Generational Effects of a Commercial Glyphosate-based Herbicide on *C. elegans*

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Farmers worldwide use glyphosate based herbicides (GBHs) to eliminate weeds and increase their crop yields. The active ingredient of GBHs, glyphosate, targets the shikimic acid pathway that is required by many organisms, including plants, some bacteria, and fungi, to produce aromatic amino acids that are necessary for survival and growth. Unlike these organisms, animals do not have the shikimic acid pathway, so many GBH's are marketed under the assumption that glyphosate has no effect on animals. This ignores the possibility that glyphosate might have some effect outside of the shikimic acid pathway. *Caenorhabditis elegans* is a microscopic nematode found in the soil of crop fields sprayed with GBHs. If GBHs are harmless to organisms not containing a shikimic acid pathway, the model organism *C. elegans* should be able to survive when treated with commonly used concentrations of a commercial GBH. We set out to determine whether *C. elegans* can develop a tolerance to GBHs over the course of multiple generations. When exposed to stressful conditions, organisms that are best suited to deal with the stress survive and produce more progeny, allowing the population to better cope with that stress in the future. If a proportion of the nematodes can survive an exposure to a low dilution of a GBH, their progeny may have an increased tolerance and survival rate in higher concentrations of a GBH. To test this, *C. elegans* were treated with increasing concentrations of a GBH in an attempt to allow a tolerance to develop over successive generations. Four separate groups were treated with concentrations of GBH that doubled each generation. Two of the groups started at a dilution of 0.0125% GBH and the other two started at a dilution of 0.125% GBH. In addition, there were two identical control groups that were not treated with the GBH until the final generation. To give the nematodes enough time to produce progeny after each treatment, 2-3 days (the typical lifecycle of *C. elegans*) elapsed before the next generation was transferred to new plates and treated with higher concentrations. In the final generation, the two control plates were treated with the same concentrations given to the two groups of test plates, 0.2% and 2%, respectively. The four groups of test plates had 100% survival rate when exposed to the final concentration of GBH while the control plates had 60% and 53% survival, respectively. This suggests that *C. elegans* have the ability to develop a tolerance to commercial GBHs, but nematodes that are not predisposed to resist GBHs have a lower survival rate when exposed to a GBH.