Brain gene expression response to pesticide exposure indicates effects on cognition.

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Insect pollinators including social bees are key to ecosystem stability as well as agricultural yields. Recent declines in social bees worldwide are thus concerning. A major factor implicated in these declines is the application of pesticides to crops. These are intended to control pest species, but can also negatively affect non-target wild pollinators. Behavioral and field studies have clearly demonstrated that exposure to neonicotinoid pesticides negatively impacts learning and memory abilities, foraging behavior and colony survival of social bees. We know relatively little however about the molecular mechanisms by which pesticide exposure affects bee cognition. To address this, we exposed Bombus terrestris bumblebee colonies to commonly used pesticides. We find widespread effects of pesticide exposure on the gene expression in the brain, identifying candidate pathways involved in detoxification. We describe the signatures of selection on these genes in wild populations. Our work demonstrates a novel, straightforward manner of quantifying the effects of pesticide exposure.