

Downside of a jolly evening

There are no quick answers to brighten the 'morning after'

5 ANANTHANARAYANAN

New Year's Eve is past and those of us who celebrated would have recovered from the excess, if any, of alcohol that helped the year pass into the next. But drinkers across the world would cover in gold anyone who could show them a way to lessen the agony of the hangover.

Although science says it cannot be done, there are several prescriptions, in legend, rumour or old wives' tales, which promise relief -- from fatigue, dehydration, acid stomach, a powerful headache, dullness and the inability to focus, in stark contrast to the euphoria of the "evening before". So much so that *Addiction*, the journal of the United Kingdom-based Society for the Study of Addiction, reports a formal study, "a systematic review of the evidence from randomised placebo-controlled trials," to see if any of the legendary remedies actually work.

The paper by Emmert Roberts, Rachel Smith, Matthew Hotopf, and Colin Drummond of King's College, London and the South London and the Maudsley NHS Foundation Trust, an independent body of the National Health Service in England, reports "very low quality evidence of efficacy," of different preparations, although the team did find hesitant benefits of some. None of the well-known remedies, like "raw egg and brandy," "Worcestershire sauce and red peppers," "absinthe and iced champagne," figure in the list, but there are three that the study says may be worth looking at.

The first is *clove extract*, and relieving a hangover is a new application, beyond the traditional remedy for toothache. And there are two from the world of medicine, *tolfenamic acid*, which is used to relieve migraines, and *pyritinol*, which is used to treat brain disorders. Others, with mild signs of efficacy, are *Hovenia dulcis* fruit extracts, a traditional Korean and Chinese medicine said to reduce blood alcohol levels; L-cysteine, a form of the amino acid cysteine; red ginseng, a herb believed to be anti-inflammatory, and Korean



pear juice.

The root cause of the dreaded hangover, of course, is the high level of alcohol in the bloodstream that drinking sets up for some hours. Alcohol can pass through the blood-brain barrier and its presence in the blood slows down the functioning of brain cells. The first cells affected are those that promote caution and inhibit behaviour. The drinker hence feels free and powerful. But brain cells that control speech and motor functions are also affected, and there is slurred speech and loss of balance.

This is the effect on the brain. And then, there are effects on the rest of the body. With the high alcohol content of the bloodstream, the force of osmosis causes water, which is the main content of body cells, to rush out and dilute the bloodstream. And the body is dehydrated for hours on end.

The other effect is that on the liver. The normal function of the liver is to maintain a steady level of sugar in the bloodstream. One function is to pull out excess sugar, which is after we eat, particularly something sweet. The reverse function is to pump sugar back in when sugar level is low, perhaps the more important function, as low sugar is dangerous. But

the liver does more than regulate sugar as it extracts other toxins from the bloodstream, and one of these is alcohol. And this function gets the liver quite busy when there is a large presence of alcohol in the blood. The result is that the task of replenishing the sugar level in the blood is neglected, and sugar levels fall.

Now, glucose in the blood is the only source of energy for brain cells. When the person awakes a few hours after the drinking binge, there is still alcohol to be extracted, but there is little sugar for the brain. The person hence feels blank, vacant and incoherent. And an acid stomach, headache and fatigue from unrelaxed activity during the celebration are usual accompanying condi-

tions. The combination is a feeling of such discomfort and helplessness that the person often swears never again to "touch the stuff".

Alcohol-induced hangover, a condition medically known as *veisalgia*, has been considered to be a global hazard and socio-economic burden. The paper cites estimates that in the United States, hangovers have an annual cost of \$ 2,000 for every employee. A method to reduce severity is hence not just a favour to the drinker, but an economic priority.

The paper points out that while there are several "remedies" that are claimed and marketed, there has not been a systematic, and quantitative study, which could guide both professionals and the general public. "Accurate information as to what, if any, pharmacologically active interventions are evidence-based options," the paper says.

Getting hold of reliable data, to assess the severity of hangovers and the relief, if any, brought on by specific remedies, of course, was no simple matter. The team undertook a survey of vast documented studies, to extract from them the data that was reliable, and could be considered bases for a "randomised and placebo-controlled" study. That is to say,

the subjects were not from groups that could be biased, and the effect of a substance, as a hangover relieving agent, could be identified by the absence of the same effect when a comparable hangover was treated with a "dummy" substance, with controls, to ensure that the subject did not know what was going on, etc.

Data was extracted and tabulated by independent researchers, with recourse to a third, a "referee", in case the researchers did not agree, the paper says. Along with data extraction, the quality of the data was assessed and classified as high, moderate, low or very low, based on criteria of bias, inconsistency, indirectness, imprecision, etc. And in this way, the search resulted in 269 records, 21 studies and 389 participants. Also, 38 per cent of the participants were women.

The results, as stated, were the "statistically significant" efficacy of clove extract, tolfenamic acid and pyritinol, with lesser efficacy of the four others, but based on evidence of "low quality", with no cross-checks or validation. A saving grace is that the "remedies", which were available "off the shelf", had no or mild side effects, the paper says.

The writer can be contacted at response@simplescience.in

IT'S ALL ABOUT ENERGY

Where your health is concerned, count more on the quality of the calories you consume than the calorie count

TEREZIE

A calorie is a calorie is a calorie, at least from a thermodynamic standpoint. It's defined as the amount of energy needed to raise the temperature of one kilogram of water by one degree Celsius.

But when it comes to health and your body's energy balance, not all calories are equal.

For example, some studies have reported that diets that are high-protein, low-carbohydrate or a combination of the two do yield greater weight loss than diets with other levels of fat, protein and carbs.

If every calorie in food were the same, you wouldn't expect to see weight-loss differences among people who eat the same number of calories that are doled out in different types of food.

Dietitians like me know there are many factors that influence what a calorie means for your body. Here's what we understand about calories and nutrition so far.

Energy actually available to your body

In the late 1800s, chemist W O Atwater and his colleagues devised a system to figure out how much energy -- that is, how many calories -- various foods contain. Basically, he burned up food samples and recorded how much energy they released in the form of heat.

Not every bit of energy in food that can combust in the lab is actually available to your body, though. What scientists call metabolisable energy is the difference between the total energy of the food consumed and the energy that passes out of your body, undigested, in faeces and urine. For each of the three macronutrients -- proteins, carbohydrates and fats -- Atwater devised a percentage of the calories they contained that would actually be metabolisable.

According to the Atwater system,

How many calories are in each macronutrient?

Macronutrient	Heat of combustion	Percent available	Available energy
Protein	5.65 calories/gram	92%	4.0 calories/gram
Fat	9.40 calories/gram	95%	8.9 calories/gram
Carbohydrate	4.1 calories/gram	97%	4.0 calories/gram

one gram of each macronutrient is estimated to provide a certain number of calories. The United States Department of Agriculture still uses these calculations today to come up with an official calorie number for every food.

How much energy you use

What you eat can affect what scientists call your body's energy expenditure. That's how much energy it takes to keep you alive -- energy you use breathing, digesting, keeping your blood flowing and so on -- along with what you exert moving your body. You might have heard this referred to as metabolism.

Diet quality can alter the body's energy expenditure, which is also called the thermic effect of food. For example, in one study, people eating the same number of calories per day but on either a low-carbohydrate diet or a low-fat diet had differences in total energy expenditure of about 300 calories per day. Those eating very low-carb diets used the most energy, while those eating low-fat diets used the least. In another study, high-fat diets led to lower total energy expenditure than high-carb diets did. Other researchers reported that although substituting carbs for fat did not alter energy expenditure, people who increased their protein intake to 30-35 per cent of their diet used more energy.

In general, diets high in carbohydrates, fat or both produce a four to eight per cent increase in energy expenditure, while meals high in protein cause an 11-14 per cent increase

above the resting metabolic rate. Protein has a higher thermic effect because it's harder for the body to break down. Although these variations aren't huge, they could contribute to the obesity epidemic by encouraging a subtle average weight gain.

Quality of the calories you eat

Dietitians pay attention to a food's glycaemic index and glycaemic load -- that is, how quickly and how much it will increase your blood glucose levels. A rise in blood glucose triggers the release of insulin, which in turn influences energy metabolism and storage of excess energy as fat.

Foods like white rice, cakes, cookies and chips are all high on the glycaemic index/load. Green vegetables, raw peppers, mushrooms and legumes are all low on the glycaemic index/load. There is some evidence to suggest that foods lower on the glycaemic index/load may be better for keeping blood sugar levels regulated -- regardless of the calories they contain.

Reward centres in the brain light up when people eat high glycaemic index/load foods, highlighting the pleasurable and addictive effect of foods like candy or white breads.

The fibre content of food is another thing to consider. Your body can't digest fibre -- found in plant foods like fruits, vegetables, whole grains and beans -- for energy. So, foods high in fibre tend to have less metabolisable energy and can help you feel full on fewer calories.

Empty calories -- those from



foods with minimal or no nutritional value -- are another factor to consider. Things like white sugar, soft drinks and many ultra-processed snacks don't provide much, if any, benefit in the form of protein, vitamins or minerals along with their calories. The opposite would be nutrient-dense foods that are high in nutrients or fibre, while still being relatively low in calories. Examples are spinach, apples and beans.

And don't think of empty calories as neutral. Nutritionists consider them harmful calories because they can have a negative effect on health. Foods that are the biggest contributors to weight gain are potato chips, potatoes, sugar-sweetened beverages and meats, both processed and unprocessed. On the other hand, foods that are inversely associated with weight gain are vegetables, whole grains, fruits, nuts and yoghurt.

More to health than calories and weight

It is indisputable that for weight loss, the difference between the number of calories consumed and the number of calories exerted through exercise is the most important factor. But don't fool yourself. While weight plays a role in health and longevity, weight loss alone doesn't equate to health.

Yes, some high-protein diets seem to promote weight loss at least in the short term. But epidemiologists know that in areas where people live the longest -- close to 100 years on average -- they eat a primarily plant-based diet, with very low or no

animal-based protein and low or moderate fat in the form of mono- and polyunsaturated fats.

I often hear friends or clients say things like "it's those carbs that are making me fat" or "I need to go on a low-carb diet." But these complaints drive dietitians like me, well, nuts. Carbohydrates include foods like Coca-Cola and candy canes, but also apples and spinach. Cutting down on simple carbs like soft drinks, refined-flour bakery items, pasta and sweets will definitely have a positive impact on health. But eliminating carbohydrates like vegetables and fruit will have the opposite effect.

A plant-based diet high in plant-based protein and carbohydrates mostly from vegetables, fruit, nuts and legumes is the healthiest diet researchers know of for longevity and prevention of chronic diseases like heart disease, cancer, hypertension and many other conditions.

The modern Western diet suffers from an increase in quantity of calories consumed with a concurrent decrease in the quality of calories consumed. And researchers now know that calories from different foods have different effects on fullness, insulin response, the process of turning carbs to body fat, and metabolic energy expenditure.

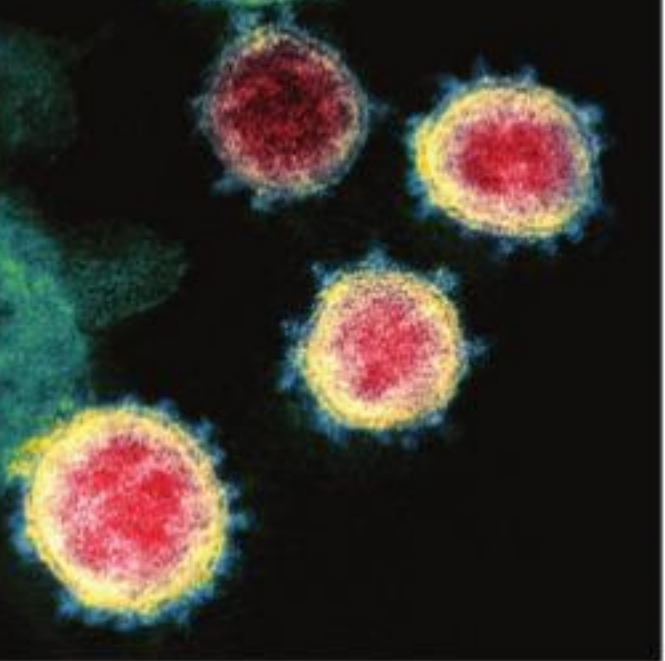
Where your health is concerned, count more on the quality of the calories you consume than the calorie count.

The writer is associate professor of food science, nutrition and health promotion, Mississippi State University, United States. This article first appeared on www.theconversation.com

PLUS POINTS

PLUS POINTS

Breakthrough



Scientists have identified antibodies that can target the unchanged parts of the novel coronavirus as it continues to mutate and evolve, an advance that could lead to new therapeutics to neutralise Omicron and other Covid-19 variants.

Identifying such "broadly neutralising" antibodies on the coronavirus spike protein, which the virus uses to enter human cells, can help develop better vaccines and antibodies which will be effective not only against Omicron but also against other variants that may emerge in the future, said David Veelsler from the University of Washington School of Medicine in the United States.

So far, studies have shown that Omicron has 37 mutations in the spike protein, which partly explains why this variant has been able to spread so rapidly, infecting people who have already been vaccinated and re-infecting those who have previously recovered.

In the new research, published in the journal *Nature*, researchers assessed the effect of these mutations by developing a disabled, non-replicating virus -- called a pseudo-virus -- to produce spike proteins on its surface. They engineered pseudo-viruses that had spike proteins along with the Omicron mutations as well as those found on the earliest variants identified during the pandemic.

The researchers assessed how well these different versions of the spike protein could bind to the ACE2 receptor -- the protein on the surface of human cells which the virus uses as a door to enter and infect tissues. They found that the Omicron spike protein could bind 2.4 times better than the spike protein found in the virus isolated at the very beginning of the pandemic. "That's not a huge increase, but in the Sars outbreak in 2002-2003, mutations in the spike protein that increased affinity were associated with higher transmissibility and infectivity," Veelsler said.

When the scientists assessed how the immune system's action against earlier isolates of the virus protected against Omicron, they found that antibodies from people who had been infected by earlier strains and from those who had received one of the six most-used vaccines currently available all had reduced ability to block infection.

To test this, the researchers used antibodies from patients who had previously been infected with earlier versions of the novel coronavirus, vaccinated against earlier strains of the virus, or had been infected and then vaccinated. While antibodies from people who had been infected, recovered, and then took two doses of a Covid-19 vaccine also had reduced activity, the study found that this reduction in neutralising activity was less -- about fivefold -- suggesting that vaccination after infection is useful.

The study also identified four classes of antibodies that retained their ability to neutralise Omicron. Antibodies in each of these classes target one of four specific areas of the spike protein present in not only the Sars-CoV-2 variants but also a group of related coronaviruses, called sarbecoviruses.

The scientists believe these specific regions on the virus spike protein remain unchanged, and are "conserved," indicating they play an essential function that the protein could lose if they mutated. Based on the findings, the researchers say designing vaccines and antibody treatments targeting these regions could be effective against a broad spectrum of variants.

The independent

Beautiful science



This picture shows how two supermassive black holes would distort light emanating from the hot gases around them. Astrophysicist Jeremy Schnittman from the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Maryland, created it by using a supercomputer to calculate the path taken by light rays through the warped space-time around the simulated black holes.

Picture courtesy NASA

