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New NSERC-funded study to examine how ingesting microplastic particles can affect brain health

Plastics are a part of our daily lives, and most Canadians perceive plastics as inert and hygienic necessities, unaware of their toxicity or damaging effects on the health of wildlife and ourselves. A new University of Lethbridge study, supported by a Natural Sciences and Engineering Research Council of Canada (NSERC) grant in partnership with Environment and Climate Change Canada, proposes to examine how chronic ingestion of microplastic particles affects brain health.

“Microplastics increasingly contaminate our food and water. Despite how common microplastics have become in our environment, we still understand very little about how chronic ingestion of these particles affects our behaviour and brain health,” says principal investigator Dr. Andrew Iwaniuk of the Canadian Centre for Behavioural Neuroscience (CCBN). “Over the next couple of years, we will address this large knowledge gap by examining how the brain and behaviour of rats is affected by ingestion of microplastics at similar levels to that found in bottled water.”



The study will address one of the key themes of the federal government’s initiative on [Plastics science and innovation for a cleaner and more sustainable future](#).

“The proliferation of plastics and the resulting contamination of our food, water and environment by plastics has become a major environmental and political issue, but we need more research on how plastics affect the brain to develop better regulations,” says Dr. Rob McDonald (CCBN).

Iwaniuk and McDonald received a \$300,000 NSERC grant for their project, *Neurobehavioural effects of chronic PET exposure*. Their research focuses on the effects of polyethylene terephthalate, or PET, a clear, strong, lightweight polyester plastic that is widely used in fabrics and water bottles and one of the most common microplastics found in our water.

PET can occur at relatively high levels in saltwater, freshwater and sediments, resulting in chronic exposure to animals living in those environments. In humans, PET occurs in drinking

water and can reach high levels in bottled water. There is even evidence that PET can accumulate in our brains, so the need to study the health effects of PET is critically important.

“Despite the prevalence of PET in water and its significant potential to affect brain function, there are few studies on the neurobehavioural effects of PET exposure,” Iwaniuk says. “A few published studies focused on only a few markers of dysfunction and use large, acute doses that do not accurately reflect how humans or wildlife are exposed to PET. We see a clear need for research on chronic PET exposure at environmentally relevant levels that address behavioural and neural effects.”

Microplastics ingestion causes damage to wildlife, as well as endocrine disruption, inflammation and stress effects that can result in poor reproduction and higher mortality rates. While there is some evidence that microplastics negatively affect brain function, data on how our brains are affected and if cognition and behaviour are impaired remains largely unknown.

“The chronic ingestion of microplastics, plastic particles smaller than 5 millimetres in size, is considered a significant health risk to both humans and wildlife, but what those health risks are have remained unclear,” adds McDonald. “The brain is extremely sensitive to most toxicants and compromised brain function can result in behavioural dysfunction, impaired physiological functions and increase the risk of diseases, like Alzheimer’s disease.”

A research team assembled by Iwaniuk and McDonald will provide rats with water containing levels of microplastics like that found in bottled water for many months to simulate exposure levels humans experience. They will then test the rats’ learning, memory, fear and other behaviours and examine their brains for evidence of neurological damage.

“We know that environmental conditions can affect the brain, but we lack sufficient data on how contaminants in our environment affect brain health. Our research represents a critical step in understanding how microplastics affect brain health. Without this information, we could be damaging ourselves, and local wildlife, far more than we thought,” concludes Iwaniuk.

To view online: <https://www.ulethbridge.ca/unews/article/new-nserc-funded-study-examine-how-ingesting-microplastic-particles-can-affect-brain-health>

-- 30 --

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