The quantitative genetics of sustained energy budget in a wild mouse

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Abstract

We explored how morphological and physiological traits associated with energy expenditure over long periods of cold exposure would be integrated in a potential response to natural selection in a wild mammal, *Phyllotis darwini.* In particular, we studied sustained energy expenditure (SusMR), the rate of expenditure fueled by concurrent energy intake, basal metabolic rate (BMR), and sustained metabolic scope (SusMS = SusMR/BMR), a measure of the reserve for sustained work. We included the masses of different central processing organs as an underlying factor that could have a mechanistic link with whole animal traits. Only the liver had heritability statistically different from zero (0.73). Physiological and morphological traits had high levels of specific environmental variance (average 70%) and postnatal common environmental variance (average 30%) which could explain the low heritabilities estimates. Our results, (1) are in accordance with previous studies in mammals that report low heritabilities for metabolic traits (SusMR, BMR, SusMS), (2) but not completely with previous ones that report high heritabilities for morphological traits (masses of central organs), and (3) provide important evidence of the relevance of postnatal common environmental variance to sustained energy expenditure.