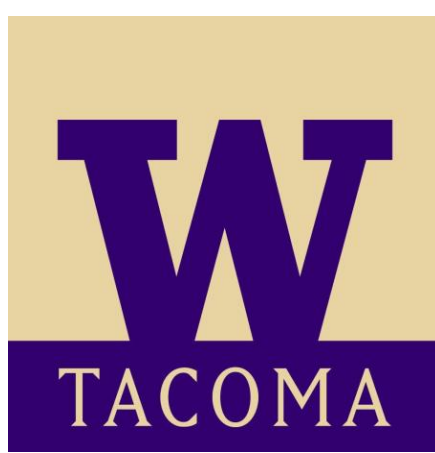


Long-Term Detrimental Effects of Popular Teeth Whitening Treatments on Oral Health

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ABSTRACT

Approximately 37 million U.S. consumers whiten their teeth. Teeth whitening may provide a boost of self-confidence, but the procedure can potentially have adverse effects on an individual's oral health. In recent years, the effectiveness of various teeth whitening techniques has been carefully studied. To learn more about the harmfulness and effectiveness of various whitening methods we performed a comprehensive literature review of different whitening procedures. The primary sources studied the whitening strengths of each procedure and noted any differences in sensitivity or pain of teeth over time. Most of the whitening treatments lacked rapid effectiveness and were unsafe for prolonged use as they caused permanent teeth sensitivity, enamel erosion, and changes to the oral microbiome. Many of these effects can eventually lead to larger problems such as complications with eating or drinking. Future research should investigate procedures that do not require harmful chemicals as well as the effectiveness of teeth whitening on different age groups. Different age groups respond differently to teeth whitening treatments because of varying enamel thickness, tooth sensitivity and strength of their teeth at a specific age. Using safer teeth whitening procedures, will lower the risk of damaging consumers' oral health in the long run.

INTRODUCTION

- Hydrogen Peroxide (or Carbamide peroxide) is the most widely used teeth whitening agent for both at home and in office teeth bleaching. About 15-78% of patients undergo external tooth bleaching.



Figure 1. Before and After Images Of a 50 Minute Bleaching Treatment. Before and after images of a teeth whitening treatment after 50 minutes elapsed time.

- Evident long term adverse effects have been prevalent among many users such as: Tooth sensitivity, enamel erosion, decline in oral microbiome formation, gum irritation, oral mucosa irritation and more (Tredwin et al., 2006). This study will mainly focus on the more common side affect: Teeth sensitivity.
- The most common treatments of teeth whitening range from professional in office, lasers, whitening toothpaste, whitening strips, LED or natural home remedies.

DISCUSSION

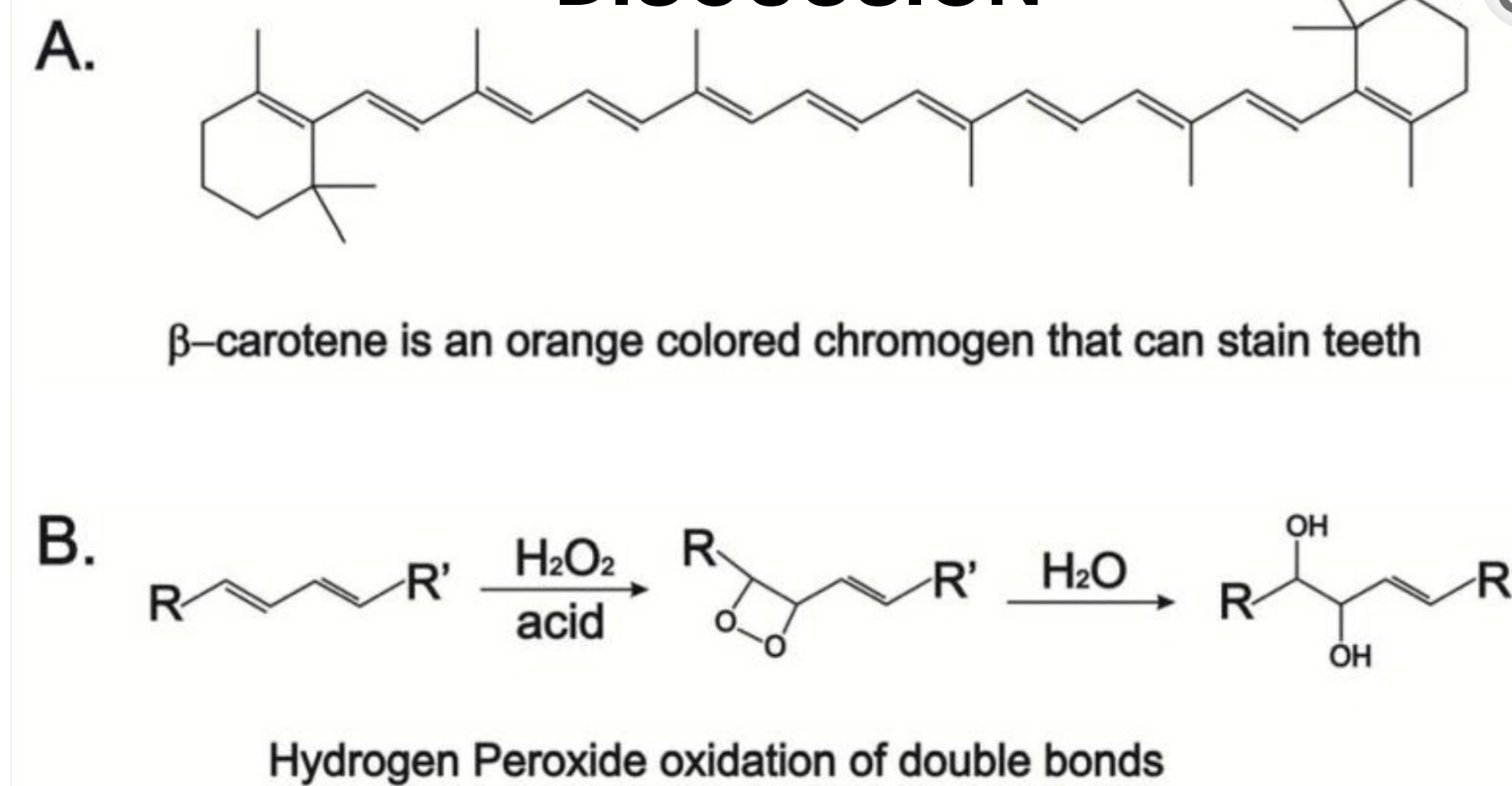


Figure 2. Two Types of Chromogens: Beta-Carotene & Oxidized Chromogen

Tooth stains that contain color or darker shades are referred to as chromogens that are found intrinsically or extrinsically of teeth. Compound A is an example of that chromogen as a large organic compound that has conjugated double bonds. Thus, compound B is the resulting form when chromogens are bleached using hydrogen peroxide as it reacts with the organic compound to oxidize the double bonds.



Figure 3. Scanning Electron Image of Human Enamel under Mirawhite Laser Bleaching

Enamel that had been treated with Mirawhite® Laser Bleaching and a diode laser. Image shows altered and significant porous enamel surface with erosions and depressions (arrows) that resulted from treatment.

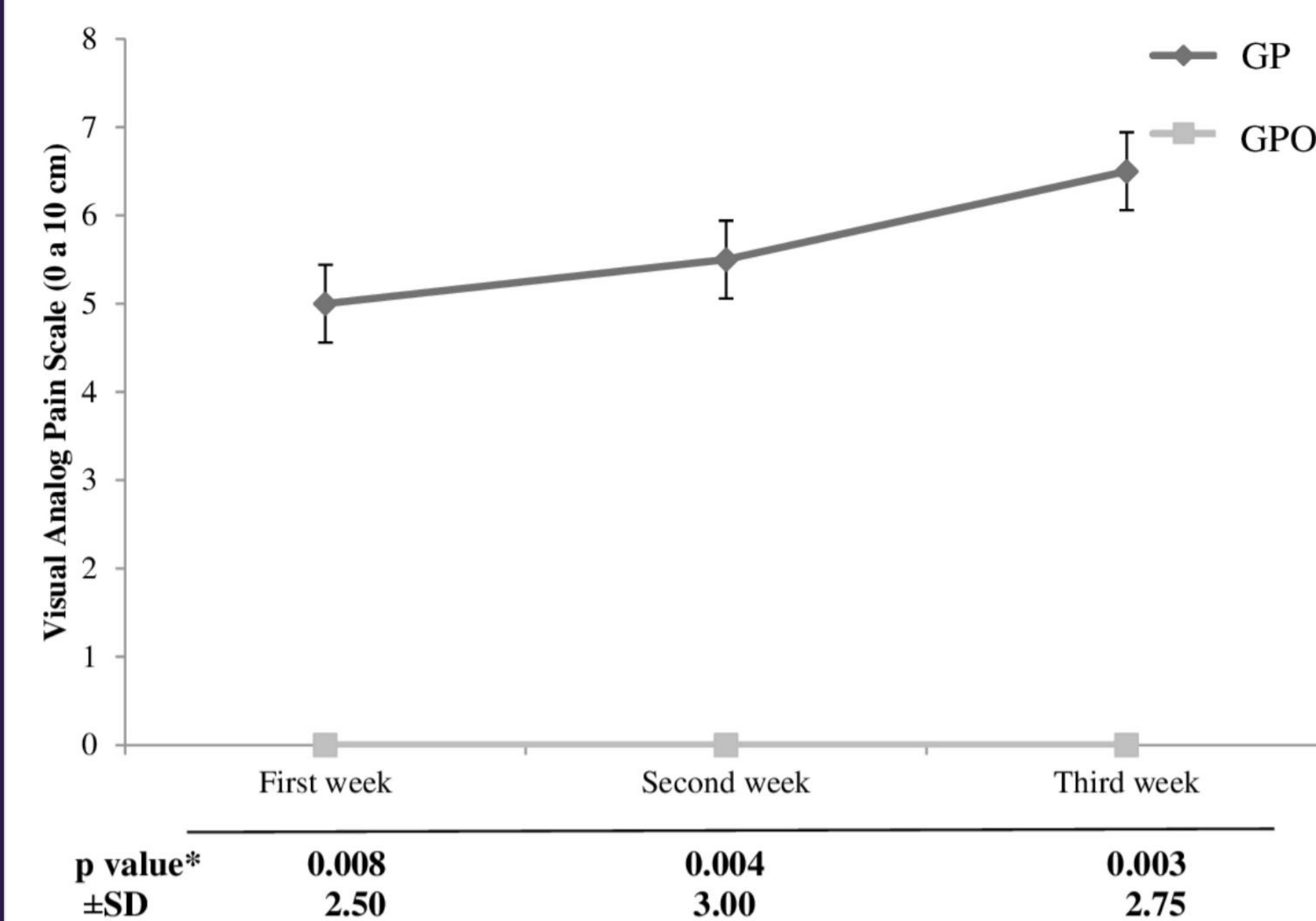


Figure 4. Standard Deviation Between Two Groups Given a Placebo Whitening Gel or Treatment

Standard deviation of an experiment between two groups of reported teeth sensitivity level. "GP" group was given 22% carbamide peroxide gel for 45 min and "GPO" group was given a placebo gel for 10 min. "GP" group reported higher amounts of pain and sensitivity resulting from whitening (Barros et al., 2022).

DISCUSSION CONT...

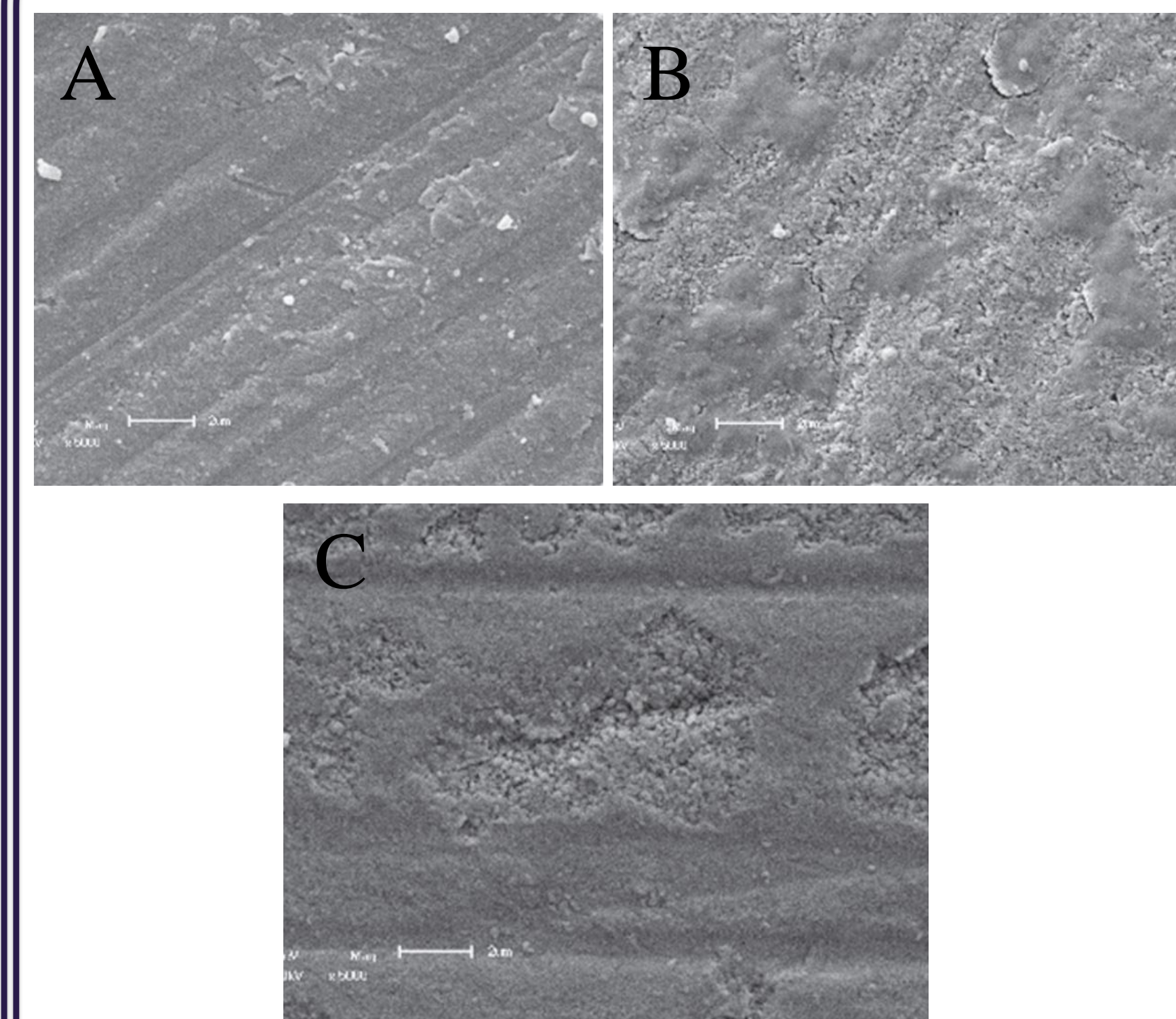


Figure 5. Scanning Electron Images of Human Enamel Before and After Bleaching With Carbamide Peroxide

Scanning electron microscope magnified images of human enamel (before and after bleaching). Panel A is human enamel without bleaching and no signs of eroded structure. Panel B is human enamel bleached with 10% carbamide peroxide using vitro methodology showing loss of mineral structure and an eroded surface. Panel C is human enamel bleached with 10% carbamide peroxide using situ condition and has a somewhat altered surface, with localized mineral loss, which is lower than the mineral loss observed for bleached enamel in vitro (Press, 2015).

RESULTS

- Teeth sensitivity is confirmed to be the most common and long-term detrimental side effect of performing teeth bleaching.
- Carbamide peroxide has a negative impact and effect on human enamel after bleaching. Some effects of using Carbamide peroxide based whitening treatments included higher amounts of pain and sensitivity including mineral loss and altered enamel surfaces.
- Using a laser as one of the teeth whitening examples, it has shown and proved to also cause negative impacts to oral health. Damage was resulted from carrying out Mirawhite® Laser Bleaching as pores formed in the enamel.

PRELIMINARY CONCLUSIONS

- There was not enough research done on safer procedures and alternatives that are practical, affordable and accessible.
- There could not be a given scale of time on how long teeth are sensitive for because it depends on type of person such as their health, age, gender, genetic makeup and other factors that affect the result in side effects from teeth bleaching.
- There has not been enough clinical trials or experiments revolving around enamel erosion or abrasion. Thus, more studying needs to be done to have a better understanding of the effects that bleaching products have on erosion or abrasion (Press, 2015).
- More research should focus on how different age groups respond to teeth bleaching since different age groups have varying types and stages of enamel strength and structure of teeth.

REFERENCES

