# Effects of Microbiome Diversity on *C. elegans* Strains with HIF Mutations

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A study published in 2013 showed that several different species of test subjects grown in sterile environments from birth were less adaptive to stress than their wild counterparts. They also expressed higher levels of stress-related hormones, such as adrenocorticotropic hormone (ACTH) and corticosterone. Hypoxia-inducible factor (hif) is a pathway that regulates the response to hypoxia and stress. Hif uses the gene *hif-1a*, which is a transcription blocker. The question addressed in this study is whether or not the microbiome has an effect on responses to stress that involve this pathway. This study used *C. elegans* strains with mutations in the hif pathway as a model to look at the correlation between microbiome diversity and heat stress response. It used four different strains of *C. elegans* with varying tolerances to heat stress. From highest to lowest heat tolerance, these are *vhl-1*, *egl-9*, *N2*, and *hif-1*, where *N2* is wild type. These strains were grown on plates with a single strain, two strains, or four strains of bacteria to promote varying levels of microbiome diversity in the worms. The worms were then incubated, and their response to the 37˚C heat stress was recorded. At hour three, the death rate of the *vhl-1* and *egl-9* worms scaled inversely with the diversity of the microbiome. At hour five, the pattern changed slightly, as the worms grown on two strains of bacteria had approximately 15% less death than those grown on four strains. The remaining strains, *N2* and *hif-1*, had normal and reduced tolerance, respectively. They both followed roughly the same pattern as the other two strains, except that the worms grown on four strains of bacteria had approximately 20% less death than those grown on two strains. Overall, this suggests that a higher level of microbiome diversity decreased the probability of death in response to heat stress response. All four strains also showed abnormal behavior when experiencing heat stress, changing from the typical sinusoidal movements to repetitious coiling and seizing movements, as recorded in digital time lapses. Further studies will investigate how *C. elegans* with multiple of the mutations respond in circumstances similar to those used in this study. An enzyme-linked immunosorbent assay will also be utilized to observe levels of the stress hormone corticosterone.