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# Now you can blame those extra pounds on the 'ice age' gene

By ANNE MCILROY

*Potatoes and gravy. Pudding. Pie. As the days get shorter and colder, many people crave rich, fatty foods almost as much they do an extra hour or two of sleep in the morning.*

Scientists who study seasonal behaviour in humans say most people report changes in how they eat, sleep and feel in the fall and winter. In some cases, the changes are extreme and can include putting on 40 pounds by the time the snow finally melts. We're not bears, so why do so many of us want to hibernate in the winter?

Robert Levitan, a senior clinical researcher at the Centre for Addiction and Mental Health, is looking to the cold, distant past for answers. He suspects that genes that may have helped our ancestors survive the last ice age still influence human behaviour when winter sets in.

One possible "ice age" gene is relatively common among North Americans - about 30 per cent of people carry it, Dr. Levitan says.

He and his colleagues - CAMH neurogeneticist James Kennedy and York University psychologist Caroline Davis - theorize that people who have it are more likely to consume satisfying, rich foods in the winter because it gives them a much-needed boost of dopamine, a chemical associated with the pleasure system in the brain.

A gene like that would play a role in regulating food consumption and energy expenditure. Evidence suggests it is activated by shorter days and that it plays a role in the urge many Canadians get at this time of year to hunker down and help themselves to an extra serving of roast pork.

"We used to have this tendency to consume carbohydrates and fats in the winter. It helped us survive. We still have this in our biology, but now it is a nuisance, because we have all this food around, plus we are less active," Dr. Levitan says.

Seasonal behaviour changes are common; one study found that 90 per cent of people report a change in either their appetite, energy level, mood or sleep pattern in the fall and winter.

But for people with seasonal affective disorder, or SAD, those shifts are disabling. By studying the genes at work in this relatively small population, scientists such as Dr. Levitan can learn more about the biological roots of the less debilitating changes experienced by so many northerners.

SAD affects an estimated 4 per cent of Canadians 20 to 50 years old and is far more common among women.

**Craving carbohydrates**

In the fall, women with the disorder start craving carbohydrates and sleeping too much. Depression is a later symptom, Dr. Levitan says.

"But it is more a profound fatigue, a real flat feeling. It is an energy-related problem as opposed to just feeling blue."

He and his colleagues have zeroed in on a gene that has a stronger effect on women with the disorder. Those with the gene gain far more weight every winter. Known as the 7R version of DRD4, the gene is carried by almost a third of North Americans.

Dr. Levitan's theory is that it helped our ancestors get through some very tough times as they migrated out of Africa into northern areas.

Until about 10,000 years ago, much of the Northern Hemisphere was covered by thick sheets of ice and snow. Slowing down and storing fat during the darkest, coldest days of the year might have helped them survive.

It was during this period of human migration - the past 40,000 years - that the gene went from being a rarity to being far more prevalent.

So what does it do?

Dr. Levitan's colleagues, Dr. Kennedy and Hubert Von Tol (who died in a cycling accident in 2006), found evidence that it is less active than other variations of the dopamine receptor gene. This led to the hypothesis that people who carry it may eat more to boost levels of dopamine in their brains.

Light is very important to the way the gene works. People with SAD start eating more in the fall when there is less sunlight, and can benefit from exposure to bright, artificial lights.

The gene also appears to be helpful to populations still on the move. A study done in Africa, among a migrating population of Ariaal people of northern Kenya, found that the gene predicted increased muscle mass in men who covered large distances.

But it didn't have the same effect in an Ariaal population that had settled down and become farmers.

People who carry the gene are also more likely to have attention deficit hyperactivity disorder, or ADHD.

Henry Harpending of the department of anthropology at the University of Utah has speculated that energetic, impulsive behaviour that characterizes ADHD may have helped early humans find resources as they explored new territory. Perhaps it also contributed to their decision to keep moving, he says.

It is a complex picture, but Dr. Levitan says it helps to think of the gene in the context of early humans picking their way across Europe and Asia and eventually making their way to North America.

**Homebodies vs. travellers**

Women who stayed put during the winter, especially if they were pregnant, might have had more children who survived, and they would have passed on the gene to their children. Men with the gene might have had the ability to travel greater distances in search of food to bring back to their families. Again, this would have helped their offspring survive.

Seasonal behaviours almost certainly involve many genes. There is evidence, for example, that levels of serotonin, another chemical that is key to brain function, vary at different times of the year.

The foraging gene, first discovered in fruit flies by University of Toronto researcher Marla Sokolowski, may also play an important role.

Fruit flies with one version of the gene are rovers; they move around a lot in search food, but actually eat less. They tend not to go into a state that resembles hibernation. They also have better memories. (Dr. Sokolowski knows this because when she and her French colleague, Fred Mery, gave the flies banana to nibble on, then delivered an electric shock, the insects learned to avoid the fruit.)

Flies with another version of the gene are sitters. They feed locally, so don't move around as much. They eat way more, and are fatter and more likely to hibernate. But their memories aren't as good.

There are parallels with SAD, says Dr. Sokolowski, who holds a Canada Research Chair in genetics and behavioural neurology. In the fall, women with the disorder become very inactive and eat massive quantities of food. They also have problems with attention and memory. "It is almost like they go from rovers to sitters," Dr. Sokolowski says.

She and Dr. Levitan are now looking to see if women with SAD are more likely to have a sitter version of the gene. So far, they have screened 300 women, and have 300 more to go.

But Dr. Sokolowski has a hunch that the gene also plays a role in how many of us feel as winter closes in.

"I eat a lot more in the fall."

*Anne McIlroy is The Globe and Mail's science writer.*