

WHAT HAPPENS TO OUR BRAIN?

(document for students)

WORK DYNAMIC

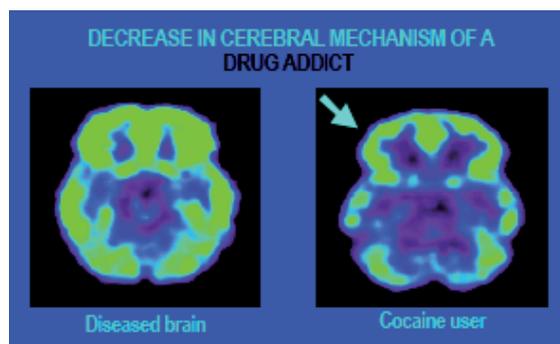
The final result of this session is the formulation of the questions that, within the activity of the “Let’s talk about drugs” programme of the “la Caixa” Welfare Project, you will ask Dr. Rafael Maldonado (university chair of pharmacology at the Universitat Pompeu Fabra). To do this, we have prepared an introduction that you must read carefully (better individually) so that we can then analyse a series of myths about the effect of drugs. This will help open up a discussion amongst yourselves that will make the question-making more productive regarding the subject **What happens to our brain?**, which you will ask Dr. Rafael Maldonado.

1. INTRODUCTION

Addiction is understood as the state that leads to the abusive consumption of a drug with the aim of obtaining a feeling of wellbeing and/or preventing the negative consequences of withdrawal symptoms, a situation that leads to a compulsive search, loss of control in consumption and successive relapses despite their negative consequences.

Drugs act on the **nervous system**, intensifying or inhibiting the activity of neurotransmission mechanisms. Taking into account the current knowledge of the functioning of the encephalon, we know that addictive drugs exercise their influence over what are called “cerebral reward circuits”, so that their consumption produces pleasure yet deactivates other behavioural control circuits, or decreases their activity.

The neurons that use dopamine as molecular messenger or neurotransmitter are located in very specific structures of the encephalon. But the **drugs with addictive capacity** -all of them very different such as cocaine, ecstasy, tobacco, cannabis, alcohol or heroin- share their capacity to affect the cerebral trunk that sends its fibres towards the limbic system, including the nucleus accumbens). These routes use dopamine as neurotransmitter.



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There are hundreds of neurotransmitters of different chemical nature, such as mono-amino and amino acids, peptides, lipids, etc. Among the most well known is the group of catecholamines (which include dopamine, noradrenaline and adrenaline), as well as acetylcholine, serotonin, and gamma-amino butyric acid (GABA). The alterations of the molecular concentration of these substances are related to large number of neurological disorders.

Regarding the active mechanism of addictive substances, we know that:

- **Cannabis** acts on some very selective targets of the brain, the cannabinoid receptors. Cannabis joins up with these receptors perfectly (like a key in its keyhole). Its consumption in adolescence causes neurobiological changes during the period of cerebral maturing and is associated with the appearance of mental disorders in adult age, with a greater consumption of other drugs in the future, with more difficulty in giving up, with problems of school performance and premature abandoning of studies.
- **Cocaine** is a stimulant drug that inhibits the recapture of dopamine. As a consequence of this blocking there is a generalised increase of dopamine in the synapses, and a continuous stimulation of the receptor neurons, which is associated with euphoria and the pleasurable effects of cocaine. But abuse of cocaine -as in the case of other drugs- creates tolerance: the brain will need an increasingly larger dose and more often in order to reach the similar levels of wellbeing.
- **Amphetamines** provide the release of dopamine (and noradrenaline) to the presynaptic neuron.
- **Heroin** connects directly to the receptor of the neurotransmitter; an action that imitates the effects of endogenous opioids, an encephalic mechanism with a control that extends beyond the neurovegetative functions and motor activity, pain, the emotions and the response to stress.
- **Nicotine**, as well as raising the levels of dopamine, it acts on specific receptors or nicotinic receptors, which increases the release of different neurotransmitters.
- **Alcohol** -which, like other drugs also raises the level of dopamine, is a depressor of cerebral function which acts particularly on neuronal networks with the intervention of GABA (gamma-amino butyric acid).
- **Ecstasy** facilitates the release of dopamine, as well as serotonin.
- As regards **LSD**, we know that it alters the functioning of the cerebral serotonin and that it increases its activity in specific areas.



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2. REFLECTION WORKSHOP

You analyse the following MYTHS and justify, from a scientific standpoint and taking into account that you are working on the subject **What happens to our brain?** , if they are true or not:

1) "Smoking a cigarette is relaxing and relieves stress"

2) "I am not addicted to tobacco, I can give up smoking whenever I want"

3) "Drinking alcohol helps you out of depressing situations, to overcome tiredness and be livelier and in form"

4) "You can control taking cannabis since it is not addictive"

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5) "Consumption of cocaine is easy to control"

6) "If you smoke heroin you can control it"

7) "Giving up heroin is practically impossible"

8) "Synthetic drugs do not create dependency"

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3. QUESTIONS TO ASK DR. RAFAEL MALDONADO

Having analysed the myths, and after a discussion between yourselves, think of 5 or more questions to ask Dr. Rafael Maldonado (remember that you have a scientific focus and that Dr. Maldonado is an expert in neurobiology of addiction):

1)

2)

3)

4)

5)

