

## Light Energy Conversion Toothbrush (Soladey™) Towards a Super Clean Mouth! : A Review

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**Abstract:** Oral hygiene is the practice of keeping the mouth clean to prevent dental decay. Cleaning the teeth is the process of removing dental plaque, which mainly consist of streptococcus mutans bacteria. Streptococcus mutans contribute towards tooth decay. Prolonged plaque presence increases the likelihood of cavities, gum diseases and gingivitis. The need for good oral hygiene is obvious and is achieved mostly through brushing the teeth with a fluoride treated toothpaste and toothbrush. The Soladey™ toothbrush differs from conventional toothbrush by utilizing a TiO<sub>2</sub> semiconductor to accomplish the plaque removal assistance of toothpaste. The following article focuses on the function of Soladey™ toothbrush as additional plaque removal force.

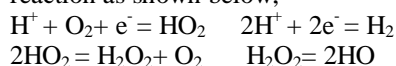
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### I. Introduction

A new toothbrush called Soladey™ has been recently introduced and is claimed to have better plaque removing potential than conventional toothbrushes due to photo-electro-chemical effect it has on dental plaque.<sup>1</sup> The basic difference between Soladey™ and the conventional toothbrush is the incorporation of an N-type semiconductor of Titanium dioxide (TiO<sub>2</sub>) at the neck of the brush.. In the presence of light, saturated low energy electrons in the wet semiconductor are transformed into high energy electrons resulting in a reduction reaction as shown below,<sup>2</sup>



This reaction results in the reduction of H<sup>+</sup> ions from the organic acid in the plaque causing its decomposition. The reaction could also have an effect on plaque formation.<sup>3,4</sup> There is also evidence that the powdered TiO<sub>2</sub> semiconductor irradiated with visible light has a bactericidal effect against Escherichia coli and streptococcus mutans.<sup>4</sup> Thus semiconductor toothbrushes are highly effective with superior plaque removing ability.

### II. Mechanism Of Action Of Soladey™ Ionic Toothbrush

When exposed to any light source (a fluorescent bathroom light, a plain light bulb, or sunlight), the photosensitive titanium rods inside Soladey converts light into negatively charged electrons (ions). The rods release these ions, which blend with saliva to attract positive (hydrogen) ions from the acid in the dental plaque.

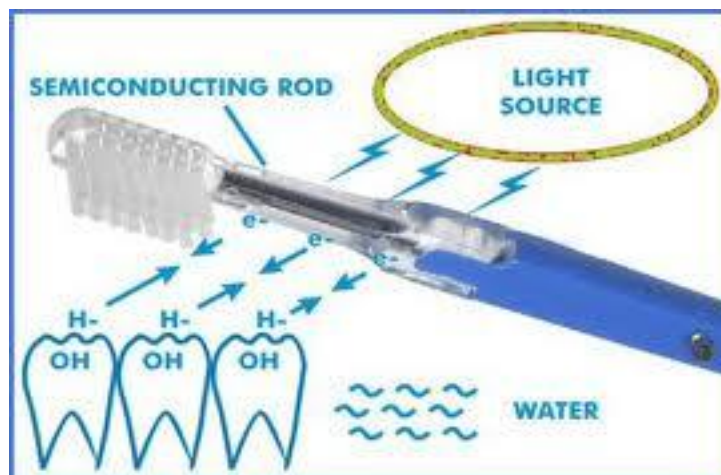


Fig 1: Mechanism of action of Soladey™ toothbrush

### III. How To Use Soladey™

- 1) After wetting the bristles and semiconductor with water, brush your teeth lightly and thoroughly in the same way as with ordinary toothbrush.
- 2) Small amount of toothpaste can also be preferred, although this is not necessary with Soladey™.
- 3) Adequate light source (natural or artificial) on the semiconductor rod is needed for activation.
- 4) If necessary mouth should be kept partly open while brushing.

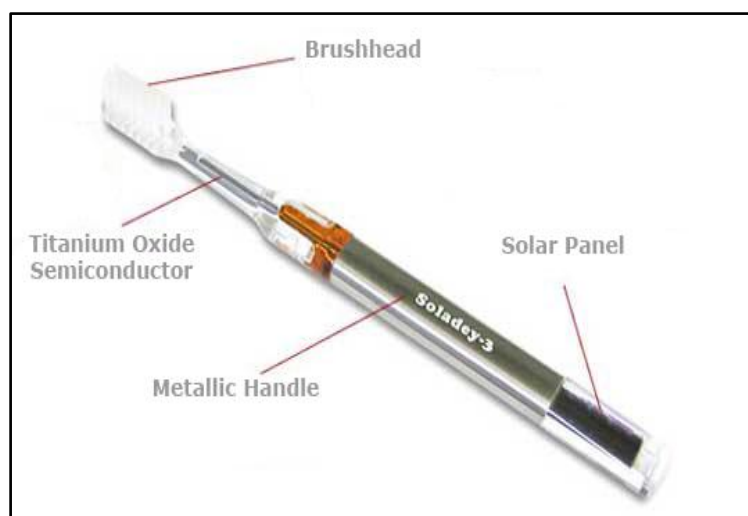


Fig 2: Parts of SOLADEY™ toothbrush

#### benefits of soladey™ toothbrush

- 1) Superior plaque removing ability providing improved oral hygiene
- 2) Environmentally friendly using ionic technology
- 3) Toothpaste not required
- 4) Using chargeable heads, Soladey is affordable and economical
- 5) Proven effectiveness by controlled clinical trials

### IV. Replacing The Brush Head

To keep SOLADEY ionic toothbrush operating at maximum efficiency, replace the brush portion every 2-3 months, depending on brushing. If the bristles become matted or worn significantly, replace the head or effective results will diminish.

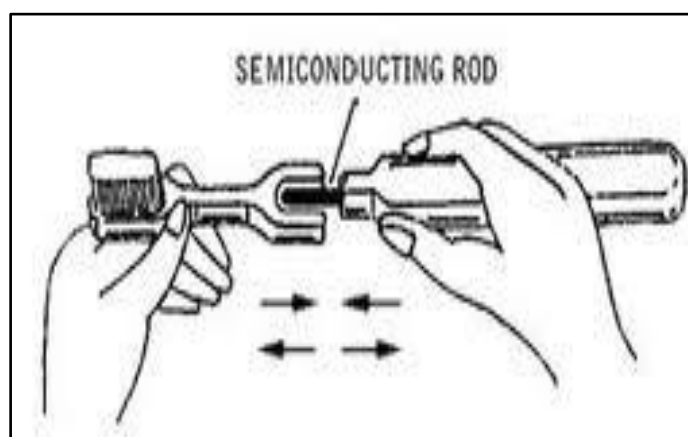


Fig 3: Method for replacing toothbrush head

### V. Conclusion

The various clinical trials carried out in this regards indicate that the toothbrush incorporated with  $\text{TiO}_2$  semiconductor had better plaque removing ability than the conventional toothbrush. The test showing that  $\text{TiO}_2$  works as a bacteria remover took 40 minutes to decrease bacteria under high intensity lighting solution. This is unlike normal low lighting brushing situation. Soladey™ toothbrush will function as a conventional toothbrush

with additional plaque removal force. Further in vitro and clinical investigations are needed in this regards to warrant exact nature of mechanism involved with this toothbrush.

### **References**

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