Chronic alcohol consumption has shown an emergence of medical disorders including alcoholic liver disease, pancreatitis, cardiomyopathy, acute respiratory distress syndrome, and tissue injury to overexposure of alcohol in the human body. Endotoxin has played a critical role in the advancement of alcoholic liver disease, and organ damage. The correlation between endotoxin and liver damage was confirmed by researchers conducting an experiment, and detecting increased plasma endotoxin levels is always linked to patients diagnosed with alcoholic liver diseases. This finding was further investigated by designing a rat model, administrated an endotoxin such as lipopolysaccharide, extracted from the cell wall of gram-negative bacteria living in the intestine, leading to the progression of fatty liver, and result in necroinflammatory changes. Minor quantity of the endotoxin is taken up by the intestine via the mononuclear epithelial lining that is transported via the portal vein to the liver. The Kupffer cells of the liver usually clear up the endotoxin, but a surplus amount of the endotoxin being exposed to the liver can activate Kupffer cells to trigger liver inflammation, and circulation of the endotoxin in human resulting in further damage to other organs. Probiotic bacteria can improve the host health and its immune system by promoting an anti-inflammatory environment to combat endotoxin production, bacterial translocation, and improve intestinal barrier integrity. It is suggested that the probiotic bacteria control inflammation by reducing the gut pH, and compete with pathogens for binding as well as receptor sites. In the current study, we examine how probiotic bacteria, Streptococcus thermophilus and Lactobacillus bulgaricus respond to ethanol. These probiotic bacteria were isolated from 5 different commercially available yogurts. Growth curves were generated using a microplate reader at different ethanol concentrations to see how the bacteria respond in the presence of ethanol. These results will provide crucial information in genetically engineering the cells to resist high levels of ethanol, and assist in ethanol oxidation to treat alcohol intoxication.

Results / Discussion

Several columns were extracted from the M17, and Lactobacillus bulgaricus media plates. Using a 50 mL Falcon Tube we put a 1:1 ratio of liquid media and glycerol to preserve the cell culture. The cell culture was stored in 1.5 mL centrifuge tubes that were stored in −80°C refrigerators. Different brands of yogurt glycerol stocks were then inoculated in cell culture tubes with 5 mL of M17 or Lactobacillus bulgaricus liquid media. The cell culture tubes were placed in a 37 degree Celsius incubator to allow overnight cell culture growth. The cell culture tubes that were visibly cloudy were transferred into a cuvette. Using a spectrophotometer the optical density of samples was measured to calculate the amount of ethanol that would be needed for treatment. First, Streptococcus Thermophilus and Lactobacillus bulgaricus were treated with ethanol separately in exponential phase. Then the combinations of the two were placed 1:1 ratio in 1.5 mL centrifuge tubes and spin down in the centrifuge. The pellet was preserved and sent for alcohol metabolism. 17257 media was added according to the calculations to ensure the bacteria would grow symbiotically. To analyze how both strains of bacteria respond to ethanol we used the microplate reader to produce growth curves, this will allow us to determine how the bacteria grow at different concentrations of ethanol.

The distribution of alcohol concentration in a particular tissue depends on the water content, rate of blood flow, and the amount of tissue mass. Ethanol is metabolized in livers or outside, but the ability similar like water to pass through the biological membranes. There is a vast amount of variations in portions of fat, and the liver is a water between people thus same dose of alcohol varies in blood alcohol concentration between individuals. Some alcohol ingested will not enter the systemic circulation, but instead can be absorbed in the stomach by different forms of enzymes that varies from individual to individual that are alcohol dehydrogenase, and alcohol dehydrogenase related. The genetic variability influences a person’s exposure to developing alcoholism and alcohol-related tissue damages. For example, in the gene alcohol dehydrogenase 2 (that is responsible for converting acetaldehyde to acetate in East Asian populations commonly have a polymorphism of this enzyme. A point mutation in the 671 allele that causes an inactive form of alcohol dehydrogenase 2 leading to the increased production of acetaldehyde in the body, and causes serious cardiovascular health issues. The suppression of Gram negative bacteria development by using antibiotics is a promising approach to combat health risks associated from alcohol consumption. It will help reduce the endotoxin occurring in the intestine that in return offset endotoxin-associated organ damage. Research was shown a species of Lactobacilli such as Lactobacillus R2LC enteral administration diminished bacteria, and probiotic bacteria properties associated with extra-abdominal infection in rats. Also intragastric infusion model of alcoholic liver injury in rats that were fed with Lactobacillus G5 decreased plasma levels of the endotoxin and alcohol induce liver damage.

Pathway

Role of Probiotic Bacteria in Alcohol Intoxication

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Abstract

Introduction

The pathway of alcohol metabolism is illustrated in figure 1. The endotoxin is a major component of bacterial cell wall, and is transported to the liver. In the liver, the endotoxin is taken up by the Kupffer cells, and endotoxin levels are always linked to patients diagnosed with alcoholic liver diseases. This finding was further investigated by designing a rat model, administrated an endotoxin such as lipopolysaccharide, extracted from the cell wall of gram-negative bacteria living in the intestine, leading to the progression of fatty liver, and result in necroinflammatory changes. A minor quantity of the endotoxin is taken up by the intestine via the mononuclear epithelial lining that is transported via the portal vein to the liver. The Kupffer cells of the liver usually clear up the endotoxin, but a surplus amount of the endotoxin being exposed to the liver can activate Kupffer cells to trigger liver inflammation, and circulation of the endotoxin in human resulting in further damage to other organs. Probiotic bacteria can improve the host health and its immune system by promoting an anti-inflammatory environment to combat endotoxin production, bacterial translocation, and improve intestinal barrier integrity. It is suggested that the probiotic bacteria control inflammation by reducing the gut pH, and competition with pathogens for binding as well as receptor sites.

Future Research

We will be focusing on identifying the genes responsible for metabolizing alcohol and its derivatives. Specifically we will look for if both alcohol dehydrogenase, and alcohol dehydrogenase related. These enzymes have a significant role in alcohol oxidation. Next, we will further investigate the amount of acetaldehyde, and acetaldehyde produced by the combinations of strands to confirm if the probiotic bacteria are metabolizing alcohol. This crucial information will help attenuate the serious health risks associated with alcohol代谢.