CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

S1721

Project Title

The Alcoholic Effect on Bovine Biological Catalysts

Abstract

Objectives/Goals

To determine if different durations of alcohol exposure will affect a bovine liver's rate of enzymatic reaction.

Methods/Materials

Three consecutive trials were carried out. Every trial consisted of seven different durations of alcoholic exposure, which was the independent variable of the experiment. The alcoholic exposure ranged from five minutes to thirty minutes all running concurrently throughout the individual trials. Each portion of liver that was exposed to the alcohol weighed .030kg. The rate of enzymatic activity was measured by the oxygen volume produced by the reaction between the catalase discs and the hydrogen peroxide over a two minute period. The following variables were controlled: the amount bovine liver, hydrogen peroxide, time, water, isopropyl alcohol (50% concentration) and catalase discs. The control groups was a catalase solution in which the liver had no exposure to alcohol.

Results

The liver with no alcoholic exposure, the control group, had a constant enzymatic reaction that lasted the complete testing period. By the end of the enzymatic reaction, the oxygen volume for the control group reached 17ml, as opposed to the liver that was exposed to the alcohol for a 30 minute period which had an enzymatic reaction that only lasted 70 seconds and produced an oxygen volume of 9ml. The rate of enzymatic activity was found to be inversely proportional to the exposure time of the bovine liver to isopropyl alcohol. The enzymatic activity of the bovine liver decreased as the alcohol exposure time increased.

Conclusions/Discussion

According to our data, our hypothesis was supported. The longer the bovine liver was exposed to the alcohol, the lower the rate of enzymatic activity. The metabolism of alcohol predominately occurs within the liver, producing free radicals as a by-product, molecular fragments that contain oxygen. Oxygen is highly electronegative and craves electrons and as a result, free radicals interfere with proteins by denaturing their conformation; thus, inhibiting enzymes by interfering with molecular bonds. The production of these free radicals explains why the rate of enzymatic activity decreased as alcoholic exposure increased. This experiment supports our understanding of how the consumption of recreational alcohol, a damaging chemical, interferes with the function of the liver by denaturing the dehydrogenase enzymes involved in the metabolism of alcohol.

Summary Statement

To determine the effects of alcohol exposure on enzymatic liver functions.

Help Received