Alcohol: the after effects

Following a very merry Christmas, are you in the first few days of a self-imposed dry January? With indepth knowledge of both medicine and wine, Dr Michael Apstein explains how our bodies process alcohol and whether a New Year detox really works

THE FIRST QUESTION I get when people hear that I'm a gastroenterologist (liver doctor) who writes about wine is: 'How much is safe to drink?' My answer is always the same – 'It depends' – and it's difficult to be more helpful.

Safe levels of alcohol consumption differ depending on the individual. People metabolise (break down) alcohol differently, resulting in dramatic differences in its absorption into the blood. This amount of alcohol – the blood alcohol concentration (BAC) – determines its effect on the body. The more a person can metabolise the alcohol, the less gets into the blood stream. Hence, those individuals who metabolise alcohol more efficiently will have a lower BAC, a lower risk of adverse effects from it and become less intoxicated.

Above: it's important to keep tabs not only on how much you drink, but also what and how you drink it. Your age and gender are also factors in how well your body processes alcohol

The speed of drinking and whether you're drinking spirits or wine has an enormous impact on BAC. But so does your gender and age, whether you eat while drinking, whether you are a sporadic or daily drinker and – perhaps surprisingly – which wine you drink.

The alcohol content of wine has crept up over the past few decades as producers delay their harvests in a bid to achieve ever more ripeness in the grapes and make (what they think are) more flavourful wines. Riper grapes contain more sugar, which translates into higher alcohol levels after fermentation.

Comparing BAC between men and women

The values in the following table are calculated using the formula from a website *(www.globalrph.com/bac.cgi)* that allows estimation of blood alcohol concentration (BAC).

These calculations are only rough estimates because the formula does not account for individual differences in how the liver metabolises alcohol. Individuals should not rely on these values or online calculators for predicting blood alcohol levels, or for determining whether it is safe or legal to drive.

The table compares an average 60kg woman with an average 80kg man, each of whom consumes two 175ml glasses of wine over a 90-minute period. Note that while the alcohol content of the wine rises 25% (from 12% to 15%), BAC goes up by a greater proportion, 33% (0.080% to 0.107%) for women and 43% for men. As more alcohol hits the stomach and then the liver, more of it gets through into the blood

NB *0.080% is the legal limit for driving in England, Wales and the US, while a 0.050% prevails in Scotland, Ireland and other European Union countries*

Alcohol content in a wine (vol%)	**Blood alcohol concentration** (vol%)	
		
	Women	**Men**
12%	0.080	0.037
13%	0.089	0.042
14%	0.098	0.047
15%	0.107	0.053

The bottom line

A 80kg male who drinks wine regularly and has just consumed two glasses of wine during a proper meal eaten leisurely over two hours will have a BAC level that is dramatically lower than that of a 60kg woman who drinks only occasionally and has polished off those two glasses quickly without eating.

A lot has been written about the taste and style of these 'modern' or 'blockbuster' wines and whether they have the ability to develop with bottle age. But absent from the discussion is the effect these more robust wines have on BAC. It's not trivial.

Seemingly small differences in the alcohol content of a wine result in dramatic and important differences in BAC. Going from two glasses of white Burgundy containing about 13% alcohol by volume, to an equal amount of (usually) higher-octane Australian Chardonnay at 14% for instance, could determine whether you're under or over the legal limit for driving. Indeed, as the wine's alcohol content increases from 12% to 15% – a 25% jump – blood alcohol levels rocket up 33% to 43%, depending on gender *(see table above)*.

Gender, age and eating

The breakdown of alcohol starts in your stomach, where an enzyme called alcohol dehydrogenase (similar to the ones found in the liver) is located. Women either have less of this stomach enzyme or it works less well in them than men because oestrogens inhibit it – scientists haven't figured out which. As a consequence, women break down less alcohol in the stomach, which means that more passes into the small intestine where it is absorbed. The end result is that a woman, despite drinking an equal quantity of alcohol at the same rate as a man, will have a higher BAC.

Body composition also favours men when it comes to reducing BAC. Alcohol is distributed only in the parts of the body composed of water, as opposed to fat. Since men's bodies contain a higher proportion of water than women's bodies, the same amount of alcohol will be dispersed in a larger volume, resulting in a lower BAC.

And a 60-year old man or woman will have a higher BAC than a 25-year-old drinking the same amount of alcohol. As individuals age, their livers – and maybe their stomachs – contain less of the enzymes that break down alcohol. And to make matters worse, as people age, their bodies lose water and gain fat. A 60-year-old man cannot break down the alcohol as quickly because he has fewer alcohol-metabolising enzymes, and since he has less body water, there is less volume into which the alcohol can be diluted.

When we eat – especially when we eat fat or protein – the stomach automatically slows the speed with which it delivers the food to the small intestine, allowing for a slow and steady absorption of nutrients from the small intestine. Consequently, drinking wine with a meal (as opposed to drinking it on an empty stomach) results in the alcohol staying longer in the stomach, allowing more of it to be broken down. As a result, less alcohol reaches the ➢

'A US wine label recording alcohol concentration as 13.5% means that the wine could, in fact, contain 15% alcohol'

Photographs: www.timeincukcontent.com

A dry January?

Some people believe that 'giving your liver a rest' by abstaining from alcohol for a month or so is beneficial. In fact, there's no science to support this practice, nor does it make sense physiologically. The liver can metabolise a small and steady amount of alcohol without difficulty. If you think you need to take a month off, you're either drinking too much during the rest of the year or you have a guilty conscience. But giving up alcohol will, all other things being equal, result in a modest weight loss. Foregoing one 175ml glass of wine a day for a month will save you the caloric equivalent of 0.5kg of weight.

Photographs: Petra Bindel/Getty Images

small intestine and less is absorbed into the blood. And voilà, the BAC is lower in individuals who drink wine with meals than it is in those who drink it on an empty stomach.

The rate at which the stomach empties its contents into the small intestine might explain the additional buzz people describe from drinking sparkling wine. In 2003, British researchers showed that the blood alcohol level is higher after people drink Champagne than after they drink the same amount of defizzed bubbly. A reasonable, but as yet unproven, explanation is that the carbonation stimulates gastric emptying and thereby reduces the time the alcohol remains in the stomach where enzymes would break it down.

How often do you drink?

Whether a person has been drinking daily or sporadically determines the rate at which the liver breaks down alcohol. This is because the enzymes responsible are inducible, meaning the liver makes more of them when it needs to, like a factory that recruits more workers when business picks up. Drinking one or two glasses of wine daily stimulates the liver to make more alcohol dehydrogenase. Consequently, people who drink daily are capable of metabolising more alcohol than those who drink only on the weekends because their livers contain more alcohol dehydrogenase. This means that the chronic imbiber will have a lower BAC than the sporadic drinker after consuming the same amount of alcohol.

Most daily wine drinkers experience this phenomenon when, due to a brief illness, they temporarily avoid drinking. After a week of abstinence, the first glass of wine has a bigger impact than usual. Even with just a week of not drinking, the liver has lost some of its alcohol-metabolising enzymes. Consuming your usual amount of wine results in more alcohol flooding into the bloodstream and reaching your brain. Gradually, over the ensuing days, the liver induces more alcohol-metabolising enzymes and a person's tolerance returns.

This only holds true to a point, though. You can never induce enough enzymes to offset the potentially lethal effects of binge drinking, a practice that must be avoided since it is always hazardous, as last year's BBC documentary *Horizon* showed (*www.bbc.co.uk/news/health-32798569*).

Part of the problem in estimating BAC when drinking wines produced in the US is the discrepancy between the wine's stated and real alcohol content. Although EU regulations permit a tolerance of plus or minus 0.5%, looser US regulations allow a tolerance of plus or minus 1.5% of alcohol for wines under 14% alcohol and plus or minus 1% for wines over 14%. Hence, a US wine label recording alcohol concentration as 13.5% means that the wine could, in fact, contain 15% alcohol.

There's no magic way to reduce BAC. Drinking vast quantities of water won't do it because normal kidney function prevents you from increasing body water into which the alcohol could be diluted. Drinking coffee or taking other stimulants may make you 'feel' more alert, but has no effect on BAC. Even consuming a large, rich meal after drinking is ineffective – the horse has already bolted. The normal liver will continue to break down alcohol at a rate of about eight grams (one unit) an hour. So the only way to reduce BAC after drinking is to wait. D

Above: think twice before you give up your daily glass of wine in January – there's no scientific evidence to prove that abstaining has any benefit beyond moderate weight loss

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