The Role of Resveratrol in Lowering and Controlling Blood Pressure

1. INTRODUCTION

Hypertension is a pressing issue in America that affects millions of people1. The overall health and wellbeing of those affected is seriously hindered because of it and a majority of them are on medication in order to control it. However, there is a way to improve, and in many situations even control, hypertension without pharmaceutical drugs. Resveratrol is a polyphenol that acts as an antioxidant found in the skin of red grapes that has been shown to lower blood pressure as well as participate in disease management and prevention and improve overall health and well being1. Resveratrol is naturally found in grapes and in many experiments has been isolated in order to further examine its role in lowering and controlling blood pressure in both animal and human studies. Researchers, scientists, and health professionals have been able to further generalize the findings of these studies and experiments in order to implement a suggested dosage of resveratrol in supplement form in order to provide people with the health benefits associated with it.

Resveratrol is an antioxidant which means it neutralizes free radicals and induces antioxidant enzymes1. The scientific name for resveratrol is 3,4',5-trihydroxystilbene and belongs to the polyphenolic compounds class of stilbenes1. Not only has resveratrol been proven to lower blood pressure but it has also been shown to lower LDL cholesterol levels, increase DNA stability, induce phase II drug-metabolizing enzymes, inhibit hydroperoxidase functions, act as an anti-inflammatory agent, and aid in the health promotion of several chronic conditions like aging, heart disease, and cancers1. Through extensive research of resveratrol and its pathway in the human body, it has been found that resveratrol is absorbed and then rapidly metabolized once it is joined to glucuronic acid or sulfate. These new compounds that are formed are called resveratrol glucuronides or resveratrol sulfates. These compounds are able to travel in blood plasma and enter cell membranes1. The main role of resveratrol that will be focused on is its role in aiding to lower and control blood pressure.

1. REVIEW OF LITERATURE

The first article that will be reviewed is titled “The efficacy of Resveratrol in controlling hypertension: study protocol for a randomized, crossover, double-blinded, placebo-controlled trial”. The experiment was conducted in order to determine whether resveratrol is an effective antihypertensive agent2. This experiment included 100 human subjects, 50 of which had prehypertension and 50 of which had stage 1 hypertension. For four weeks the first group received 500 mg of pure resveratrol in a capsule twice a day and the second group received a placebo. The participants’ blood pressure was measured and recorded once per week. After four weeks, the two groups switched treatments and the blood pressures were measured and recorded again once per week2. This study was a double-blinded study meaning that neither the participants nor the people giving the treatment and taking the blood pressure measurements know which group is receiving the resveratrol capsule and which group is receiving the placebo. This is definitely a strong positive for any study because it immediately eliminates a huge source of possible bias and therefore decreases human error within the study. The group with prehypertension does not receive any medication during the eight weeks of the study; however, the participants with stage 1 hypertension did continue to receive their usual medications for hypertension during the study2. At the end of the experiment, it was shown through the recorded blood pressure measurements that overall resveratrol did lower blood pressure in these subjects with prehypertension and stage 1 hypertension2. The blood pressure lowering effects of resveratrol were stronger in those with prehypertension than in those that already had hypertension. It is hypothesized by the researchers that this may be due to the fact that those with hypertension are already resistant to their own medications and it may take longer for the effects of resveratrol to show in them. However, the resveratrol was still effective among them2. Also, the sample size of this study was relatively small, so in order to really evaluate the effectiveness of resveratrol in hypertensive patients, a new study needs to be conducted that includes a much larger sample size and a longer period of treatment with the resveratrol. Overall, this study was a relatively strong study regarding validity and reliability. One downfall of the article itself is that it failed to describe the participants themselves regarding age, race, and gender. These demographics may not have anything to do with what is being studied in the experiment, but just in case it does sway the results, it is important that this information is included.

The second article for review is titled “Resveratrol decreases fructose-induced oxidative stress, mediated by NADPH oxidase via an AMPK-dependent mechanism”. Through research, it has been found that hypertension is caused by many things including the pathogenic factor of oxidative stress3. It has also been found that resveratrol increases NO bioavailability, therefore, decreasing risk of and preventing cardiovascular disease and hypertension. This study was conducted in order to determine whether resveratrol decreases the generation and production of ‘reactive oxygen species’ which would therefore decrease high blood pressure in fructose-induced hypertension3. The study was four weeks long and included 30 rats (16 week old males) with high blood pressure. They were obtained and kept in individual cages. They were randomly divided into five equal groups. The first was the control group, the second was fed 10% fructose, the third was fed 10 mg per day pure resveratrol, the fourth was fed 10% fructose and 10 mg per day pure resveratrol, and the fifth group was fed fructose for the first two weeks and then switched to fructose and resveratrol for the last two weeks. The systolic blood pressure of the rats was measured and recorded at the beginning of the experiment and then every single day thereafter for the full four weeks. At the end of the four weeks the researchers determined that eating a diet high in fructose is associated with high blood pressure. The most interesting results of the five groups was the last group that was fed fructose for two weeks and then fructose and resveratrol for two weeks. For the first two weeks, the blood pressures of the rats steadily increased the entire time. Then when the resveratrol was introduced, the blood pressures leveled out and then rapidly decreased back to baseline. They found that resveratrol has this effect on blood pressure because it inhibits ANF-II-induced cardiomyocyte hypertrophy. This is linked directly to the fact that resveratrol acts as an antioxidant3. Overall, this experiment was extremely strong because it examined many of the effects and combinations of resveratrol with fructose which is a cause of hypertension. The study could have been improved if it would have been done with human subjects (if ethical) and included more subjects to increase validity of the results.

The third article for review is titled “Vascular and Cardiac Effects of Grape Powder in the Spontaneously Hypertensive Rat”. This study is unique because it deals with resveratrol in the form of freeze dried grape powder. This experiment was conducted in order to examine the effect of resveratrol and other phytochemical constituents in grapes such as catechins, anthocyanins, flavanols, and other stilbenes on vascular and cardiac effects4. These specifically include blood pressure, lumen narrowing, and vascular compliance. Eight week old rats with spontaneous hypertension were obtained and caged individually. They were divided into three groups, the first group was the control group that did not receive any supplement, the second group received pure resveratrol in freeze dried form once a day in 1.75 mg dosages, and the third group received grape powder supplement that included resveratrol, catechins, anthocyanins, flavanols, and stilbenes in 10 mg dosages4. The study was held for ten weeks during which the rats were ten to twenty weeks old. At the conclusion of the study, the researchers reported that resveratrol failed to reduce blood pressure but did increase vascular compliance and decreased lumen diameter. The group that received the grape powder had significant blood pressure lowering but had reduced vascular compliance and no effect on lumen diameter4. From these results it can be concluded that the resveratrol itself may not be lowering blood pressure, but all of the phytochemicals and polyphenols together in grapes aids in blood pressure lowering. Therefore, the best way to incorporate these into an individual’s diet would be to eat whole grapes instead rather than supplementing.

The fourth article that will be reviewed is titled “Fruit intake and cardiovascular disease mortality in the UK Women’s Cohort Study”. This experiment was conducted in order to examine the effects of fruits on cardiovascular functions in women. The fruits studied were citrus fruits (oranges, grapefruits), berries (raspberries, strawberries), pomes (apples, pears), drupes (apricots, nectarines, peaches, plums), tropical fruits (bananas, kiwi fruit, mangoes, papaya, pineapple), and grapes5. A 217- food item frequency questionnaire was sent out to 61,000 women. 35,692 women responded and participants who did not provide sufficient information, had cancer, type II diabetes, angina, history of strokes, extreme total energy intakes, and fruit consumption outliers as well as outliers pertaining to age, socioeconomic status, and lifestyle habits were removed. So, the study consisted of 30,458 participants5. The women then participated in a four-week long food log where all foods and portions were recorded. Also, the women measured and recorded their blood pressure and cholesterol once per week. At the conclusion of the study, it was determined that women who have a higher intake of total fresh fruits (particularly grapes) have a lower risk of fatal CVD because they exhibit lower blood pressure and cholesterol levels than women who do not have a diet sufficient in fresh fruits. Also, there was a lack of association between high fruit juice intake and acceptable blood pressure and cholesterol levels5. Therefore, it can be concluded that grapes do contribute to lowering blood pressure levels and/or preventing high blood pressure in the first place. Overall, this study in particular was very strong and has high validity because it had such a large sample size. However, it is weaker than the other studies because it did not isolate resveratrol itself, only grapes as a whole.

1. CONCLUSION

Based on the information recorded through these experiments and studies as well as many others, it has been concluded that resveratrol does successfully aid in lowering and controlling blood pressure. An appropriate dosage of resveratrol for the average human being is 200 mg per day in order to ensure the health benefits associated with resveratrol1. However, even though it is known that resveratrol is in fact the specific antioxidant agent that is responsible for lowering blood pressure, it is recommended that individuals still consume resveratrol naturally in the form of red grapes so that they are also including the other phytochemicals that beneficially work with resveratrol in the body. As found through a specific study, these include catechins, anthocyanins, flavanols, and other stilbenes4. Health professionals do still recommend a supplement of resveratrol in a lower amount because even with high intake of naturally occurring resveratrol, its bioavailability in the body is low due to its high sensitivity to low pH environments specifically in the stomach and also rapid metabolism1. So, the most appropriate form of intake for resveratrol is a 25 mg dose supplement and frequent smaller intake of red grapes (or other forms of naturally occurring resveratrol) throughout the day.

Although there has been a lot of information gained regarding the role of resveratrol in lowering blood pressure on animals (mostly rats), human trials are limited. In order to fully have a grasp on the effects of resveratrol in the human body, more studies, specifically randomized controlled trials, need to be done that include large sample sizes to ensure reliability. The evidence found through these articles that were reviewed and discussed does support the hypothesized thesis mentioned earlier that resveratrol aids in lowering blood pressure. From the research gathered it is clear that there are significant health benefits associated with consuming resveratrol in red grapes; however, there are also a few risks. High levels of resveratrol can result in toxicities that may lead to nausea, diarrhea, and weight loss if taken in dosages of 2 g (2000 mg) or higher on a daily basis1. It is important not to over-supplement resveratrol because it is a fat-soluble compound which means excess can be stored in body tissue. Overall, every individual (with the exception of those with certain food allergies), especially those with hypertension or prehypertension should be incorporating red grapes in their daily diets to ensure sufficient amounts of resveratrol.

References

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