THE INFLUENCE OF AIR TEMPERATURE AND HUMIDITY ON THE METABOLIC RATE AND THE BODY TEMPERATURE OF THE GEESE

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Abstract

The metabolic rate of 83 mature, starving geese was measured under different climatic conditions: temperature was 22, 28, 34°C, the relative humidity was 65 and 90 %. The metabolic rate corresponded to the environmental temperature and humidity. The lowest value was kept when the temperature was 28 °C. The body temperature was measured on seven part of the skin surface and in the cloaca. The skin temperature was in closer correlation with the air temperature than the rectal temperature. In the examined temperature domain (from -15 to +36°C) there were two temperature-doorsteps, where the body temperature altered significantly. The influence of high relative humidity was more sensible under warm environment as it was expected.

Introduction

Different external and internal effects can exert an influence on the metabolism of the geese. These factors act on the production and the energy requirement (Molnár, 1990) of the geese. One of these factors is the climate. This experiment was done in order to study the alteration of the metabolic rate and the body temperature of the geese originated from the temperate zone and housed under warm climate.

Materials and Methods

The metabolic rate of 83 mature, starving geese was measured in a respiration chamber, where the temperature and the air humidity were stabilized (Table 1).

The body temperature of 232 geese was measured on the skin (beak, head, neck, back, leg, wing, foot) and in the cloaca.

Results and Conclusions

The metabolic rate corresponded to the environmental temperature and humidity (Table 1). Similarly to the results of Nichelman et al.(1976), the lowest value was kept on 28°C. As a result of thermal panting there were changes in respiratory rate. The values of RQ depended on the temperature but it was independent from the relative humidity (Table 1).

In warm climate the heat loss by evaporation is getting to be more important (Freeman, 1983). When the air humidity was 65 % the vapour production of the geese increased according to the higher temperature, but the saturated air hindered the expansion of the rate of the evaporative heat loss (Table 1). Measuring the importance of the evaporation, Romijn and Lokhorst (1966) obtained similar ratio-change in hens under different climate.

The skin temperature was in closer relation with the air temperature than the rectal temperature. In the examined temperature domain (from -15 to +36 °C) the temperature on every measured part of the body altered significantly ($p \leq 1$ and $p \leq 5$) at two temperature-borders: at 19-20 °C and 28-32 °C. The raising temperature associated with high humidity (90%) increased not only the surface but the core temperature of the body too ($p \leq 0.1$ and $p \leq 0.1$ resp.). If the air humidity was not high, the cloaca-temperature changed barly (NS) and the back-skin temperature did not increased so much due to the thermoregulation.

Table 1. Metabolic rate, heat loss and body temperature of geese under different climatic conditions

Room temperature °C	22		28		34	
Relative humidity %	65	90	65	90	65	90
Surface of body m^2	0.300	0.305	0.303	0.300	0.304	0.300
RQ*	0.72		0.85		0.92	
Heat production $kJ/m^2/d$	2478	2449	2132	2407	2593	2535
Latent heat loss** $kJ/m^2/d$	1669	1027	1800	1273	2353	1342
Ratio of latent heat loss %	67	42	84	53	91	53
Back-skin temp. °C	36.9	36.9	38.1	38.4	38.3	39.0
Cloaca temperature °C	39.9	39.9	40.5	40.5	40.5	41.1

* RQ= CO_2 production/O_2 consumption

** It was calculated assuming an equivalence of 24 kJ/g H_2O evaporated (Richards, 1977.).

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