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Adaptive trade-off between reproduction and survival in Mediterranean fruit flies induced by changing dietary conditions

The conception of the cost of reproduction provides an important insight on connection between fertility and life span in living organisms. Despite substantial progress in understanding this connection many important features of fertility-longevity trade-off are masked by confounding factors, and remain poorly understood. We performed reanalysis of data from experimental study of fertility and longevity response to different diets in females of Mediterranean fruit fly *C. capitata* [1, 2]. A negative dependence between average fertility and longevity was observed in the long lived part of experimental cohorts as the protein content of the diet changed. In order to explain the observed phenomenon we suggest a mechanistic resource allocation model. The model is further development of the resource allocation model proposed in [3]. The presence of a fertility-longevity trade-off suggests a possibility of existence of some resource used both by reproduction and somatic maintenance in a fly. The trade-off may be a manifestation of metabolic machinery, processes and genetically determined laws of control which define balance between the processes of reproduction and regeneration. We propose and discuss a principle of dynamic resource allocation which explains fertility-longevity data for the long-, intermediate- and short-lived flies. Adaptive allocation of metabolic and other resources allows flies to tailor their life history parameters to the environment. Due to limitations of the physiological adaptation a significant share of the population may be genetically “preadapted” to different environmental conditions thus contributing to population stability and heterogeneity. This may be observed even in relatively homogeneous populations, such as experimental fly cohorts.

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