

Thermography: a non invasive method to investigate thermoregulation as welfare indicator in Naked Neck broiler chickens.

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Abstract

The aim of this research was to evaluate the effects of the high environmental temperature on naked neck chicken thermoregulation. 28 naked neck birds (randomly chosen, sex ratio 1/1, RedJACouNu, environmental temperatures: 22°C = Control, 34°C = Treatment, standardized rearing conditions and diets), data collection: 4 and 7 wks of age. 5 temperature record areas: Periocular, Wing, Shank, Foot, Second Finger. Thermocamera. AVIO TVS 500, Statistical analysis: Anova, GLM variables: environmental temperature, body areas.

Temperature differences of the considered areas was underlined in order to understand thermoregulation capability of birds. Results showed as thermography can be considered a useful method in measuring skin temperature as a welfare indicator in poultry production.

1. Introduction

Thermography is a non invasive technique that could be used to record skin temperature at distance. It allows to evaluate thermoregulatory changes in birds without interfere with their physiological and behavioural status resulting in objective data that can be used to investigate birds coping ability.

Poultry production is worldwide one of the most important branch of animal production, it can be considered an affordable source of animal protein even in developing countries. A clear link between animal welfare, production systems and food quality standards has been already described in literature. Furthermore animal welfare is considered an indicator of food safety, quality and healthiness.

In addition chicken biodiversity is one of the most endangered genetic resource considering the world wide diffusion of very few commercial hybrids lines characterized by fast growth and high meat yield. The quality level of meat product is the result of the complex interactions between birds' genotype and rearing condition. Alternative productions systems like organic farming, free range, label rouge, etc., require birds with different characteristics both in growth rate and in adaptability level to 'natural' environment. Some commercial hybrid lines developed for these alternative productions have the naked neck gene, a natural mutation present in many traditional breeds all over Europe, limiting feather covering at neck level (fig.1). The presence of this gene is considered very favourable for chicken meat production in tropical and subtropical countries.

Considering the negative economic impact that high temperature combined with poor birds' welfare due to birds limited coping ability should be considered very important to evaluate birds' adaptability using an on field objective method.

The aim of the present experimental trial was to evaluate the effects of the high environmental temperature on naked neck chicken thermoregulation through a non invasive objective method.

2. Materials and methods

A total of 28 birds Red JA Cou Nu Hubbard hybrids were analysed. Sex ratio was 1/1. The birds were reared under two different temperatures: the control one 22 °C and the treatment one: 34°C. The birds of the two groups were reared in standardized conditions and fed the same diets.

Birds temperature data were recorded at week of age 4 and 7. Superficial body temperature was recorded in 5 body areas: Periocular, Wing, Shank, Foot, Second Finger. Avio thermal imaging camera model TVS500 was used (Table 1)

Data were analysed using SAS® statistic package: physical measurements were analysed by ANOVA (GLM procedure), environmental temperature and measurement area were considered as sources of variance. Student's t-test was applied to the calculation of the least square means difference.

3. Results and discussion

Birds' external temperature reaction to high environmental temperature has been recorded. Thermoregulation is a basic step in birds adaptation and adaptability to different environmental condition, furthermore temperature should be considered an important environmental stressor influencing birds' physiology and behaviour. The results of the present

analysis show birds' external temperature variation according to environmental rearing temperature. ~~and~~ Moreover, these results describe thermographical characteristic of birds reared under high temperature and the effect of this negative environmental characteristic on intensively reared chickens. Temperature differences of the considered areas have been underlined and are in accordance with birds high physiological temperature (average internal body temperature 41.5 °C) and show the effectiveness of thermography for skin temperature data collection. Furthermore periorcular temperature could be chosen to be the most useful record area being constantly visible during bird activity even if grouped in intensive system facilities. Body temperature variation in stressful situation can be considered a welfare indicator in poultry production and in the conservation and promotion policies for rare breeds and alternative hybrids.

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Table 1. Technical characteristics of thermocamera AVIO TVS500

Measurement range	-40 to 500°C: Standard to 2000°C
Temperature resolution	Better than 0.05°C with Averaging
Accuracy	±2°C or ±2% *1
Frame time	1/60 seconds
Detector	Uncooled FPA, 320(H) x 240(V) VOx microbolometer
Wavelength	8 to 14µm
FOV	19.4°(H)x14.6°(V) (with standard 22mm lens)
Spatial resolution	1.07mrad
Measurement distance	30cm to ∞
Effective pixels	320(H)x240(V)

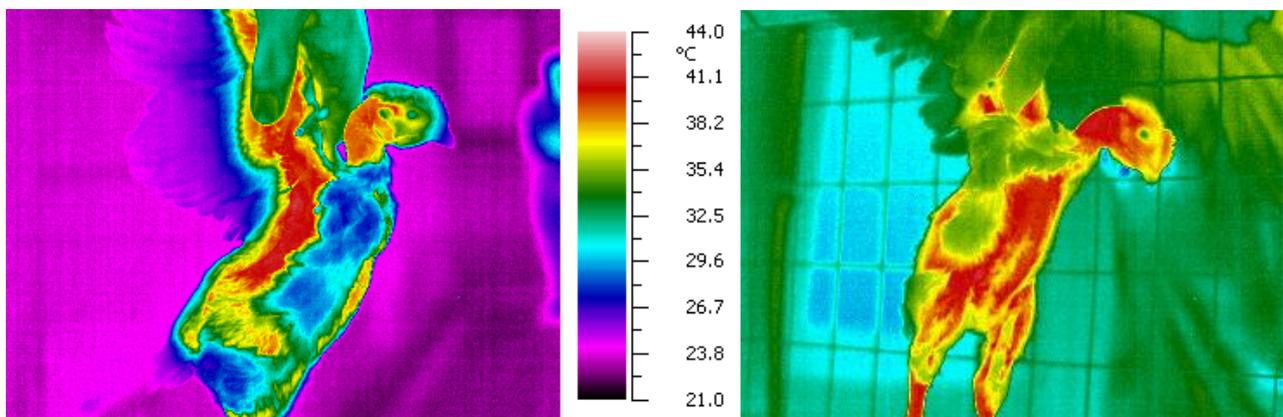


Fig 1. Naked neck chicken images at 22°C (left) and 34°C (right)..