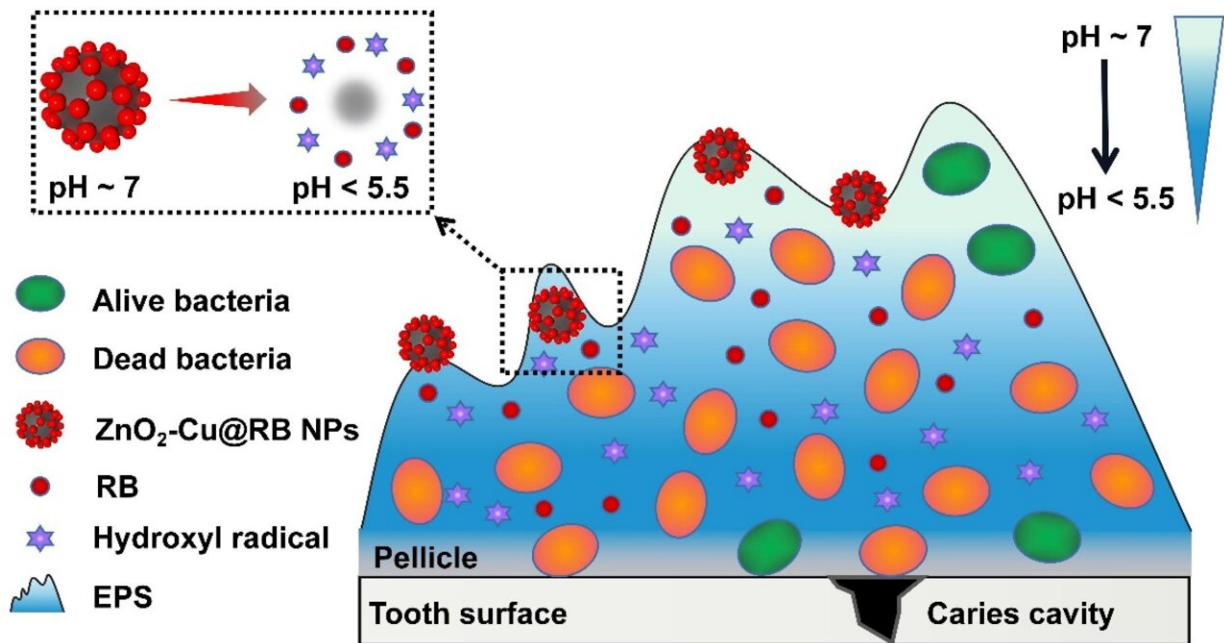


Researchers propose new strategy for prevention and treatment of dental caries

June 20 2022



Schematic diagram of the effects of ZnO₂-Cu@RB NPs on *S. mutans* and its oral biofilm. Credit: Chen Zhuo's group

One of the most common biofilm-related infections is dental caries which affects more than 60% of children and almost all adults around the world.

The [pathogenic bacteria](#), *Streptococcus mutans* (*S. mutans*), induce cavities based on the formation of extracellular polysaccharides (EPS)

and their survival in acidic environments. The plaque biofilm formed has the characteristics of water insolubility, retention, and low membrane permeability.

A research group led by Prof. Chen Zhuo from the Fujian Institute of Research on the Structure of Matter of the Chinese Academy of Sciences has developed a pH-responsive metal peroxide nanocomposite for chemodynamic therapy (CDT) by loading Rose Bengal (RB), an antibacterial agent, on copper-doped zinc peroxide nanoparticles ($\text{ZnO}_2\text{-Cu}$ NPs).

The study was published in *Chemical Engineering Journal* on May 26.

The researchers found that $\text{ZnO}_2\text{-Cu@RB}$ NPs could quickly produce sufficient H_2O_2 in an acidic biofilm environment. The divalent copper ions (Cu^{2+}) were released and participated in a Fenton-like reaction to produce hydroxyl radicals. Therefore, the self-supplied Cu^{2+} and H_2O_2 greatly enhanced the efficacy of CDT.

They also revealed that $\text{ZnO}_2\text{-Cu@RB}$ NPs (at a concentration of $256 \mu\text{g mL}^{-1}$) killed more than $8.0 \log_{10}$ of *S. mutans* embedded in the EPS-rich matrix.

" $\text{ZnO}_2\text{-Cu@RB}$ NPs effectively inhibited the production of acidic substances, the formation of biofilm, and the demineralization of apatite at low pH. Local application of $\text{ZnO}_2\text{-Cu@RB}$ NPs effectively inhibited the occurrence and severity of [dental caries](#) without harmful effects on the body," said Prof. Chen.

This study demonstrates the potential of $\text{ZnO}_2\text{-Cu@RB}$ NPs as an effective [antibacterial agent](#) for the treatment of bacterial biofilm-related diseases.

More information: Yuxiang Zhang et al, Bacterial biofilm microenvironment responsive copper-doped zinc peroxide nanocomposites for enhancing chemodynamic therapy, *Chemical Engineering Journal* (2022). [DOI: 10.1016/j.cej.2022.137214](https://doi.org/10.1016/j.cej.2022.137214)

Provided by Chinese Academy of Sciences

Citation: Researchers propose new strategy for prevention and treatment of dental caries (2022, June 20) retrieved 20 April 2024 from <https://medicalxpress.com/news/2022-06-strategy-treatment-dental-caries.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.