Toothpaste containing synthetic tooth minerals can prevent cavities as effectively as fluoride: Clinical trial

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Brushing twice a day keeps the dentist away—but can we improve on the toothpaste we use to maintain clean teeth, preventing medical issues that

spiral from poor dental health? Most toothpastes use fluoride, a powerful tool for oral hygiene. However, fluoride can pose health problems in some cases, especially for children who consume too much fluoride by swallowing most of their toothpaste: children normally use only a tiny dose of toothpaste to avoid these problems, but that reduces toothbrushing efficacy.

In the search for alternatives, a team of international scientists and Polish clinicians have identified a hydroxyapatite toothpaste that works just as well as fluoride toothpaste to protect against cavities.

"Hydroxyapatite is a safe and effective alternative to fluoride in caries prevention for daily use," said Professor Elzbieta Paszynska of the Poznan University of Medical Sciences, co-principal investigator and corresponding author of the study published in *Frontiers in Public Health*.

Minimally invasive dentistry

Hydroxyapatite is a calcium phosphate mineral found in the skeleton. It's known to be very safe for human consumption and has previously been shown to help with oral conditions like periodontitis. It can both inhibit the demineralization of teeth, a key step towards a cavity, and contribute to remineralization, which reinforces damaged tooth surfaces.

"Currently, in dental care, the aim is to use 'minimally invasive dentistry' as often as possible," explained Paszynska. "This means trying to preserve as much tooth tissue as possible, including those altered by initial caries that still show the ability to remineralize. The use of remineralization compounds is a boon, as it may limit the need for invasive treatment of carious lesions with a drill."

To see if it would help patients without specific dental conditions, the clinicians recruited 189 adults aged 18–45 to take part in an 18-month-

long double blind randomized clinical trial. They aimed to see all patients through to the end of the study without an increase in cavities.

171 patients completed the trial, evenly split between the hydroxyapatite toothpaste group and the control group with fluoridated toothpaste. All patients had at least 10 teeth without cavities, were willing to use an electric toothbrush, and had no pre-existing tooth problems in need of treatment.

Patients were provided with electric toothbrushes and replacement heads for these brushes, as well as neutrally packaged toothpaste that could have contained either the hydroxyapatite toothpaste or a fluoride toothpaste. Neither patients nor examiners knew which toothpaste a given patient was using, and patients used no other oral care products. They were also asked to brush their teeth at the same time every day—twice a day, after meals, for three minutes each time—but they were not asked to change their diets.

"We did not monitor the diet of each subject as the aim was to test two different toothpastes, not the influence of the diet on the caries progress," said Paszynska.

Hydroxyapatite equally effective

Throughout the trial, patients visited the clinicians every six months for an examination and to receive a fresh supply of toothpaste. Their teeth were visually examined and checked for any shadows that might reveal an early-stage cavity using a DIAGNOcam device. A plaque disclosing solution was also used to see how clean their teeth were.

Each stage of the trial was monitored for consistency between patients, and patient safety was monitored at every appointment to make sure there weren't any unanticipated side effects.

At the end of the trial, the scientists found that nearly 90% of patients in both groups had no new cavities. There was no statistical difference in efficacy between the patients using a hydroxyapatite toothpaste and the control group using a fluoride toothpaste: both worked equally well.

"Previously published clinical trials also show the caries-preventing effect of hydroxyapatite in risk groups such as children and patients undergoing orthodontic therapy," said Paszynska. "With our new clinical trial, it has been shown that hydroxyapatite prevents dental caries in adults. This is important from a public health perspective."

More information: Caries-preventing effect of a hydroxyapatite-toothpaste in adults: A 18 months double-blinded randomized clinical trial, *Frontiers in Public Health* (2023). DOI: 10.3389/fpubh.2023.1199728. www.frontiersin.org/articles/1 … bh.2023.1199728/full

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