Research study describes the role part of the brain plays in memory

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A research with experimental rats carried out by the Institute of Neuroscience of the UAB describes the brain region connected to how our declarative memory functions.

According to this experiment, part of the prefrontal cortex plays a key role in the social transmission of food preference. This research has helped learn more about how this type of memory functions. In the future, this information could be useful to find new treatment for diseases that affect the memory, such as Alzheimer's disease.

Declarative memory is described as a flexible, conscience and associative type of memory (i.e., it is based on relations between different stimuli). It differs from other types of memories that allow us to recall effective or emotionally-charged data, or carry out processes such as riding a bicycle or playing an instrument. Declarative memory allows us to remember things such as specific moments of our lives, names of people, what we ate for lunch, the capitals of the world, etc. The malfunctioning of this type of memory is one of the most common symptoms found in those suffering from Alzheimer's disease.

A useful model from which to learn about how declarative memory functions is the social transmission of food preference. In other species, this task is connected to the survival of the species and plays a crucial role in their evolution. In this research, the social transmission of food preference was carried out with experimental rats.

When one rodent sniffs another rodent's snout right after the second one has eaten, the first one will later choose to eat the same exact food. Animals learn to remember what their congeners eat and, in that way, lower the risk of eating new foods that could be harmful to them. In addition, they must later use this information acquired during a brief episode of social interaction in very different circumstances. Therefore, they need the flexible expression of memory, which is one of the main traits of declarative memory.

This task depends on learning how to associate smells, a function that is commanded by a specific region of the brain, the nucleus basalis magnocellularis (NBM), which produces acetylcholine (a neurotransmitter that "transfers information" from one neurone to another through synapses). This chemical substance is essential in making the memory work correctly. The nucleus basalis magnocellularis equivalent in humans is the nucleus basalis Meynert. Precisely this is one of the regions of the brain that shown signs of degeneration among those who suffer from Alzheimer's (and who are often treated with drugs that help to produce acetylcholine).

The acetylcholine produced by the nucleus basalis is transferred to other regions of the brain, where it is "recognised" by receptor molecules. The research team examined the possibility of one part of the brain, the prelimbic prefrontal cortex, being linked to the social transmission of food preference. To do so, they applied a chemical compound to the experimental rats that neutralised the acetylcholine receptors (muscarinic cholinergic receptor) of this region. By blocking the receptor, the effect of the neurotransmitter was also neutralised and the changes in the animals' behaviour were observed.

The results demonstrated that the social transmission of food preference was clearly affected after neutralising the acetylcholine receptors. Researchers also verified that the effects were not due to other aspects

that could alter the experiment, such as lack of olfactory perception, motivation or social interaction. The results therefore suggest that the prelimbic prefrontal cortex, via the use of acetylcholine, regulates cognitive operations (e.g. flexibility in behaviour, attention or strategic planning) that could be needed to correctly express social transmission of food preference, and therefore necessary for our declarative memory.

Source: Universitat Autonoma de Barcelona