

News Release

Dr. Brian Dingmann Studies Rotifers

By Elizabeth Tollefson on Wednesday, August 17, 2005

So what, you might say, if someone is doing some research on microscopic, aquatic organisms known as rotifers.

Well, if you've swum in a body of water at some point in your life, you've probably swallowed some water accidentally at one point or another. If that's the case, Dr. Brian Dingmann said, you've more than likely eaten some rotifers.

"If they like to swim in a lake or river, most people have come in more contact with rotifers than they're aware," he added. "They can be found in any standing body of water, from birdbaths, to puddles and lakes."

Dingmann, who has a Ph.D. from Georgia Tech in applied biology, last spring finished his first year teaching microbiology and zoology at the University of Minnesota, Crookston (UMC). This summer, as part of the University of Minnesota's Undergraduate Research Opportunity Program (UROP), he's researching rotifers alongside UMC student Vanessa Armstrong in a laboratory on campus.

A prior research paper indicated that three chemicals released into the environment by humans stop sexual reproduction in rotifers. Dingmann's research seeks to add more evidence to the prior paper by connecting the reproduction problem to either the female rotifer or the male. If the male is sterile, Dingmann explained, the focus can shift to morphology/shape changes after exposure to the chemicals that may affect male reproduction.

Simply put, the three chemicals being targeted by Dingmann and Armstrong's research are finding their way into the water, and research is showing that they're adversely affecting rotifer reproduction. The potential problem is magnified because rotifers dwell near the bottom of the food chain. If rotifers begin decreasing in numbers due to chemically induced reproduction difficulties, the impact will be felt far beyond organisms unseen to the naked eye.

"Fish feed on them, so the problem moves its way up the chain," Dingmann explained. "That's what's so important to stress, because people might read about rotifer research and wonder why we're doing this. It's simple: Rotifers are food for fish. Eventually, down the road, if we're affecting food for fish and affecting the fish population, you're going to have a lot of upset people."

The research is focusing on three chemicals used by humans in a variety of ways. The chemicals find their way to water through the leaching process, or are flushed directly into water.

"Waste treatment centers don't take away any of our hormones; they only take our organics," Dingmann explained. "Our hormones are flushed directly into lakes and streams, and they're affecting rotifers."

Recently, Dingmann and Armstrong conducted their first experiment to try to determine which rotifer, the male or female, is most affected by the chemicals. They then repeated the experiment. They were somewhat disappointed to see that early results were inconclusive.

Unlike a fish kill, with horrifying images of dead fish on a beach or floating on the water, rotifer damage is far less apparent, mostly due to their microscopic size. But even if people could see them with the naked eye, Dingmann said it's not like there would be dead rotifers everywhere.

"This is a disruption of their hormone system; it's sub-lethal damage. It's changing their biology without killing them," he explained. "A big thing in toxicology research is endocrine disruption. Everyone is trying to find chemical hormone disruption in any kind of animal, and when it comes to reproduction, rotifers are sentinels. They're a standard model organism in toxicology research."

Before they could do anything, Dingmann and Armstrong had to venture outside the laboratory to collect rotifers. Using a special net and digital camcorder on the Red Lake River, they were able to catch a bunch. Now, they have dormant eggs in the lab. Once placed in water, the eggs hatch. "A lot like sea monkeys," Armstrong said.

The research tandem hopes their work leads to a better understanding of the endocrine system of an animal that has only 1,000 cells. The bigger goal of such research, however, is spreading the word. "You publish it, you present it, you make people aware of what's going on," Dingmann said. "And not only do I learn, another huge benefit is that Vanessa gets to be a part of it; it furthers her exposure and her education."

He already knows that he'll be presenting his findings at an international conference in Mexico in the spring of 2006.

About UROP

Armstrong's work with Dingmann is just one of seven UROP projects underway this summer at UMC. Other projects are focusing on science, technology, music, agronomy and other topics.

UROP participants like Armstrong first must write a project proposal. They can either do research on their own under the supervision of a faculty member, or, in Armstrong's case with Dingmann, assist with research already underway. Once a proposal is approved at UMC, it advances to the Twin Cities U of M campus for approval. Each summer, at least a handful of UROP projects are undertaken at UMC.

Funding for a minimal wage and supplies is what makes a UROP project possible. Armstrong plans to write future UROP proposals to continue Dingmann's rotifer research. When this summer's work is completed, she will use the findings as the basis for a Website.

A mother as well as a student, Armstrong is a senior who's studying pre-pharmacy. If all goes as planned, she'll pursue a pharmacist degree at the University of Minnesota, Duluth.

"There's a huge need in the field," she said.

In addition to her UROP work, Armstrong is, "on the side," assisting Pam Elf, who teaches along with Dingmann in UMC's biology program, with her research. Elf is testing hormones in various reptiles.

"There are research opportunities at UMC that people don't know about," Armstrong said. "It's not just one project, one facet or one result; it's ongoing and it's growing, with more opportunities in the future."

Dingmann, who's in the process of establishing a UMC research collaborative with Georgia Tech, echoed those sentiments.

"This is very outward," he said. "Research here is going places."

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