Switching on the mommy gene

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Although a doting mom cuddling and caressing her infant may not seem to have much in common with a rat mother, she does. Not only are there striking similarities between the brain and hormonal systems of rats and humans that drive maternal behaviour, a U of T Mississauga professor suggests that early negative life experiences such as isolation, stress, trauma or inattentive parenting can affect whether a woman--or a rat--will become a good mother.

Alison Fleming, a UTM psychology professor and Canada Research Chair in Behavioural Neurobiology and Genetics, has studied the question of why mothers want to mother for 30 years. Her research investigates how early childhood experiences can trigger changes in the brain, hormones, and ultimately gene activity—changes which may have long-term effects not seen until decades later. “The quality of parenting a mother gives her offspring relates to the quality of mothering she herself received as a baby,” Fleming says. “It’s a cross-generational transmission of mothering style.”

Recently named as a lead investigator for the University of Toronto’s newly established Institute for Human Development (IHD), Fleming joins a team of the university’s top scholars and scientists devoted to untangling the connections between early childhood experiences and future health and well-being. The IHD will put research results to work by devising grass-roots interventions to optimize the prenatal and early childhood periods. From boosting a child’s school readiness to reducing the risk of obesity, diabetes and mental illness, or paving the way for effective parenting years down the road, the Institute ultimately aims to

set children on the right path for life.

Fleming's fascination for understanding maternal behaviour stems from her own experience being raised by a distant mother. "My mother was totally uninvolved with her children and I never understood why," Fleming says. "When I was in college, I met a professor who studied mothering and I thought, 'God, I'd really like to figure this out.'"

Fleming's research reaches beyond nature versus nurture and into the realm of epigenetics, the ability of environmental factors to switch genes on or off without altering the underlying structure of DNA. "This concept is not new," Fleming says, "but it has gained a lot of interest in my field to provide a mechanism through which early experiences could have an effect."

According to Fleming, a rat who licks and grooms her pups or a woman who engages and interacts with her baby, will produce offspring that are more likely to grow up to be sensitive and attentive mothers themselves. Similarly, babies that have been deprived, abused or neglected will often have trouble later on to mother. In either case, epigenetics are at play. "It's an experiential effect," Fleming says. Rat pups born to a low-licking mother but raised by a high-licking mother have a gene 'turned on' to exhibit high-licking when they become mothers. "It's interesting that the experience can happen now, the gene alteration can happen now, but the expression of the gene can happen a lot later," Fleming says.

As a collaborator in the Maternal Adversity, Vulnerability and Neurodevelopment (MAVAN) study currently underway in Ontario and Quebec, Fleming will get a closer look at how genes interact with the environment to affect parenting. MAVAN tracks 500 women and their children from the second trimester of pregnancy until the children are five years old, assessing health, mood, cognition, hormones, genetics and other parameters.

As always, Fleming will use the findings to search for ways to help parents and children overcome the effects of negative early experiences. “Although the biology is similar, we’re much smarter than rats,” Fleming says. “For us, biology is not deterministic.”

Provided by University of Toronto Mississauga