The Effects Of Flavanol From Cocoa On Cardiovascular Health

Cardiovascular disease (CVD) is one of the most prominent health conditions in the United States. CVD is an umbrella term for damage done to the cardiovascular system that affects the body's overall functioning and ability to adequately pump blood throughout the body. Damage can be done to the vessels or valves, damage to the heart muscle itself, or congenital defects that one is born with. Health conditions that exist under this umbrella term can be due to vascular damage or due to value damage. Some vessel damage conditions include include peripheral vascular disease (PVD), peripheral artery disease (PAD), stroke, hypertension, myocardial infarction (MI). Conditions involving improper valve functioning include regurgitation or stenosis, and can be related to poor cardiovascular health or can be caused by other agents such as infections, congenital or can be due to old age (SITE). In the United States, many people are dying of stroke and heart disease. CVD affects people of all ages and ethnicities, and often it can be prevented or treated with lifestyle choices such as exercise and healthy eating. There are small changes that can be made in everyday life that can promote healthy heart functioning. One change that can be implemented into life is the consumption of dark chocolate. The purpose of this paper is to explore the effects of dark chocolate on aspects of cardiovascular health including arterial stiffness and functioning, perfusion in microcirculation, total cardiac output, cholesterol levels and blood pressure.

CVD can manifest in many different ways, but it is often due to everyday lifestyle choices. When one does not have good cardiovascular health, the cardiovascular system can not function as it once could and there are some common symptoms that present themselves when this occurs. Symptoms of heart disease that can occur in your blood vessels shortness of breath, chest pain, chest tightness, chest pressure and angina. Pain in neck and jaw can occur as well as numbness or weakness in legs and arms (SITE). Weak heart muscle signs and symptoms may include shortness of breath, fatigue, dizziness, irregular heartbeats, swelling in lower extremities, dizziness and lightheadedness. Theses signs and systems are all of a result of lifestyle choices leading to poor functioning of the cardiovascular system.

There are many known actions that can be taken to promote cardiovascular functioning and overall health. Some known measures that can be taken to prevent CVD include avoiding smoking, limiting alcohol intake, maintaining a healthy weight, participating in regular exercise and eating a healthy diet. Smoking damages blood vessel walls which can increase plaque buildup, leading to narrowed vessel walls. Alcohol consumption can increase blood pressure which can lead to other conditions such as cardiomyopathy, stroke or MI. Inactivity and sedentary lifestyle is associated with increased cardiovascular events because exercising encourages arteries to dilate more quickly, helps to regulate and lower blood pressure, helps to maintain a healthy weight, improves cholesterol levels and helps with blood sugar regulation (Last source). Lastly, practicing healthy eating choices is essential for promoting cardiovascular health because many foods contribute to healthy heart functioning, and many decrease efficient cardiovascular functioning. Choices such as increasing fruit and vegetable intake, choosing whole foods instead of processed, increasing healthy fats and limiting unhealthy fats, reducing sodium intake can greatly increase overall cardiovascular functioning. The consumption of dark chocolate has been thought to have properties that are conductive for cardiovascular health.

Dark chocolate contains plant derivative nutrients also known as bioactives that are part of a naturally occuring compound called flavonoids. In dark chocolate these compounds are referred to as cocoa flavanols and can be found cocoa powder and cocoa powder containing foods such as dark or milk chocolate. In this literature review, the benefits of dark chocolate consumption will be discussed.

Description of Literary Sources

When finding articles for the research paper, the terms dark chocolate, hypertension, high blood pressure, flavanols, endothelial function, prevention, hypertension pathophysiology, cardiovascular health and management were typed in the search bar in the CINAHL database. In order to obtain articles that have the most recent and relevant information, the date range was set to only articles within the last five years. Only research articles are going to be used in this literature review, so research publication type was selected in order to refine the search on the database. The full text box is also selected to avoid being connected to articles that are unobtainable. All of the articles in this literature review are research articles that are a max of five years old and are about the effect of dark chocolate on cardiovascular health and hypertension.

West, McIntyre, Piotrowski, and Poupinet (2014) performed an experimental study that explored the relationship between dark chocolate and its effects on arterial function and arterial stiffness. In the study 30 middle-aged overweight adults were recruited to take place in the randomised crossover study. The experiment was controlled by a placebo and took place over a four week period. The intervention group received a total of 37 g/d of dark chocolate and a chocolate beverage that had 22 g/d of cocoa. In total subjects received 814 mg/d of flavanol. The controls used during the study were a chocolate bar that matched in color and similar taste, but was low in flavanol in order to not take away from the purpose of the control. The beverage control did not have any cocoa in it at all. The researchers found that the cocoa treatment increased diameter of the brachial artery by 6%, and volume was increased by 22%. There was a significant decrease in arterial stiffness observed in female subjects but not change in arterial stiffness was observed in male subjects. Reactive hyperaemia index and flow mediated dilation were unchanged and fasting blood measures remained unchanged as well. For both groups, there was no change observed in fasting blood pressure, however resting blood pressure was increased by 4 mmHg for a short period of time after cocoa consumption. In conclusion, there was an association between increased cardiovascular health and consumption of high flavanol cocoa and dark chocolate. Specifically, women in the treatment group experienced reductions in arterial stiffness and both male and female subjects in the treatment group experienced an increased in arterial vasodilation.

In a 2015 study by Sansone et al. (2015), researchers aimed to explore the effects of cocoa flavanol (CF) on cardiovascular health. To examine the association, researchers had used two groups of comparable middle aged adults with no previous cardiovascular health issues. One hundred subjects were randomly assigned to either the treatment group of the control. Twice daily, the treatment group received 450 mg of CF in the form of a beverage, and the control group received a beverage that contained no CF but was otherwise matched for nutrient value. After one month, components of cardiovascular health will be measured such as fibromuscular dysplasia, plasma lipids, blood pressure. With these values, researchers were able to calculate Framingham Risk Scores and pulse wave velocity. It was found that in all categories measured,

the treatment group experienced a positive effect in cardiovascular health when compared to the control group. Endothelial function in the treatment group was improved by 1.2% after a month of flavonol consumption. There was no change measured in the diameter of brachial artery in the treatment group or control. The treatment group experienced a decrease in systolic blood pressure by 4.4 mmHg and diastolic blood pressure by 3.9 mmHg when compared to the control group. When compared to the control, treatment group LDL cholesterol was decreased by 0.17 mmol/L and total cholesterol was decreased by 0.20 mmol/L. An increase of 0.10 mmol/L was observed in HDL-cholesterol. Fasting blood glucose and HbA1C remained unchanged during this study. There was an increased plasma concentration of 1045 nmol/L when comparing the control to the treatment group, but the observed values were not significantly different than values taken after one day consumption of flavanol, demonstrating than flavanol intake increased plasma concentration short term. When evaluating flavanol effects on cardiovascular health using the Framingham Risk Scores, it was found that flavanol consumption over a one month period decreased the risk of developing coronary heart disease or CVD, or to experience a myocardial infarction. No decrease in stroke risk was observed.

A study was conducted in 2015 to examine the effects of long and short term cocoa consumption on cognitive function and cardiovascular health. Massee et al. (2015) recruited a total of 40 young healthy adults aged 18-40 years old that did not currently have any known cardiovascular health issues. Participants were randomly assigned to either the treatment of the control group. Treatment group participants received an active cocoa tablet containing 250 mg catechin polyphenols and 5.56 mg caffeine, and the control group received a tablet identical in appearance made of inert cellulose powder. In additional to measures for cognitive function, researchers gathered data to examine cardiovascular markers such as blood pressure and cerebral blood flow. Measurements were taken prior to ingestion of the tablet, and two hours after ingestion to compare baseline and short term effects of cocoa. In order to measure long term effects of cocoa ingestion, researchers compared baseline values to values taken daily for four weeks. Peripheral and central aortic blood pressure was measured using a blood pressure cuff. The common carotid artery was assessed using a doppler to gather a value for cerebral blood flow velocity. Researches found no effect on cardiovascular health for short term or long term consumption of cocoa.

In a 2015 study, researchers investigated the effects of cocoa flavanol on 22 young and 20 elderly adults with no prior history of cardiovascular issues. In this study, subjects were randomly assigned to two groups, the intervention group and a placebo that was marched in nutrients but contained no cocoa flavanol. For 14 days the treatment group received 450 mg of cocoa flavanol in the form of a drink twice daily, and the control group used consumed the placebo drink for the same amount of time and just as often. Researchers aimed to measure endothelial function by recording the flow mediated vasodilation (FMD) and monitoring blood pressure. Other aspects of cardiovascular health that were measured included perfusion in microcirculation, vascular stiffness, conductance of conduit and resistance arteries, stroke volume, heart rate and cardiac output. Monitoring of these values was done over an acute period (1 hour after consumption) and over a chronic period (after the full 14 day period). The study was a randomized, controlled, double blind, and used a parallel group. It was found that for both population groups, both young and elderly, endothelial function was improved as evidenced by an increase in FMD in an acute setting as well as after the 14 day trial. A significant decrease in systolic blood pressure as observed in the elderly population in the acute trial as well as after the 14 day period, but in the young population systolic blood pressure was only significantly reduced in the acute period. Consumption of flavanol significantly decreased

diastolic blood pressure (DBP) and total peripheral resistance (TPR) in the acute and chronic periods for both groups. There was no apparent effect on stroke volume, cardiac output and heart rate (Heiss et al., 2015).

Summary & Conclusion

Four research articles were reviewed and analyzed that experimentally tested the effects on the consumption of cocoa flavanols on cardiovascular health and functioning. All studies recorded baseline values for what they were measuring prior to starting the experiment, occurred over an extended period of time and featured a treatment group and a control group. Similar methods were used for assessing cardiovascular functioning and health throughout the experiments. According to West et al. (2014) flavonol consumption increases brachial artery diameter by 6% and stroke volume by 22%, as well as decreases arterial stiffness for female participants. No change in blood pressure was observed. Sansone et al. (2015) found no change in brachial artery diameter, but a decrease in blood pressure of 4.4 mmHg systolic and 3.9 mmHg diastolic was observed as well as a 0.2 mmol/L decrease in total cholesterol. Massee et al. (2015) measured changes in peripheral and central aortic blood pressure as well as blood flow velocity and found that CF consumption had no effect on cardiovascular health. Lastly, Heiss et al. (2015) found a decrease in blood pressure for participants as well as a decrease in TPR. No effect was observed on stroke volume or cardiac output.

The information gathered from these studies can be used in a clinical setting to teach patients how to improve their cardiovascular health. Encouragement of consumption CF containing foods while in the hospital could help to promote healthy habits when the patient is discharged. If the patient doesn’t like chocolate containing foods, CF can also be consumed in tablet form. Nurses can educate patients on the studies that have been done in order to encourage patients to take the initiative and make changes in their daily life to improve cardiovascular health. During this teaching portion, it is important to explain the effects of cocoa flavanol consumption and why those effects might be desirable for the patient. To assess patient understanding, a teach back method may be appropriate to ensure the patient fully understands the importance of cardiovascular health as well as how flavanol consumption can promote healthy cardiovascular functioning.

In conclusion, cocoa flavanol consumption improves cardiovascular functioning and health in a variety of ways and for various populations. It is important to implement things into everyday life that promote heart health for people with and without CVD. Those without CVD ca n implement things into their life to increase cardiovascular health, and those with CVD can improve overall function and decrease risks of complications associated with CVD such as stroke and MI. Dark chocolate consumption can be an easy and tasty way for individuals to promote cardiovascular health and functioning.