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Brain cortex neural reservoir analysed

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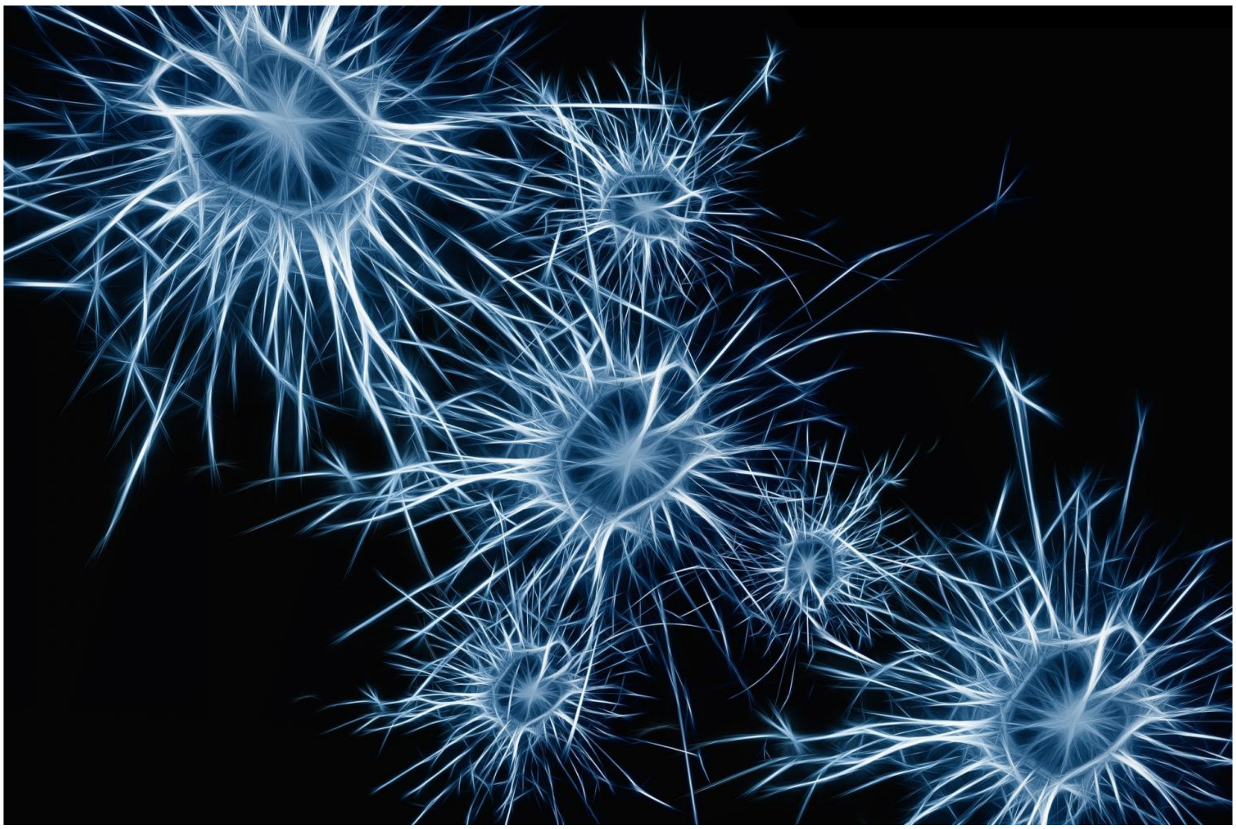

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A recent study headed by Dr. Juan Nácher of Valencia University has shed light on a new function of neural plasticity and confirms the presence of a 'reservoir' of neurons that are added to the networks during adult life rather than during the developmental stage, as is normally the case.

Even though researchers still do not know exactly which neural networks they can become a part of, nor the factors that cause their maturation, these neurons could be involved in some types of learning or memory.

The results of this project have been published in *Cerebral Cortex* in an article titled "Cellular Plasticity in the Adult Murine Piriform Cortex: Continuous Maturation of Dormant Precursors Into Excitatory Neurons."

For this research, Dr. Nácher drew from studies that confirmed the presence of a significant population of immature neurons in the cerebral cortex of adult rodents. "At first, we thought the neurons were of recent generation, but we verified that even though they were generated during embryonic life like the rest, they remained in an immature state for a large part of the animal's life."

When the individual reaches adulthood, these immature neurons are not functional as their dendrites and axons are underdeveloped and are not part of synapses with other neurons. It is as if they were "disconnected." However, they disappeared as the animals grew older. "We suspected that they matured and gradually became integrated into neural networks, but without knowing what type of neurons they turned into as time goes by. This research has verified that they turn into the characteristic excitatory neurons of the cerebral area where they are located."

Even so, as Dr. Nácher confirms, there are still many questions surrounding them and their maturation and integration processes. "These neurons are very interesting because, even though in rodents they are restricted to a very specific area linked to smelling, for primates, including humans, they are spread over practically the entire cerebral cortex and in large numbers. This abundant presence leads us to believe that they could have a significant role which we are yet unaware of."

On the other hand, testing with animals has revealed that the immature neurons are affected by chronic stress and in animal patterns of depression. According to the researcher, if this is confirmed in humans, it could help to learn more about pathologies with neural implications.

The study was carried out using genetically modified mice. "These transgenic mice have a fluorescent protein which only reveals itself in immature neurons. Taking advantage of this, we were able to view their morphology and activate it to ensure it was present in the neurons for a longer period of time. The protein became active when the mice were young and we could see the state of these neurons when the animals became older. We verified that, at first, the fluorescent neurons were immature, did not receive synapses and were atrophied and that, six months later, they had turned into regular excitatory neurons," explains Dr. Nácher.

The transgenic animals were created in Salzburg, while the INCLIVA team was in charge of analysing the immature neurons of the rodents to learn how their morphology changed, how they received synaptic contacts and how they became integrated into the networks.

The next step is to study these neurons in humans. The team is already looking for data on the distribution of these neurons in order to verify their presence and whether they have an effect on certain pathologies. They are also learning how their addition to cerebral activity takes place. "It seems like the immature neurons are progressively added to the cerebral networks from when the individual is an adult as he or she ages. In animals, we know that their integration rate is progressively lower because they don't grow back: they are slowly added to the networks. If these neurons take part in any kind of cognitive activity, it is possible that in older animals, the process will run less smoothly as time goes by, as there are less and less immature neurons."

Even though the study is currently in an initial phase and talking about its uses is premature, "we could try to establish methods to control the maturation of these neurons at any given moment, for example, following brain damage. We also know that some antidepressants and other psychotropic medication affect the maturation process of these cells, which enables us to open new lines of research in this field," concludes the researcher.

Provided by Asociacion RUVID

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