



Oral Health Project: A Survey of the UWEC Student Population

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INTRODUCTION

Dental caries and other oral health abnormalities are still significant health problems in today's world of advanced medical science and technology. The developing awareness of oral health and its connections to overall health has brought about an increase in interest in its study. Recent research has shown a connection to coronary artery disease in relation to the oral bacterial population. Not only are diabetics more susceptible to periodontal disease, but the affliction makes their blood glucose levels more difficult to manage. Recently it has been shown that pregnant women with periodontal disease are at a higher risk of pre-term labor. Children raised in households with smokers have been found to be more susceptible to dental caries due to the exposure to secondhand smoke.

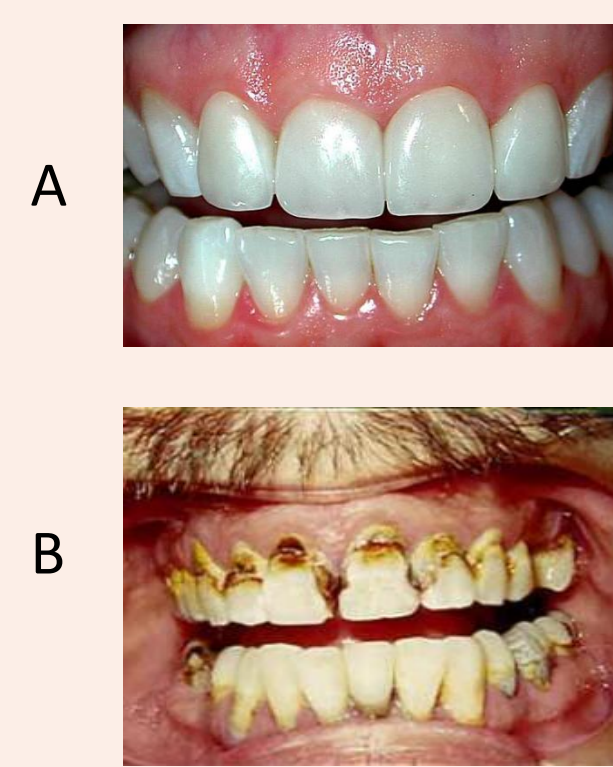


Image 1: A. Healthy Teeth. B. Teeth showing carious lesions and periodontal disease manifested as gingivitis.

RATIONALE

The oral flora consists of a diverse population of microbes. This study specifically targeted the bacterial organisms *Streptococcus salivarius* collected from the saliva of college students at UWEC. The main focus of the study was to compare daily oral habits (brushing and flossing) of the students with the bacteria species in their saliva. However, other factors were studied as well, such as soda consumption and tobacco and alcohol usage. Significant results were found relating increased pathogenic oral flora in females to males. Results from subjects of the random sample exposed to second hand smoke while growing up also showed an increased incidence of Colony Forming Units (CFU's) of pathogenic bacterial populations.

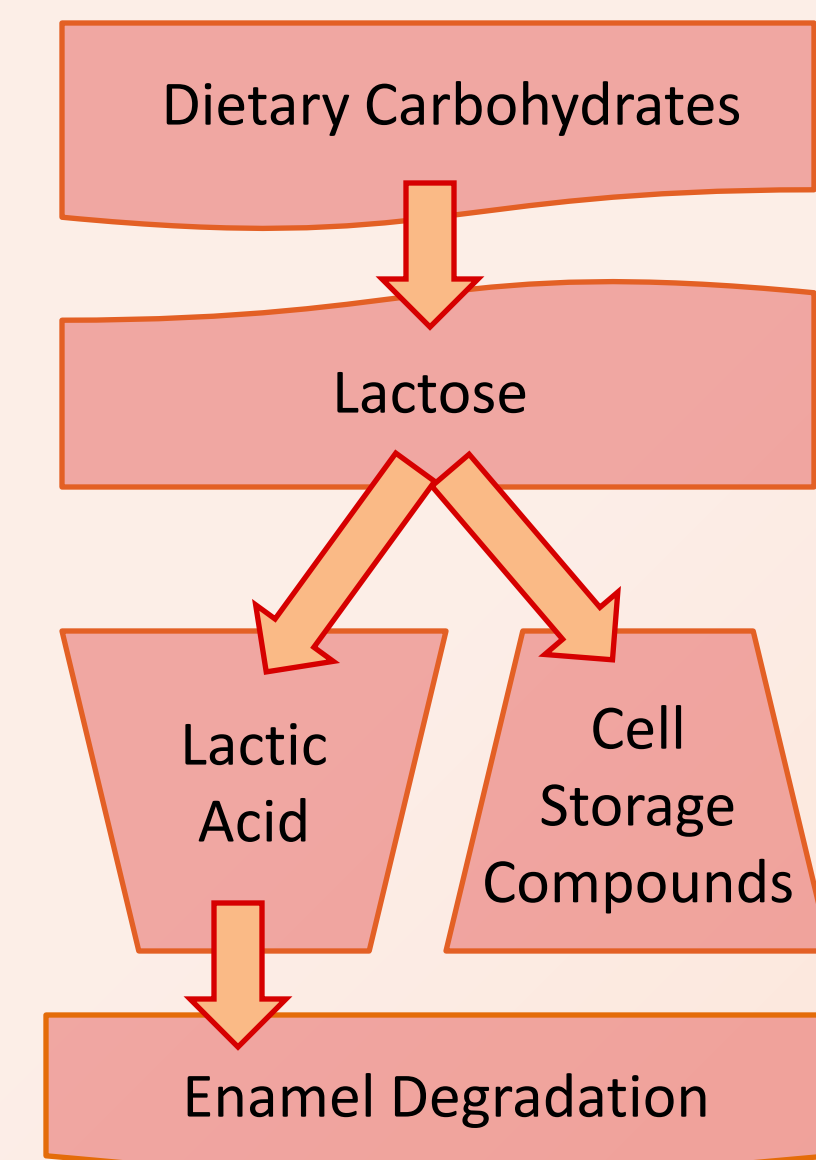


Diagram 1: A flowchart showing how the presence of carbohydrates leads to periodontal disease.

MATERIALS AND METHODS

SAMPLE COLLECTION

The questionnaires and saliva collection tubes were obtained from approximately 75 UWEC students in various lab classes. Each student was asked to fill out an anonymous questionnaire regarding age, gender, oral habits, tobacco and alcohol usage as well as second hand smoke exposure. Questions regarding soda and sweet consumption and dental visits were also answered. Sterile tubes were provided for collection of saliva samples and students were requested to provide approximately two (2) mL of sample.

INOCULATION AND ASSESSMENT

Each sample was diluted by a factor of 100 with sterilized water. Two types of selective media were inoculated by the diluted saliva samples. Poured plates prepared with the Difco Mitis Salivarius Agar medium, which is selective for *Streptococcus salivarius*, were inoculated with 100 µl of each student's diluted saliva sample. This medium was used to obtain quantitative results relating to the CFU's of *S. salivarius*. Plates were observed and colonies were counted at 72 hours. Tubes of Snyder media, selective for fermentative bacteria, were inoculated with 100µl of saliva and allowed to incubate. Colorimetric results (green to yellow) were read and recorded at specific time intervals (20, 24, 31, 41, 49, 67, 72 hours). Yellow color was regarded as a positive result. Statistical analysis and data plotting was performed using GraphPad Prism 5 computer software. All analysis was performed as paired two-tailed t-tests.

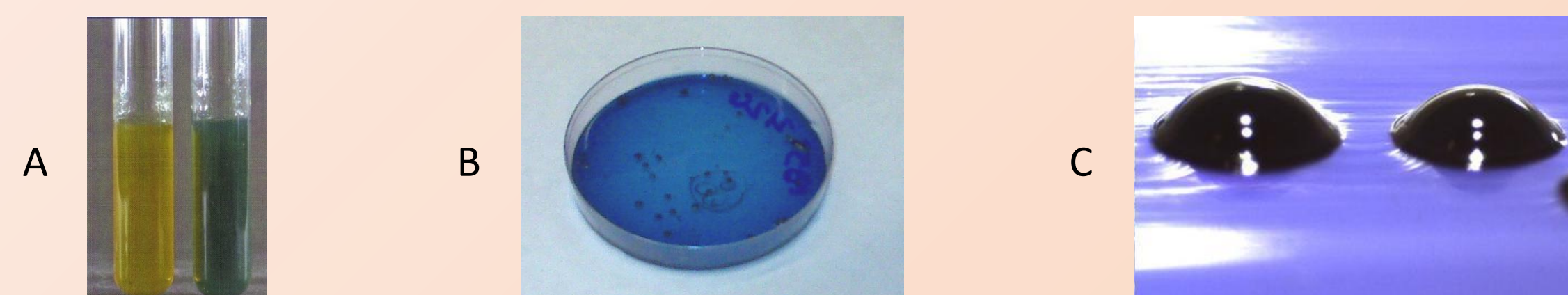


Image 2: A. Snyder media (from Microbiology Lab Techniques). B. An inoculated plate with Difco Mitis Salivarius Agar medium. C. A closeup of *S. salivarius* colonies (from ASM MicrobeLibrary.org).

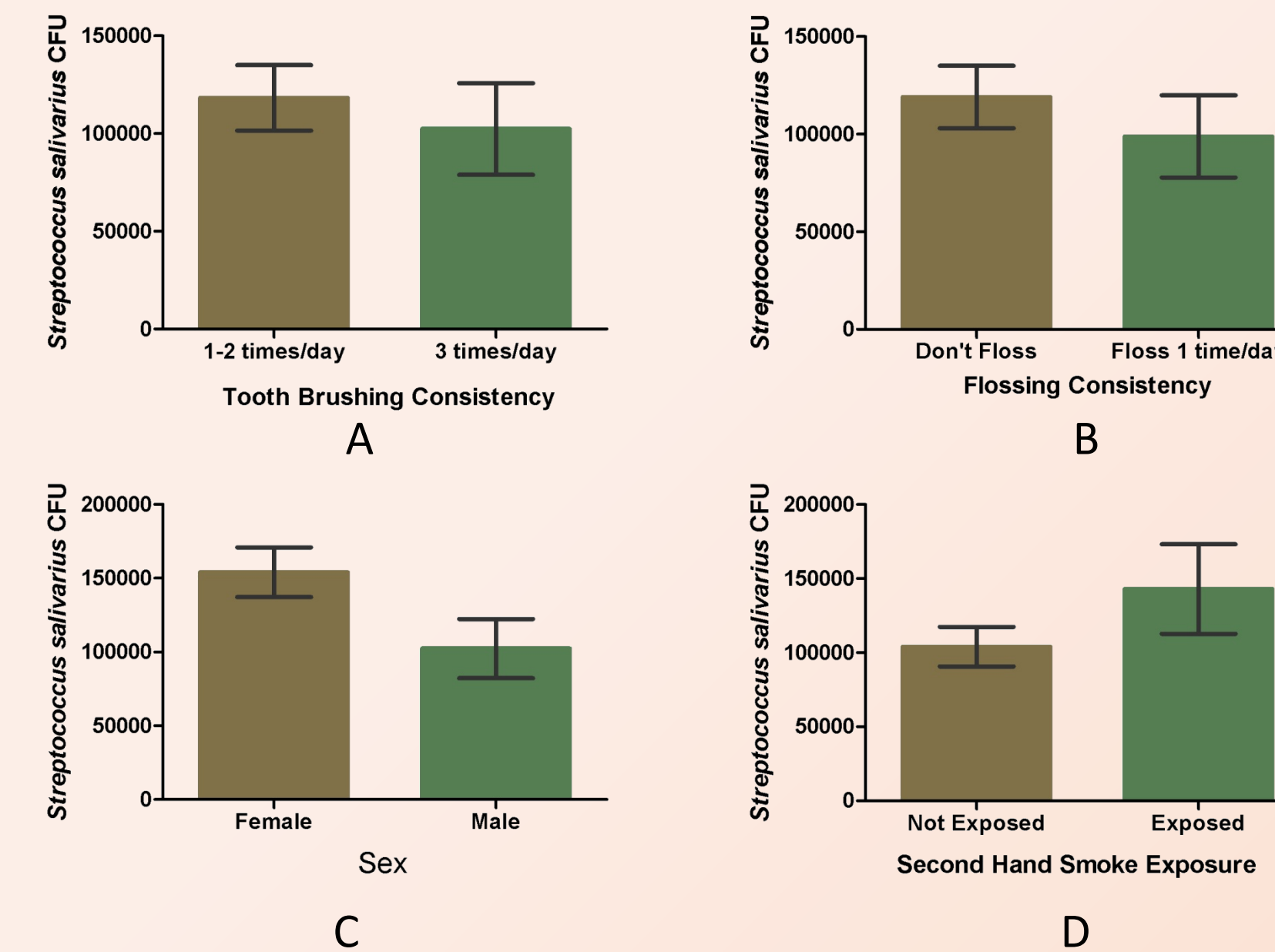


Figure 1: A compilation of the most significant comparisons from the survey results based on habits and upbringing. **A. $p = 0.147$, $df = 7$. B. $p = 0.1373$, $df = 13$. C. $p = 0.001$, $df = 14$. D. $p = 0.0066$, $df = 8$.** Significant results are bolded. Error bars represent SEM.

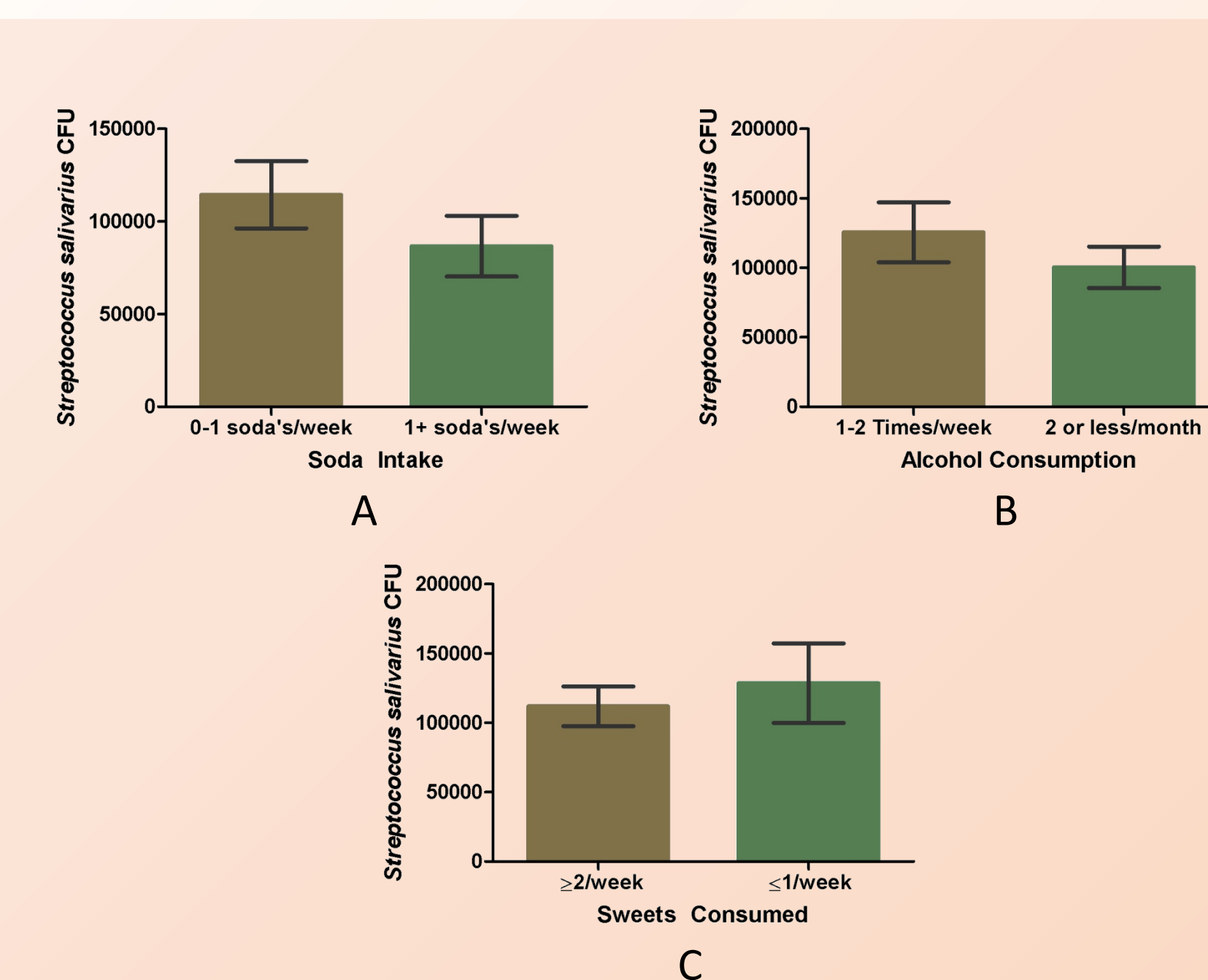


Figure 2: A compilation of the most significant comparisons from the survey results based on metabolite consumption. **A. $p = 0.0854$, $df = 18$. B. $p = 0.0479$, $df = 15$. C. $p = 0.6331$, $df = 8$.** There are no significant results in this group. Error bars represent SEM.

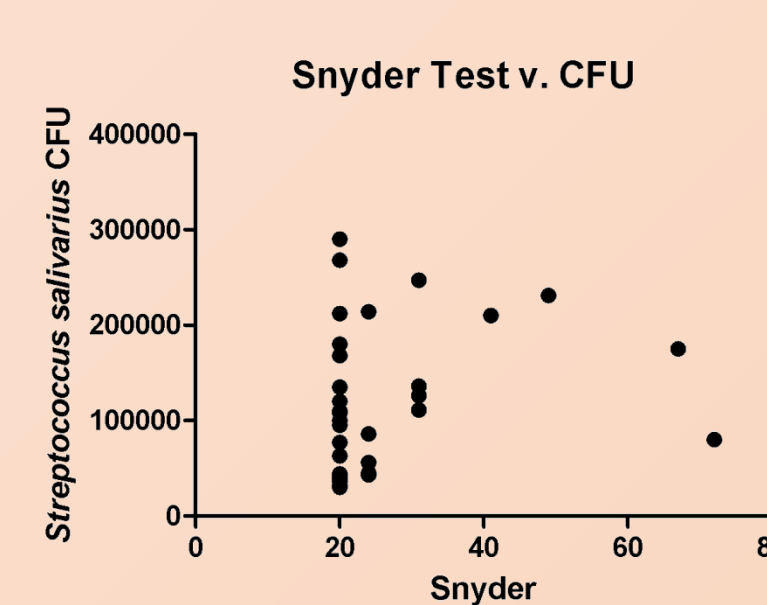


Figure 3: A scatter plot presenting a comparison of the two assays. There seems to be no correlation between the two.

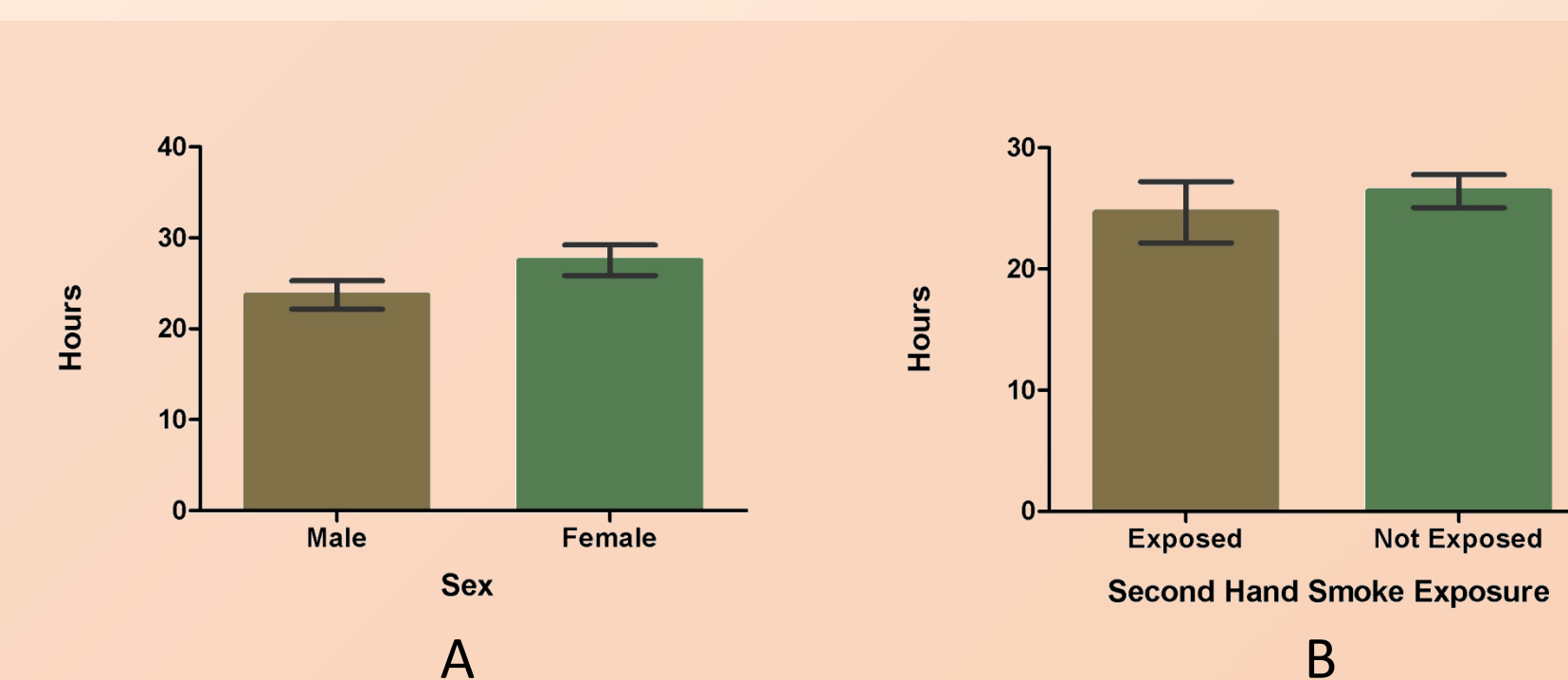


Figure 4: A grouping of graphs created from Snyder media results. **A. $p = 0.0225$, $df = 34$. B. $p = 0.0774$, $df = 21$.** Significant results are bolded. Error bars represent SEM.

DISCUSSION

While there is no significant difference in the consistency of tooth brushing (figure 1A) and flossing (fig. 1B) and the presence of *S. salivarius*, it seems as though there is a lower incidence of the species in higher repetition of these behaviors. There was higher number of the bacteria found in the mouths of female subjects (fig. 1C). One hypothesis for this is that the specific hormone levels found in females of this cohort are elevated, which may contribute to the higher incidence of this species. Remarkably, those subjects exposed to secondhand smoke did indeed seem to show a higher prevalence of *S. salivarius* (fig. 1D). Figure 2 represents data that did not show significant results. It does however suggest that higher soda and alcohol consumption may result in lower *S. salivarius* colony counts (fig. 2A, B). Though counterintuitive, this may be explained by the acid content in the soft drinks, or the restrictions on the survey results in this category. Nothing can be said about the relationship between sweets consumed and *S. salivarius* CFU's (fig. 2C). Results between the Difco Mitis Salivarius agar medium and the Snyder medium appear to be inconsistent (fig. 3). These inconsistencies can also be seen in figure 4. Though females may have a lower amount of *S. salivarius* in their mouths, the Snyder media results (fig. 4A) imply that these subjects are less susceptible to dental caries. This may be due to the fact that *S. salivarius* isn't the primary bacteria in the formation of this affliction. Studies have shown, that the bacteria is a urea secreting organism which may sustain other populations of bacteria that play a larger role in periodontal disease. More specific surveys need to be conducted in order to authenticate these relationships.

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