



Easing the stress of day-old chicks in the hatchery

Can Mother Nature help?



Agenda



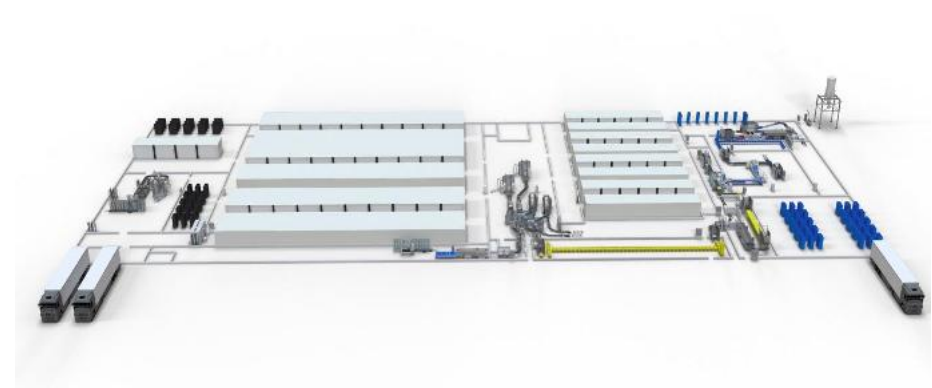
Hatchery practices



Poultry welfare principles



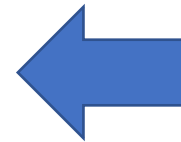
New tools and solutions – MHUSA – trial in the UK



Exponential growth of the Poultry Industry



Increase of automation and intensification of processes.



Chick Quality :

- ✓ Sanitary status
- ✓ Physical appearance
- ✓ Productive Performance

WELFARE

Last decade, increasing concerns of end consumer, retailers and society in general.



The Five Freedoms



**FREEDOM FROM THIRST
HUNGER AND MALNUTRITION**

**FREEDOM FROM
DISCOMFORT AND EXPOSURE**

**FREEDOM FROM
PAIN, INJURY AND DISEASE**

**FREEDOM FROM
FEAR AND DISTRESS**

**FREEDOM TO EXPRESS NORMAL
BEHAVIOUR**

In 1965, a technical inquiry committee into animal welfare called the **Brambell Report** recommended that animals be free to stand up, lie down, turn around, groom, and stretch their limbs.

Based on this report, the Farm Animal Welfare Council (FAWC) developed the so-called Five Freedoms (Webster, 2001; Underwood et al., 2021)



POSSIBLE STRESS FACTORS



Environmental

Abrupt changes in temperature, poor ventilation, wet litter



Physiological

Inability to regulate body temperature in day-old chicks, age of sexual maturity



Social

Overcrowding during brooding or rearing, unbalanced male to female ratio in breeder flocks



Pathological

Exposure to ecto- or endoparasites, mycotoxins or infectious pathogens



Nutritional

Feed deprivation, unbalanced diets, texture difference



Physical stress

Catching, handling, transportation



Psychological

Fear of predators, being chased



Possible effects:

- Fear behaviour
- Sub-optimal growth
- Immune-depression
- Decreased intestinal function
- Decreased productivity
- Morbidity & Mortality

What is a “mother hen pheromone” ?

- Hen pheromone is a solution of a synthetic analog of the Mother Hen Appeasing Pheromone (MHUSA). In nature, the hen produces that pheromone through the uropygial gland a few days before and after hatching, which makes chicks feel appeased in their first days of life, feeling close to their mother.



- The diffusion of hen pheromone comforts the day-old chicks at hatch, allowing a better tolerance to the hatchery stress.



Throughout their lives, animals communicate in different ways.

Communication via pheromones is an innate communication established from an early age.

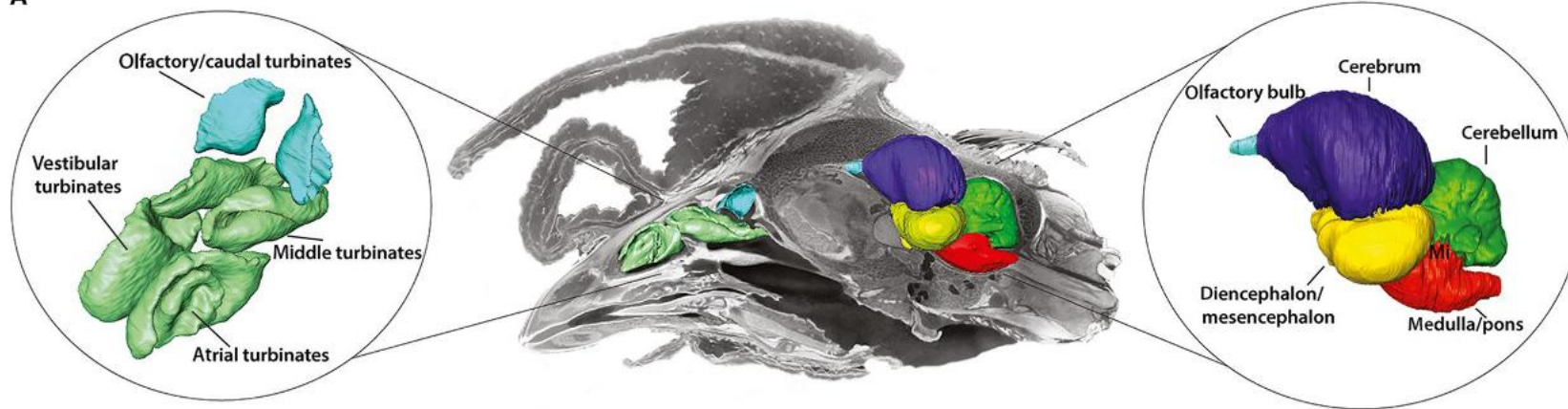
This is the oldest and most widespread mode of transmission of information among living beings.



Are birds anosmic?



A



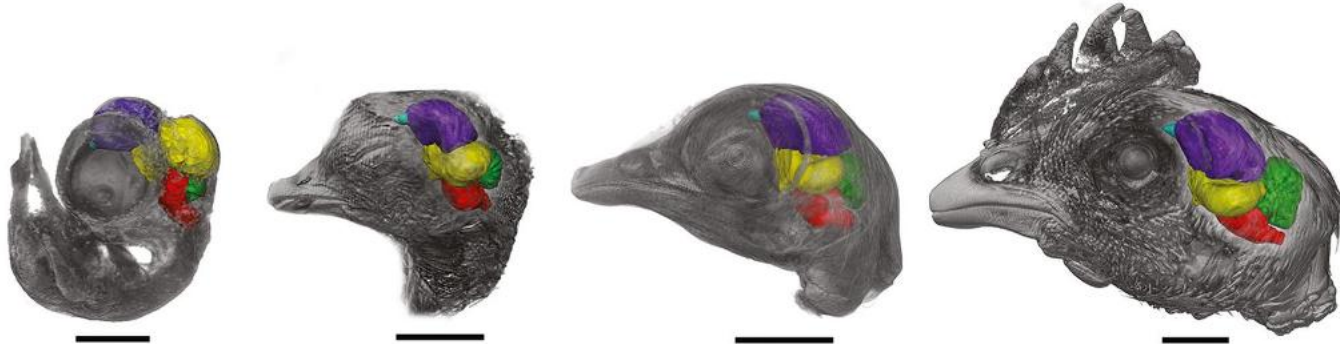
ED 9

ED 15

ED 18

W6

B



Coronal cross-section through the nasal and oral cavities in *Gallus gallus*.

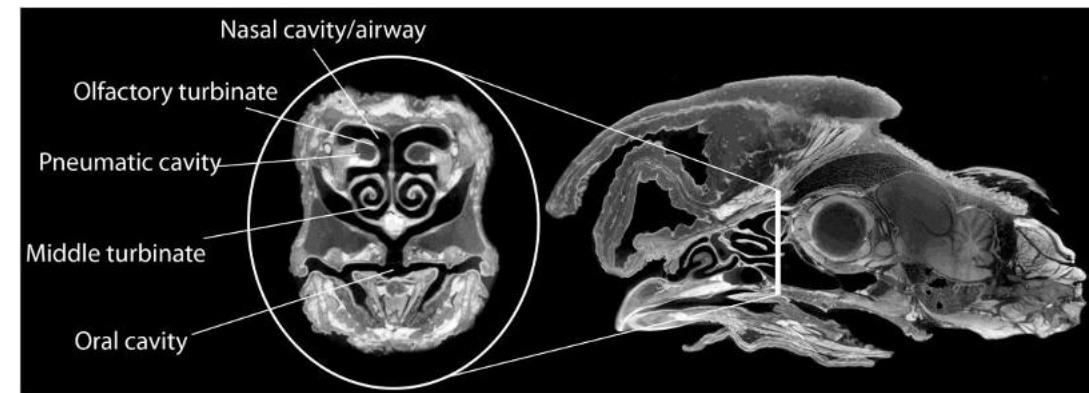
Olfactory System

- ✓ Ability to detect odours (concentration $<1\%$)
- ✓ Odours detection is functional in domestic chickens two days before hatching

SOURCE:

Comparative growth in the olfactory system of the developing chick with considerations for evolutionary studies

[Aneila V. C. Hogan](#), 2020





Mode of Action

Spraying

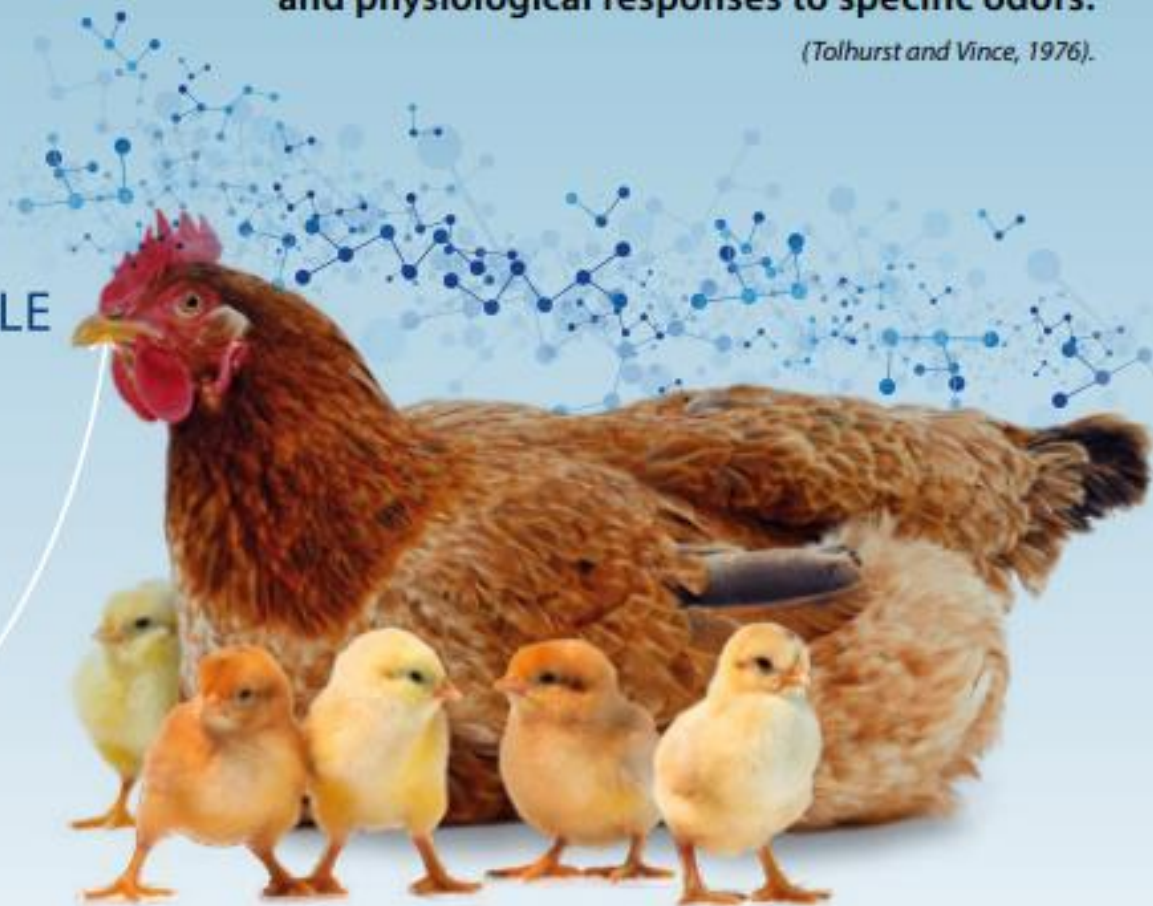
hen pheromone

*inside the hatcher surfaces and
over eggshells before hatch will:*

MIMIC MOTHER HEN CARE,
RECREATE MOTHER-CHICKEN
IMPRINTING, AS CLOSE AS POSSIBLE
TO NATURAL CONDITIONS,
HELP DAY OLD CHICKS TO BE
APPEASED WITH NO IMPACT
ON VITALITY.

- The pheromone is detected by the olfactory system, which transmits a message to the brain, inducing specific behavior.
- Studies have demonstrated that odor detection in domestic chickens is already functional two days before hatching, the chick displays behavioral and physiological responses to specific odors.

(Tolhurst and Vince, 1976).





What is MHUSA?

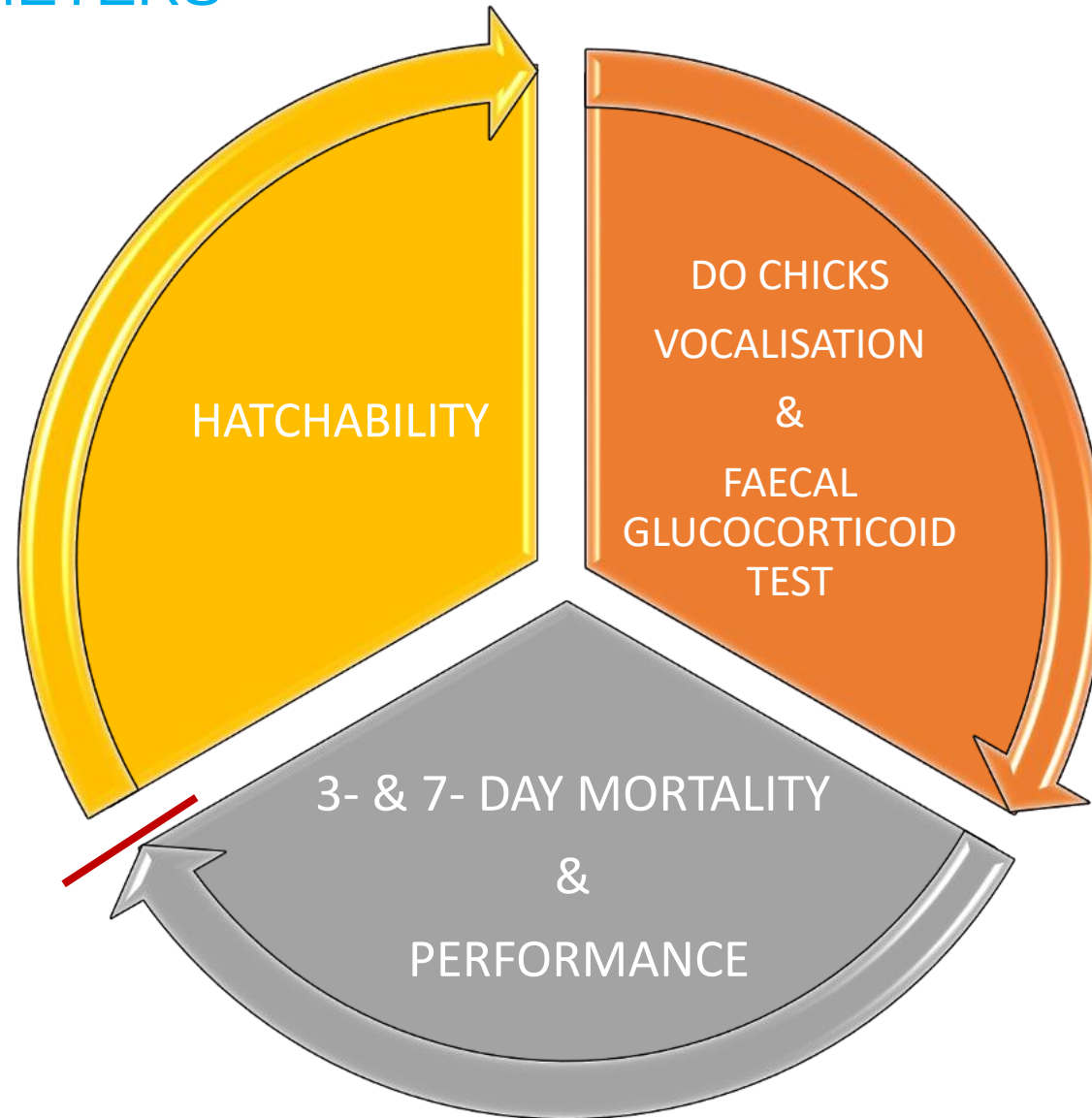
- Synthetic analogue of the Mother Hens Uropygial Secretion Pheromone, in emulsion form.
- MHUSA helps the day-old chicks to appease negative effects of stress.
- To be applied by spraying over the hatcher surfaces and egg before hatch.



- One application 72 - 24 hr before hatch
- About 3 minutes per hatcher



FOLLOWED PARAMETERS





Scientific publications

VOCALISATIONS DU POUSSIN : DEVELOPPEMENT D'UNE METHODE D'ENREGISTREMENT ET D'ANALYSE

Michaud Félix¹, Créach Pauline², Brouard Bruno¹, Gazengel Bruno¹, Simon Laurent¹, Collin Anne³, Métayer-Coustard Sonia³, Travel Angélique²

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INTERFACE

royalsocietypublishing.org/journal/rsif

Research



Cite this article: Mao A *et al.* 2022

Automated identification of chicken distress vocalizations using deep learning models.

J. R. Soc. Interface **19**: 20210921.

<https://doi.org/10.1098/rsif.2021.0921>

Automated identification of chicken distress vocalizations using deep learning models

Axiu Mao¹, Claire S. E. Giraudet^{1,2}, Kai Liu^{1,3}, Inês De Almeida Nolasco⁴, Zhiqin Xie⁵, Zhixun Xie⁵, Yue Gao⁶, James Theobald⁷, Devaki Bhatta⁷, Rebecca Stewart⁸ and Alan G. McElligott^{1,2}

¹Department of Infectious Diseases and Public Health, and ²Centre for Animal Health and Welfare, Jockey Club College of Veterinary Medicine and Life Sciences, City University of Hong Kong, Hong Kong SAR, People's Republic of China

³Animal Health Research Centre, Chengdu Research Institute, City University of Hong Kong, Chengdu, People's Republic of China

⁴School of Electronic Engineering and Computer Science, Queen Mary University of London, London, UK

⁵Guangxi Key Laboratory of Veterinary Biotechnology, Guangxi Veterinary Research Institute, 51 North Road Yuxi, Nanning 530003, Guangxi, People's Republic of China



animals



Article

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

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³ College of Agrarian Sciences, The Federal University of Grande Dourados, Dourados 79804-970, MS, Brazil

⁴ Department of Animal Science, Federal University of Roraima, Boa Vista 69300-000, RR, Brazil

⁵ Department of Management, Development and Technology, School of Sciences and Engineering, São Paulo State University, Tupã 17602-496, SP, Brazil

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Simple Summary: The objective of this study was to investigate chick vocalization through the sounds emitted during social isolation and different flock sizes. The research questions were: Which would be the ideal flock density at the first week of broiler chicken rearing? Moreover, could we



ELSEVIER

APPLIED ANIMAL
BEHAVIOUR
SCIENCE

Applied Animal Behaviour Science 75 (2001) 61–74

www.elsevier.com/locate/applanim

Vocalisation in chicks (*Gallus gallus* dom.) during stepwise social isolation

G. Marx^{*}, J. Leppelt, F. Ellendorff

Institute for Animal Science and Animal Behaviour Mariensee, Federal Agricultural Research Centre, Höltystr. 10, D-31535 Neustadt, Germany

Accepted 20 July 2001



**Vocalisations recording of
DO chicks in dispatch room
- top, middle, and bottom
boxes (15 per flock)**



Voice Memos



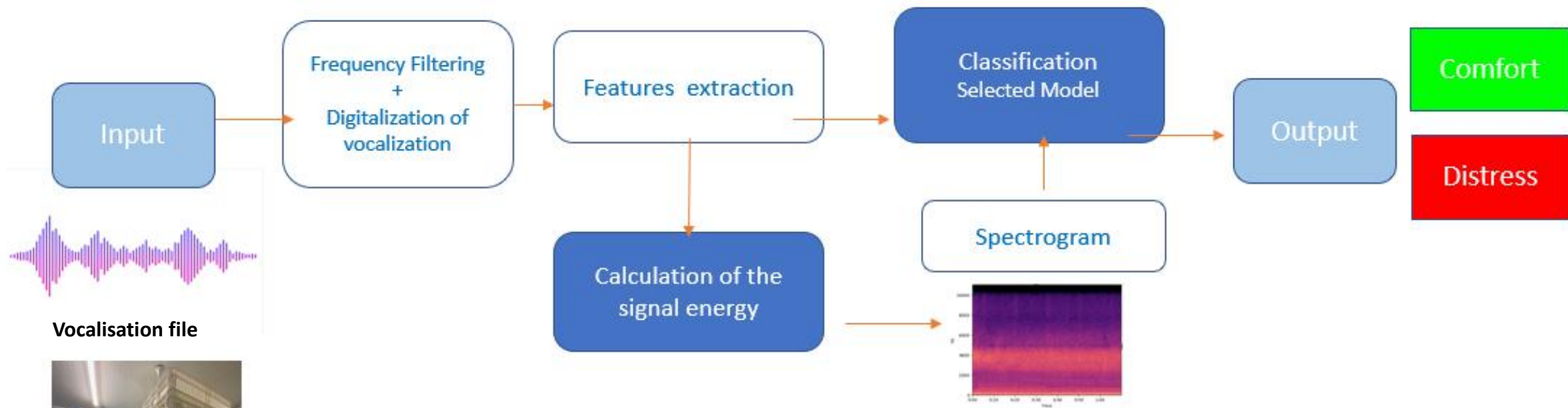
**MiniDSP UMIK-1 Calibrated
Microphone**



**Environmental conditions –
temperature, humidity, CO₂,
light intensity**



The schematic view of the vocalisation signal processing



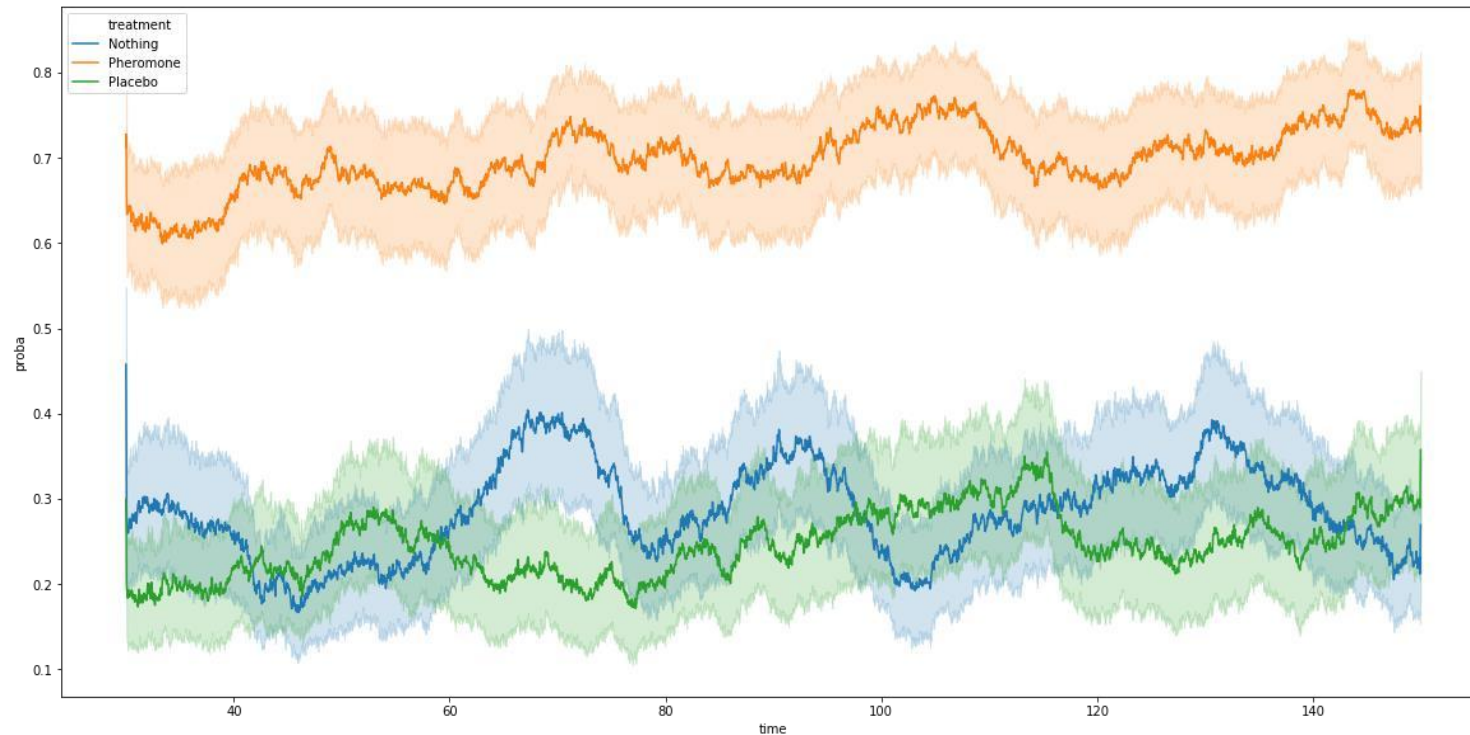
Vocalisation file



1. The algorithm process the field audio recordings using the **Python** programming language.
2. Then, classifies the sound files according to sound engineered features to train a machine learning classifier.
 - **Feature extraction : Amplitude, Spectral centroid, bandwidth, and zero-crossing rate.**
3. This process allows to automatically identify differences in the vocalizations between the two groups.



Graph. Time series curves showing the probability of the classification of the sound files for the 3 groups.



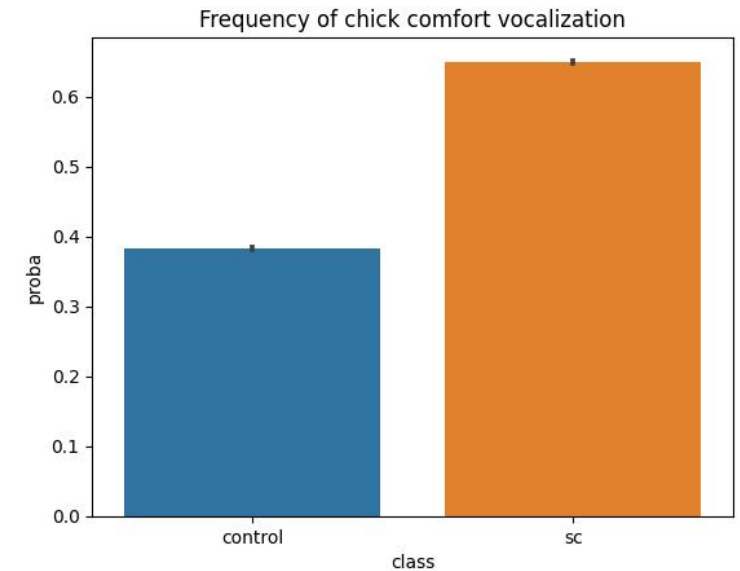
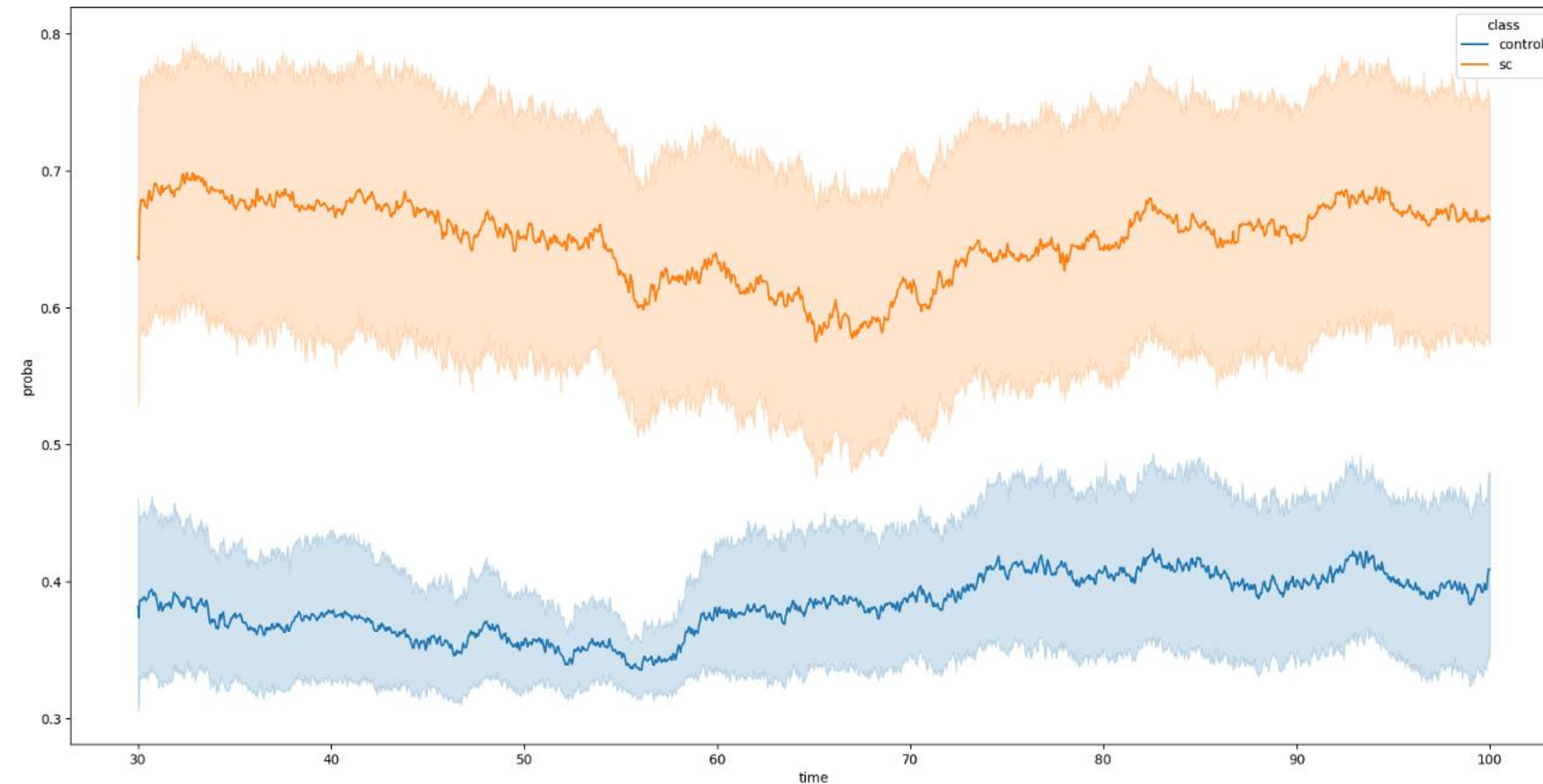
Treatment groups

- = Nothing (No treatment)
- = Pheromone
- = Placebo

- ✓ The results of sound analysis allow us **to identify two different patterns of vocalisations** between the chicks treated with Pheromone versus the non-treated and placebo.
- ✓ **The appeasing effect of Pheromone is demonstrated by the more frequent identification of comfort vocalizations** (higher probability (0,65-0,80) in treated birds versus the no treatment or placebo group).



Time series curves showing the probability of the classification of the sound files of the 2 groups



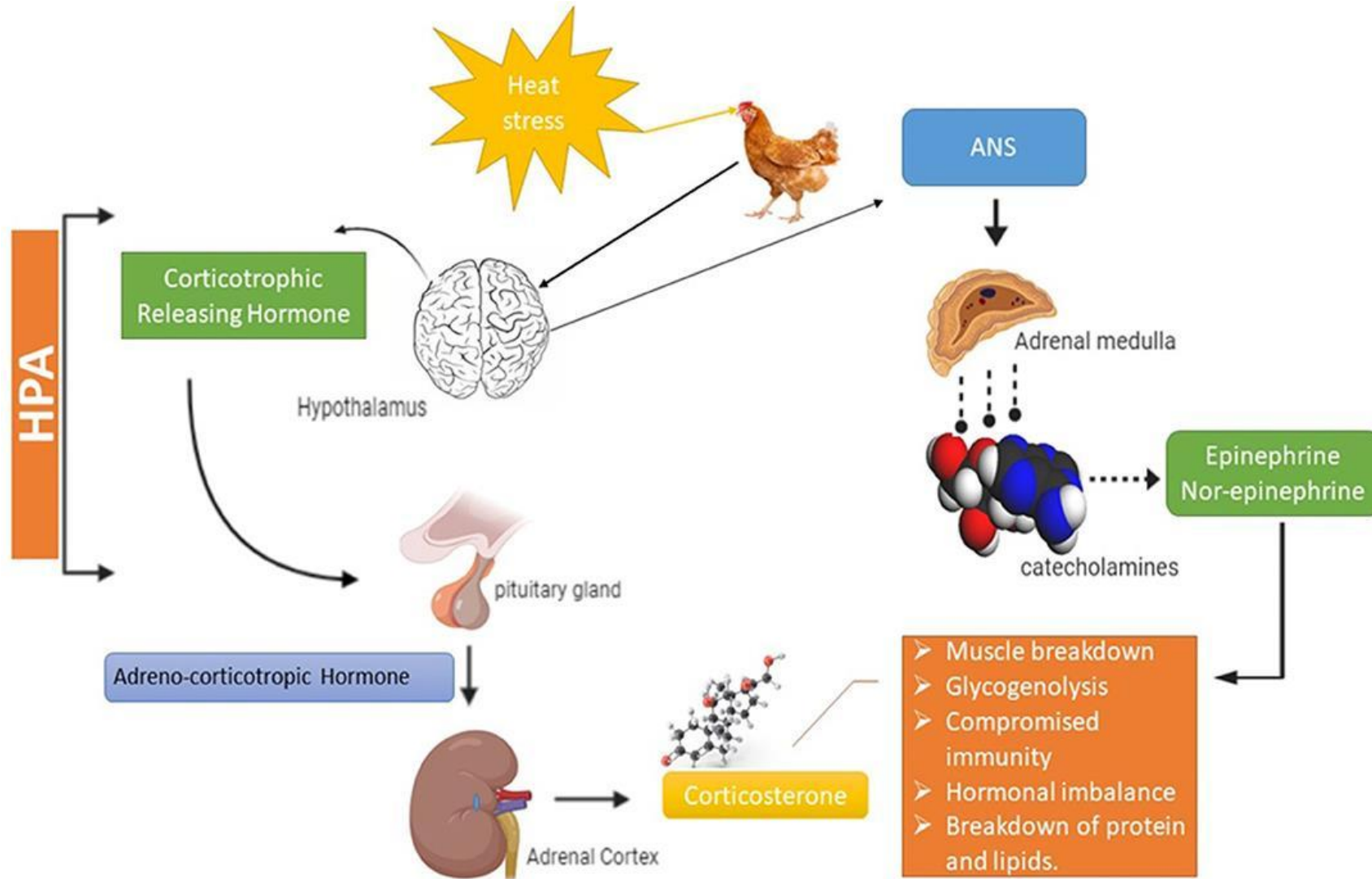
of Recordings

Mean Accuracy 74.39%

Mean Precision 72.22%

Two distinct patterns of vocalisations between the chicks treated with the Pheromone versus the negative control group.

Mechanism of stress in chickens



SOURCE:

[Poultry Response to Heat Stress: Its Physiological, Metabolic, and Genetic Implications on Meat Production and Quality Including Strategies to Improve Broiler Production in a Warming World.](#)
Nawaz 2022

Faecal glucocorticoid metabolites - procedure



- Faecal samples
- Control group - 2 flocks = 40 pool samples
- MHUSA group – 3 flocks = 58 pool samples
- Total number of pool samples analysed = **98**
- **1 pool sample = 5 chickens**

Lab (UK) – extraction after 24h

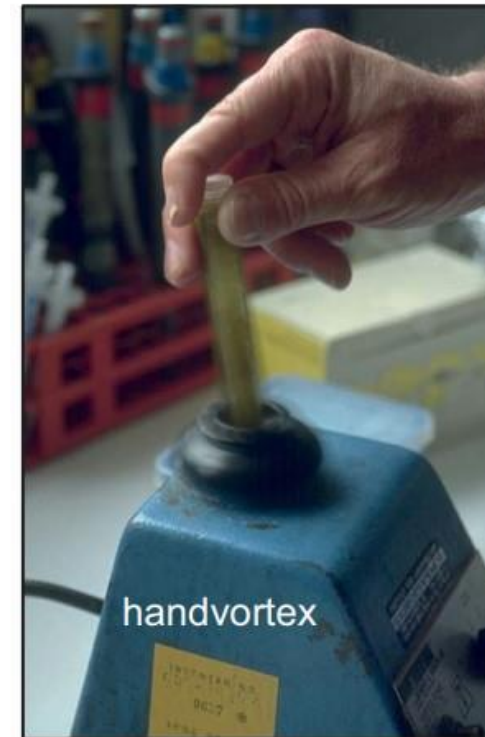
Weigh 0.5 g of wet faeces (pool samples – average 5)



Add 5 ml 80% methanol*



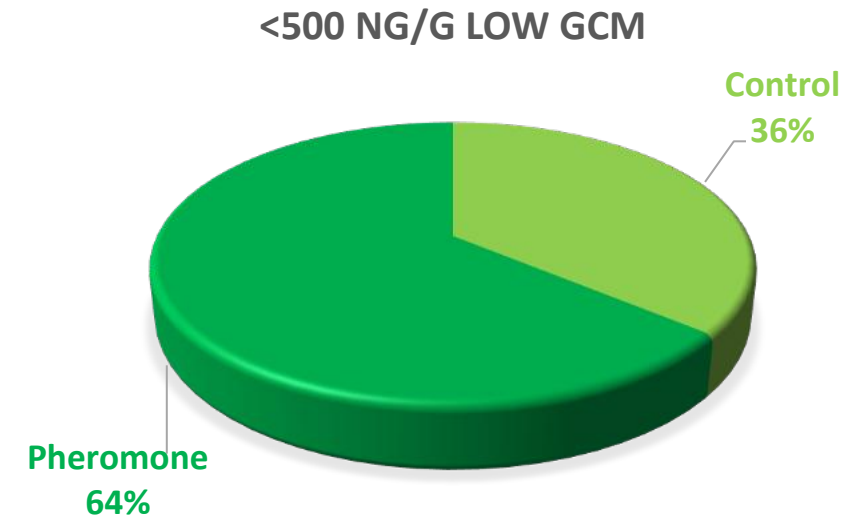
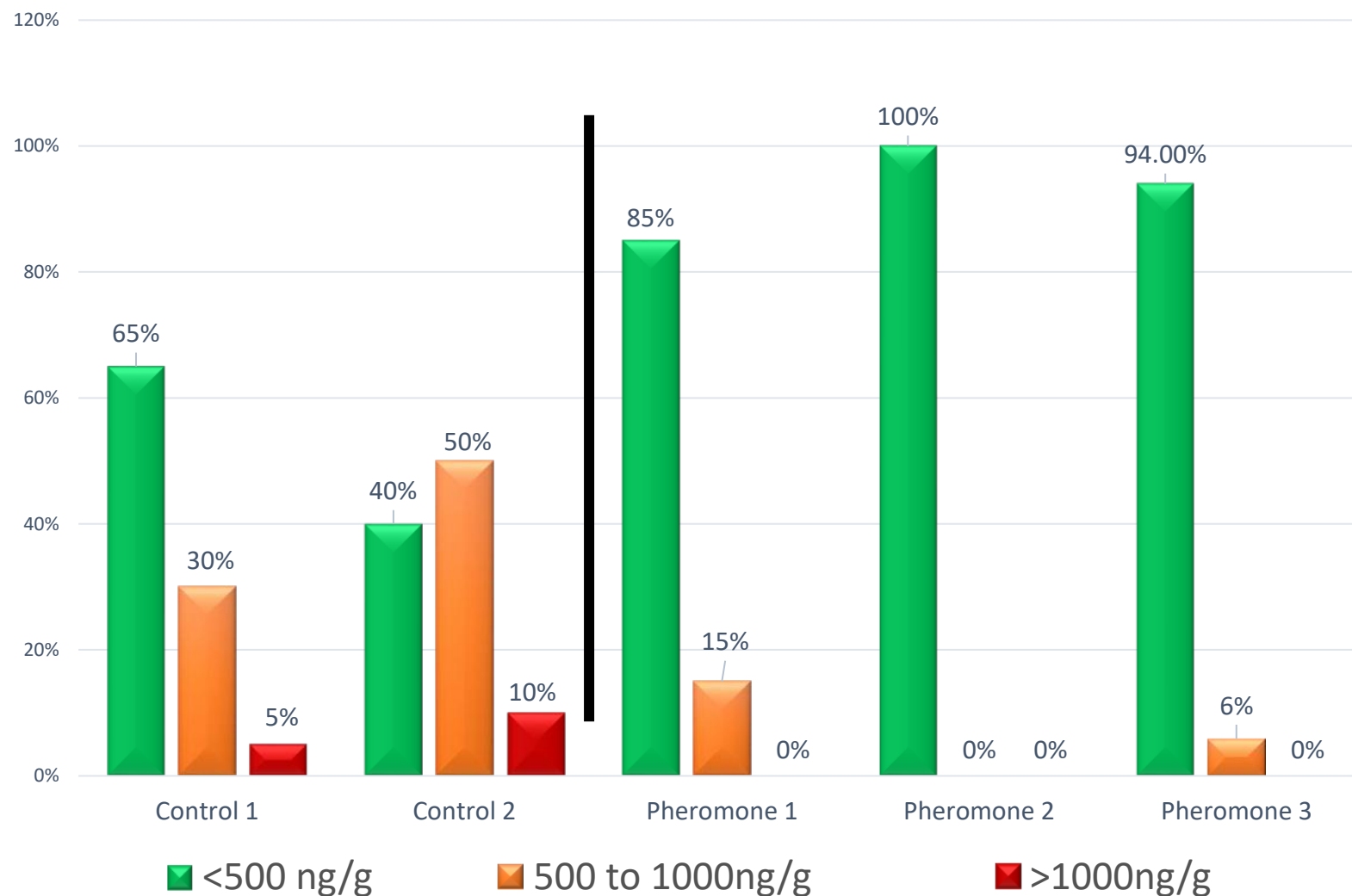
Vortex for 30 min on a multivortex or 1-2 min on a handvortex and centrifuge (2500 g; 15 min)



Faecal glucocorticoid metabolites - results



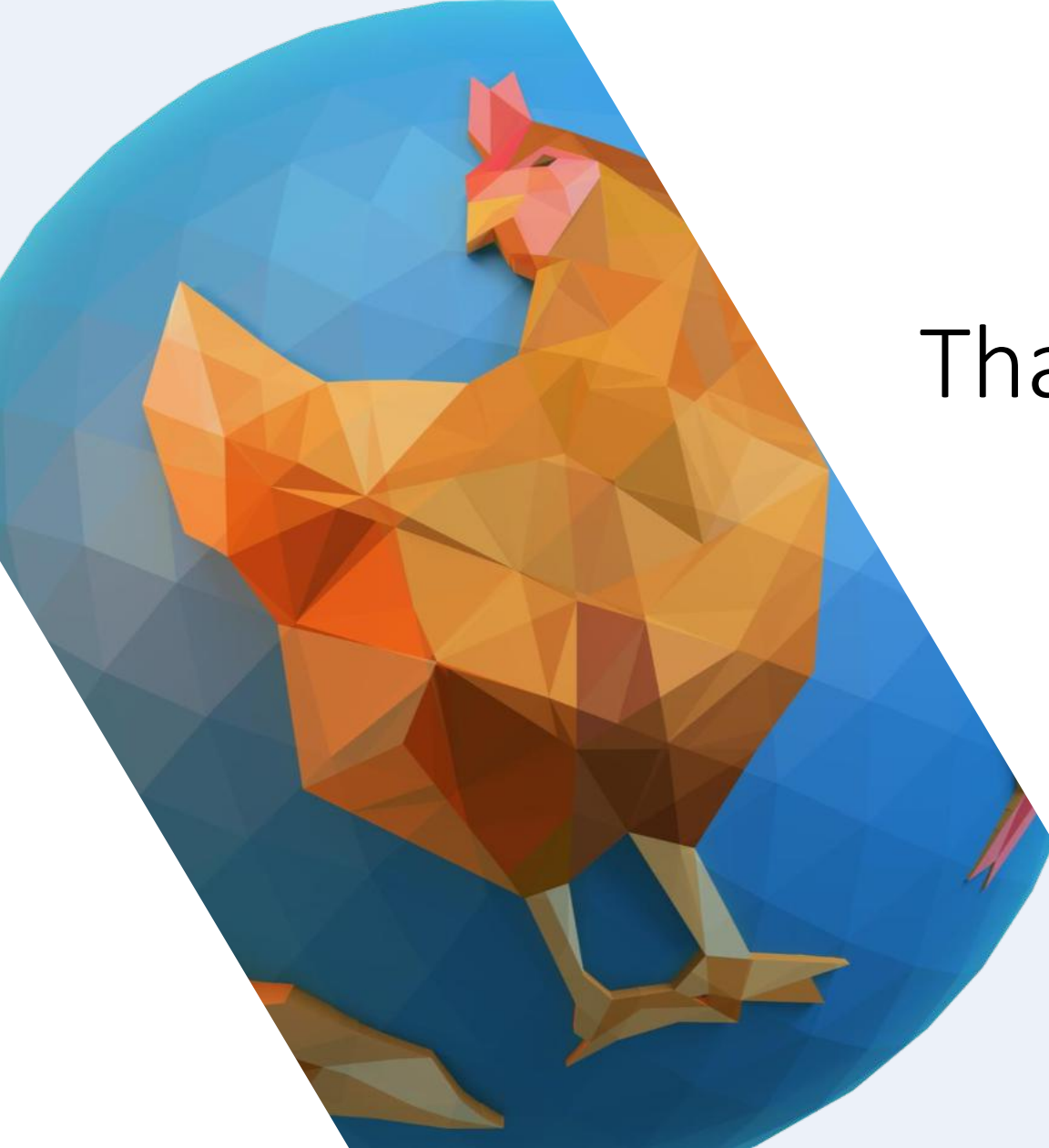
Results of glucocorticoid metabolites control vs. pheromone group



Significant difference
between the two groups showing
**lower level of corticosteroid
metabolites in faecal samples in
pheromone group.**



1. Animal welfare integrates physical health, emotional state and behaviour of animals.
2. Maternal hen pheromone, is a tool available for improving the comfort of the birds at hatch to better tolerate the hatchery process.
3. What we do today in the hatchery, can have a long-lasting impact on the welfare, health, and performance outcomes of the flock.



Thank you for your attention!