# Cannabis & memory losses

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*Numerous studies have shown that elevated consumption of cannabis can lead to losses of memory in the short to long term. Recent studies permit us to consider whether this effect could be due to a perturbation in the mitochondria present within hippocampal cells of the brain.*

The psychoactive effects of **cannabis** are due to delta-9-tetrahydrocannabinol (THC), the principal cannabinoid present in this plant. This molecule possesses a structure similar to the cannabinoids naturally present in the body (such as anandamide) and could thus interact with their receptors which are present in several regions of the brain. Because these natural cannabinoids are the neurotransmitters involved in several mental processes (emotions, sensory perception and memory), THC could artificially affect these processes and modify the normal functioning of the brain.

Some of these effects are considered to be positive (improvements in humor, relaxation, increased appetite) while others are negative (difficulties concentrating, poor coordination and loss of motivation, amongst others).

## LOSS OF MEMORY

The problems with memory are another undesirable secondary effect that is often observed in regular consumers of cannabis, because THC acts directly on the hippocampus, a region of the brain that is indispensable for memory.

According to work performed by a group of French scientists, this negative effect of THC is due to its interaction with a receptor located in the mitochondria, the centers of energy within the cells[1]. They discovered that this interaction unleashes a cascade of events which ultimately lead to a reduction in the activity of the respiratory chain located in the mitochondria, resulting in decreased energy produced within the cell. This loss of energy diminishes the performance of the neurons, which explains the poor memory function associated with the consumption of cannabis.

This is the first time that research has clearly demonstrated that the mitochondria play an important role in advanced cognitive functions such as learning and memory. This is, however, not as

surprising as one might think; even though the brain represents only 2% of the body weight, it alone consumes up to 25% of the energy used by the body. Since the mitochondria are responsible for this production of energy (in the form of ATP), it is obvious that these "energetic centers" play an extremely important role in the function of the brain. It is also interesting to note that people who suffer from diseases caused by dysfunctional mitochondria exhibit serious neurological symptoms.

## DANGEROUS ABUSE

Over the past few years, our society has become ever more tolerant of cannabis use. The recreational use of the drug has been decriminalized for decades and there is increasing discussion about simply legalizing its sale.

This change in attitude is normal, because cannabis has been generally available to buy for over 50 years and we now know that its occasional consumption does not provoke any major negative effects on health. But, as is well illustrated by the results of the study published in *Nature*, the abuse of cannabis leads to major derangement of neuronal function and can thus cause several mental troubles, notably to the memory processes.

As with alcohol, the border between the positive and negative effects of cannabis is very fine and it must be treated with moderation. Just because a substance is legal does not mean that it is without danger.

(1) Hebert-Chatelain E et al. A cannabinoid link between mitochondria and memory. Nature 2016;539:555-559.

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