In Vitro Abrasivity Assessments of a New MultiCare Whitening Toothpaste

M.A. Kaminski*, A.M. Pfarrer, R.V. Faller
Procter & Gamble Co., Mason, OH, USA

ABSTRACT

In addition to protection against caries, cleaning and removing plaque and stain from teeth are considered fundamental benefits of tooth brushing. Laboratory abrasion models, such as the Radioactive Dentin Abrasion (RDA) and Radioactive Enamel Abrasion (REA) models are generally accepted ways of measuring safety, from the standpoint of abrasion, of toothpastes. The purpose of this study was to assess the RDA and REA levels for a new multi benefit toothpaste, which contains a modified silica abrasive as the enhanced cleaning agent, relative to a conventional silica based abrasive toothpaste. The RDA model utilizes human tooth roots irradiated with ^{32}P. The concentration of ^{32}P in the post brushing slurry is measured relative to a standard (calcium pyrophosphate). The REA model is equivalent to the RDA model, except human enamel specimens are used in place of dentin. Two products: a) Crest MultiCare Whitening and b) Crest Regular were compared in each study. RDA results: a) 144 ± 2.6; b) 99 ± 3.2 with a>b (P>0.05). REA results: a) 5.9 ± 0.5; b) 3.3 ± 0.4 with a=b (P>0.05). An RDA value <250 is considered safe for everyday use. For toothpastes with a neat pH in excess of 5.5, there is no limit with respect to REA (ISO 11609, 1995 guidelines). **These data confirm this new MultiCare Whitening Toothpaste is safe for everyday use.**

INTRODUCTION

Abrasion is a function of both the hardness of the abrasive as well as particle size. It is known that certain combinations can bring about unanticipated results. For this reason, both dentin, which represents a "worst case" scenario, and enamel abrasion studies were conducted on a new MultiCare Whitening toothpaste to determine if this product falls within the predicted range.

PURPOSE

The purpose of this study was to assess the RDA and REA levels for a new multi benefit toothpaste, which contains a modified silica abrasive as the enhanced cleaning agent, relative to a conventional silica based abrasive toothpaste.

MATERIALS AND METHODS

Specimen & Brushing Machine Preparation

Eight human dentin and eight human enamel specimens were irradiated to generate radioactive phosphorous (^{32}P). Specimens were embedded in methylmethacrylate such that the buccal or lingual surface was exposed. Blocks containing the embedded specimens were attached to a V-8 cross brushing machine and centered on the head of a standard ADA approved toothbrush installed on a brushing machine. The brush tension was adjusted to 150 grams.

Preconditioning & Treatment

Reference slurries were prepared consisting of $Ca_2P_2O_7$ and CMC in a 10% glycerin solution. The reference slurry was added to the treatment tubes mounted on the brushing machine and the specimens received a preconditioning brushing of 1500 strokes. Treatment slurries were prepared immediately prior to treatment by mixing 25 grams of dentifrice in 40 ml of deionized water.

Eight specimens were run in duplicate in a crossover design with each test product brushing sandwiched between an ADA reference brushing. Specimens were rinsed with deionized water at the completion of each brushing. One milliliter of slurry was diluted to 5ml of scintillation cocktail and immediately read on a scintillation counter. The mean CPM/g of the reference slurry, pre and post test product brushing, were calculated and each test product evaluated relative to the ADA standard.

DISCUSSION

The scale used to measure relative abrasivity of toothpastes is called the RDA (Radioactive Dentin Abrasion) scale. This scale starts at 0 and is open ended. It is accepted by experts and governmental agencies that toothpastes which score above 250 on this scale (2.5 x the result of the abrasivity standard, which is arbitrarily set at a value of 100) should not be recommended for daily use. It is generally agreed that any product that falls below 250 is considered safe for everyday use. Using this scale, independent testing has confirmed that most marketed formulations fall well below the upper limit of 250, with typical scores of 150 or less. The REA (Radioactive Enamel Abrasion) test is similar to the REA model, with the major difference being the use of human enamel rather than dentin as the test substrate, and the data scale being much lower. While some recommendations have been made to set an upper REA score limit of 40 (4 x the abrasivity standard, which is arbitrarily set at a value of 10), there is, in fact, no upper limit for formulations whose neat pH is in excess of 5.5. Most marketed toothpastes exhibit REA scores in the range of between 3 10. The studies reported here confirm that no unanticipated results have been demonstrated for either dentin or enamel abrasion, and that the new product, which contains a modified silica abrasive as an enhanced cleaning agent, is safe for everyday use. The higher RDA score for the new whitening toothpaste is indicative of products with enhanced cleaning potential.

DATA

	RDA		REA	
Crest MultiCare Whitening	144	+/- 2.6	5.9	+/- 0.5
Crest Regular	99	+/- 3.2	3.3	+/- 0.4

CONCLUSION

These data confirm this new MultiCare Whitening Toothpaste is safe for everyday use, and also suggest superior cleaning potential for this toothpaste relative to the positive control.

P&G