Research raises consciousness for dehydration concerns in diabetic patients

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Research by Derek Daniels and colleagues has shed light on factors that may increase the likelihood of dehydration in diabetics. Credit: Douglas Levere

Some drugs used to treat diabetes mimic the behavior of a hormone that a University at Buffalo psychologist has learned controls fluid intake in subjects. The finding creates new awareness for diabetics who, by the nature of their disease, are already at risk for dehydration.

Derek Daniels' paper "Endogenous Glucagon-Like Peptide-1 Reduces Drinking Behavior and Is Differentially Engaged by Water and Food Intakes in Rats," co-authored with UB psychology graduate students Naomi J. McKay and Daniela L. Galante, appears in this month's edition of the *Journal of Neuroscience*.

The hormone, GLP-1, works in the body to increase the release of insulin, functioning the same way as many common injectable treatments for diabetes. Extensive research has already established GLP-1's role in the control of food intake, but the new study's authors say there was a profound absence of literature on its role in fluid intake.

"Naomi picked this up early on in her graduate work and published two other papers before this one showing GLP-1 decreases fluid intake in ways that weren't appreciated before," said Daniels, whose lab studies the neurobiology of ingestive behaviors, like thirst and dehydration.

When GLP-1 binds to receptors in the body it sends a signal to the brain that decreases fluid intake.

"We blocked that signaling," said McKay. "In doing so, we found an elevation in water intake."

But what sounds like straightforward behavioral pharmacology is a bit tricky when measuring incremental increases in a rat's fluid intake, especially when working with units of volume as small as the segments of time that measure computer processing speeds. Rats consume fluid in nanolitres, and since filling a teaspoon requires nearly 5 million nanolitres, researchers use a lickometer to study licking patterns.

"Licking patterns can give us hints about why rats drink more or less after an experimental manipulation," said Daniels. "In this study, we found that the rats were probably drinking more because they were

feeling less full from the drinking."

Lickometers measure the number of times a rat's tongue touches an electrical port. In doing so, the rat unknowingly completes an electrical circuit at the same time the port dispenses water. Each completed circuit is one lick. The lack of any sensation protects the integrity of the count. The number of licks are tracked and then translated into a given volume of fluid.

"Clearly what we're seeing, not just in this paper, but in all three papers, is that these substances decrease drinking behavior," said Daniels. "But we're not saying people shouldn't use these drugs to treat diabetes, and we're not saying they are ineffective tools for the treatment of diabetes. However for populations already at risk for dehydration it may be something we want to be more concerned about."

These conclusions arise from what Daniels says is "a reverse-engineering approach or a reverse drug discovery approach."

"Normally, it's the basic research that informs the applied research. Basic research tells us what drugs to try for treating a disease. But in this case, we've used the drug and the clinical relevance to learn more about basic abilities of the body and how the body functions," said Daniels.

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