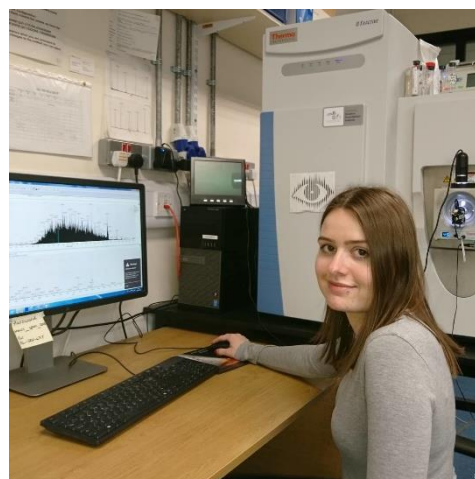


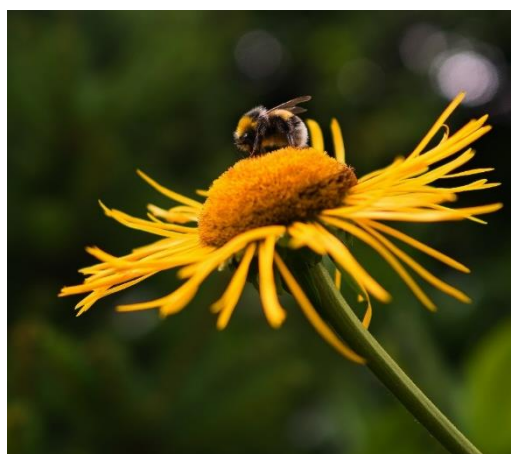
Best Oral Presentation at Environ 2020 Winner – Merissa Cullen, NUI Maynooth

Comparison of active ingredient and commercial formulated glyphosate on the brain and digestive tract of the bumblebee *Bombus terrestris*

Bees are important pollinators for crops such as raspberries, strawberries and tomatoes. These pollination services contribute €153 billion to the global economy annually and ensure that a healthy balanced diet is affordable.



Pesticides protect food crops from pests, disease and unwanted plants; they are a cheap and easy solution keeping food crops safe and affordable. However, many pesticides harm bees and can drive decline. But, in research, focus is on the pesticide active ingredient rather than commercial formulations - which are used in agriculture and amenity settings - which have added ingredients to improve pesticide efficacy.



My research - part of the PROTECTS project (<https://protects.ucd.ie>) – fills this gap. We used mass-spectrometry based proteomics to answer: (1) whether glyphosate affects the gut or brain of the bumblebee *Bombus terrestris*? and (2) whether the active ingredient and commercially formulated glyphosate treatments affect bees differently?

We orally exposed bumblebees to field-realistic concentrations of glyphosate alone (active ingredient) or a commercial glyphosate formulation for five days before analysis of the brain and gut proteome. Our results show clear differences between both treatments in how they affect: (1) the mitochondria in both tissues, (2) endocytosis and the lysosome in the digestive tract and (3) translation in the brain. However, we noticed a conserved 'glyphosate' response; Both treatments altered amino acid biosynthesis across each tissue and, in the brain, protein homeostasis and oxidative phosphorylation were affected.

These results demonstrate that glyphosate can affect non-target organisms. While similarities exist, the effects differ depending on exposure to glyphosate alone or as a commercial formulation. This highlights a need for more stringent testing of non-pesticidal ingredients in commercial formulations and will help elucidate a mode of action for glyphosate in insect pollinators.