



Tipple Play, How Alcoholic Spirits Do Their Work

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Snuffling and snorting like a pig in a truffle bed as my sinuses close off, breathing with audible labor as the airways constrict, I sometimes make a spectacle of myself when I drink red wine.

At private dinner parties, friends cringe when I wipe my running nose on a cloth table napkin. Around public banquet tables, guests in tuxedos and evening gowns turn the other way at the snorkeling sounds of congestion in my throat-or maybe I just imagine they do. I disgust myself, but I can't resist red wine and its wealth of flavors.

"Maybe you're allergic to sulfites," everybody says, everywhere, again and again, but white wines, which don't bother me in the least, are much richer in sulfites, which are added to prevent spoilage.

Nope, there are other ingredients in red wine that can conjure up allergic reactions. All alcoholic drinks, in fact, from wine and beer to those pop-skull potatoes we call "spirits," contain myriad compounds besides alcohol. Those compounds both enhance the pleasure of libation and worsen the pain of celebration.

Popularly known as "congeners," they come from the plants and processes used to make alcohol taste better. They include methanol, acetone, ethyl acetate, methyl ethyl ketone, histamines, prostaglandins and even-pay attention, you guys who think that real men booze it up-plant hormones, or phytoestrogens, which generate man-breasts and other feminine characteristics in men who drink too much.

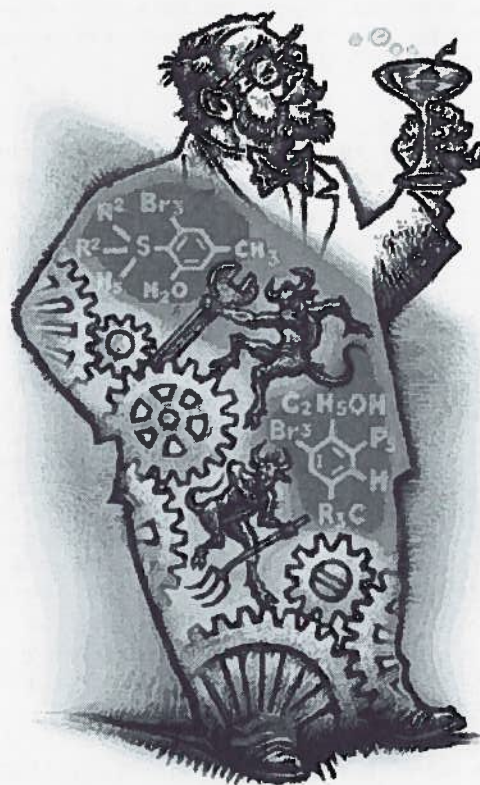
Scientists have measured thousands of different congeners in a single liquor, depending on how far down in the parts per million or parts per trillion they're willing to look.

"Congeners are a variety of volatile substances that get out of the intestines and readily cross the blood-brain barrier [from the bloodstream into the brain], and in the cells they have potential to exert a lot of effects," says Dr. Frederick Freitag, associate director of the Diamond Headache Clinic in Chicago.

Congeners are richer in red wine than in white. Unlike clear distillates such as vodka, "brown" spirits like brandy, dark rum and whiskey are dense in congeners from the years and years they spend in oak barrels to make them mellow and lip-smackingly luscious. But there's nothing mellow about the morning after.

In one clinical study, for example, one group of test subjects drank 1.5 grams of bourbon per kilogram of body weight (that's about six shots for me, at 200 pounds) and another group drank the same amount of vodka. Of the bourbon drinkers, 33 percent got a "severe hangover." For the vodka drinkers, it was 3 percent.

The researchers, of course, never claimed that the vodka drinkers were singing "Oh, What a Beautiful Morning" when the sun came up. Alcohol needs no help from congeners to make us miserable. Water-soluble, the alcohol stampedes for those parts of the body with the highest water concentration. The brain sucks it up like a sponge, and within 90



seconds after the first drink the alcohol is already starting to cross the blood-brain barrier, where the fun begins. Following a shot (1.5 ounces) of 80-proof booze or its equivalent, the blood alcohol content (BAC) peaks in 30 to 45 minutes, unless, of course, you keep pumping it in.

The rising tide of the BAC is the feel-good phase. It's the ebbing of BAC that brings on the feel-bad phase. Why do we feel so bad for so long? A typical person who is seriously soused (BAC of 0.25) at 2 a.m. can still be too drunk to drive, according to his or her blood alcohol level, the next day at 1 p.m.-and not be alcohol-free until 7 that night.

All that time, the liver is turning alcohol first into acetaldehyde and then into acetic acid-vinegar, which makes the term "pickled" very apt. Acetic acid is harmless, but unconverted acetaldehyde is toxic. Flood the liver with more alcohol than it can handle, and the small amount of this poison that isn't metabolized causes heart arrhythmia, palpitations, facial flushing, dizziness and nausea. Alcohol also notches up nausea by affecting the nerve signals that increase stomach acid.

As the kidneys strain to remove alcohol from the body, they also remove water, with its vitamins and minerals. The body is dehydrated, perhaps most noticeably the head: Lowered cranial blood pressure puts the brain in a viselike bind, causing the pounding morning-after headache.

The general weakness and lethargy of a hangover is caused by the buildup in the body of lactic acid, another end product of alcohol metabolism, according to **David Craig, professor of chemistry at Hobart and William Smith Colleges in Geneva, New York**. Athletes have to push themselves to the limit before the buildup of lactic acid sabotages the ability of their muscle fibers to contract. Alcohol allows us the convenience of achieving lactic "acidosis" without having to break a sweat.

Next-day fatigue is also a result of sleep deprivation caused by something called the rebound effect: The brain compensates for the sedative effect of alcohol by exciting our nerves. As the alcohol fades away, the excited nerves launch their own little party-and it's hard to sleep with a party in your head. You wake in the morning to find that the brain's turbocharged neurons are still at it, amplifying the sensory processing of light and sound (which accounts for the dripping faucet that sounds like a cannon). If you really tie one on, your brain gets even with you by adding tremors, depression, anxiety, irritability and cranked-up sweat glands. "The brain tries to adapt to the way that alcohol influences brain functions by compensating certain neural pathways," says Craig, who is co-director of the schools' Alcohol Education Project. "When the alcohol goes away, those compensations are still in place."

Alcohol also ratchets up the body's reaction to allergens. Research at the University of Santiago in Spain has shown rising levels of immunoglobulin-E (IgE), the antibody specific to allergens, in the bodies of people who drink even moderate amounts of alcohol-sniff, sniff.

Which bogies in the bourbon and demons in the dark rum are most potent? Science grasps at drinking straws.

Jonathan Howland, a Boston University professor studying alcohol and sleep disturbance, points to methanol, which is somewhat higher in wine and brandy but present in all drinks.

"It's a poison in and of itself," he says. "When people drink radiator fluid and go blind or die, it's because they're drinking methanol. The onset of hangover symptoms seems to track along with methanol." Methanol, Howland points out, breaks down into formic acid, the ouch of ant bites and bee stings, and formaldehyde, the primary agent in embalming fluid.

"I think it's the higher alcohols, especially butanol, that give you the hangover," says Laurence Peterson, dean of the College of Science and Math at Kennesaw State University near Atlanta. "The most prevalent impurity from grains is butanol. You talk to old moonshiners here in Georgia, they used to filter it through bread, and that absorbed the higher alcohols that give headaches."

Some people may get allergic reactions from agents like egg whites and fish protein used in the "fining" of wines, precipitating the solids. Research implicates a variety of other congeners as sources of significant reaction, from tannins and prostaglandins to tyramines and sulfites.

Histamines are what I suspect in my red wine allergy. Histamines are the molecules that pour into your bloodstream during an allergic response and make you sniffle. And guess what? Some reds have 32 times the level of histamines in whites, 12 times the level in beer and six times the level in champagne.

And my red wine allergy always seems to come with dinner. High-histamine foods like eggplant,

Parmesan cheese and certain kinds of fish might add to the histamine level of red wine, while the alcohol increases histamine absorption and increases the overall immune response.

Unfortunately, for every study that supports a congener's role as a primary irritant, there's also research that questions it, and that holds true for histamines.

"A lot of people try to lay off histamine as the big culprit for causing headaches," says Freitag, "but there's so much histamine in a variety of other foods that it's most unlikely that it's the cause."

Unfortunately, he adds, congeners of are poorly understood because society and funding sources still have negative feelings about studying alcohol.

That means it's up to the individual to go where scientists fear to tread, each of us conducting an analysis of our own individual response to the spectrum of options. Opening bottle after bottle with all the sober gravity of the scientific endeavor.

That's my kind of research.

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