Dynamic digestive responses to increased energy demands in the leaf-eared mouse (*Phyllotis darwini*)

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Abstract

A major area of interest in comparative physiology has been to understand how animals cope with changing environmental demands in time and space. The digestive system has been identified as one of the more sensitive systems to changes in environmental conditions. However, most research on this topic has evaluated these effects during peak energetic demands, which do not allow for evaluation of the dynamics of the digestive response along a more natural continuous gradient of environmental conditions. We examined phenotypic flexibility in digestive responses of the leaf-eared mouse *Phyllotis darwini* to increments in total energy demands (via sequential exposure to 26, 12 and 0°C). Additionally, we evaluated the effect of a moderate energy demand (12°C) over three different time periods (7, 17 and 27 days) on digestive traits. Moderate increases in energy demand were associated with changes in the distribution of digesta in the gut, whereas higher increases in energy demand involved increases in the tissue mass of digestive organs. Time-course analysis showed that at 12°C practically all digestive variables reached stable values within 7 days, which is in agreement with empirical data and theoretical deductions from cellular turnover rates. We conclude that although the input of energy and nutrients into the digestive tract is typically periodic, many aspects of digestive physiology are likely to be flexible in response to environmental variability over both short-term (daily) and long-term (seasonal) time scales.