

Research shows club drug GHB associated with brain and cognitive changes

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Scientists have discovered that regular use of the party drug GHB, and especially unconsciousness following GHB use, is associated with brain changes including negative effects on long-term memory, working memory, IQ, and higher levels of stress and anxiety. This work is presented at the ECNP conference in Barcelona, following partial peer-review publication*.

GHB (gamma-hydroxybutyrate), also known as 'G', 'liquid ecstasy' (etc), is a central nervous system depressant. It is used extensively in clubs, but also in private house parties. It produces an initial feeling of euphoria in users, but it can also cause sleepiness, and users easily tip into a coma. Some regular recreational users will often fall into a coma, which can require hospital treatment: it is not unusual that regular GHB users have experienced more than 50 GHB-induced comas. Despite its limited recreational use, GHB overdose and coma is the third** most common drug-related cause for emergency medical attendance in Europe, after heroin and cocaine, and this trend is increasing.

To understand the effects of GHB on the [brain](#), a team of scientists from the Amsterdam UMC, recruited 27 GHB users who had experienced multiple GHB-induced comas (with a minimum of 4 comas), 27 GHB users who had never had a coma, and 27 volunteers who had used drug combinations (polydrug), but had never used GHB. Each person was asked to complete an adult reading test as proxy for IQ, anxiety, depression and stress questionnaires and they performed different neurocognitive tasks while undergoing a brain scan (fMRI, functional Magnetic Resonance Imaging).

There were two main findings. Firstly, GHB use, even in those who did not undergo a coma, was associated with alterations in identification of negative emotions. Secondly, the presence of GHB-induced comas, but not the use of GHB per

se, was associated with lower IQ (despite similar educational level), and altered brain processes during verbal long-term memory and working memory. Additional analyses showed that these findings could not be attributed to group differences in the use of drugs other than GHB.

Lead researcher, Filipa Raposo Pereira, said "Surprisingly little is known about the effects of GHB in humans, and as far as we know, these are the first functional MRI scans to gauge the effect of the regular GHB use and multiple GHB-induced comas. Our results indicate that there may be risks involved in regular GHB use. This is particularly relevant to regular users with multiple GHB-induced comas; we found that these users show differences in cognition to either those who don't fall into a [coma](#), or drug users who have never used GHB.

In an as yet unpublished study, we show that those with multiple GHB-induced comas also have 63% more stress and 23% more anxiety, and alterations in long-term memory. MRI scans also show that there are changes to the brain, with some areas showing altered brain activity and connectivity between memory-related cerebral pathways. These results show that there are brain and cognitive changes associated with multiple GHB-induced comas. Most users experience only the feeling of elation followed by drowsiness or sleep, so they don't see that there might be any negative effects. This work indicates that might not be the case".

Commenting, Professor David Nutt (Imperial College, London) said: "This research is interesting and recreational users should be made aware of these findings. They probably reflect periods of hypoxia due to excessive GHB concentrations in brain. When GHB is used in a regulated fashion as a medicine—for example, for narcolepsy—there doesn't appear to be a similar risk, so patients on this medicine should not worry".

More information: Conference Abstract P718:

The influence of GHB-use and GHB-induced coma on affect and the affective network

*This work includes new material, not presented elsewhere. It includes research from the peer-reviewed papers: Adverse effects of GHB-induced coma on long-term memory and related brain function, Filipa Raposo Pereira et al (published in *Drug and Alcohol Dependence*, Sept 2018) doi.org/10.1016/j.drugalcdep.2018.05.019 and Effect of GHB-use and GHB-induced comas on dorsolateral prefrontal cortex functioning in humans, Filipa Raposo Pereira et al (published in *Neuroimage: Clinical*, Sept 2018) doi.org/10.1016/j.nicl.2018.09.022 Other parts of the work have not yet been published.

**See European Drug Report, 2017, www.emcdda.europa.eu/system/files/2017/05/541/TDAT17001ENN.pdf Figure 3.8. Background information on GHB (from the European Monitoring Centre for Drugs and Drug Addiction, 2008) can be found at: www.emcdda.europa.eu/system/files/2017/05/B_and_GBL_107300.pdf

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