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Comparison of Bacterial Contamination and Antibacterial Efficacy in Bristles of Charcoal Toothbr ushes versus Non charcoal toothbrushes a Microbiological Stud

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**Summary**

Mitali Vilas Thamke, Amol Beldar, Priya THakkar et al conducted a microbiological randomized control clinical trial using the crossover design on randomly chosen people that were eligible for the study from the Department of Periodontology and Implantology. Comparison of Bacterial Contamination and Antibacterial Efficacy in Bristles of Charcoal Toothbrushes versus Non charcoal toothbrushes a Microbiological Study was conducted in 2018 Jul-Sep at MGV's KBH Dental College and Hospital, Nashik, Maharashtra, India, and published in Wolters Kluwer -Medknow Publications <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6104356/> . A total 50 people were instructed to use Charcoal infused and non charcoal infused toothbrush bristles over a period of time to evaluate the difference in antimicrobial properties and amount of microbial growth. In order to test for the amount of anaerobic periodontopathogenic microbes which are the main cause for periodontal disease they had to conduct an anaerobic microbiologic study. Mitali Vilas Thamke, Amol Beldar, Priya THakkar et al conducted a microbiological randomized control clinical trial using the crossover design on randomly chosen people that were eligible for the study from the Department of Periodontology and Implantology. Comparison of Bacterial Contamination and Antibacterial Efficacy in Bristles of Charcoal Toothbrushes versus Non charcoal toothbrushes a Microbiological Study

**Article Information**

Comparison of Bacterial Contamination and Antibacterial Efficacy in Bristles of Charcoal Toothbrushes versus Non charcoal toothbrushes a Microbiological Study by Mitali Vilas Thamke, Amol Beldar, Priya THakkar et al**.** Published in Wolters Kluwer -Medknow Publications, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6104356/> . FInancial support and sponsorship Nil and no conflicts of interest.

**Study Analysis**

This is a randomized control clinical trial using the crossover design conducted in Jul-Sep of 2018 at MGV's KBH Dental College and Hospital in Nashik, India**.** An anaerobic microbiological study to evaluate bacterial growth and antibacterial efficacy of charcoal toothbrushes and non charcoal toothbrushes.

**Study Purpose**

The authors conducted this study due to the fact that activated carbon was proven to remove bacteria from water systems and therefore was thought to have bacterial resistant properties. It is known that charcoal toothbrushes are used in South-East asian countries and they claim to have antimicrobial properties, therefore the authors wanted to confirm whether or not this claim is, in fact, correct. The anaerobic microbial study was conducted based on studies showing that microorganisms, that are periodontopathogenic are indeed facultative anaerobes, which is the main cause for periodontal disease.

Before the study was conducted the toothbrush was known for its capability of disease transmission along with dental instruments and dental floss, being that the toothbrush is put in a moist and humid environment that permits bacterial growth near the toilet or on the sink in bathrooms. Studies also showed that periodontopathic organisms that were infectious were cultured from toothbrushes in patients diagnosed with necrotizing periodontitis such as *Enterobacteriaceae* and *Pseudomonadaceae.* This advanced the knowledge of how the toothbrush can contribute to transmitting bacteria right back into the mouth after a scaling and root planing treatment procedure. The purpose and aim of this study was to distinguish the difference in the amount of anaerobic bacterial contamination and antimicrobial efficacy of charcoal infused toothbrush bristles and non charcoal infused toothbrush bristles.

**Experimental Design**

The researcher examiners were specially trained to be able to recognize if the participants were acceptable for inclusions of this study. These examiners had been calibrated in the sense of using the plaque index scores and gingival index scores on participants and comparing it to a fixed standard score.The 50 patients that were chosen randomly were in the age range of 18-35. The inclusions for the study that had to be met were that they were able to brush manually twice a day 2x a day with a plaque score of less than 2 and gingival index score of less than 2. Anyone that had open carious lesions, plaque or gingival index scores higher than 2, throat infections, gingivitis, periodontitis, smokers, or used antibacterial toothpaste or mouthwash or were medically compromised were excluded from this study. The participants were grouped instructed to use charcoal toothbrushes first using the Bass method of brushing angling the bristles at a 45 degree angle into the gingival sulcus and brushing all teeth surfaces posteriorly and anteriorly for 2 minutes twice a day, morning and night for one week. Participants were also instructed to keep the toothbrushes at least 2 feet away from the toilet. They were not to use any mouthwash throughout the week and told not to touch the bristles of the toothbrush upon rinsing under running water.

After one week the used charcoal toothbrushes were returned in sterile pouches that were provided and all participants had a washout period of 1 week. This was done in order to get rid of any charcoal activity left in the system so they can proceed with the next part of the study. The non charcoal toothbrush was then given to the participants and they were instructed to repeat the same type of brushing technique and all the same techniques as were done with the charcoal toothbrushes. Seven days later the toothbrushes were also returned in sterile pouches and one-third of the bristles from both charcoal and non charcoal toothbrushes were cut off and placed in sterile Petri dishes separately. A total of 100 blood agar plates were prepared in order to be inoculated for the 50 non charcoal toothbrush bristles and 50 for the charcoal toothbrush bristles. The bristles were placed in a 5mL saline solution inside of a test tube and using a sterile pipette the examiners inoculated blood agar plate with .1 mL from the saline solution containing the bristles. A sterile cotton swab was used to make a smear with the solution on the agar plate. The blood agar plates were then placed in a gas pack jar to allow for anaerobic culture and then placed in an incubator containing the temp. that allows for microbial growth. Microbial growth is measured in colony forming units (CFU) in which was presented after 48 hrs of incubation. To evaluate the antibacterial efficacy a zone of inhibition was evaluated for both types of toothbrushes.

Data was collected and analyzed statistically using a paired sample t-test and a set probability value. After the three week period of this experiment was done the colony forming units between both types of bristles showed significant results. Statistically they did analyzethe results of the paired sample *t*-test comparing the number of colonies that formed on all 100 blood agar plates. The CFU mean Standard Deviation (SD) for the used charcoal infused bristled toothbrushes was 37.960 with a Standard error of the mean of 1.948 which gave a Mean difference (SD) of 115.40 . For the used non charcoal infused bristled toothbrushes the CFU mean (SD) was 151.36 with a Standard error of the mean of 2.648 which also came to a mean difference (SD) of 115.40.

**Results**

The results were significant according to the probability level, the p value was set at 0.03 and the resulting value obtained was <0.001. The research examiners found no growth after the 24 h incubation however the colonies were placed back into incubation. Growth was then seen after 48 h of incubation at a much higher amount in the blood agar plates containing the non charcoal toothbrush bristles. Also the antibacterial efficacy of charcoal toothbrush found a 10 mm zone of inhibition for charcoal tooth bristles compared to non charcoal toothbrush, which was found to be only 3 mm of a zone of inhibition.

**Conclusion**

The authors findings confirmed that the charcoal infused bristles had significantly greater antimicrobial properties and less bacterial growth which makes them a product for the prevention of oral disease causing microorganisms. The background knowledge of activated charcoal is that it is known to have properties that neutralize toxins, poisons and has been placed in water systems where it removed bacteria such as *P. aeruginosa and E. coli.* Therefore, the idea of infusing charcoal in toothbrush bristles was highly due to the fact that it could inhibit bacterial growth and it could make brushing more effective to treat and prevent gum disease. There are no proposed studies, no limitations and no conflict of interest.

**My Impression**

I think this study is extremely important. These findings can contribute greatly to the field of dental hygiene being that this will have a great impact on the population in preventing disease causing bacteria. Although this seems like a great product I have many questions on the effect it can have on the enamel, being that activated charcoal is abrasive. I understand the advantages of the toothbrush bristles being infused with charcoal but I would also like to have learned about the disadvantages. I would like to know how we, as dental professionals, are supposed to advertise this product to patients with sensitivity or even carious lesions. Also, how much activated charcoal is considered to be safe without causing harm?. Yes this can help with reversing gingivitis or maintaining a patient with periodontitis but at the same time it can actually worsen the patients enamel and overall health. Can this product be used in junction with a desensitizing toothpaste? How would that work? Does this toothbrush eliminate the need for a dentifrice? Wouldn't this product be more abrasive in junction with a charcoal based dentifrice? Were there any complaints of sensitivity from the participants? How will the developing teeth of the younger population be affected by this? I would like to learn more on the outcomes of people that used this over a longer period of time and what is the lifespan for the use of these brushes before replacing them. Also it is not known whether or not participants did in fact use a dentifrice in the privacy of their home seeing how it does not state anywhere that they were instructed not to use any. This may have altered the studies results.

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