



## How Alcohol Causes Anxiety

It's well-known that excessive drinking of alcohol can lead to next-day anxiety. That anxiety can in turn lead to the desire to drink more alcohol to ease it, leading to a cycle of excess alcohol and addiction. A study I read on this leads to speculate on how alcohol causes anxiety.

### **Binge drinking increases bacterial components in the bloodstream**

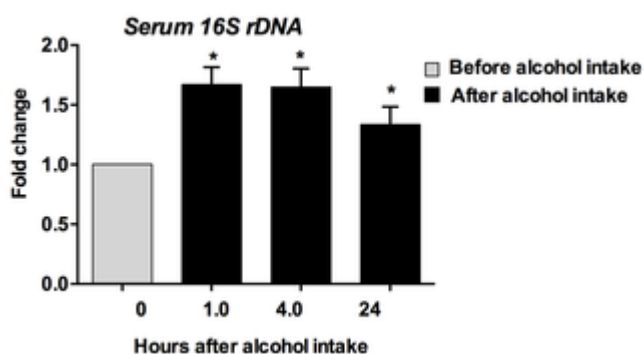
The study is [Acute Binge Drinking Increases Serum Endotoxin and Bacterial DNA Levels in Healthy Individuals](#).

Binge drinking, the most common form of alcohol consumption, is associated with increased mortality and morbidity; yet, its biological consequences are poorly defined. Previous studies demonstrated that chronic alcohol use results in increased gut permeability and increased serum endotoxin levels that contribute to many of the biological effects of chronic alcohol, including alcoholic liver disease. In this study, we evaluated the effects of acute binge drinking in healthy adults on serum endotoxin levels. We found that acute alcohol binge resulted in a rapid increase in serum endotoxin and 16S rDNA, a marker of bacterial translocation from the gut. Compared to men, women had higher blood alcohol and circulating endotoxin levels. In addition, alcohol binge caused a prolonged increase in acute phase protein levels in the systemic circulation. The biological significance of the in vivo endotoxin elevation was underscored by increased levels of inflammatory cytokines, TNF $\alpha$  and IL-6, and chemokine, MCP-1, measured in total blood after in vitro lipopolysaccharide stimulation. Our findings indicate that even a single alcohol binge results in increased serum endotoxin levels likely due to translocation of gut bacterial products and disturbs innate immune responses that can contribute to the deleterious effects of binge drinking.

The contents of the gut are not intended to be placed into the circulation. Normally, so-called tight junctions in the lining of the intestines keep bacterial contents inside the gut and out of the circulation, but binge drinking opens up the tight junctions and allows leakage of contents into the circulation.

In the study, healthy volunteers ingested “2 ml vodka 40% v/v ethanol/kg body weight in a total volume of 300 ml orange/strawberry juice”. Using myself as an example, at 73 kg body weight, that would be 146 ml, or (146/750) about 1/5 of a bottle of liquor, or about 5 ounces. That comes to just over 3 drinks which, while it was ingested at one sitting, isn't really all that much.

Blood alcohol went to a maximum of about 85 mg/dl, or just over the legal driving limit (which used to be 100 mg/dl). Again, not all that high. The chart below shows how levels of bacterial DNA climbed, by about 60%. Levels of bacterial lipopolysaccharide (LPS), which is a seriously toxic product that consists of parts of the bacterial cell wall, rose to a similar degree.



These bacterial components that get into the bloodstream wreak havoc, increasing levels of inflammation and contributing to liver damage.

## The connection between bacterial LPS and anxiety

In animal models, “[Lipopolysaccharide \(LPS\)](#), a component of gram-negative bacteria, is widely used to systematically stimulate the immune system and generate profound physiological and behavioural changes, also known as ‘sickness behaviour’ (e.g. anhedonia, lethargy, loss of appetite, anxiety, sleepiness).”

Inject a rat with LPS, and acts sick and displays signs of anxiety.

In healthy human volunteers, “LPS was found to produce increases in the concentrations of cytokines and CSs [corticosteroids], as well as inducing mild fever, anorexia, anxiety, depressed mood and memory impairment. The levels of anxiety, depression and cognitive impairment were positively correlated with the levels of circulating cytokines, a finding supporting yet again the involvement of cytokines in the mediation of the emotional and

cognitive responses to illness.”

In humans, LPS produces depression and anxiety.

If binge-drinking alcohol produces increases in LPS in the blood, then that’s probably the cause of day-after, alcohol-induced anxiety.

And of course anxiety and depression go together. Binge-drinking could cause depression.

The authors of the first paper observe, “Mutant mice lacking genes related to immune function exhibit decreased alcohol consumption indicating immune signaling promotes alcohol consumption. Thus, it is tempting to speculate that **LPS increase in the systemic circulation after an acute alcohol binge could promote the desire for alcohol consumption.**”

In other words, the immune reaction to binge-drinking stimulates the need for more alcohol, leading to addiction.

## Conclusion

To my mind, the fact that binge-drinking as few as 3.5 drinks promotes leaky gut and increases in LPS in the blood stream provides a clear mechanism as to why alcohol leads to anxiety. It’s completely related to well-founded observations in biological psychiatry that bacterial LPS is elevated in people with depression and anxiety, and that fixing leaky gut can help overcome these conditions. Same in [chronic fatigue syndrome](#).

And yes, leaky gut is real.

**PS: I devoted a chapter to the vagaries of drinking alcohol in my new book, [Best Supplements for Men](#).**



**PPS:** [Check out my Supplements Buying Guide for Men.](#)