

Epigenetic study of lactose intolerance may shed light on the origin of mental illness

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A new study on the epigenetics of lactose intolerance may provide an approach to understanding schizophrenia and other complex, serious illnesses.

Both lactose intolerance and schizophrenia are inherited. In addition, neither condition emerges in the first years of life, but rather both appear years or even decades later, says senior author Dr. Arturas Petronis, head of the Krembil Family Epigenetics Laboratory in the Campbell Family Mental Health Research Institute at the Centre for Addiction and Mental Health (CAMH).

The study, published in *Nature Structural and Molecular Biology*, showed that a combination of genetics and epigenetics - factors that turn genes on or off - could explain how lactose intolerance develops over time. These basic principles can be applied to the study of more complex mental illnesses such as schizophrenia, bipolar disorder or Alzheimer's disease. All these conditions also have DNA risk factors but take decades before clinical symptoms develop, says Dr. Petronis, who also is the Tapscott Chair in Schizophrenia Studies at the University of Toronto.

More than 65 per cent of adults worldwide are lactose intolerant and cannot process the milk sugar lactose. Lactose intolerance is influenced by one gene, which determines if a person will lose the ability to process lactose over time. More specifically, those with some variants of this gene will gradually produce less lactase, the enzyme that breaks down lactose, as they age.

"The question we asked is why does this change happen over time? All newborns are able to digest lactose, independently from their genetic variation," says Dr. Petronis. "Now, we know that epigenetic factors accumulate at a very different pace in each person, depending on the genetic variants of the lactase gene."

Over time, these [epigenetic changes](#) build up and inactivate the lactase gene in some - but not all - individuals. At this point, these individuals would start experiencing symptoms of [lactose intolerance](#).

Unravelling the epigenetic control of the lactase gene involved a collaborative effort of CAMH, University of Toronto, the Hospital for Sick Children, Vilnius University and the Lithuanian University of Health Sciences.

Mental illnesses are much more complex, and many more genes with their epigenetic "surroundings" are implicated. But in essence, the same molecular mechanisms may account for the delayed age of onset of illnesses, such as schizophrenia, in early adulthood, says Dr. Petronis.

The combination of genes and epigenetic factors that build up over time with age, provide a plausible avenue to investigate in illnesses such as [schizophrenia](#). "We came up with interesting hypotheses, and possibly insights, into risk factors for brain disease by studying aging intestines," he says.

More information: Viviane Labrie et al, Lactase nonpersistence is directed by DNA-variation-dependent epigenetic aging, *Nature Structural & Molecular Biology* (2016). [DOI: 10.1038/nsmb.3227](https://doi.org/10.1038/nsmb.3227)

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