The brain's “resilience”: Yale University study reveals that neurons have their own “emergency battery” [1]

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When the main energy source for neurons fails, glycogen reserves are activated so that neurons can continue to function, even during times of high energy stress. (Shutterstock)

Imagine that, as often happens in the archipelago, the power goes out in your home. But you're not worried, because you have other sources of energy—batteries, generators, or solar panels—that keep the essentials running. The same thing happens with a hybrid car; it uses different fuels to propel itself.

Something similar happens in the brain, according to a new study from **Yale University** [3], which found that neurons—the cells that allow us to think, feel, move, learn, remember, and react—have their own “emergency battery” in the form of glycogen, a type of stored sugar, explained Puerto Rican scientist **Daniel Colón Ramos** [4], corresponding author of the research and professor of neuroscience and cell biology at Yale School of Medicine.

"We found that, contrary to what was previously thought, neurons have another type of fuel that they also use, called glycogen. Glycogen is actually a chain of sugars, and that chain of sugars functions like a battery, like a reserve,“ he told **El Nuevo Día** by telephone. ”The way glycogen works is equivalent to a solar panel battery, **where you store energy and, when you are in an energy-stress situation, you can then use the battery to power the rest of the house."**

In summary, when the main energy source of neurons fails, these reserves are activated so that neurons can continue to function, even in times of high energy stress, according to findings published in the scientific journal **Proceedings of the National Academy of Sciences** [5]

(PNAS).

According to Yale researchers, this mechanism is vital because it allows neurons to maintain communication—through synaptic vesicles—even in situations of high energy stress. Without this backup battery, the connection between neurons—and with it, thought, reflexes, and memory—could be affected.

“The prevailing thinking in the field was that glycogen was not being used by neurons, but that these energy stores were in other cells called glial cells,” he added. “The concept of glycogen as a battery, as an energy reserve, was known, but it was known for other cells, such as muscles. (...) These energy reserves are what allow athletes, for example, to ride bicycles for long distances, because sugar runs out quickly, and then what you have left are these batteries working.”

Colón Ramos recalled that “the brain functions on the energy it has.” “If you don't have energy, that's the difference between a dead brain and a living brain,” he emphasized. In that sense, the new study **could help develop ways to protect the brain in conditions such as strokes, epilepsy, or neurodegenerative diseases, all of which are related to energy problems in cells.**

“This has important consequences because the brain's capacity, or resilience, depends on mechanisms such as these. So, if we don't understand the mechanisms that give the brain its resilience, in cases where those mechanisms are not working properly, we won't understand what is not working properly,” said the Puerto Rican scientist.

As part of the study, the Yale team used the microscopic worm *Caenorhabditis elegans* (C. elegans), a simple model that allows for the study of nervous system processes.

Colón Ramos described the transparent organism—which has been at the center of several Nobel Prize-winning scientific discoveries—**as a “pioneering model” in the field of scientific research.**

“This worm is a wonderful tool for making this kind of discovery, because we have a lot of control over the animal's biology, we understand many of the components of its biology. So, we can look at these kinds of questions with a high level of curiosity, which allows us to understand the questions at a level that would be almost impossible to understand in any other system, especially in a system like an intact human being,” he emphasized.

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