Inheritance of lifespan is sex-dependent in fruit flies

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Like mother, like daughter; like father, like son. Evolutionary biologists at the universities in Bielefeld and Uppsala (Sweden) have now shown that this proverb also applies to inheriting a long life – at least for fruit flies (Drosophila). The research team found that the descendants of these insects mostly inherit their lifespan from their own sex: male descendants will very probably live about as long as their fathers; female descendants, about as long as their mothers. The scientists are publishing their findings on Thursday 12 September in the renowned journal *American Naturalist*.

The new study by the German–Swedish research team has turned a previous assumption by biologists and physicians upside down: up to now, they had thought that the genetic risk of a disease was equally strong in both female and male descendants.

The study proceeded from the assumption that the average life expectancy of women and men differs –this may be for genetic reasons but also due to different lifestyles. The German–Swedish research team wanted to find out how far this sex difference in the lifespan depends on the genetic make-up.

To carry out their experiments, the researchers intervened in the heredity of fruit flies by cross-breeding them with special fly mutants. This enabled them to breed 50 hemi-clones; that is, groups of individuals in whom one-half of the genetic make-up is absolutely identical, whereas the other half is completely unrelated. From each hemi-clone, the

researchers determined the lifespan of 400 females and 400 males. 'What's special about this approach is that it enables us to measure the influence of this 50 per cent identical genetic make-up in both sexes', says Dr. Holger Schielzeth from the Faculty of Biology – one of the authors of the study.

The authors then used the data from the hemi-cloned fruit flies to read off how similar the individuals in a hemi-clone are and how far females and males from one hemi-clone share the same lifespan. Results showed that the lifespan was very similar within sexes, whereas the calculated relation between sexes was only slight. Hence, Methuselah genes in the father exert only a limited influence on female descendants – at least in fruit flies. Vice versa, particularly long-lived females do not necessarily have long-lived brothers, fathers, or sons. Approximately three-quarters of the genetic components of life expectation are effective only within the same sex.

The researchers conclude that the risk of a fatal hereditary disease is passed on above all within the same sex. 'Gene variants that could be problematic for one sex seem to have only a comparatively low influence on the life expectation of the other sex', says Holger Schielzeth. In principle, this finding could also generalize to human beings, because human life expectancy is also hereditary. According to Schielzeth, this sex-specific heredity may also be relevant for medicine, and that therapies should pay more attention to sex-specific risks.

More information: Lehtovaara, A. et al. Heritability of lifespan is largely sex-limited in Drosophila, *American Naturalist*, published online on 12 September 2013. DOI: 10.1086/673296

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