Could nanoparticles make tooth surface too greasy for microorganisms to boom?

The long history of humanity has seen a lot of improvements. Science has enabled us to expand our understanding of the physical authenticity around us, while technology continues to offer conveniences and newer traditions for the betterment of humanity. Human beings can see the need for peaceful coexistence at the level of human society and recognize the need for research as a fundamental need. We have navigated a long way from the times of warring, tribes, and the fear of natural elements. While we made tremendous advancements and innovations, the question still remains, are we satisfied with the current research in our field or whether there is a need to explore into more and more?

Now, the dental researchers at Pennsylvania have established a method to use nanoparticles to break down dental plaque effectively and wipe out more than 99.9% of the cavity-causing microorganisms within minutes, thus it may help to prevent tooth decay. The microorganism that lives in dental plaque and contributes to tooth decay often resists the traditional antimicrobial treatment modalities, as they can "fleece" within a sticky biofilm matrix, a glue-like polymer scaffold. Researchers applied the nanoparticles and hydrogen peroxide topically to the teeth of rats, which can develop tooth decay when infected with Mutans Streptococci just as humans do. Twice-a-day, 1-min treatment for 3 weeks significantly reduced the onset and severity of tooth decay in rats as compared to the control or treatment with hydrogen peroxide alone. The researchers at the University of Pennsylvania have also observed no adverse effects on the gums or oral soft tissues from the treatment. Instead of applying an antimicrobial to the teeth, they took advantage of the pH-sensitive and enzyme-like properties of iron-containing nanoparticles to catalyze the activity of hydrogen peroxide, a commonly used natural antiseptic. The activated hydrogen peroxide produced free radicals which were able to degrade the biofilm matrix and kill the bacteria within, significantly reducing plaque and preventing the tooth decay, or cavities, in an animal model.

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"Even after using a very low concentration of hydrogen peroxide, the process was incredibly effective at disrupting the biofilm," claimed the researcher's staff of the University of Pennsylvania. The research carried out earlier revealed that the iron oxide nanoparticles behave similarly to a peroxidase, an enzyme found naturally that catalyzes oxidative reactions, often using hydrogen peroxide. They used these nanoparticles in an oral setting, as the oxidation of hydrogen peroxide produces free radicals that can kill the microorganisms; they grew a biofilm containing the cavity-causing bacteria Mutans Streptococci on a tooth-enamel-like surface and then exposed it to sugar. The nanoparticles adhered to the biofilm were retained even after stopping the treatment and could effectively catalyze hydrogen peroxide in acidic conditions, as claimed by the researchers. Further, they also exhibited that the nanoparticles' reaction with 1% or less hydrogen peroxide solution was remarkably effective in killing bacteria, wiping out most of the microorganisms in the biofilm within 5 min, an efficacy 5000 times greater than using hydrogen peroxide alone. They further demonstrated that the treatment regimen, involving a 30 s topical treatment of the nanoparticles followed by a 30 s treatment with hydrogen peroxide, could breakdown the biofilm matrix components, essentially removing the protective sticky scaffold. This is the beginning of new era in the prevention and control of dental caries. However, nanoparticles may pose another problem, especially the toxicity part needs to be checked in long-term studies. Nanoparticles in the body are a weird subject. They

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sometimes tend to aggregate where they should not. As nanoparticles are the kind of materials existing since the dawn of time, owing to gridding processes used in food and other material production.

Science is fundamentally neutral - whether it is good or bad, it is dependent on the people creating it and ultimately using it. The vast majority of science is done for the betterment of human welfare, as well as for the "advancement" of humanity and therefore, on the whole, the discovery or new research can be thought of as good. Science can be a blessing to humanity if properly used.

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