Study explores fetal alcohol impact at molecular level

19 July 2013, by Paul Mayne

While some physicians tell women a small amount of alcohol is OK during pregnancy, Ben Laufer vehemently disputes any such advice – and he has the research to back it up.

The Western PhD student (Biology) said fetal alcohol spectrum disorders are characterized by life-long changes in gene expression, neurodevelopment and behaviour. But while the mechanisms that initiate and maintain these changes are not known, Laufer's research suggests a role for alcohol-induced epigenetic changes, both at binge- and moderate-level consumption.

His study, Long-lasting alterations to DNA methylation and ncRNAs could underlie the effects of fetal alcohol exposure in mice, was published in *Disease Models & Mechanisms*, an open-access international biomedical research journal.

Through mice studies, which he said have close to 90 per cent similar genetic content to humans, Laufer found changes in gene expression, regardless the level of alcohol.

Laufer, a student in professor Shiva Singh's laboratory, is interested in the epigenetic mechanism.

You get genes from your mom and dad, and together that makes up your DNA. The thing is you don't just inherit DNA from your parents. DNA is actually only a small amount of the inheritable material. So what it comes down to is these mechanisms, Laufer said.

"With epigenetics, pretty much all your cells, with a few exceptions, have the exact same DNA sequence, yet they're all so different. Your brain cell is much different than a skin cell, for example. The only difference between them is where these epigenetic marks are."

Laufer equates the genome to a computer, with the epigenome acting as the software.

"Depending on where these marks are positioned, the genetic sequence takes on an entirely different structure. It's pretty much the 3-D shape of the DNA and that entirely influences whether these genes are active or inactive," he said.

He added environmental responsive epigenetics as well. But while your genome is static, epigenetics can happen after a single generation. Generally, they aren't as pronounced, said Laufer, but in certain cases they can be and it's the brain that is most reliant of all.

"My theories are that's how your consciousness, your cognition, as well as brain development are regulated," he said.

Laufer expected affects from the alcohol consumption, but not as profound. He found a third of the genome's epigenetic marks, specifically DNA methylation, showed changes in young adults – even 70 days after they were exposed, which he said is plenty of time to recover.

"This is from a mother who would have had a moderate amount of alcohol, roughly correlating to a mother that would have a beer every now and then or glass of wine on the weekend. It's not good," Laufer said. "The big concept here is there's a big public health issue now because there are still a lot of doctors out there telling mothers that it's OK to have a drink or two, don't go crazy.

"Doctors like the black-and-white answers, but with scientists, it's all these shades of grey. It's just not worth it. "

While he's not the first to show the dangers of alcohol consumption during pregnancy, Laufer sees his as the most extensive at the molecular level, while other studies have been simply judging

behaviour.

"A lot of complex brain diseases are being linked together, such as autism and schizophrenia, which are believed to have a very similar genetic background," Laufer said. "Now, we've linked fetal alcohol to that."

Provided by University of Western Ontario