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A mass budget for transgenic "Supermice" engineered with extra rat growth hormone genes: evidence for energetic limitation

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ABSTRACT

Genetically engineered "Supermice" (*Mus musculus*, transgenic strain Tg[MT-1,rGH],Bri2) possess multiple copies of rat growth hormone genes yielding growth rates 220% that of normal mice. To discover how Supermice alter their acquisition and allocation of resources under elevated costs of growth, a resource allocation study was conducted on forty 50-day-old normal and transgenic male mice. Individual dry mass budgets were used to compare rates of growth, consumption, faecal deposition, digestive assimilation, and respiration over 11-day intervals. The mean body mass of transgenic mice was 153% that of normal animals during this period. Surprisingly, on a mass-specific basis, Supermice consumed 6% less food despite their higher investment in growth (normal: 0.50 ± 0.01 mg food/mg dry body mass per day; Supermice: 0.47 ± 0.01 mg food/mg dry body mass per day). Assimilation efficiency was also slightly lower in Supermice (64.1%) than in normal animals (66.7%). Enhanced growth was achieved entirely through improved conversion efficiencies. Gross and net production efficiencies of Supermice were 227 and 244% those of controls, respectively. Such increased efficiencies appeared to be the result of diverting resources from processes such as behaviour, longevity assurance, and other respiratory demands. Evidence for such trade-offs supports the "principle of allocation," a key assumption for theories of life-history evolution.

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