

## Colgate Optic White Hydrogen Peroxide Toothpaste Laboratory Evaluation

M. Cowen, J.M. Powers

### INTRODUCTION:

Staining or darkening the appearance of teeth can broadly be put into two categories which describes where the color change is occurring: Intrinsic and Extrinsic staining. Extrinsic staining occurs on the tooth enamel surface where pigments are trapped on the pellicle surface. This can be due to ingested substances, tobacco use and bacterial action and/or other substances. Intrinsic staining occurs when the internal enamel /dentin of the tooth is discolored either during tooth development, certain drug interactions, trauma and genetic factors. Internalization of discoloration can also occur when extrinsic colored pigments become internalized in areas of enamel defect and exposed dentine.

There are many whitening toothpastes available on the market and they come in two primary categories. Most have abrasives designed to primarily remove surface stains, while others have ingredients such as hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) that can penetrate the small porosities of the enamel and break apart the pigments that cause staining on the surface and inside enamel porosities. Hydrogen Peroxide is a popular bleaching agent as the relatively small molecule penetrates anywhere stains may reach, oxidizes the stains, which reduces the intensity of their color.

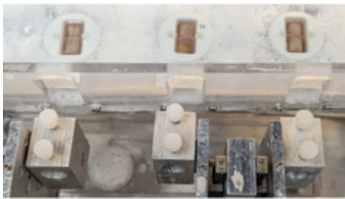
In this study, we evaluated the in vitro whitening effectiveness of **Colgate® Optic White® Platinum** toothpaste, containing 3% hydrogen peroxide, by using a spectrophotometer on stained bovine teeth brushed with our Toothbrushing Simulator. We compared its performance against **Colgate® Cavity Protection** toothpaste, which contains no hydrogen peroxide, to assess the difference in in vitro stain removal efficacy between mechanical action and the combination of chemical and mechanical action.



### STUDY DESIGN:

Bovine Teeth were stained and randomly divided between groups with 12 replications each. Teeth were measured at baseline, at 6 brushing cycles and 14 brushing cycles with a **Spectroshade Micro II Spectrophotometer** (MHT Optic Research, Switzerland).

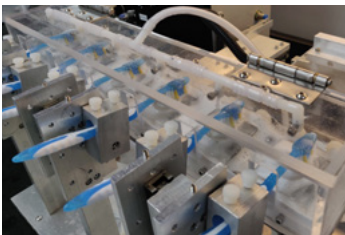
Teeth were brushed with a 1:1 ratio of artificial saliva and toothpaste with **Colgate Optic White Platinum** and **Colgate Cavity Protection** for 2 minutes at 120 rpm in a figure 8 pattern for 14 total cycles before being rinsed.



#### Whiteness Index

$$W^* = (a^{*2} + b^{*2} + (L^* - 100)^2)^{1/2}$$

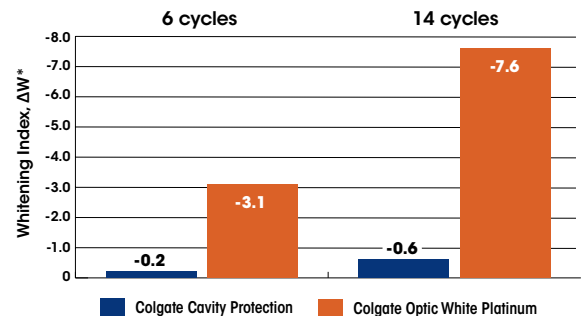
$$\Delta W^* = W^* \text{ treated} - W^* \text{ baseline}$$



### RESULTS:

Tooth color was measured by a spectrophotometer which gave L\*a\*b\* color coordinates. A common measurement of whitening changes is calculated using a formula ΔW\*. In this "Whiteness Index" a negative value change indicates whiter.

### Change in Whitening



The toothpaste without hydrogen peroxide showed minimal change in color of the stained teeth, while **Colgate Optic White Platinum** showed superior in vitro whitening efficacy expressed as Delta W. This study shows that for fourteen two-minute brushing treatments which represents about a week of product usage, the toothpaste with hydrogen peroxide performed better than a toothpaste without. The decolorizing property of hydrogen peroxide has been shown to chemically alter stain molecules on the surface and within teeth leading to whiter results. This in vitro study validates the mode of action showing that incorporation of hydrogen peroxide in a toothpaste leads to superior stain removal and whitening results in comparison to a non-whitening fluoride dentifrice.

Research supported by Colgate-Palmolive Company