THE EFFECTS OF WATERMELON POWDER ON RISK FACTORS OF CVD AND INFLAMMATION IN ATHEROGENIC DIET FED RATS

Running Head: Effects of watermelon powder on CVD and inflammation in rats

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For over a decade, a spotlight has been placed on the leading cause of death in the United States which is cardiovascular disease (CVD) [1]. This is a family or an umbrella of diseases which consists of many medical conditions. All of which have appeared to correlate with certain diet choices and low physical activity levels amongst those who become diagnosed with them. Upon observation, one could say that the cases of such diseases grow with the waistline of the people who are affected by them. Diets which are high in calories, saturated fats, trans-fats, sodium, and cholesterol are some of the main contributors to these diseases because they increase body fat, blood lipids, and blood pressure. Even more concerning is the fact that childhood obesity has become more common in society today, which means that such diets may even be affecting the new generations [2]. Given these circumstances, there has been a great deal of conversation revolving around a variety of foods that may prevent such medical conditions. Often termed as superfoods, there are many nutrient dense fruits and vegetables that contain a variety of chemical components which are beneficial for health and disease prevention. Antioxidants are chemicals which contribute to this statement. Antioxidants are in relation to the pigments of fruits and vegetables which contribute to their color and they also function in eliminating free radicals that cause damage to cells by oxidation. Another association with antioxidants is their ability to possibly lower inflammation, which is the response to adverse stimuli by the body’s immune system. Both oxidative stress and inflammatory markers may be used to predict the risk of developing CVD in both adults and adolescents [3].

Watermelon is a particular fruit which has been brought into the spotlight due to its antioxidant sources which include lycopene and beta-carotene [4]. In addition, watermelon contains the amino acid L-citrulline, which may be converted to L-arginine once absorbed by the
body. Studies have found that this amino acid may be linked to lowering high blood pressure [5]. Other studies have suggested that watermelon juice may contribute to lowering body weight, cholesterol, and development of arterial plaque [6]. Such studies have utilized both animal models such as mice and human participants that were supplied servings of watermelon juices, extracts, or the fruit itself. Atherogenic diets which consist of added cholesterols and saturated fats may be given to animal models for several weeks in order to yield biological effects such as elevated serum cholesterol which contributes to CVD [7]. Inflammation promoting substances such as dextran sodium sulfate (DSS) may also be administered to animal models for the purpose of differentiating between inflammations among groups by measurement of C-reactive protein CRP [8] and [9].

The purpose of this study was to determine if watermelon powder decreases the risk factors associated with CVD and inflammation among rats that are fed atherogenic diets. The hypothesis was that watermelon powder lowers the risk factors of both CVD and inflammation by increasing antioxidant levels, altering lipid profiles, and reducing inflammation.
Discussion

When considering that there are numerous medical conditions which reside under CVD, it is important to note that there are many causes and warning signs to such circumstances. Poor diet choices that consist of large amounts of saturated fats and calories are some of the primary contributors to these medical conditions. Elevated levels of LDL cholesterol and triglycerides positively correlate with these contributors, while elevated HDL has an inverse correlation. Inflammation is also a sign of CVD and antioxidants have been shown to reduce this biological reaction to cell damage. Fruits and vegetables have been known to positively affect each of these factors, and watermelon has been identified as one in particular to study and see if any of its particular components are more effective in doing so.

In one study which used watermelon extract, researchers found that the watermelon fed mice had reduced weight gain when compared to the control group [6]. This study differed from the former because the DSS-treated rats had a lower final body weight than the non-DSS treated, while the same applied for their spleen weights and triglyceride levels. This could be justified by the fact that the DSS-treated rats were eating less. Perhaps the rats’ appetites were affected by the DSS treatment. If future studies were to address watermelon’s affect on weight management, then it may be applicable to withhold from using inflammation inducing chemicals and also start with subjects which are already in the status of obesity.

In Holt’s study, they successfully added to data already known about adults in regards to fruits and vegetables and their ability to lower inflammation and oxidative stress; their study found that the same applied amongst adolescents [3]. This study provided even more specificity to the prior data in that significance was found from not just a variety of fruits but particularly watermelon powder. In addition, it displayed that watermelon powder may lower inflammation
and oxidative stress within an even younger age group being that the rats used would be comparable to 12 years old humans upon testing. This may be interpreted as an essential piece of information considering the rising cases of childhood obesity [2] Therefore, future studies may venture into testing for such effects among children. Find cite

The total antioxidant capacity measured was higher in the watermelon powder fed group than the control group. In a similar study, the bioavailability of the antioxidant lycopene was measured in serum levels to see if there was a difference from diets including watermelon juice which had been heated; the researchers found that there was no difference between heated watermelon juice and even when compared to tomato juice [4]. In this study, the total antioxidant capacity suggests that antioxidants from the watermelon powder must also have adequate bioavailability which must also explain why serum lipids were affected. Reason being, the study identified that LDL cholesterol, total cholesterol, and triglycerides were lower in the watermelon powder fed rats when compared to the rats who were given the control diet, which had increases in these markers. As for the HDL cholesterol, there was a decrease shown in the DSS treated rats, while it was not conclusive to say whether or not watermelon powder had an effect on serum levels. This observation supports that watermelon is effective in improving blood lipids. LDH was higher in the control fed rats when compared to the watermelon powder fed rats, which suggests that watermelon may be beneficial for heart health because high LDH is associated with myocardial infarctions. In future studies, the effects of this study could be measure further by using human subjects. Also, it may be more supportive and accurate with a larger population such as (n=200) coupled with a longer duration such as one year. An alternative could be to use different age populations.
The CRP was a marker for inflammation and it was decreased significantly in the watermelon fed group as compared to the DSS control group which means that watermelon aided in decreasing the inflammation caused by DSS. This observation may be relevant to the measurements of serum LDL cholesterol levels, as inflammation is an after effect of cell damage possibly caused by oxidation of LDL cholesterol.

In summary, this study supported the assertion that watermelon may be beneficial for cardiovascular health in that it lowered serum levels of blood lipids in adults, adolescents, and maybe even children. Though earlier studies have shown the potential for watermelon to aid in weight loss, the use of DSS may alter such abilities. After many studies, it seems as though watermelon’s antioxidants surely have positive effects on cardiovascular health being that lipid profiles have been found favorable and inflammation has been decreased.

In conclusion, it appears that incorporating watermelon powder into a dietary regiment may reduce the risk of CVD by affecting lipid profile, inflammation and antioxidant status in a way that is medically recognized as favorable.
References


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