

5 Energy requirements for growth in young tortoises (*Testudo hermanni boettgeri*, Mojsisovic, 1889)

D. Justet¹, C. Rotat¹, E. Lhoest¹, J. Detilleux², C. Remy⁴, L. Grolet³, P. Dortu³, L. Istasse¹, M. Diez¹
¹Animal Nutrition Unit, ²Quantitative Genetic Unit, Department of Animal Production, Faculty of Veterinary Medicine, University of Liège, ³ASBL Carapace, Parc Paradisio, Cambron Casteau, Brugelette, ⁴Musée d'Histoire Naturelle et Vivarium de la Ville de Tournai, Belgium
mdiez@ulg.ac.be

Introduction: Captive breeding of *Testudo hermanni* is often associated with rapid growth and shell deformation. The objectives of the study are 1) to determine the minimum level of energy allowing growth and 2) to test the effects of 2 levels of energy allowances and of hibernation on growth during the first year of life.

Animals, material and methods: Forty hatchling *Testudo hermanni boettgeri* were divided into 5 groups of 8 animals of similar body weight (BW) (mean \pm SD, 12.3 \pm 1.3 g). The groups differed in terms of their hibernation status: either hibernating (H+, groups A, B and E) or not hibernating (H-, groups C and D) and in terms of the energy allowances they received: either High Energy (HE, groups A and C) or Low Energy (LE, groups B and D). The 5th group (Group E) was fed *ad libitum*. With the exception of group E, the tortoises were kept individually in similar captive conditions for a period of 1 year. Food was offered in the form of fresh plants (*Taraxacum officinale*, 0.44 kcal/g as fed, *Trifolium* spp., *Plantago* spp. or others). The starting point for determining energy allowances was the equation from Donoghue and Langenberg (1996) : $SMR = 32 (BW^{0.75})$ where SMR = Standard Metabolic Rate in kcal/day and BW in kg. The usual recommendation for growth is 2 SMR, corresponding to 2.3 kcal or 5.2 g of fresh food for the HE groups. This amount was decreased daily until all the food offered was consumed by at least one group. After 3 weeks, 2 levels of energy allowance, corresponding to 0.15 and 0.30 SMR, were offered during growth. Tortoises were weighed at weekly intervals. Bone density was studied using radiography. Repeated measures of BW were analyzed using a mixed linear model including BW at birth, SMR, origin, and time ($P < 0.05$).

Results: A SMR at the level of 0.15 allowed growth but a MR at the level of 0.10 did not. During the first 3 months of life, the 5 groups grew at the same rate while receiving 2 energy allowances, respectively 0.15 and 0.30 MR, corresponding to 2.6 and 5.8% of BW as fresh food. The growth rate was significantly correlated with BW at birth and not with the energy allowances. After 5 months of age, the following parameters became significant: energy level, hibernation status, BW at birth, and time. After hibernation, bone density was higher in hibernating tortoises, in comparison with non hibernating ones. At the age of one year, the BW ranged between 24.9 \pm 2 (group B, LE, H+) and 41.6 \pm 9 g (group C, HE, H-).

Discussion: The energy level allowing growth is very low. Hibernation and energy allowances strongly influence growth in hatchling *Testudo*, but only after 5 months of life. Hibernation naturally slows growth but seems to increase bone mineralisation.