

AQUATIC EXPOSURE OF LARGEMOUTH BASS AND FLORIDA MANATEE TO GLYPHOSATE

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Glyphosate is the most used herbicide worldwide, with no historical comparison. In Florida, it is used routinely as a sugarcane ripener and for terrestrial and aquatic vegetation management. Previous studies have shown that chronic exposure can lead to immune dysfunction in animal models. Because of its extended use in water bodies and runoff from agricultural areas, fish and manatees can be chronically exposed. We exposed adult largemouth males during 21 days to glyphosate and Rodeo (formulation for invasive aquatic plants) to 10 mg/L of glyphosate and chemically equivalent concentration. We isolated total RNA from the head kidney and performed RNA sequencing. Glyphosate significantly enriched molecular pathways related to leukocyte infiltration necessary for the occurrence of an inflammatory attack. Rodeo exposure significantly enriched two immune pathways: drug metabolism and herpes simplex infection. The drugs highlighted in the pathway lead to immune suppression when administered to humans and herpes infection occurs in immune-suppressed fish. High doses of glyphosate and Rodeo exposure lead to immune dysfunction in largemouth bass and Rodeo had additional toxicity pathways. In addition, we analyzed the concentration of glyphosate in plasma of 65 Florida manatees with LC-MS/MS; 56 from Crystal River and 24 from Brevard County. The average concentration was $0.039 \pm 0.03 \mu\text{g/L}$ in Crystal River and $0.05 \pm 0.025 \mu\text{g/L}$ in Brevard County. One possible route of exposure to the manatees could be drinking water. Therefore, we installed novel passive devices (POCIS) in Florida waterbodies to measure chronic exposure to glyphosate. Two POCIS were deployed for 15-35 days in Crystal River, Caloosahatchee River, St. Lucie Canal and the outflows of Storm Treatment Area. We will analyze the concentration of glyphosate accumulated using LC-MS/MS. We will deploy them again in November-December when manatees utilize more fresh-water refuges and coincide with glyphosate spraying for sugarcane ripening.

PRESENTER BIO: Maite De Maria is an International Ph.D. Student at the College of Veterinary Medicine, University of Florida. She received the Everglades Foundation For Everglades Scholarship to examine the link between agricultural runoff and water quality in outflow from Lake Okeechobee. She will determine the concentration of the widely used glyphosate in the outflow from Lake Okeechobee, and its possible consequences in the immune systems of wildlife that are chronically exposed. She is doing her Ph.D. in the Department of Physiological Science and in the Aquatic Animal Health Program as a Fulbright Scholar. She received her master degree in Ecology and Evolution in her home country (Uruguay). Her research has always been related to anthropogenic activities and wildlife, particularly marine mammals. She also participated in a successful interdisciplinary project aimed at understanding problems of artisanal fishers in Uruguay. Among the problems addressed in this participatory project was the interaction of fishermen with sea lions. Together they developed a plan to change the way fishing gear was used to diminish the interaction with these marine mammals. She has also worked with trace elements in sea lions and its trophic transfer. Now at UF, Maite is making her own path in research in toxicology with the guidance of experienced and innovative advisors, working with novel techniques such as non-invasive biomarkers for contaminant exposure.