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IISc builds magnetically guided nanobots for tooth sensitivity relief

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While the immediate goal is to relieve sensitivity, the implications of this work extend much further



Sensitive teeth need tough toothpaste, but technology can also help. Researchers at the Indian Institute of Science (IISc), Bengaluru in collaboration with deep-tech startup Theranautilus have now engineered CalBots – magnetic nanobots that can penetrate deep into dentinal tubules, which are tiny tunnels in teeth that lead to nerve endings. These CalBots can then form durable seals for worn enamel, offering lasting relief from sensitivity in just one application.

The CalBots use a completely new class of bioceramic cement. While bioceramics are widely used in orthopaedics and dentistry for their mineralising properties, the team wanted a solution tailored for hypersensitivity – a formulation that could travel deeper and last longer.

To test their innovation, the team used human teeth extracted for clinical reasons and created conditions where the dentine was exposed. On these samples, they applied CalBots under a magnetic field for 20 minutes, during which the bots sealed the dentinal tubules by forming deep, stable plugs – a result confirmed through high-resolution imaging. Encouraged by this, they progressed to animal trials in collaboration with researchers at IISc's Center for Neuroscience.

The CalBots are composed entirely of materials classified as 'Generally Recognised as Safe' (GRAS), ensuring high biocompatibility. Toxicity tests on mice showed no adverse effects.