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Effectiveness of an Oral Care Tablet Containing Kiwifruit Powder in Reducing Oral Bacteria in Tongue Coating: A Crossover Trial

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**Summary of the article:**

Yuki Matsumura, Daisuke Hinode, and Makoto Fukui conducted a study regarding the use

of an oral care tablet containing kiwifruit powder in reducing the bacteria in tongue coating, which in relation will influence halitosis as well. The study took place at Tokushima University in Japan. The authors had published their piece on Wiley in December 2019. (https://onlinelibrary.wiley.com/doi/10.1002/cre2.262) .

The study consisted of 32 students that attended Tokushima University, where they were

divided into 2 groups and were given intervention directions, either a mechanical way of removing tongue coating by utilizing a tongue brush or the chemical way by utilizing the oral care tablet. There was an additional intervention given to both groups after they had both been evaluated for the first two interventions.

The authors concluded that the use of an oral care tablet significantly decreased the number

of total bacteria when compared to the known method of utilizing a tongue brush. They believe that with more research and studies the kiwifruit powder tablet could be a new phenomenon.

**Article information:**

The title of the article selected is “Effectiveness of an oral care tablet containing kiwifruit

powder in reducing oral bacteria in tongue coating: A crossover trial”. The study was conducted by Yuki Matsumura, Daisuke Hinode, and Makoto Fukui. The article was published on John Wiley & Sons, under the Clinical and Experimental Dental Research (Volume 6, Issue 2) journal which can be found on this link--<https://onlinelibrary.wiley.com/doi/10.1002/cre2.262>. This article was published in December 2019. Under this link--https://pubmed.ncbi.nlm.nih.gov/32250572/ you can find the abstract of the article in the PubMed database, the DOI of the article is 10.1002/cre2.262. Lastly, the authors disclosed that there was no conflict of interest for this study.

**Study analysis:**

1. **Type of study:**

The following study utilized the study type of randomized control trials (RCTs), more

specifically, the crossover design. Having separated the subjects into 2 groups and have them go through three interventions with a wash-out period before every intervention throughout the study. These washout periods were three days or more. This study was conducted in Tokushima University, which is the national university in Tokushima, Japan. There was no specific given time for when the study was conducted, the only information regarding time given was that the study was conducted for more than three weeks which was more than they had anticipated.

1. **Study purpose:**

The focus of the study was targeted towards Halitosis. After seeing a survey by the Japanese

Survey of Dental Diseases, they had seen how frequently people were concerned about having oral malodor. Previously knowing that oral malodor is due to volatile sulfur compounds (VSCs) that appear on the tongue as a coating. The emphasis on bacteria that are found in the dorsum of the tongue includes hydrogen sulfide, methyl mercaptan, and dimethyl sulfide which can also later metabolize into *Fusobacterium nucleatum,* which plays a part in periodontal pathogens. Regarding periodontitis, it was reported that about 60% of volatile sulfur compounds originated from the tongue surface in these patients. Adding to this, they had gathered that 70% of their subjects had no recognition of their coated tongues or any anticipation of removing them when doing their home-oral care.

This is when they had wondered if there was another efficient way of removing such coating,

aside from the known mechanical removal method. The curiosity arose when they had seen multiple reports regarding the chemical cleaning for tongue coating and their effectiveness to suppress VSCs by just utilizing an oral tablet that contained cysteine protease (actinidin) from kiwifruit. Their focus was on the pathological effects of halitosis and the bacteria involved. Since there are very few studies showing the relationship of the effects the oral tablet has on oral bacteria, they took it upon themselves after having the chance to obtain the approved oral tablet by Ezaki Glico Co. to investigate the effects of the bacterial and VSCs concentration in tongue coating.

1. **Experimental design:**

The study consisted of thirty-two students that attend the university where the study was

conducted, Tokushima University. As for ethics, the participants were informed about the methods and objectives of the study allowing them to apply their autonomy and later signing for written informed consent, as in addition, two students did decide to not complete the study and had the right to drop out during intervention three. Before they had officially settled with the thirty-two participants, they made sure to rule out anyone pregnant, a smoker, anyone receiving antibiotic treatment or had received within two weeks and anyone that showed signs of being allergic to kiwifruit to reduce any outliers and have a more accurate finding.

Samples size was selected through a preliminary study done with five participants. The found

data of the number of oral bacteria after using the chemical and mechanical cleaning methods, the variable of the number of bacteria, and the sample size was based on a two-tailed test. From the preliminary study, they had found the number of participants needed to not have any data point surpass the highest and lowest acceptable variable values in the range of P<0.05, with a 90% probability that the findings will fall within the interval of “true” findings. As well as an anticipated 1.19 substantive significance. Which is how they later narrowed it down to thirty-two participants, making it a sample size of six-teen for each group when randomly divided to start each intervention.

The study was conducted over time. The first two interventions were done within an hour,

while the third intervention would last the whole day since the subjects were given instructions that had to follow the number of meals taken. They had a system where they would evaluate each subject before and even after providing an intervention. To evaluate the subject, they first took pictures of the dorsum of the tongue using a digital camera which was used to follow the Winkel tongue-coating index (WTCI). The Winkel tongue-coating index was quantitatively measured using a scale of 0-2. Having a range of 0-12 overall in the oral cavity, since visually the tongue is divided into six sections where each section would be scored. Furthermore, they utilized an Oral Chroma which is a device that measured the VSC concentration in the subject’s oral cavity. Lastly, the use of a Bacteria Counter was needed to measure the number of total bacteria in the tongue coating. The Bacterial Counter was used following the manufacturer’s instructions. Each sample was collected by using a sterile cotton tip by the method of swabbing. Two-centimeter swabbing motions three times going forward and backward on the dorsum of the tongue. The samples were later suspended in 5ml of distilled water in a disposable cup for sanitary reasons. After following these steps, the samples were quantified with the Bacteria Counter, where they later dispensed the samples into vials and kept at -80 degrees Celsius until it is further utilized for a polymerase chain reaction analysis. There was a total of five evaluations done during this study.

Regarding statistical findings, the study provided different types of graphs and multiple

tables full of statistical findings for different variables. From gathered information by all subjects; to the two groups separately. Providing the standard deviation and median for every bacteria and overseen information.

The researchers and examiners were calibrated by utilizing objects and an index. The use of

the Winkel tongue-coating index allows them to acquire quantitative information. The numeric system of the index is very clear on whether it is a 0-no coating, 1-some coating, and 2-intense coating. I would say by following this index, calibration is reinforced. The same goes with the objects used for evaluations.

1. **Results:**

Findings consisted of seeing drastic changes in levels of hydrogen sulfide, volatile sulfur

compounds and the Wilken tongue-coating index between the first and second intervention, which was focused on mechanical use and chemical use of tongue coating removal which can be shown in figure 4. Although they did not see a significant difference when it came to the reduction of bacteria that causes oral malodor for the first intervention, the remaining two interventions showed the opposite. The use of the oral care tablet targeted the reduction of the bad bacteria that causes malodor in the oral cavity, it was shown to being more effective than just regular mechanical tongue brushing. This can be seen in table 4, where the probability levels drastically decrease between intervention one and intervention two, making the probability level less than 0.01 in just about every evaluated item.

1. **Conclusion:**

Ultimately, they concluded that an oral care tablet that contains kiwifruit powder might be

the more effective way to reduce total bacteria and *F. nucleatum* in tongue coating which along comes VSC and the effects of oral malodor. The authors were aware of how the oral cavity is always in a bi-directional relationship with the body, meaning that something that is so overseen like tongue coating can be aspirated into the lungs and cause a more systemic concern aside from the concerns we focus on which are oral diseases. They saw that the reduction in tongue coating and the bacteria that is found in the coating was overall benefiting our general health. Making this study the first observation of this field, it left with many other possible conclusions. One being that the oral care tablet might also be effective in the removal of biofilm since the oral care tablet has shown effectiveness in the reduction of pathogenicity. Another would be that more could be explored relating how the salivary flow in the mouth is in the effect of the oral care tablet and how that can contribute to the decrease in total bacteria in the oral cavity. Therefore, they propose to analyze other types of bacteria that are concerning to halitosis aside from the ones investigated during this study. As well as having a variety of ages when enrolling subjects, since data was limited for just teens for this study. This can further broaden the knowledge on this phenomenon that comes from just an oral care tablet made up of kiwifruit powder.

**My impression:**

This study caught my attention when I had first come across it. This study focused on what I

believe to be the most forgotten part of the month when it comes to home oral hygiene, the tongue. This study further depicts how if the bacteria on the tongue is not interrupted by removing the coating that accumulates then it would contribute to things like periodontitis and even systemic complications like aspiration pneumonia to esophageal cancer. From experience, patients I had seen during DEN 1200 that did not utilize a tongue cleaner did not seem faced by the coating. They just thought of the gag reflex they would get when they did attempt to brush their tongue with a tongue brusher. This study interested in just that, the fact that there is another form of effectively removing the tongue coating without activating such reflux which can discourage a patient. The benefits of removing tongue coating effectively like the reduction of pathologic bacteria that contribute to halitosis are just another addition to why the oral care tablet would be a great addition to someone’s oral homecare.