

Charcoal and charcoal-based dentifrices

A literature review

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The practice of brushing teeth with charcoal products may be regaining popularity. The first recorded use of charcoal for oral hygiene has been credited to Hippocrates in ancient Greece.¹ Use of charcoal for cleaning the teeth has been practiced in many parts of the world including the United Kingdom, Italy, Cameroon, Nigeria, Tanzania, Republic of Senegal, Bangladesh, India, and Malaysia. Powdered charcoal, soot, or coal ash has been applied to teeth with fingers, chewing sticks, or cloth, and used as a single-agent dentifrice²⁻⁵ or in combination with flavoring agents, botanicals, and various inorganic compounds.^{6,7}

Charcoal-based preparations have been used for a variety of medical applications, principally as an antidote for acute poisoning and drug overdose⁸ and less often for management of skin infections,⁹ reduction of wound malodor,¹⁰ pruritus associated with dialysis,¹¹ as a drug nanocarrier,¹² and medical tattooing.¹³ Charcoal has also become fashionable as a food ingredient in various preparations or as a food coloring agent in China, Japan, and

ABSTRACT

Background. Sales of charcoal dentifrices and powders have rapidly emerged into the Internet marketplace. The authors conducted a literature review to examine the efficacy and safety of charcoal and charcoal-based dentifrices.

Methods. The authors searched the MEDLINE and Scopus databases for clinical studies on the use of charcoal and charcoal-based dentifrices and laboratory investigations on the bioactivity or toxicity of charcoal and charcoal-based dentifrices, published through February 2017. The authors used a defined search strategy to identify randomized, controlled clinical trials with a follow-up duration of 3 months or longer. In addition, the authors selected the first 50 consecutive charcoal dentifrices from Google.com and Amazon.com for ascertainment of product assortment and advertising promotions.

Results. The authors' literature search identified 118 potentially eligible articles. Thirteen studies reported brushing the teeth with raw charcoal or soot; however, none of these studies met the inclusion criteria. Two studies offered nonspecific caries reductions, 3 studies reported deleterious outcomes (increased caries, enamel abrasion, nonquantified negative impact), and 1 study indicated only that brushing with raw charcoal had no adverse effects on oral hygiene. Seven other studies reported only on the use of charcoal for oral hygiene. Internet advertisements included unsubstantiated therapeutic claims—such as antibacterial, antifungal, antiviral, and oral detoxification, as well as potentially misleading product assertions. One-third of the charcoal dentifrices contained bentonite clay, and 1 contained betel leaves.

Conclusions. The results of this literature review showed insufficient clinical and laboratory data to substantiate the safety and efficacy claims of charcoal and charcoal-based dentifrices. Larger-scale and well-designed studies are needed to establish conclusive evidence.

Practical Implications. Dental clinicians should advise their patients to be cautious when using charcoal and charcoal-based dentifrices with unproven claims of efficacy and safety.

Key Words. Consumer product safety; dentifrices; oral hygiene; product labeling; safety; toothpaste.

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Figure. Photo of charcoal dentifrice.

South Korea and championed to improve one's health status.¹⁴

Limited information has been published with regard to the growing interest in commercially available charcoal dental formulations (Figure). In this literature review, we report the usage of charcoal-based products for oral hygiene, examine evidence of bioactive capacity and adverse health effects, and include Internet advertising claims and packaging information.

METHODS

Search strategy. We established comprehensive search strategies to identify studies for inclusion in this review. We searched PubMed, MEDLINE, and Scopus databases for reports on the efficacy and safety of cleaning teeth with charcoal products published in the English language literature through February 2017, using the following 3 strategies and search terms:

1. charcoal OR charcoal-based OR activated charcoal OR soot;
2. toothpaste OR dentifrice OR oral hygiene OR tooth cleaning OR teeth OR oral health OR dental;
3. 1 OR 2.

We also screened reference lists of potential articles for relevant published studies. In addition, we searched the electronic databases of 4 dental journals—namely, *Journal of Periodontology*, *Journal of Clinical Periodontology*, *Journal of Periodontal Research*, and *Journal of Dental Research*.

Assessment of validity and data extraction. From our literature search, we identified 118 potentially eligible articles. Two authors served as reviewers (J.B., M.R.) and independently screened the titles, abstracts, and full texts of the articles identified in the search. We resolved disagreements through discussion until reaching a consensus. None of the articles reviewed met the search criteria. Nevertheless, we provided a comprehensive literature review of charcoal as an oral cleanser to enhance the discussion. We extracted data on the following topics and recorded them:

- citation, authors, and year of publication;
- methodology;

- study population, including city and country, and age of participants;
- oral hygiene comparisons;
- outcome measures;
- source of funding.

Product labeling. Search strategy. We conducted an Internet search on Google.com and Amazon.com, and used the key words “charcoal toothpaste.” We identified 50 consecutive types of toothpastes and tooth powders, and advertised information served as the source of this product database. We excluded other oral charcoal products (toothbrush bristles, mouthrinses) from this report.

RESULTS

Literature review. We found 13 studies on the use of charcoal or charcoal-based products for oral hygiene. Six articles reported clinical observations of toothbrushing with raw charcoal, of which, 2 studies offered nonspecific caries reduction with charcoal when compared with toothbrushing, with or without toothpaste (Table 1).^{2,6,15-18} Three of these studies reported deleterious outcomes (increased caries, enamel abrasion, nonquantified negative impact), and 1 study indicated that brushing with raw charcoal had no adverse effects on oral hygiene. Seven additional studies reported on the use of charcoal for oral hygiene but had not delineated clinical comparisons of effectiveness with other oral methods of hygiene (Table 2).¹⁹⁻²⁵

Product information. We summarized product labeling related to therapeutic and other marketing claims for the 50 charcoal-based dentifrices on Internet Web sites (Table 3). The country of origination of most products was not mentioned; designated countries included the United States, United Kingdom, Japan, India, Thailand, Lithuania, Australia, Hong Kong, China, Korea, and Switzerland. Lists of ingredients were posted for 39 products. Only 8.0% (4) of the products contained fluoride. The most common cosmetic claim was the promotion of tooth whitening, advertised for 96.0% (48) of the products. Consumer-appealing terms such as ecofriendly, ecological, herbal, natural, organic, or pure appeared in 88.0% (44) of the product advertisements and 54.0% (27) of the products included at least 2 different descriptors. One product listed 9 organic ingredients, and another product contained 8 organic ingredients. Therapeutic claims were made for nearly one-half of the products. Forty-six percent (23) of the products claimed the capacity for detoxification, and 44.0% (22) of the products were advertised as antibacterial or antiseptic and 6 of these also were said to be antifungal. Thirty percent (15) of the products were promoted to remineralize, strengthen, or fortify the teeth; 28.0% (14) of the products claimed to be low abrasive or gentle to the enamel. Ten percent (5) of the products offered some extent of professional dental endorsement;

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