Being right-brained or left-brained comes down to molecular switches

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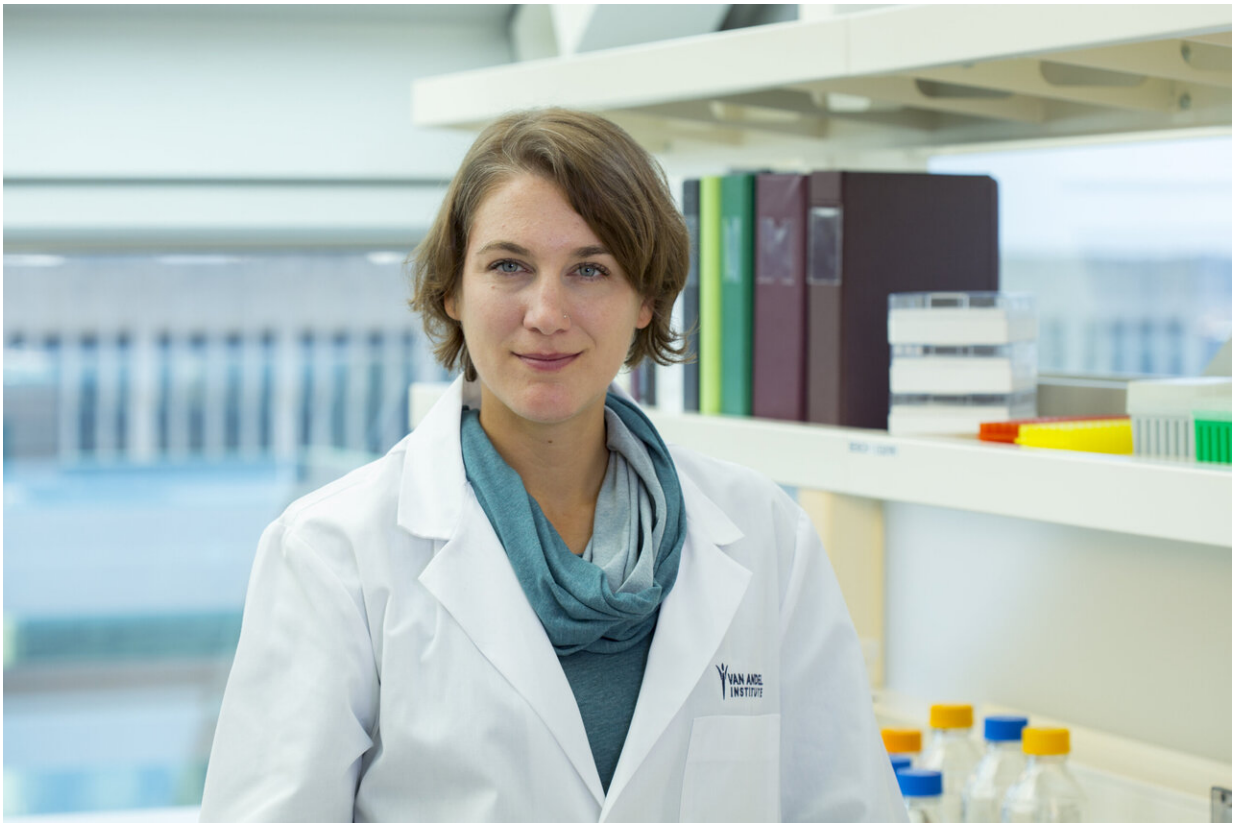

Dr. Viviane Labrie. Credit: Van Andel Institute

Scientists may have solved one of the most puzzling and persistent mysteries in neuroscience: why some people are "right-brained" while others are "left-brained."

The answer lies in how certain genes on each side of the brain are switched "on" and "off" through a process called epigenetic regulation. The findings may explain why Parkinson's disease and other neurological disorders frequently affect one side of the body first, a revelation that has far-reaching implications for development of potential future treatments.

The study was led by Van Andel Institute's Viviane Labrie, Ph.D., and published in the journal *Genome Biology*.

"The mechanisms underlying brain asymmetry have been an elephant in the room for decades," Labrie said. "It's thrilling to finally uncover its cause, particularly given its potential for helping us better understand and, hopefully one day, better treat diseases like Parkinson's."

Each cell in the brain has the same genes but it is epigenetics that dictate whether those genes are switched "on" or "off." Labrie and her collaborators found numerous epigenetic differences between the hemispheres of healthy brains that are linked to variations in gene activity. Notably, these differences, or asymmetry, could make one side of the brain more vulnerable to neurological diseases.

For example, epigenetic abnormalities on one side of the brain could make that hemisphere more susceptible to the processes that cause the death of brain cells in Parkinson's. The differences in cell death across hemispheres leads to the appearance of the disease's hallmark symptoms, such as tremor, on one side of the body before the other. As the disease progresses, symptoms on the side first affected often are more severe than symptoms on the other side of the body.

The findings also give scientists a vital window into the various biological pathways that contribute to symptom asymmetry in Parkinson's, including brain cell development, immune function and

cellular communication.

"We all start out with prominent differences between the left and right sides of our brains. As we age, however, our hemispheres become more epigenetically similar. For Parkinson's, this is significant: people whose hemispheres are more alike early in life experienced faster disease progression, while people whose hemispheres were more asymmetric had slower disease progression," Labrie said. "Many of these changes are clustered around genes known to impact Parkinson's risk. There is huge potential to translate these findings into new therapeutic strategies."

Labrie is already starting to look at this phenomenon in other neurological diseases like Alzheimer's.

The study is one of the first to parse the molecular causes of brain asymmetry. Early research on the left versus right brain was conducted in the mid-20th century by Roger Sperry, whose groundbreaking work with split-brain patients earned him a Nobel Prize.

More information: Peipei Li et al, Hemispheric asymmetry in the human brain and in Parkinson's disease is linked to divergent epigenetic patterns in neurons, *Genome Biology* (2020). DOI: 10.1186/s13059-020-01960-1

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