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Effect of Jungga Orange Peel Essential Oil (Citrus Jambhiri) on Platelet Function in Male Rats Given High Intensity Physical Activity

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Abstract

Physical activity is one of the stress factors that can provide physiological changes to the function of the hematological system such as changes in platelet count. Physical activity can produce free radicals that can result in cell damage including platelets. Platelets play a role in the hemostasis process, If the platelet count is too low, it can cause excessive bleeding. However, if there is an increase in platelet count too high, it can cause thrombosis that can inhibit blood vessels. Antioxidants have a protective effect on cells and eliminate free radicals. The objective of this research was to ascertain the reaction of platelets to the injection of jungga orange peel essential oil (citrus jambhiri) in male rats that were subjected to strenuous exercise. Twenty male rats (3-4 months old, 180-200 grams) of the Wistar strain of the white rat (Rattus norvegicus) were used in the experiment. Using a random number generator, 20 white rats were split into two groups. In group P1, the rats swam for 50 minutes, three times a week, for four weeks. In group P2, the rats swam for 50 minutes, three times a week, for four weeks, and were also given 0.05 milliliters of jungga orange peel essential oil every hour prior to swimming. Based on these findings, it appears that there is a statistically significant difference between the P1 and P2 groups in terms of the average platelet count, with the P2 group exhibiting a decline in platelet count. Antioxidant substances contained in the essential oil of jungga orang have the ability to inhibit the decline in platelet function after high-intensity physical activity.

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INTRODUCTION

Platelets' primary role is to defend blood vessels against endothelial damage caused by the everyday mild trauma that takes place and to start the healing process for wounds that occur on the walls of blood vessels. Platelets also play a role in the formation of new blood cells. By constructing a blockage with adhesion paths (the attachment of platelets to the sub-endothelial tissues of injured blood vessels) and aggregation, you can prevent further damage to the blood vessel (attachment between platelet cells) (Guyton & Hall, 2008; Thon & Italiano, 2012).

Platelets travel through the circulatory system and play a role in the process of hemostasis, which ultimately results in the development of blood clots. It is possible for there to be an excessive amount of bleeding if there are not enough platelets in the blood.However, a high platelet count can lead to thrombosis, which can inhibit blood arteries and lead to events like stroke, myocardial infarction, pulmonary embolism, or blockage of blood vessels to other areas of the body, such as the limbs. The release of platelets from the bone marrow, splenic arteries, and intrapulmonary circulation is linked to an increase in platelet count (Lister et al., 2008; Periayah et al., 2017).

One of the stress factors that can generate physiologic changes to the functioning of the hematological system, such as variations in the quantity of platelets, is physical exercise (Arnab & Sundar, 2013). Platelets contribute to the mechanism of hemostasis by adhering to the area of jejas and aggregating with one another. This is a process that is referred to as primary hemostasis in normal circulation, and it occurs when platelets are present in the blood (Versteeg et al., 2013).

Physical activity of a moderately intense nature has the potential to produce an excessive amount of free radicals, which might result in oxidative stress. The use of antioxidants is one way to alleviate the effects of oxidative stress. The essential oil of lime contains flavonoids, which are molecules that act as antioxidants. Flavonoids have the potential to exert a preventive impact against the damage that is brought on by the oxidative stress that is brought on by physical activity (Dekany et al., 2008).

After participating in physical activity, there is an increase in catecholamine levels, an increase in adenosine diphosphate (ADP), and an increase in thromboxanE A2, all of which can lead to alterations in platelet activation. These findings come from research that was conducted in the past. Other researchers have shown that aerobic exercise of a mild to moderate intensity can increase platelet counts in young women. This effect was seen in both of the studies that were conducted (Lister, 2008).

Aerobic exercise is regarded as having the same health benefits as a drug; nonetheless, exercise can occasionally result in an unexpected cardiac death. Not only is the research of the processes behind the influence of aerobic exercise on arterial thrombosis very important for the prevention of such cardiac events, but it is also very significant for determining how different forms of exercise and physical activity can be performed in a secure manner (Escribano et al., 2010). The objective of this research was to ascertain the reaction of platelets to the injection of jungga orange peel essential oil (citrus jambhiri) in male rats that were subjected to strenuous exercise.

METHODS

Subjects

Twenty male rats (3-4 months old, 180-200 grams) of the Wistar strain of the white rat (Rattus norvegicus) were used in the experiment. Using a random number generator, 20 white rats were split into two groups. In group P1, the rats swam for 50 minutes, three times a week, for four weeks. In group P2, the rats swam for 50 minutes, three times a week, for four weeks, and were also given 0.05 milliliters of jungga orange peel essential oil every hour prior to swimming.

Design study

In this study, a posttest group design was used in conjunction with the true experimental method.

Procedures

In addition, the rats were subjected to a high-intensity physical activity treatment, which consisted of either swimming as quickly and as vigorously as they could until they were about to drown or showing signs of fatigue, which included almost completely drowning, with the exception of their noses, and a reduction in the range of motion in their limbs. The length of time spent swimming is often between 45 and 50 minutes. In order to obtain the highest potential level of the rat's physical activity, a stimulus is applied to the mouse while it is swimming (its head is pressed into the water). This causes the mouse to swim as quickly and as furiously as it can until it is almost completely submerged. After that, the Hematology Analyzer is used to conduct a test on the platelets in the rat's blood.

Data Analysis

The t-test was used to analyze the data.

RESULT

The Independent t-Test was used to compare the average platelet count of the P1 group, which consisted of people who engaged in high-intensity physical activity but weren't given any jungga orange peel essential oil, to that of the P2 group, which also engaged in high-intensity physical activity but received the oil. The results of this comparison are presented in table 1, and the P1 group had a significantly lower average platelet count than the P2 group. It is known that the average platelet count in the P1 group was 297.80 (m/uL) and the average platelet count in the P2 group was 266.30 (m/uL) (p=0.004). These numbers may be found in table 1. Based on these findings, it appears that there is a statistically significant difference between the P1 and P2 groups in terms of the average platelet count, with the P2 group exhibiting a decline in platelet count.

Table 1. The means platelets on two groups

Variabel	P1 group mean ±sd	P2 group mean ±sd	P
Platelets (m/uL)	297.80 ± 45.04	266.30 ± 66.39	0.004

DISCUSSION

Platelet counts went down in the p2 group, which led to a significant difference in the average platelet count between the p1 and p2 groups. However, the p1 group had a higher average platelet count. The reduction in platelet count that is caused by flavonoids, saponins, alkaloids, beta-carotene, vitamins, and minerals is able to stabilize the generation of megakaryocytes and platelets, prevent cell deformation in the pancreas, and stop the production of free radicals. .

Antithrombotic activity can be attributed to flavonoids, which are the most abundant type of phenolic substance. Flavonoids achieve this by preventing cyclooxygenase from metabolizing arachidonic acid (ferreira et al., 2011; lazarim et al., 2009). Platelet development can be affected by vitamin c antiplatelet properties, which include the stabilization of the creation of megakaryoblast and megakaryocyte cells and the prevention of tissue deterioration caused by free radicals (david, 2011; kobialka et al., 2014). Because mild and moderate exercise stimulates an increase in thrombopoietin generated by the kidneys and liver, regular exercise that is performed for an extended period of time and over a prolonged period of time will enhance the formation of platelets in the blood. During times of increased physical activity, the body's need for oxygen rises, which in turn stimulates the production of thrombopoietin. This, in turn, leads to an increase in platelet production in the bone marrow (lister, 2008).

Platelets travel through the circulatory system and play a role in the process of hemostasis, which ultimately results in the development of blood clots. It is possible for there to be an excessive amount of bleeding if there are not enough platelets in the blood. However, if the platelet count is too high, it can induce thrombosis, which can inhibit blood arteries and lead to events such as a stroke, myocardial infarction, pulmonary embolism, or the blockage of blood vessels leading to other areas of the body, such as the extremities of the arms or legs (aqinda, 2011).

While submaximal exercise has been shown to reduce platelet count and lengthen bleeding time, the administration of glutathione prior to submaximal exercise has been shown to raise platelet count and shorten bleeding time. Results from this study are in line with those found by fajri et al. (2015). Several studies found that platelets increased by 18% to 80% right after treadmill activity. The intensity of an instantaneous workout affects the number of platelets that are added to the blood.

Free radicals can accumulate in the body as a result of the increased oxygen consumption that is required for physical activity. The presence of an excessive amount of free radicals will result in oxidative stress, which will, in turn, cause an increase in both the bleeding time and the blood cell count. Antioxidants included in the essential oil of jungga orange peel have the potential to alleviate the negative effects of oxidative stress.

The flavonoids that are included in the essential oil of jungga orange peel are known to have antioxidant properties. Flavonoids are the most abundant type of phenolic chemical, and they are candidates for use as antioxidants in the neutralization of free radicals. Flavonoid compounds have been shown to have antithrombotic effect via blocking cyclooxygenase's metabolism of arachidonic acid. This is accomplished by flavonoid compounds (zheng & wang, 2001; shahriyari and yazdanparast, 2009).

CONCLUSION

Platelet function can be protected from the aftereffects of strenuous exercise by antioxidant chemicals that are found in the essential oil of citrus jungga, which are able to be found in high concentrations in the oil.

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