Research & Table Clinic Day 2020 Structured Abstract

TITLE: The Future of Nano-Robots in Dentistry

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OBJECTIVES: Micro-robots are being used in the medical field for a variety of procedures, such as: drug delivery and precision therapeutics. This research is used to determine how micro-robots can be incorporated into dentistry.

METHODS: Google Scholar was used to find viable research related to micro-robots in dentistry. The terms 'micro', 'nano', 'robots', and 'dentistry' were used when searching for articles. The criteria used when narrowing down articles found, included articles that were peer-reviewed, conducted less than five years ago, and directly related to the topic. When analyzing research, all articles that were considered literature reviews were excluded.

RESULTS: Micro-robots are effective in non-invasive medical procedures. To be successful, these robots need to maneuver around small areas without damaging adjacent tissues. By having a triplehelical motor, the nano-robot will have added-degrees of freedom which will allow for the precise maneuvering in both "forward" and "reverse" movements. A helical structure will perform better in areas of high viscosity, yet in areas of low viscosity, a more tubular body with a flat tail is desired.4 One study found that the TDE controller performance was more efficient in low-viscosity fluids versus a PID controller. In order for the nano-robots to function properly and to prevent sinking, a magnetic field is needed. For the micro-robot to successfully kill bacteria and degrade the biofilm EPS matrix, catalytic activation is required.1 Nanoparticles without the catalytic activation were unsuccessful in this process.

CONCLUSIONS: It is shown that nano-robots have been successful in degrading the biofilm EPS matrix and killing bacteria, thus helping to keep the oral environment healthy. However, future research is needed to determine other factors such as: overall safety needs, if micro-robots can cause tooth discoloration or enamel defects, if these robots are able to perform other dental procedures (detecting oral cancer or removing hard calculus), and whether such outcomes will remain successful on dental patients.

LEARNING OBJECTIVES:

1. To understand the purpose of using micro-robots in the field of dentistry
2. To become familiar with the different types of micro-robots and micro-particles
3. To gain a better understanding of how micro-robots function