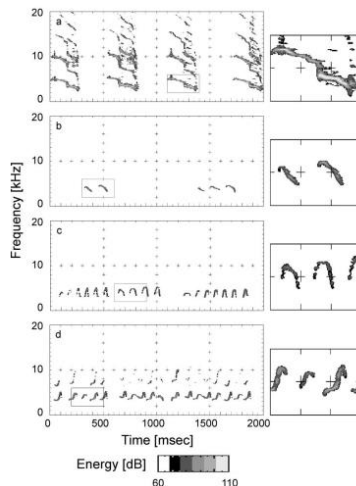
	Description
Distress call	**Descending** frequency and repetitive, **high-energy** vocalization calls.
Short peep	**Descending** frequency, **low energy**, and short range of duration.
Warbles	**Repetitive** bow-type elements, and **low energy**. Cry of somnolence.
Pleasure note	**Ascending** frequency, **low energy** and short range of duration.

poul pharm

Validation – broiler vocalization detector

Linear-frequency power spectrogram

Time (s)
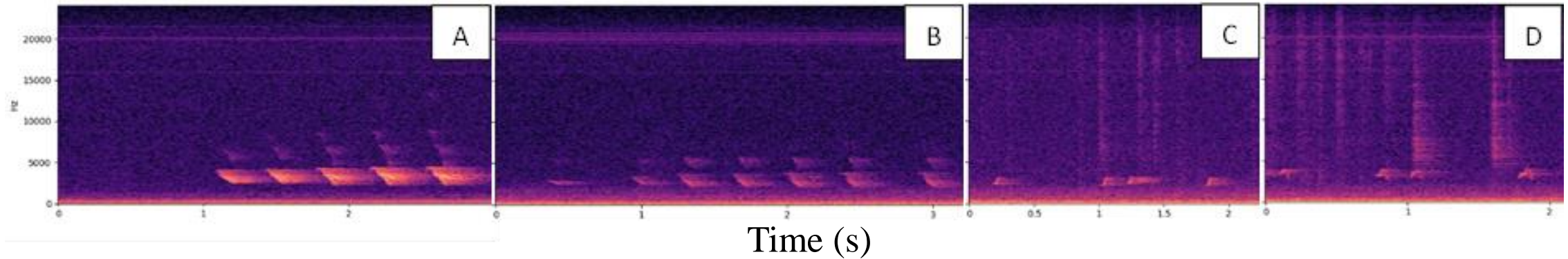
A: Distress calls   B: Short peeps   C: Pleasure notes   D: Warbles

Validation – broiler vocalization detector

Linear-frequency power spectrogram

Time (s)
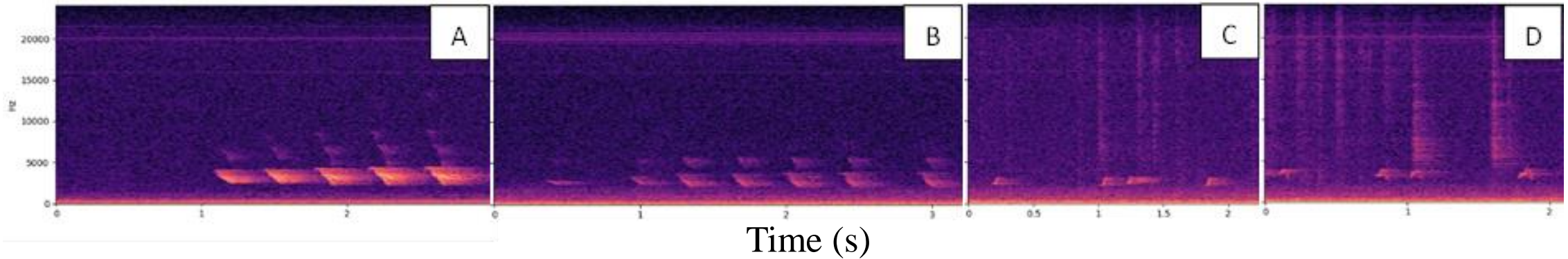
A: Distress calls   B: Short peeps   C: Pleasure notes   D: Warbles
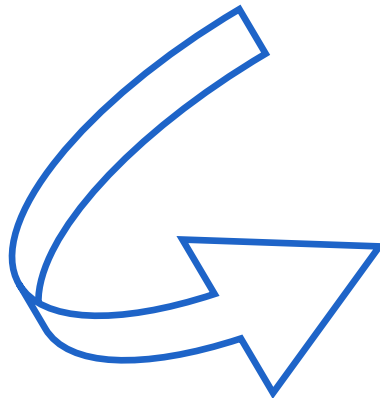
Broiler sound category	Accuracy
Distress calls	97.7%
Pleasure notes	96.4%
Short peeps	92.3%
Warbles	95.0%
Other sounds	94.5%
Average	**95.2%**

Pattern of vocalization

- 4 Pens / Round
- From 1 to 42 days
- 2 Microphones / Pen

Legend:
- 🔴 Distress calls
- 🟢 Short peeps
- 🔵 Pleasure notes
- 🟡 Warbles
- 🟠 Others

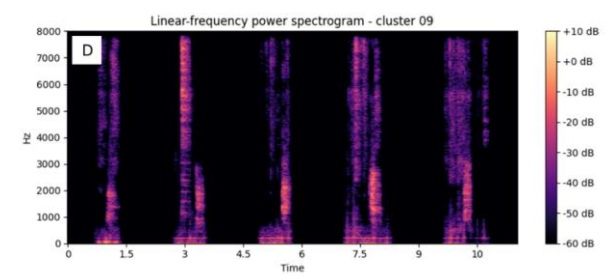Round 1   Round 2   Round 3   Round 4
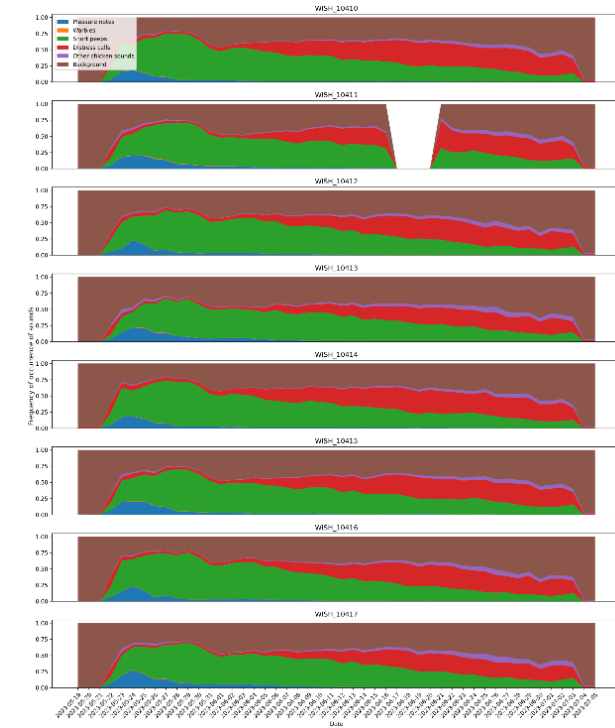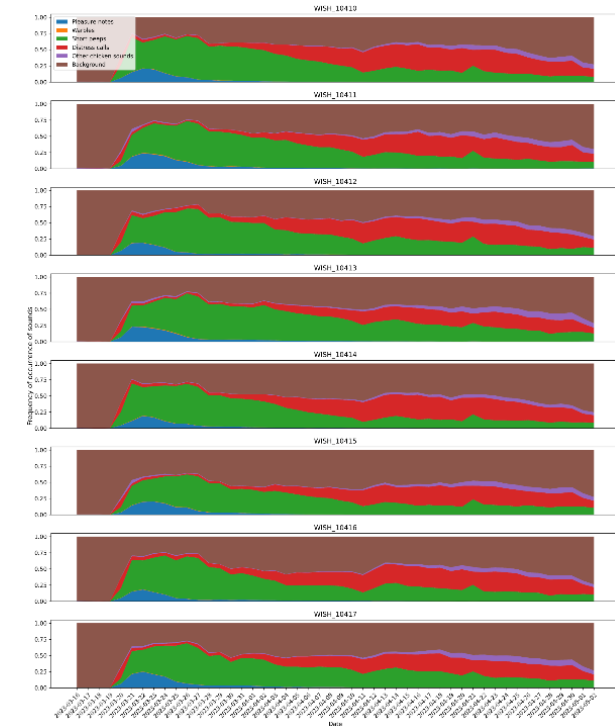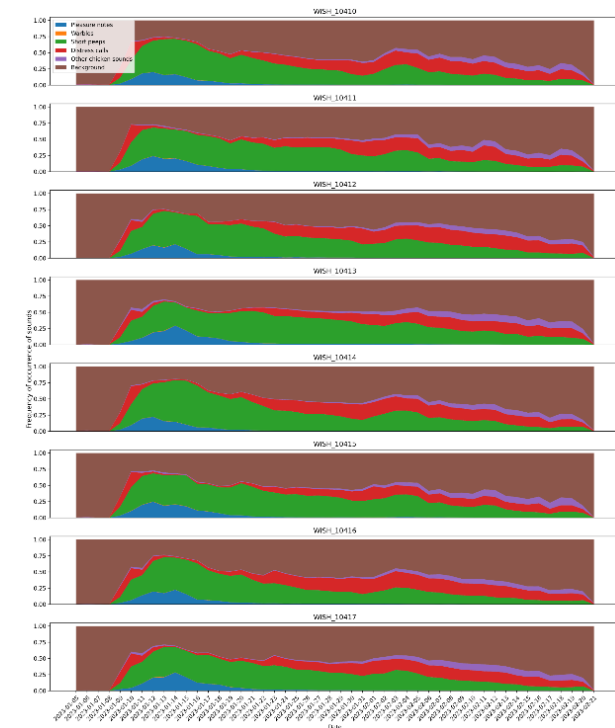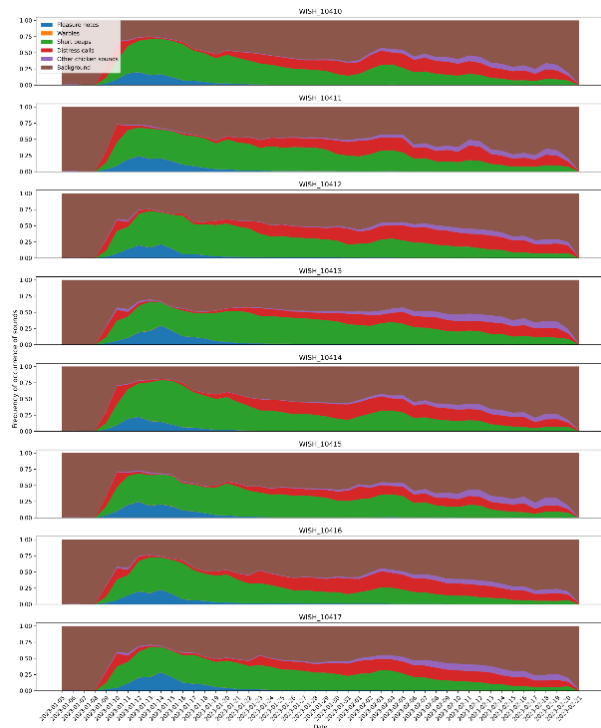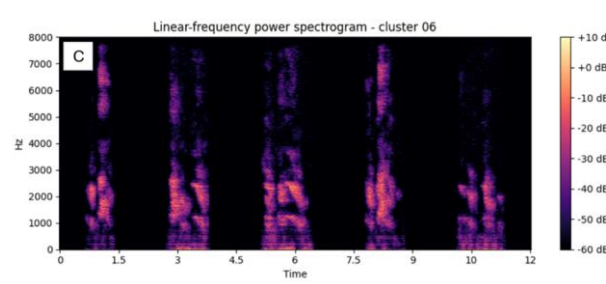
CLUSTERS
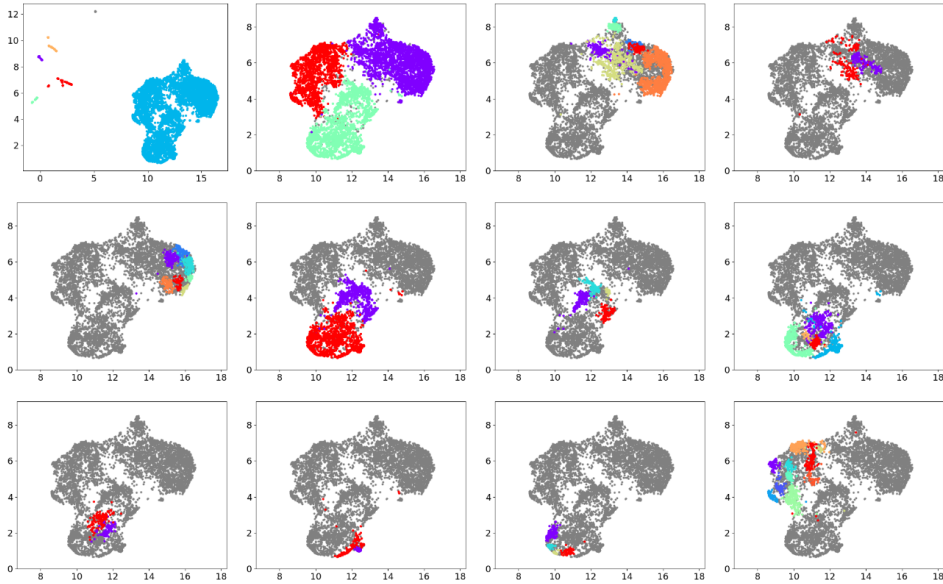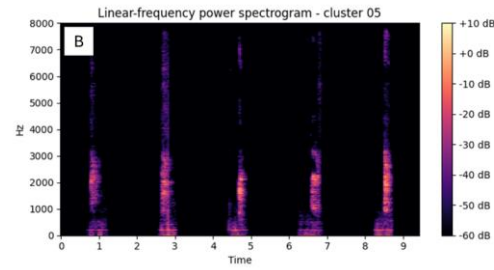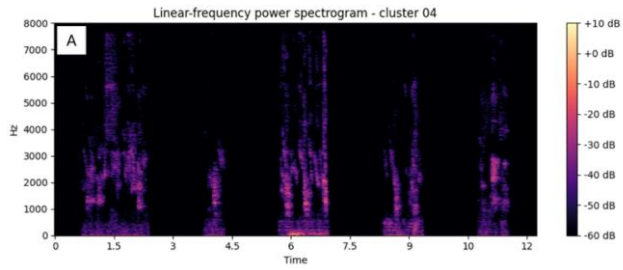

Total : 38 clusters

Auditive + visual
Euclidean distance
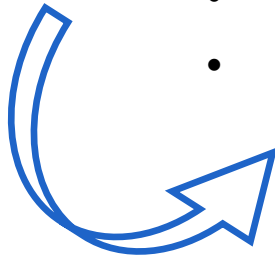
- 18 not chicken related
- 4 pleasure notes
- 2 warble notes
- 4 consolidated
- 2 consolidated

Clusters	Distance	Accepted
16 and 17	2.592	Yes
15 and 16	3.046	Yes
15 and 17	3.189	Yes
14 and 15	3.488	Yes
11 and 12	3.722	Yes
11 and 17	3.848	No
5 and 12	3.902	No
13 and 14	3.940	No
5 and 11	3.959	No
4 and 9	3.973	No
12 and 13	4.020	No
14 and 17	4.029	No
14 and 16	4.058	No
11 and 13	4.061	No
11 and 16	4.064	No

CLUSTERS

Linear-frequency power spectrogram - cluster 04

Linear-frequency power spectrogram - cluster 05

Linear-frequency power spectrogram - cluster 06

Linear-frequency power spectrogram - cluster 09

Linear-frequency power spectrogram - cluster 10

Linear-frequency power spectrogram - cluster 11 12

Linear-frequency power spectrogram - cluster 13

Linear-frequency power spectrogram - cluster 14 15 16 17

Linear-frequency power spectrogram - cluster 39

Linear-frequency power spectrogram - cluster 41

Image Analysis - Validation

Early problems Detection

Disease detection
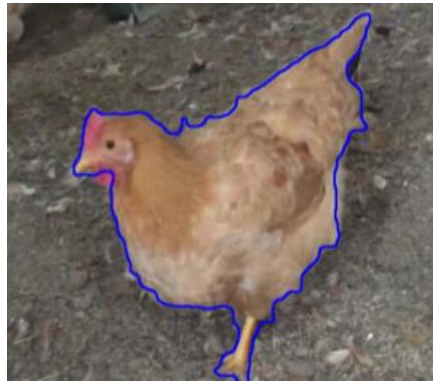
3D Image

Zhuang et al, 2018

Mortensen et al, 2016
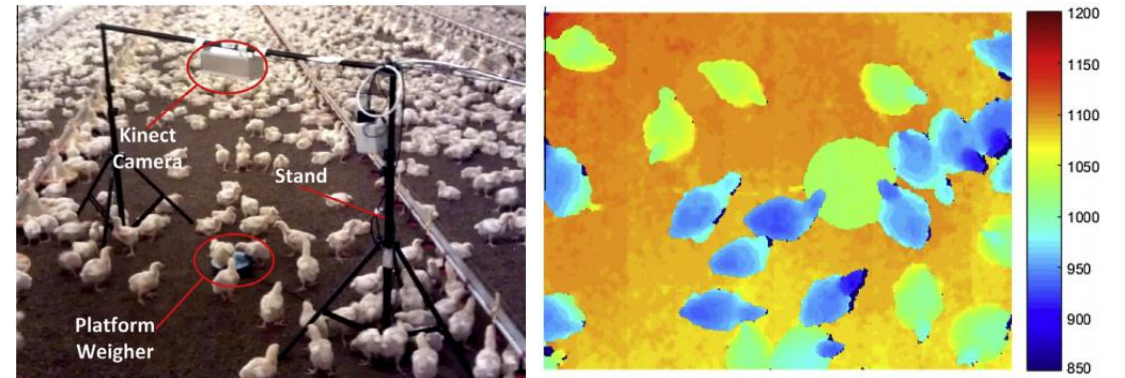
▶ Body sensors

Star-Oddi logger
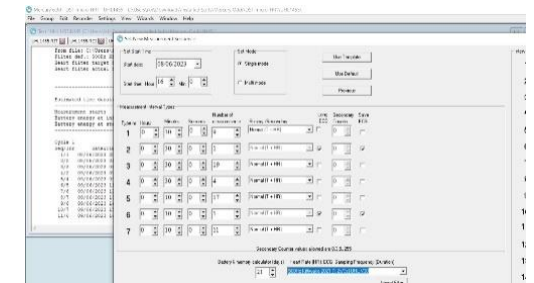
Thermal microchip
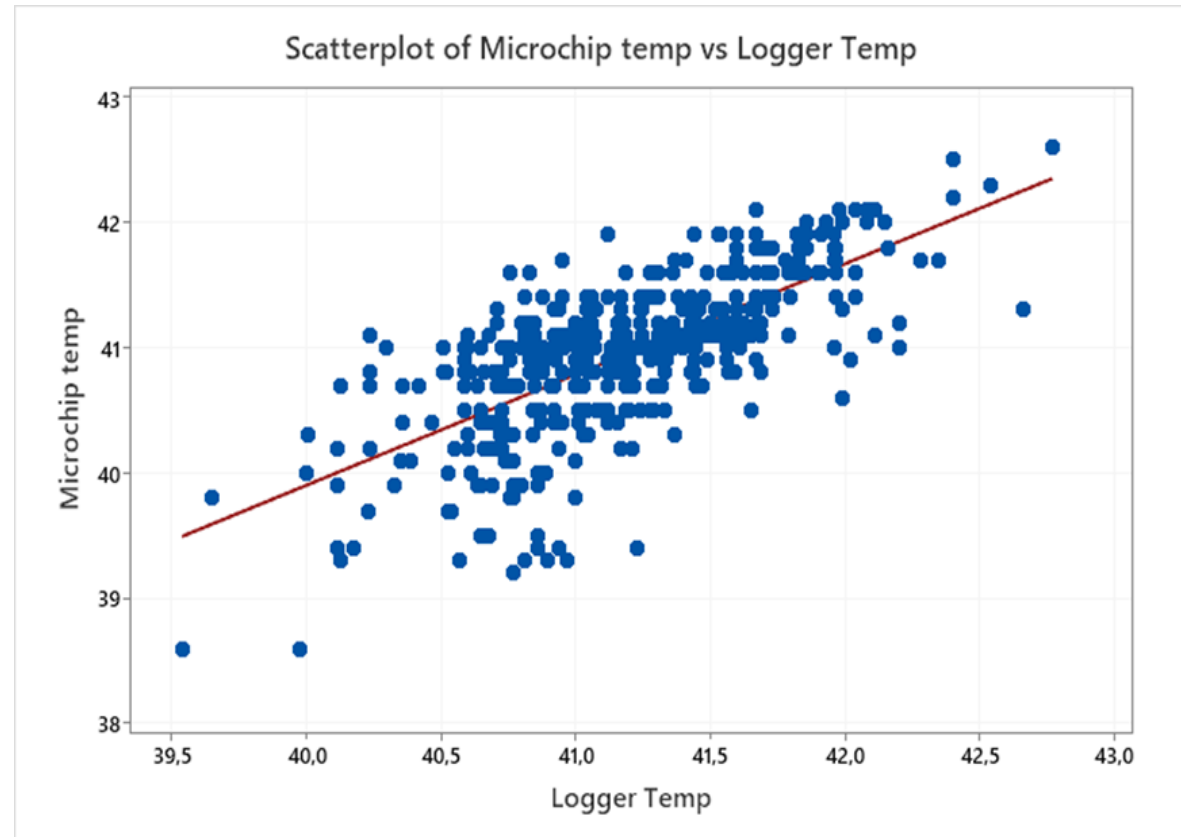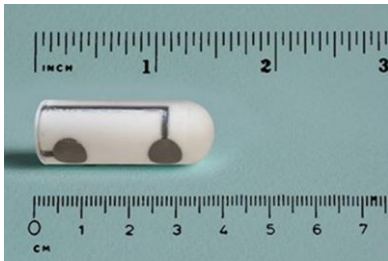
Validation of body temperature

- Body temperature: Thermal microchips and Star-Oddi loggers

  - **Positive correlation** (r=0.699)

Ultra-wide band and accelerometer

▶ Take home message

Traditional parameters and scoring systems are still of great value
- Subjective
- Labor working
- Corticosterone - feathers and droppings

Technology
- Sound and image analysis can offer precise and continuously monitoring
- Body sensors can provide important individual data from broilers
- Decrease N° of animals used – more date gathered
- Big groups
- Available data
- Cost?

poul
pharm

Thank you