The history about hangovers biology essay

Science, Biology

Hangovers are a combination of physical and cognitive symptoms that can present following the ingestion of alcohol. This is a problem because it affects a large portion of the population, especially among college students, and costs billions of dollars annually, primarily in lost productivity. The primary causes of the hangover are dehydration, immune response to alcohol, and the poisonous effects of congeners and alcohol metabolites. The following steps should be taken to avoid hangovers when drinking: eat a full meal before beginning to drink alcohol, avoid dark alcohols, stay hydrated by drinking nonalcoholic beverages between drinks and upon waking up, sleep more if possible, eat a small and digestible meal in the morning, and take tolfenamic acid if sober and still suffering from severe hangover symptoms.

Table of Contents

Introduction

Hangovers are the bane of partygoers and social drinkers everywhere, causing a host of maladies that leads to decreased productivity in their work and studies. An alcohol hangover, or veisalgia, is a combination of physical and cognitive symptoms that occurs after alcohol and its metabolites are eliminated from the body following the ingestion of alcohol. Its manifestation can vary between individuals, but symptoms often include: headache, diarrhea, loss of appetite, fatigue, tremors, and cognitive impairment. 1 Though this problem has persisted since man first consumed alcohol, and despite its pervasive nature, those seeking to avoid a hangover are relegated to a series of folk remedies that are rarely backed up by scientific testing. While a hangover is often viewed as an inconsequential consequence of irresponsible behavior, hangovers have been associated with

increased risk of cardiac death in people not known to have heart disease, and have been experimentally shown to impair the ability to drive, operate machinery, and perform routine tasks associated with school and work. 2 The economic cost of hangovers alone is staggering. A 1997 study of hangovers in the workplace determined that missed work, loss of productivity, and medical costs associated with hangovers represent 1. 1% of the GDP annually, which, adjusted to today’s economy, is $166 Billion per year, most of which is incurred by light to moderate drinkers. 3 Hangovers also have a significant effect on college students in particular. In a study of a rural New England university, 25. 5% of college students reported having at least one hangover, and 8. 1% reported missing class due to their hangovers, both " in the past week." Additionally, 28. 9% of respondents stated that their hangovers had negatively impacted their ability to perform school work. 4 Moreover, hangovers have not been shown to be a deterrent to alcohol consumption, and, counter intuitively, may actually lead to alcoholism. A study investigating the relationship between personality traits and problem drinking found that there is a statistically significant association between high-risk personalities and alcoholism only if the subject commonly experienced hangovers after drinking. It is believed that this link occurs because these subjects continue drinking to alleviate hangover symptoms. According to the researchers, this may serve as an initial step towards problem drinking. 5Because of the vast negative consequences that hangovers have on society, it is imperative that an effective means of mitigating these symptoms be determined. Therefore, this paper will

investigate the causes of hangovers, and explore both preventative and reactive methods of alleviating their symptoms.

Medical Causes of Hangovers

While the underlying physiology that produces hangovers is not fully understood, a number of factors have been shown to cause various aspects of the hangover, including dehydration, immune response, volume and type of alcohol consumed. DehydrationIn patients experiencing hangovers, substantial changes in chemicals known as endocrine parameters, which are hormones released by the endocrine system, were reported. Notably, there were alterations in the levels of vasopressin, aldosterone, and renin, which collectively act on a number of systems to aid in water retention and regulation of blood pressure. Patients also experienced metabolic acidosis, which lowers pH levels in the blood. 6 Combined, these two responses cause a large portion of the dehydration associated with hangovers. Moreover, alcohol acts as a diuretic, i. e. it increases urinary output, causing up to one liter of water to leave the body for every 4 drinks. Increasing the body’s output of water faster than it absorbs water can quickly lead to dehydration. Many symptoms of dehydration are those observed during a hangover including weakness, dizziness, and lightheadedness. 7 Contrary to popular belief, however, dehydration is not the only source of hangovers. Rehydration after alcohol consumption can diminish hangover symptoms, but not completely relieve them. 1Immune responseAlcohol consumption also precipitates an increase in pro-inflammatory cytokine and interferon-gamma in the blood stream. These chemicals are both cytokines which are signaling molecules released by cells to relay information, and are believed

to be the cause of the cognitive symptoms of hangovers. The release of cytokines into the blood stream triggers a similar release in the brain that is particularly high in the hippocampus region, which is responsible for storing short term memories. It is therefore believed that these chemicals disrupt the hippocampus' normal activities, resulting in the cognitive impairment experienced by those suffering from hangovers. 6 Additionally, when injected into mice, these cytokines caused weakness, fatigue, decreased appetite, and inability to concentrate, 8 all of which are commonly experienced during hangovers. This further suggests that the immune system's response to the ingestion of alcohol plays a significant role in causing hangovers. Volume and Type of Alcohol ConsumedLarger doses of alcohol have been shown to increase hangover severity; however, the hangover is not entirely volume dependent. A study investigating the effects of glucose and fructose, showed that mixing pure alcohol with these sugars moderated the effects of metabolic disturbances, which increase with amount consumed, during the course of the following hangover, but did little to decrease its overall severity. 9Other hangover symptoms, though, are dependent on the amount of alcohol imbibed. Alcohol causes nausea by irritating the lining of the stomach, through its diuretic effect and the by the production of acetaldehyde. Nausea and other gastrointestinal disturbances are caused by alcohol's direct irritation of the stomach. When ingested, alcohol increases the production of gastric acids. As the stomach empties through normal digestive processes accelerated by alcohol's effects as a diuretic, the excess acid begins to attack the lining of the stomach, causing inflammation, which leads to nausea. 7 Furthermore, when alcohol is metabolized it produces

acetaldehyde, a known toxin that causes headaches and nausea if not quickly removed by the liver. 10Alcohol also inhibits the body’s production of the natural stimulant glutamine in proportion to the amount consumed. Glutamine is then overproduced once the alcohol leaves the body in order to compensate. 10 The excess this stimulant causes the body to not receive the full effects of sleep causing fatigue. The type of alcohol consumed also greatly affects the severity of the resulting hangover depending on the amount of congeners they contain. Congeners are chemicals that are structurally similar to ethanol, including fusel alcohol, acetone, and aldehydes, that are produced during the fermentation process. Dark alcohols such as whiskey, tequila, and wine contain high amounts of congeners, while beer and clear alcohols like vodka and rum have relatively few. Ingesting high levels of congeners have been shown to increase the length and severity of hangovers. 11

The Solution

It is possible to mitigate the effects of a hangover through both preventative and reactive measures. In the former, precautionary actions are taken beforehand or while drinking to lessen the severity of the hangover, while in the latter actions are taken to alleviate the symptoms after the hangover has begun. Invariably, everyone knows of a number of these remedies, though many lack a solid scientific foundation. This section will discuss the efficacy of several common remedies in order to determine a series of actions to minimize the severity of hangover symptoms. PreventativeIn this section common prevention methods used to prevent hangovers will be examined and compared to the medically known causes of hangovers to assess their

individual effectiveness. Eating a Meal before DrinkingThis method has always been taught to people when discussing how to drink responsibly. Any alcohol education course will undoubtedly state that one should never drink on an empty stomach or the alcohol, and resulting hangover, will have a greater effect. This has been shown to be true, and has the benefit of facilitating the process of waking up in the morning. Two of the main reasons for hangovers are a buildup of acetate and aldehydes, as the liver cannot process them fast enough. A full stomach will slow the absorption of alcohol into the bloodstream which gives the liver, allowing the liver more time to remove them from the body before they accumulate. Food also acts a barrier that prevents alcohol from irritating the stomach lining. This will help prevent the nausea and gastric discomfort the next morning[*]. While this is a good idea, eating a meal before drinking alcohol will only prevent a small number of hangover symptoms. HydrationThis might be the most common hangover prevention method practiced today. People swear by consuming copious amounts of water before bed as a miracle cure. This method is also very effective. Moreover, drinking water between drinks is even more effective, as in addition to hydrating, this tends to decrease the overall volume of alcohol imbibed. Dehydration is one of the main causes of the hangovers, headache, and overall body discomfort. Drinking water heavily the night before does help in mitigating the next morning’s misery. However, just like in sports dehydration doesn’t only mean the loss of water. Drinking juices or sports drinks before bed is has an even better result, as they contain electrolytes which replenish those lost through urination. Orange juice is also particularly effective due to its high levels of Vitamin C which neutralizes many

congeners [B]. Hydration alone will not prevent all symptoms, as this does little to suppress the immune response, but it will make a significant impact. Avoid Dark AlcoholsBeer and clear alcohols contain considerably fewer congeners, toxic chemicals produced during fermentation, than dark alcohols, for example, whiskey contains 37 times more congeners than vodka (9), and as a result. As a result, clear alcohols produce much less severe hangovers. Figure 1 graphically summarizes this result, showing the relationship between hangover severity and the amount of congeners contained in a typical drink, while listing alcohols in order of increasing congener content. Figure 1. Depiction of congener content vs. hangover occurrence and severity (D)Prevention SupplementsThere are a large number of advertised hangover prevention supplements sold in grocery stores, vitamin shops, and convenience stores. These consist of hundreds of drinks, powders, and pills out there that promise that if you follow their instructions and take their product you can drink as much as you want without any consequences the next morning. However, these products are not FDA approved and are mainly multivitamin or herbal supplements. Vitamin B6 has been shown to be effective as a hangover remedy, but since it is water soluble, it would likely not be present in high enough doses to have significant effects at the onset of a hangover if taken prior to drinking (2). In some cases they may be effective, but not more so than following the prevention methods above. Considering that the other methods are cheaper and more effective, these preventative supplements should be avoided. ReactiveIn this section, the effectiveness of common methods of mitigating symptoms after the onset of a hangover will be discussedPain RelieversThe

most common pain relievers are ibuprofen and acetaminophen. Ibuprofen is a non-steroidal anti-inflammatory drug (NSAID) that works by suppressing the immune system. Taking an NSAID has been shown to reduce the symptoms that accompany the immune system’s response to alcohol, including headache, fatigue, and weakness; however, ibuprofen puts extra stress on the liver, and can lead to erosion of the lining of the stomach if taken for long periods of time, so this should not be a common strategy of hangover prevention. Tolfenamic acid, sold under the brand names Clotam Rapid and Tufnil, is another NSAID that has shown been shown to improve subjective symptoms of hangovers without some of the damaging consequences of ibuprofen, but has not yet undergone full therapeutic trials for hangover prevention (2). Acetaminophen does not have anti-inflammatory properties, so it may help alleviate a headache, but will not affect other symptoms, and also puts unnecessary stress on the digestive system, and should be avoided in conjunction with alcohol. Greasy FoodA large greasy breakfast is a popular morning of remedy, but unfortunately, there is no scientific evidence to support this claim. Doctors recommend a small, easy to digest meal due to the fact that an upset stomach is a symptom of a hangover. HydrationWhile it may be too late for water to prevent a hangover, water is helpful while in the throes of one. It will not be an instant cure, but given time, drinking water or a sports drink will eliminate dehydration and the symptoms that accompany it. CoffeeCoffee and alcohol rumors have been around forever. There are those who believe that drinking coffee will help sober someone up from drinking, but this is a fallacy. Also, though drinking coffee after sobering up is commonly used in an attempt to

mitigate hangover symptoms, this belief is similarly not grounded in reality. While the caffeine may help with fatigue, drinking coffee will make the hangover worse. Caffeine is both acidic and a diuretic, meaning that it will further the upset stomach symptoms while at best maintaining levels of dehydration, extending the duration of hangover symptoms. These are obviously not ideal when trying to rid oneself of hangover symptoms[*]. SleepWhile most people don’t have the option of going back to bed in the morning due to work, school, etc., sleep is a helpful tool. Alcohol upsets peoples normal sleep patterns so while the person might have gotten a full night’s rest, it wasn’t as restful or helpful to the body as a full night of sober sleep. This decrease in restful sleep helps causes the feelings of general unwellness, fatigue, and headaches associated with hangovers. Another added benefit is while asleep the symptoms of a hangover are not felt, allowing the worst of the symptoms time to dissipate. So while this isn’t very helpful for weekday hangover, it might be the ideal decision when one wakes up Saturday morning regretting their decisions last night[*].

Conclusion

Hangovers present as a combination of symptoms, commonly including headache, diarrhea, loss of appetite, fatigue, tremors, and cognitive impairment or some combination thereof, occurring after drinking alcohol. Additionally, hangovers are prevalent in society, especially among college students, negatively impacting performance at work and in school. The primary causes of this are dehydration, immune response to alcohol, and the introduction of toxins from both alcohol and its metabolites. Many things have been touted as cures, but they are often based on personal experience

and other anecdotal evidence, rather than science. There are two main methods of hangover prevention commonly practiced, referred to here as preventative and reactive measures. In general, preventative measures are more effective, but in order to fully combat the symptoms of the hangover, both actions should be taken. The following steps have been shown to reduce severity of hangover symptoms, and if taken together, should eliminate a majority of hangover symptoms. First, eat a full meal before drinking. This slows the rate at which the body absorbs alcohol, allowing the liver more time to process alcohol and its metabolites, while simultaneously protecting the stomach from the additional acidity brought about by the presence of alcohol. Next, avoid drinking dark alcohols in large quantities. Dark alcohols, such as brandy, whiskey, and wine contain a much larger amount of congeners, toxic byproducts of the fermentation process, than clear alcohol or beer. These congeners have been shown to increase the severity of hangovers. Also, be sure to remain hydrated. In order to do this effectively, intersperse nonalcoholic beverages between drinks, or drink a large amount of liquid before going to sleep, especially if drinking liquor, since it has such a high percentage of alcohol by volume. If symptoms are present in the morning, go back to sleep if this is an option. Continue to drink nonalcoholic beverages, while avoiding caffeine, as this will prolong dehydration, and eat a small, easy to digest meal. Additionally, if all else fails to adequately reduce symptoms, tolfenamic acid has been shown to reduce the majority of symptoms associated with hangovers, but this should not be taken with alcohol still in the body. Though no side effects have been found, mixing alcohol and medication is never a good idea.

Recommendations

Eat a full meal before beginning to drink alcohol. Avoid dark alcohols. Drink other liquids either between alcoholic beverages, or before going to bed, and after waking up. If symptoms are present upon waking up: Sleep more if possible. Eat a small and easy to digest meal. Take tolfenamic acid if sober and suffering from severe symptoms.