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Azelaic Acid Promotes Fatty Acid Desaturation in Caenorhabditis elegans at Cold Temperature, Thereby Enhancing Longevity

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Objectives: Azelaic acid (AzA), a naturally occurring α, ω-dicarboxylic acid in wheat, rye, barley and sorghum, has been reported to exert anti-inflammatory and anti-oxidation property. AzA has long been used as an antiacne drug by inhibiting bacterial DNA synthesis. Recently, its role in reducing high fat diet-induced adiposity through activation of olfactory receptor 544 has been reported. However, its physiological role in environmental stress (e.g., fasting and cold) and aging is unknown.

Methods: We conducted PCR analysis and lifespan assay under multiple stress conditions (fasting, cold, and oxidative stress) using C. elegans

Results: Using *C. elegans* as an invertebrate animal model, we demonstrate that AzA treatment resulted in a significant extension of the survival under cold and oxidative stressed condition with no effects on the pumping rates, locomotive activities and growth rate. This was accompanied by a marked increase in expression of fatty acid desaturases genes, such as *fat-1, fat-5* and *fat-7*, with a decrease in lipolysis related genes such as *aak-2* and *atgl-1*. Moreover, the effect of AzA on the survival under cold condition was abolished in the *fat-1, fat-5, fat-7* and *aak-2* mutants.

Conclusions: Taken together, our results suggested that azelaic acid contributes to lifespan extension at low temperature in *C. elegans* through augmentation of unsaturated fatty acid synthesis.

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