SUMMARY AND CONCLUSION

Stressful stimulus influences the onset and progression of a number of disorders in human beings leading to hypertension, stroke and depression. The stress increases the blood pressure, heart rate, increases plasma cholesterol levels and has adverse effects on coagulation and fibrinolysis. All the systems: the heart, the blood vessels, the immune system, the lungs, the digestive system, the sensory organs and brain are modified to meet the perceived danger. Prolonged exposure to continued stress can be very damaging by decreasing hippocampus function and also by decreasing cell proliferation rates. With the urbanization and westernization of our society stress is increasing day by day which causes an increase in the incidence of psychosomatic, psychiatric and cardiovascular diseases. Stress enhances the release of various hormones. Epinephrine increases blood pressure and heart rate, diverts blood to muscles and speeds reaction time. Cortisol releases sugar from the body reserves. Stress circuit affects systems throughout the body. The hormones of the hypothalamic-pituitary-adrenal axis exert their effect on the autonomic nervous system, which controls such vital functions as heart rate, blood pressure and digestion.

The involvement of reactive oxygen species (ROS) has been identified in the pathogenesis of various diseases. ROS are continuously generated in cells exposed to an aerobic environment during the course of normal metabolism. ROS damage proteins, DNA and other biomolecules. ROS are short-lived species and are generated in normal cells under pathological conditions, metabolism of different xenobiotics, exposure to ionizing radiations and different stress conditions.

Stress both physical and psychological has a major role to play in the pathogenesis of a number of diseases. Our study is aimed to study the effect of various types of stress on lipid metabolism and antioxidant status. It is considered relevant to study the levels of lipid parameters - total cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol and scavenger enzymes of reactive oxygen species- superoxide dismutase (SOD), catalase (CAT),
glutathione peroxidase (GPx), glutathione-S- transferase (GST) and reduced glutathione (GSH) content in various stress conditions with a view to assess the role played by these stress conditions in the incidence of cardiovascular diseases.

Hence the present study is aimed to understand

1. Whether physical and psychological stress and stress caused by external agents produce any changes in the lipid metabolism and antioxidant status in experimental animals and also to understand whether this information is useful in understanding the risk of getting coronary artery disease in these stress condition.

**Materials and Methods**

In present study Male albino rats (Sprague-Dawley strain) weighing (150-175g), were divided into seven groups of 6 rats each. The groups were

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Normal control rats</td>
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<tr>
<td>II</td>
<td>Fresh water swimming (F W S)</td>
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<tr>
<td>III</td>
<td>Cold water swimming (C W S)</td>
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<td>IV</td>
<td>Overcrowding</td>
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<td>V</td>
<td>Isolation</td>
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<td>VI</td>
<td>Exposure to cigarette smoke</td>
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<td>VII</td>
<td>Alcohol administered</td>
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Animals were subjected to the above-mentioned stress for a period of one month. At the end of the experimental period the animals were sacrificed and their blood, liver, heart, kidney and aorta were collected for various biochemical estimations. The biochemical investigations such as lipid profiles- total cholesterol, LDL-Cholesterol, triglycerides and HDL- cholesterol and markers of oxidative stress such as superoxide dismutase, catalase, glutathione peroxidase, glutathione-S- transerase and reduced glutathione content and lipogenic enzymes and transaminases (serum glutamate oxaloacetate and pyruvate
transaminase) were also estimated in the tissues of stress exposed and normal animals. The following findings were obtained.

1. The lipid profile parameters such as cholesterol, triglycerides and LDL-cholesterol and transaminases were also found to be significantly elevated in isolation, overcrowding and alcohol administration and cigarette smoke exposure when compared to those of normal control rats. HDL-cholesterol was significantly decreased when compared to that of the normal control rats. Swimming stress showed a significant decrease in cholesterol, triglycerides and LDL-cholesterol and an increase in HDL-cholesterol were obtained.

2. The markers of oxidative stress such as superoxide dismutase, catalase, glutathione peroxidase and glutathione-S-transferase significantly decreased in all stress condition except cigarette smoke exposure. Cigarette smoke exposure significantly enhanced the activities of all the antioxidant enzymes. Alcohol significantly increases the activities of glutathione-S-transferase and glutathione peroxidase.

3. The values of reduced glutathione significantly decreased in all the tissues of rats exposed to all types of stress. The values of lipid peroxidation significantly increased in the serum and tissues of rats exposed to all types of stress.

4. The activities of HMG CoA reductase was significantly increased in the swimming, isolation and cigarette smoke exposure and a significant decrease in HMG CoA reductase activity was observed in the alcohol administered group. Activities of glucose 6 phosphate dehydrogenase and malic enzyme significantly increased in Fresh water swimming, cold water swimming, alcohol administration and cigarette smoke exposed group.

5. Combined action of alcohol and cigarette smoke lead to a significant increase in lipid parameters, lipid peroxides and serum transaminases. Combined exposure to alcohol and cigarette smoke enhanced the oxidative stress and thus adversely affecting the antioxidant system.
All the types of stress studied: swimming, isolation, overcrowding, alcohol administration and cigarette smoke exposure produces significant changes in the lipid metabolism. Alcohol administration and exposure to cigarette smoke produces more damage to tissues, followed by fresh water swimming and cold-water swimming stress. Overcrowding and isolation stress cause least damage to tissues compared with other stresses. It is also clear that stress - physical, oxidative and psychological increases lipid peroxidation in rats when compared with normal control rats. The alcohol administration, smoke exposure and induces more lipid peroxidation compared with control rats. The fresh water swimming and cold-water swimming stress induces less lipid peroxidation compared with oxidative stress, and isolation and overcrowding stress induces very little elevation in the lipid peroxidation products. The stress induces the production of free radicals, which reduces the activities of antioxidant enzymes. Alcohol administration and exposure to cigarette smoke produces more oxidative damage to the tissues followed by fresh water swimming and cold-water swimming stress. Overcrowding and isolation stress cause least damage to the tissues compared with other stress conditions.

The combined treatment of alcohol and cigarette smoke was found to enhance the lipid parameters and lipid peroxidation and serum transaminases. In conclusion combined exposure to alcohol and smoke enhanced the oxidative stress and thus adversely affect the antioxidant system and thus is likely to be more harmful than the effect of smoke or alcohol alone. The study was extended to evaluate the effect of S-allyl cysteine sulfoxide (SACS) and diallyl disulphide (DADS) on various parameters in alcohol administered experimental rats. It was observed that the oxidative stress induced by alcohol administration may be partially neutralized by the administration of SACS and DADS.


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Horie R., Yamore Y., Nara Y., Sawamura M., Mizushima S.,(1’991). Aggravating effects of isolated caging on the development of hypertension and its complications in stroke-


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