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Does CBD affect our bodies response to Alcohol?

A New Study
by Professor Saoirse O'Sullivan

After a single dose of CBD (of approximately 21 mg, consistent with the types of doses used in over the counter products), there was no effect on blood alcohol levels in university students who consumed an alcoholic beverage (0.54g/kg of ethanol). In these studies, CBD did not affect the effects of alcohol on performance tests of reaction speed, steadiness or coordination (Belgrave et al., 1979; Bird et al., 1980). CBD alone had no effect on the performance tests. Using a higher dose of 200mg CBD, Consroe and colleague found that CBD caused a slight reduction in blood alcohol levels after healthy volunteers consumed 1g/kg of alcohol, although CBD did not change the effects of alcohol on motor and cognitive performance tests (Consroe et al., 1979). Similarly, in animal studies, CBD treatment (from 2.5-50 mg/kg) did not affect the locomotor response to chronic alcohol treatment or the intoxicating effects of alcohol (Filev et al., 2017; Liput et al., 2013). Even at much higher doses (30-120 mg/kg/day), CBD did not affect the blood alcohol levels after consumption of a high dose of alcohol in animal studies (Viudez-Martínez et al., 2018b), suggesting CBD does not affect the metabolism (breakdown) of alcohol.

Alcohol metabolism happens mainly in the liver by two enzymes; alcohol dehydrogenase and cytochrome P450 2E1 (Chan and Anderson, 2014). While CBD is known to inhibit many of the cytochrome P450 liver enzymes particularly 2C19, and CYP3A, there are no studies to date suggesting CBD affects CYP2E1 (Bansal et al., 2020). Glucuronidation by UDP-glucuronosyltransferases (UGTs) is also a detoxifying pathway for ethanol. In laboratory studies, CBD was found to inhibit ethyl glucuronide (EtG) production by inhibition of the liver enzymes UGT1A9 and UGT2B7 (Saabi et al., 2013), however this is only minor pathway for alcohol breakdown.

Together these studies suggest that CBD (at doses ranging from 21mg to about 8 grams) does not significantly affect alcohol metabolism, blood alcohol levels or the physiological/intoxicating effects of alcohol on motor or cognitive function.

Effects of alcohol on CBD metabolism

There is only one study investigating the effects of alcohol on CBD exposure where a single dose of CBD (750 mg) was given in healthy adults following feeding or alcohol (40 g alcohol diluted in 500 mL still lemonade). Relative to the fast state, alcohol caused a modest increase in the plasma levels of CBD (Crockett et al., 2020) suggesting alcohol affects some aspect of CBD pharmacokinetics, although whether this is at the level of the absorption or metabolism of CBD has not yet been clarified. The increase in CBD's bioavailability with alcohol was similar to that seen with feeding a low fat meal or with whole milk. Plasma levels of the CBD metabolite 7-COOH-CBD were lower after alcohol, suggesting that there may be inhibition by alcohol of the breakdown pathway that leads to 7-COOH-CBD.

Effects of CBD on the damage caused by alcohol

Hamelink and colleagues first showed in a rat model of binge drinking that CBD treatment (20 or 40 mg/kg given intraperitoneally) protected areas of the brain relating to memory, navigation and the perception of time, and the protective effects of CBD in this model were similar to common anti-oxidants (Hamelink et al., 2005). Transdermal delivery of a 5% CBD gel in a similar rat model of binge drinking also lead to a 50% reduction in the damage caused by alcohol in the same areas of the brain (Liput et al., 2013).

Other animal studies have shown that CBD also reduces the liver damage caused by excessive alcohol drinking. When CBD (5 mg/kg) was given to mice at the same time as ethanol, CBD reduced the increases in markers of liver damage such as aminotransferase (AST), triglycerides (fats) and oxidative stress (Yang et al., 2014). A more recent study in mice also showed that chronic CBD treatment (5 or 10 mg/kg for 11 days) reduces the damage caused by alcohol in the liver by reducing the alcohol-induced inflammation, oxidative stress and the accumulation of lipids (fatty liver disease) (Wang et al., 2017).

While this research is still at the preclinical stage, the data suggests that the protective effects of CBD seen in many pathologies extend to that caused by alcohol, and this should be tested now in human studies.

Effects of CBD on alcohol intake

In an animal model of alcohol use disorders, high doses of CBD (starting at 30 and increasing up to 120 mg/kg/day for 15 days) was found to reduce alcohol consumption in mice (Viudez-Martínez et al., 2018b). The same researchers went on to show that the effects of CBD treatment in this model were better if the animals were given naltrexone at the same time, a medicine already used to treat alcohol use disorders (Viudez-Martínez et al., 2018a). They also showed that this is partly due to activation of serotonin receptors. Interestingly, these researchers found that CBD treatment was better at reducing alcohol consumption in male than in female mice (Viudez-Martínez et al., 2020).

These animal studies suggest that high doses of CBD may be useful as a medication to treat alcohol use disorder as CBD helps to reduce the reinforcing properties of alcohol and alcohol intake. Because of this research, there are now clinical trials in the USA and Australia examining the potential of CBD to treat alcohol use disorder and alcohol withdrawal.

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Summary

Although research in this area is limited, data so far suggests that CBD does not affect the intoxicating effects of alcohol (because it does not appear to affect alcohol breakdown), but does reduce the damaging effects of alcohol on the brain and liver as a consequence of its anti-inflammatory and anti-oxidant properties. In animal modals of binge drinking, high doses of CBD reduce alcohol consumption and the motivation to drink alcohol, and CBD is now being pursued as a potential for alcohol use disorder.

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Professor Saoirse Elizabeth O'Sullivan (@ScienceSaoirse) received her doctorate from Trinity College Dublin in 2001 and moved to the University of Nottingham in 2002 as a Research fellow where she began researching cannabinoid pharmacology through basic and clinical research. She was made Lecturer in 2007, Associate Professor in 2011 and Full Professor in 2019.

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