THE IMPACT OF CINNAMON ON GLUCOSE LEVELS AND ALCOHOL CRAVINGS IN EARLY RECOVERY

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Abstract

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Heavy alcohol consumption has a negative impact on all areas of the human body. Research suggests a direct correlation between alcohol and blood sugar levels. Glucose intolerance, due to such alcohol use, has been shown to create pre-diabetes in some individuals. Within the past ten years, research has been conducted on the benefits of cinnamon in regulation of Type II diabetes. This review of literature and studies suggests a possibility that cinnamon may be beneficial for individuals attempting to maintain abstinence from alcohol. Literature surrounding alcohol and blood sugar and literature surrounding cinnamon was explored. Specific research surrounding cinnamon and recovery from alcoholism has not yet been conducted, as of this writing. As sugar cravings increase in the early stages of abstinence, blood glucose levels fluctuate. Cinnamon can potentially assist in stabilization of such fluctuations. Individuals are urged to consider all options for abstinence from alcohol, while under the direct supervision of their primary care physician.

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CHAPTER 1

INTRODUCTION

Cinnamon, which is native to Southeast Asia and originated in India, has been used for centuries to treat diabetes. The traditional Chinese medicine dating back 4,700 years was used to treat colds, gastrointestinal issues, and painful menstrual cycles. It was also known for improving energy, vitality, and blood circulation (UCLA Biomedical Library). The characteristic flavor comes from a compound in the essential oil of the bark of the Cinnamomum zeylanicum tree, called cinnamaldehyde (Planet Botanic Canada). The health benefits of cinnamon on blood sugar levels recently became a focus for Type II Diabetes research. Results of a study conducted by Khan, Safdar, Khan, Khattak, and Anderson (2003), demonstrated that an intake of 1-6 grams of cinnamon a day reduces serum glucose, triglyceride, LDL cholesterol, and total cholesterol in people with type 2 diabetes (Khan, et al, 2003).

Furthermore, carbohydrate and sugar cravings are not uncommon in individuals in early recovery, or with periods of abstinence, from alcohol. Frequently, alcoholics maintaining a period of abstinence will report such cravings occurring. This was identified by Bill Wilson and Dr. Bob Smith, the founders of Alcoholics Anonymous, in 1935 when they wrote, "One of the many doctors who had the opportunity of reading this book in manuscript form told us that the use of sweets was often helpful, of course depending upon a doctor's advice. He thought all alcoholics should constantly have chocolate available for its quick energy value at times of fatigue. He added that occasionally in the night a vague craving arose which would be satisfied by candy. Many of us have noticed a tendency to eat sweets and have found this practice beneficial" (Alcoholics Anonymous, 2001, p. 134). Alcohol dependent individuals have demonstrated a preference for sweet taste, which is exacerbated upon abstinence from alcohol.

Current research is beginning to focus on the interaction of blood sugar levels, glucose, and alcohol consumption. Chronic use of alcohol is considered to be a potential risk factor for the incidence of type 2 diabetes mellitus, which causes insulin resistance and pancreatic cell dysfunction that is a prerequisite for the development of diabetes (Kim and Kim, 2012).

As alternative medicine methods are being considered as a viable option to treat different ailments, consideration needs to be made involving cinnamon and alcohol cravings. It may be feasible for some individuals in early recovery to include cinnamon in the diet as a tool for assisting blood sugar fluctuations.

Statement of the Problem

To what extent can fluctuations in blood sugar levels create cravings for alcohol and can cinnamon help to stabilize glucose levels and reduce such cravings? A broader understanding of the phenomenon of craving is essential for the individual is seeking long-term sobriety. If there is a direct correlation between sugar depletion implications towards alcohol cravings and vitamin deficiencies, possible medication therapy and behavioral modification techniques can be effective for the alcoholic in reducing the potential for future alcohol use. The addition of cinnamon into a recovery lifestyle, with proper nutrition and healthy eating habits, could potentially assist in reducing alcohol cravings and creating another recovery tool.

Definition of Terms

- Atherosclerosis- the term for the process of fatty substances, cholesterol, cellular waste products, calcium and fibrin (a clotting material in the blood) building up in the inner

lining of an artery. The buildup that results is called plaque. (American Heart Association)

- Cortisol- the major natural glucocorticoid elaborated by the adrenal cortex; it affects the metabolism of glucose, protein, and fats and has mineralocorticoid activity. (Dorland's Medical Dictionary for Health Consumers
- Glucagon-a hormone produced in the pancreas. Glucagon is used to raise very low blood sugar. Glucagon is also used in diagnostic testing of the stomach and other digestive organs. (U.S. National Library of Medicine)
- Glycogen-the brain and other tissues require a constant supply of blood glucose for survival. Glucose from the diet, though, arrives irregularly. Some tissues, particularly the liver and skeletal muscle, store glucose in a form that can be rapidly mobilized, glycogen. Liver glycogen is used to buffer the overall blood glucose level; glycogen is synthesized when blood glucose is high, and glycogen is degraded (with the resulting glucose released into the blood stream) when blood glucose is low, such as during the early stages of a fast. Muscle uses its glycogen stores for energy during strenuous exercise. (Stanford Edu.)
- Metabolic syndrome- is a cluster of conditions — increased blood pressure, a high blood sugar level, excess body fat around the waist or abnormal cholesterol levels — that occur together, increasing your risk of heart disease, stroke and diabetes. (Mayo Clinic)
- Myopathy-an abnormal condition of skeletal muscle characterized by muscle weakness, wasting, and histologic changes within muscle tissue, as seen in any of the muscular dystrophies. A myopathy is distinct from a muscle disorder caused by nerve dysfunction. (Mosby's Medical Dictionary, 8th edition)

Delimitations of Research

The references used for the review of literature were collected over a period of 40 days using the resources of the Karmann Library at the University of Wisconsin – Platteville and Wyllie Library at the University of Wisconsin – Parkside. The several search engines provided by EBSCOHOST were used. The key search terms were “sugar cravings and relapse”, “diabetes and alcohol use”, “carbohydrate cravings and alcohol”, “glucose levels and alcohol cravings”, “health benefits of cinnamon”, “cinnamon and diabetes”, “history of cinnamon”, and “nutrient deficiencies and relapse”. Previous research brought much insight and understanding into the medical problems associated with alcoholism and created the building blocks for current research. With technology improvements, current research has been focused on understanding the profound chemical alterations in the brain, leading to new treatment approaches.

Method of Approach

A review of literature relating to research, studies, and anecdotal evidence was conducted. Specifically on topics pertaining to blood sugar levels, carbohydrate cravings and nutrition, sweet preference, health benefits of cinnamon, and the impact of cinnamon on blood sugar levels.

CHAPTER II REVIEW OF LITERATURE

METABOLISM OF ALCOHOL

Alcohol is metabolized in the body in different ways. The main avenue is through the liver, which alcohol is then broken down into two different enzymes, alcohol dehydrogenase and aldehyde dehydrogenase. These enzymes break the alcohol apart so that it can be removed from the body. Alcohol dehydrogenase then turns into acetaldehyde (a toxic poison and carcinogen), then to acetate, which is broken down to water and carbon dioxide and is removed through the kidneys, bladder, and lungs. When large amounts of alcohol are consumed two other enzymes are produced, cytochrome and catalase, which break down a relatively small amount of alcohol. Alcohol is also removed when it interacts with fatty acids, which become the compounds that have been shown to contribute to damage to the liver and pancreas. Alcohol metabolism also occurs in the pancreas, brain tissue, and gastrointestinal tract. Acetaldehyde is a toxic poison that is produced in the metabolism process, which can eventually lead to damage in those vital organs. (National Institute on Alcohol Abuse and Alcoholism, 2007).

THE IMPACT OF ALCOHOL ON THE PANCREAS

The purpose of the pancreas is to produce digestive enzymes for food digestion and to produce the hormones insulin and glucagon. Both insulin and glucagon are regulators of blood sugar levels. Insulin serves to lower blood sugar levels in the muscle and fat tissues, as well as the conversion of glucose into glycogen. Insulin also inhibits the production of more sugar molecules (gluconeogenesis) in the liver. Glucagon serves to increase blood sugar levels and promotes gluconeogenesis and the breakdown of glycogen into glucose. In other words, insulin and glucagon work to balance the blood sugar levels. (Emanuele, Swade, Emanuele, 1998).

Beverages with alcohol can have large amounts of carbohydrates and sugars, as generally liquor (which does not have any carbohydrates, unless it is flavored) is mixed with sugar syrups, sodas, or juices. Upon excessive consumption of carbohydrates, our pancreas produces insulin in response to the increase in the blood sugar levels. When to much insulin is produced by the body, a reverse mechanism occurs and the blood sugar concentration shoots below the normal range. Hypoglycemia, below normal range, and hyperglycemia, above normal blood sugar range, may occur.

Alcohol-induced hypoglycemia typically occurs in people who sometimes for days have been drinking alcohol but not eating. In such a fasting state, the body has two major mechanisms for maintaining the blood sugar levels necessary to provide energy to the brain. It is either by the breakdown of glycogen (glycogenolysis) or production of glucose (gluconeogenesis). Glycogen is a large molecule that serves as a storage form of glucose in the liver. When not eating, glycogen is broken down into glucose molecules, secreted by the liver into the blood, in an attempt to maintain the blood sugar levels. However, after one or two days of this, the glycogen supply will be depleted. Alcohol metabolism in the liver will shut down the process of gluconeogenesis, resulting in the body's mechanisms to sustain blood sugar levels are inactivated, resulting in profound hypoglycemia. However some people with alcoholic ketoacidosis have very high blood sugar levels, because of the lack of insulin prevents glucose uptake (Emanuel, Swade, Emanuele, 1998).

HEALTH BENEFITS OF CINNAMON

Cinnamon contains essential oils such as cinnamic acid, cinnamaldehyde and cinnamate. It has been used for centuries for treatment of numerous ailments and conditions, such as fever,

blood circulation, menstrual issues, stomach discomfort, fighting infection, stopping bacteria and fungus, tranquilizer, and asthma. In a pharmacological review of literature, Jakhetia, Patel, Khatri, Pahuja, Garg, Pandey, and Sharma (2010) noted the antioxidant properties, inhibitory effect on the intestines, anti-microbial properties, anti-inflammatory activities, and impact on blood sugar levels. It is suggested that ground cinnamon, 1-6 grams a day or 80mg of cinnamon extract per day, can have potential numerous positive health benefits. Of concern, is amounts more than such could potentially be very toxic and dangerous. In addition, taken in supplement form, it may cause blood sugars to drop, increased heart rate, upset stomach, and excessive perspiration.

Singh, Maurya, deLampasona, and Catalan (2007) conducted research to analyze the antioxidant, antifungal and antibacterial potential of volatile oils and oleoresins of the cinnamon leaf and bark along with other compounds. They concluded that the potency of the constituents such as eugenol and cinnamaldehyde could provide a chemical basis for some of the health benefits claimed for cinnamon (Singh, et al).

CURRENT ALCOHOL AND GLUCOSE RESEARCH

Research conducted by Avena, Carillo, Needham, Leibowitz, Hoebel (2005), sought to answer whether learning to binge on sugar, to a degree that causes signs of dependence, altered subsequent alcohol intake. In Experiment 1, Sprague-Dawley rats were given escalating concentrations of ethanol for the course of twenty days. Rats were given intermittent ethanol access with twelve hour daily access, consumed more 4%, 7%, and 9% ethanol during the first hour of access, and more 9% ethanol daily than did rats in the continued ethanol access group. In Experiment 2, with ethanol as a gateway to sugar intake, the rats from Experiment 1 were

switched to 10% sucrose with 12-hour daily access for one week. Rats in the intermittent ethanol access group consumed significantly more sugar than was consumed by rats in a control group with no prior ethanol exposure. In Experiment 3, with sugar being used, four groups were maintained for 21 days, with intermittent to sugar and food, unlimited sugar and food, intermittent access to food, or unlimited access to food. Four days later, all groups were switched to intermittent ethanol access. The group with intermittent access to sugar and food consumed the most 9% ethanol (Avena, et al. 2005).

The conclusion drawn suggests the co-morbidity between binge-eating disorder and alcohol intake and the tendency of people abstaining from alcohol to consume excessive amounts of sugar. The researchers suggest that ethanol may help alleviate withdrawal from sugar and intermittent sugar access may cross-sensitize with ethanol (Avena, et al. 2005).

In the COMBINE study conducted by Leggio, Ray, Kenna, Swift (2009), measured the differences in outcomes using anti-craving medication (naltrexone, acamprosate) with behavioral therapy or use of the anti-craving medication. The study hypothesized that heavy drinking may increase blood sugar levels and glucose played a punitive role in alcohol preference.

The researchers conducted a study that included 1,383 participants in eleven different sites throughout the United States, was conducted in an outpatient AODA treatment, participants had a history of heavy alcohol use in the preceding 90 days with four days of abstinence, and no acute withdrawal symptoms. All participants provided blood samples with glucose levels quantified, body mass index, percentage of heavy drinking days (PHDD), date on alcohol consumption in the time-line follow back, and self report craving tests were conducted regarding obsessive and compulsive components as part of the pre-treatment.

Overall, the findings are consistent with preclinical data demonstrating the role of glucose

on alcohol preference, alcohol intake, and alcohol-seeking behaviors. The results indicated that the blood glucose level was significantly and positively correlated with PHDD; pretreatment blood glucose level was positively correlated with PHDD during treatment, and that association reached statistical significance for weeks 4 and 8 of treatment, but not at weeks 12 and 16. This may suggest the pretreatment blood glucose level could predict PHDD during treatment and glucose could influence drinking patterns and behaviors. Furthermore, heavy alcohol drinking is a risk factor for cardiovascular diseases through the increase of blood glucose levels and increases the risk of other medical conditions. After 12 weeks of total abstinence, the correlation disappeared, suggesting that the link between insulin and craving was only during the active drinking phase. (Leggio, et al., 2008a). The study did not find a significant correlation between blood glucose level and alcohol craving and did not take into consideration the impact of the medication(s) on alcohol cravings. (Leggio, et al. 2009).

Shanmugam, Mallikarjuna, and Reddy (2011) conducted a study which rats were divided into five groups (normal control, alcohol treatment, diabetic control, diabetic plus alcohol treatment, diabetic plus glibenclamide treatment). The results indicated that the blood glucose levels were significantly elevated and the body weight significantly decreased in alcohol treated diabetic rates. The finding concluded that alcohol consumption by a diabetic may be harmful.

CURRENT CINNAMON AND GLUCOSE RESEARCH

Research conducted by Hlebowicz, Helbowicz, Lindstedt, Bjorgell, Hoglund, Holst, Darwiche, and Almer (2009), was conducted on 15 healthy subjects. Participants were given rice pudding with and without 1 or 3 grams of cinnamon. The study concluded that injestion of 3 grams of cinnamon reduced the postprandial serum insulin and increased the glucagon-like

peptide without affecting blood glucose. The results suggested a relation between the amount of cinnamon consumed and the decrease in insulin concentration.

Research to test the impact of Ceylon cinnamon on blood glucose and lipids in diabetic and healthy rats, was conducted by Ranasinghe, Perera, Gunatilake, Abeywardene, Gunapala, Premakumara, Perera, Lokuhetty, and Katalanda. It was conducted in two phases with four groups of Sprague-Dawley rats. Phase one evaluated acute effects on fasting blood glucose and on post-oral blood glucose. Two of the groups were provided distilled water and the other two received cinnamon extracts. In phase two, the food consumption, body weight, blood glucose, and lipids was evaluated for over one month. The conclusion of the study suggested the Ceylon cinnamon reduced blood glucose, reduced food intake, and improved the lipid parameters in the diabetes induced rats.

Research conducted by Subash, Prabuseenivasan, and Ignacimuthu, which streptozotocin male diabetic wistar rats were given cinnamaldehyde in 5, 10, and 20 mg/kg bw for 45 days. They found that plasma glucose concentration was significantly decreased in a dose dependent manner. Also, oral administration of cinnamaldehyde significantly decreased glycosylated hemoglobin, serum total cholesterol, and lipoprotein cholesterol levels. The results of this study indicated that cinnamaldehyde possesses hypoglycemic and hypolipidemic effects.

Qin, Panickar, and Anderson (2010) conducted a review of sixteen different research studies (conducted between 2003 and 2010), which included human, animal and *in vitro* experiments involving cinnamon or its components. Focus of the studies included effect of cinnamon on Type II diabetes, metabolic syndrome, post-menopause with Type II diabetes, body mass index, polycystic ovary syndrome, fasting glucose, adolescent with Type 1 diabetes, and with healthy adults. The review examined the effects of cinnamon on glucose, insulin, and lipid metabolism

associated with metabolic syndrome. They determined that cinnamon and components of cinnamon, "has been shown to have beneficial effects on essentially all of the factors associated with metabolic syndrome, including insulin sensitivity, glucose, lipids, antioxidants, inflammation, blood pressure, and body weight" (Qin, et al, 690).

Their review of research also concluded that cinnamon also has the potential to decrease inflammation, with tristetraprolin being a potential therapeutic target for such treatments. It was also determined that cinnamon controls vascular endothelial growth factor and decreases proliferation of cancer cells, inhibits tau aggregation associated with Alzheimer's Disease and blocks cell swelling associated with strokes. However, the research comparison also indicated that five studies (Suppapitiporn et al, 2006; Vanschoonbeek et al, 2006; Blevins et al, 2007; Altschuler et al, 2007; Tang et al, 2008), did not find any significant effects of cinnamon.

CHAPTER III

CONCLUSIONS AND RECOMMENDATIONS

Is it possible for cinnamon to have an impact on blood sugars in early recovery? Based on the data and research conclusions, it is potentially possible. It may be as simple as having individuals include cinnamon into their diet or potentially use cinnamon gum/breath mint/candy when they are experiencing an urge or craving to drink. The strong flavor and taste of cinnamon in candy or gum, may create enough of a diversion or distraction, the brain is able to develop a new neuro-pathway, instead of reinforcing the compulsion to drink.

The evidence suggests that there clearly is a correlation between heavy drinking patterns, alcohol dependence, sweet preference, and relapse potential. This is something that the founder's of Alcoholics Anonymous were aware of, but did not have the research and evidence as to why. With the technology now available, research continues to be conducted to understand why the phenomenon of a craving state occurs, especially in the early stages of abstinence. Much has been done in regards to development of medication therapy that targets specific areas of the brain, which is believed to impact alcohol cravings. Improving individuals knowledge and understanding of the impact of substance use on the entire body, is essential for their personal recovery and future and to stop any further complications. Medical conditions associated with substance use may not be discovered until years after abstinence has been obtained.

Future research needs to be conducted on understanding the value of proper nutrition and exercise to early recovery. Holistic medicine, alternative medicine and non-traditional approaches will continue to grow in popularity, as individuals seek options towards healthier

lifestyles. Research conducted on the benefits of cinnamon and Type II diabetes, suggests that cinnamon can assist in regulation of blood sugar levels, but can also be toxic if consumed in large quantities. Individuals with Type II diabetes needs to remain under the direct supervision of their physician, when considering cinnamon supplementation. Research on the effect of cinnamon, as a tool to reduce alcohol cravings and stabilize blood sugars in early recovery, is warranted.

It is recommended that studies continue to be conducted on perceived intensity of pleasantness of sucrose taste, which has been suggested that it may involve a phenotypic marker of male alcoholic with a paternal history of alcoholism (Wronski et al., 2007). Converging research suggests that alcohol and food-seeking behaviors may also share a common neural pathway, specifically the central neuropeptide Y and the peripheral gut peptide ghrelin (Leggio, et al., 2011). Clinical evidence continues to link the consumption of sweets to alcohol intake, with studies conducted on human and animals however focusing more on neuro-biochemical mechanisms. Insulin, which is secreted by the pancreatic cells, with C-peptide, is involved in the regulation of glucose homeostasis. Some preclinical studies suggest a role of insulin in some neuro-biological pathways on the basis of addiction (Leggio, 2009). There is the potential role of the insulin/insulin receptor pathway in regulating behavioral responses to alcohol has been suggested by a study conducted on flies by Corl, Rodan & Heberlien (2005). The research concluded that insulin has a role in regulating the responsiveness and sensitivity of the mesolimbic dopamine system in intoxicating drugs (Corl, 2005).

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