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Organic diets and physical activity: Research experience using a rat model

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Introduction

Total energy expenditure or heat production is comprised of basal metabolic rate, thermic effect of food, and physical activity. Physical activity is the most variable and easily altered component of total heat production. Physical activity is influenced by a number of biological parameters i.e. diet, genetics, age, and gender. The diet components of the macro as well as micronutrients and other components (secondary metabolites) associated with a diet could contribute to the well being of the animal and cause variation in physical activity. We have previously observed that rats fed a diet composed of ingredients based on an organic cultivation system showed less movement during the day than other dietary treatments (Lauridsen et al. 2008).

Materials and Methods

The ingredients (barley, wheat, potato, faba beans and rape seed oil) used in the experimental diets were grown according to three different cultivation strategies: one conventional (C) and two organic systems (OA, organic using animal manure; and OB, organic using cover crops). The field-experiment included 2 harvest years, 3 locations and 2 replications, giving in total 36 experimental diets. In addition, a diet consisting of altromin (rat chow) was included.

The diets were given to weaned female, in groups of five rats per diet and given their assigned diet, for approx. 2.5 months. Throughout the experimental period the rats were monitored and weighed each week. The rat's heat production and physical activity was measured with two open-air circuit respiration chambers, and measurement was done on a group of 5 rats. In the chamber the rats were placed in individual cages. The activity was measured using both passive infrared detectors and video recording.

Figure 1. Rats in respiration chamber for measurement of activity and heat production.

Results

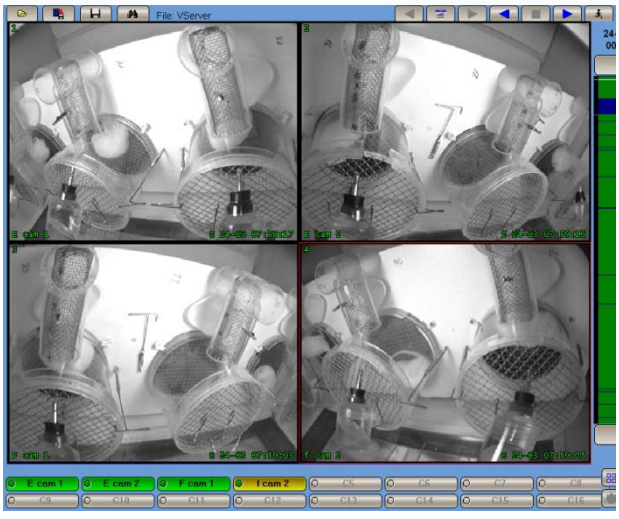

Figure 2. Screen shot of the motion recording by video in the respiration chambers.

Table 1. Relative activity (Conventional – night = 100) and heat production of rats fed the experimental diets

Diet	Altromin		Conventionel		OA		OB	
Day time	Day	Night	Day	Night	Day	Night	Day	Night
Activity								
Infra red, relative	30	67	46	100	48	113	44	99
Video, relative	52	90	56	100	56	102	56	96
Heat production								
W, J/second	3.9	4.8	3.8	4.7	3.9	4.8	3.9	4.8

Conclusion

Both methods showed that rats had the lowest physical activity level during the day. Being night-active animals, rats are usually resting during the day-time.

Differences between dietary treatments indicated a generally lower activity level of rats fed altromin than the plant-based diets of the conventional and organic systems, though these differences proved not to be significant.

No differences in heat production (W) between rats fed the different diets indicating that rats fed altromin chow spent less energy on activity related heat production.

References

Lauridsen, C., Young, C., Halekoh, U., Bügel, S.H., Brandt, K., Christensen, L.P., Jørgensen, H. 2008. J Sci Food Agric 88, 720-732.

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