

Combating Hepatocellular Carcinoma in the Developing World: A Novel Discovery of the Fungicidal Potential of Bicarbonate Solutions Against *Aspergillus flavus*

Collins, Evan (School: Ridgeview High School)

The aim of this investigation is to determine the inhibitory effects of sodium bicarbonate and potassium bicarbonate on *Aspergillus flavus* and its hepatocarcinogenic metabolite Aflatoxin B1. The extent of inhibition is evaluated two-fold. First, Study 1 investigates how varying the solute concentrations of NaHCO_3 and KHCO_3 affects the surface area of exterminated *A. flavus*. Second, Study 2 investigates how molar absorbance at 425nm (i.e. peak absorbance of Aflatoxin B1) varies among samples of *A. flavus* cultures with differing $[\text{NaHCO}_3]$ and $[\text{KHCO}_3]$. From Study 1, both $[\text{NaHCO}_3]$ and $[\text{KHCO}_3]$ are positively correlated with the surface area of exterminated *A. flavus*. However, potassium bicarbonate is shown to have a more positive ($m=40.994$) and more statistically significant ($R^2 = 0.938$) correlation. From Study 2, spectrophotometric measures indicate a negative correlation between $[\text{NaHCO}_3]$ and $[\text{KHCO}_3]$ and molar absorbance at 425nm in the *A. flavus* cultures. Potassium bicarbonate was shown to have a more negative ($m=-1.4028$) and more statistically significant ($R^2 = 0.8747$) correlation with blue absorbance at 425nm. The conclusions reached by this investigation are significant. No prior published study has investigated the inhibition of *A. flavus* by sodium bicarbonate and potassium bicarbonate; and hence, this investigation provides novel evidence of both bicarbonates' effectiveness as potential fungicidal inhibitors of *A. flavus*. The use of bicarbonates as ecological, cost-effective fungicides offers opportunity in mitigating the prevalence of hepatocellular carcinoma in agrarian regions of Asia and sub-Saharan Africa. Chemical manufacturers will be contacted for the production of a bicarbonate fungicide.

Awards Won:

Third Award of \$1,000