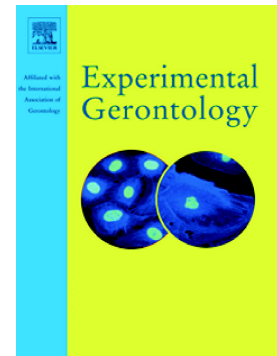


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Life-extending dietary restriction and ovariectomy each increase leucine oxidation and alter leucine allocation in grasshoppers

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Abstract

Reduced reproduction and dietary restriction each extend lifespan in many animal models, but possible contributions of nutrient oxidation and allocation are largely unknown. Ovariectomy and eating 70% of ad libitum-feeding each extend lifespan in lubber grasshoppers. When feeding levels between the two groups are matched, ovariectomy increases fat and protein storage while dietary restriction reduces fat storage. Because of these disparities in nutrient investment, metabolism may differ between these two life-extending treatments. Therefore, we examined the allocation and organismal oxidation of one representative of each macronutrient class: leucine, oleic acid, and glucose. Ovariectomy and dietary restriction each increased oxidation of dietary leucine. Dietary leucine may play a special role in aging because amino acids stimulate cellular growth. Speeding oxidation of leucine may attenuate cellular growth. Allocation of leucine to muscle was the clearest difference between ovariectomy and dietary restriction in this study. Ovariectomy reduced allocation of leucine to femur muscle, whereas dietary restriction increased allocation of leucine to femur muscle. This allocation likely corresponds to muscle maintenance for locomotion, suggesting dietary restriction increases support for locomotion, perhaps to search for food. Last, ovariectomy decreased oxidation of dietary oleic acid and glucose, perhaps to save them for storage, but the site of storage is unclear. This study suggests that the oxidation of branched-chain amino acids may be an underappreciated mechanism underlying lifespan extension.

Keywords: Branched-chain amino acids; glucose; oleic acid; storage; Target of Rapamycin

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