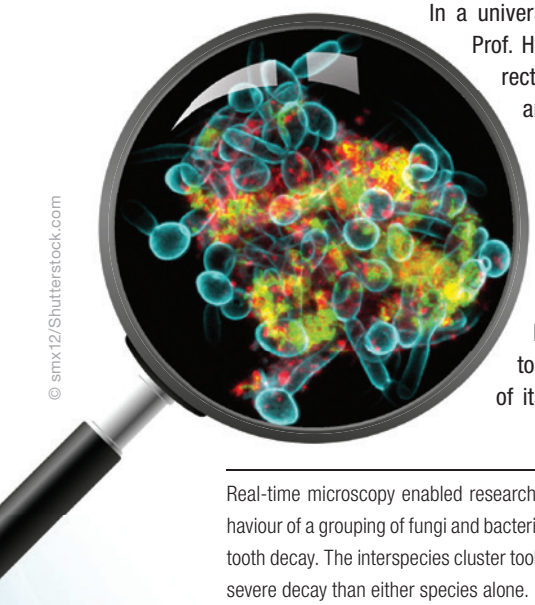
Research led by School of Dental Medicine scientists

Microbes that cause cavities can form superorganisms able to "crawl" and spread on teeth

A research team from the University of Pennsylvania has found that, within hours of growth, groupings of bacteria were able to "leap" more than 200 times their own body length across dental surfaces, offering an insightful explanation into the mechanism behind rapid bacterial colonisation and dental caries.



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Real-time microscopy enabled researchers to track the movement and behaviour of a grouping of fungi and bacteria in the saliva of children with severe tooth decay. The interspecies cluster took on new functions and caused more severe decay than either species alone. (Image: Penn Dental Medicine)

In a university press release, co-author Prof. Hyun (Michel) Koo, founding director of the Centre for Innovation and Precision Dentistry at the university, stated that, although the organisms comprising the biofilm in the laboratory were non-motile, the combination of bacteria and fungi created a "superorganism": an assemblage that was far more difficult to remove from teeth than either of its two constituents alone. The research team was originally studying severe childhood caries in toddlers when they were shocked to find that the blend of bacteria and fungi actually developed the ability to "walk" and "leap", when neither could do so before. The organisms in question, *Streptococcus mutans* and the fungus *Candida albicans*, were identified as the main components of the biofilm causing the severe caries in toddlers. The bacteria and fungi were able to develop unexpected levels of adhesion and microbial tolerance. The fungi sprouted hyphae, which enabled the bacteria to better attach themselves and prevent removal. Despite the secure attachment, the new assemblage was still able to move itself forward, "like bacteria hitch-hiking on the fungi," said Prof. Koo. This ability meant that, once the assemblages were tested on human teeth in a laboratory model, the biofilm spread much faster than anticipated, because the organisms were able to move as they grew. The findings could not only help dentists better understand the levels of prevention necessary to stave off severe caries but could also help clinicians understand bacterial proliferation in other areas of medicine. The study, titled "Interkingdom assemblages in human saliva display group-level surface mobility and disease-promoting emergent functions", was published in the 11 October 2022 issue of the Proceedings of the National Academy of Sciences.

Source: University of Pennsylvania

Researchers induce bone regeneration

A special hydrogel mimics the bone's natural environment

An innovative technology developed at Tel Aviv University may enable bone regeneration to correct large bone defects by means of a special hydrogel. Following successful tests in an animal model, the researchers now plan to move forward to clinical trials.

The study was conducted by experts from TAU's Maurice and Gabriela Goldschleger School of Dental Medicine, led by Prof. Lihi Adler-Abramovich and Dr Michal Halperin-Sternfeld, in collaboration with Prof. Itzhak Binderman, Dr Rachel Sarig, Dr Moran Aviv, and researchers from the University of Michigan in Ann Arbor. The paper was published in the *Journal of Clinical Periodontology*.

According to Prof. Adler-Abramovich small bone defects, such as fractures, heal spontaneously, with the body restoring the lost bone tissue. The problem, however, begins with large bone defects.

The researchers explain that the extracellular matrix is the substance surrounding our cells, providing them with structural support. Every type of tissue in our body has a specific extracellular matrix consisting of suitable substances with the right mechanical properties. The new hydrogel has a fibrillary structure that mimics that of the extracellular matrix of the natural bone. Furthermore, it is rigid, thus enabling the patient's cells to differentiate into bone-forming cells.

"At first, to test these properties, we grew cells in a 3D model of the gel. Then we examined the impact of the hydrogel on model animals with large bone defects that could not heal spontaneously. We monitored them for two months with various methods, including Micro CT. To our delight, the bone defects were fully corrected through regeneration, with the bones regaining their original thickness, and generating new blood vessels," explains Adler-Abramovich. The innovative gel has extensive clinical applications in both orthopaedic and dental medicine. "When we lose teeth due to extensive damage or bacterial infections, the standard treatment is dental implants. Implants, however, must be anchored in a sufficient amount of bone, and when bone loss is too substantial, physicians implant additional bone from a healthy part of the body—a complex medical procedure. Another option is adding bone substitutes from either human or animal sources, but these might generate an immune response. I hope that in the future the hydrogel we have developed will enable faster, safer, and simpler bone restoration," so Prof. Adler-Abramovich.

Source: Medical Express

CleanImplant Foundation

Dr Ken Serota will be the representative of the non-profit CleanImplant Initiative in North America

The CleanImplant Foundation, based in Berlin, Germany, has a North American office in New York City since 1 September 2022. Dr Ken Serota is acting as the Foundation's representative. He is responsible for bringing the Foundation's information campaign to the profession and the industry to ensure the highest standard and duty of care.

"We are very pleased that Dr Serota, as a dedicated ambassador of our initiative, will bring awareness of the problem of preventable, manufacture-created contamination of medical devices to the North American dental community. Together with Ken, the Foundation will be able to reach more of our colleagues, as well as implant manufacturers and distributors to foster understanding of the importance of a residue-free implant surface as an indispensable quality criterion," explains Dr Dirk Duddeck, Managing Director and Head of Research at CleanImplant.

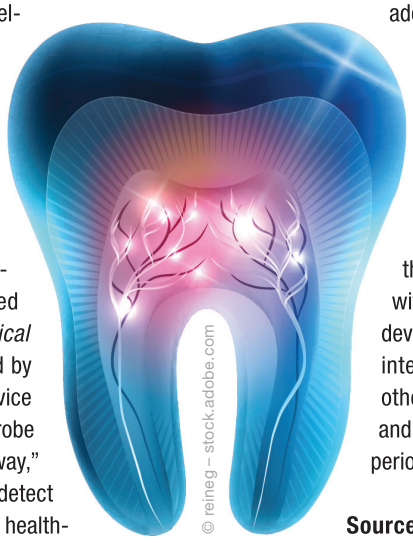
Dr Serota will represent the CleanImplant Foundation at trade shows, conferences, and congresses. As a speaker, he will educate not only colleagues about the CleanImplant Foundation's study results, their clinical relevance, and the legal implications of using substandard implants. He will be the point of contact for North American implant manufacturers who are involved in the CleanImplant quality assessment studies. Dr Serota is "…deeply convinced of the CleanImplant Foundation's mission and the unimpeachable scientific standards of its studies. Throughout my career, I have been fascinated by how the synergy of clinical skills, research studies, and ethical standards can ensure that patient centric care is guided by the highest scientific canons of quality control. It is my great pleasure to bring the CleanImplant Foundation as a 'Partner in Science' to the profession and the industry in the United States and Canada."

Source: CleanImplant Foundation

Rapid test for periodontal disease

Researchers are developing a device to rapidly determine the presence and progression of periodontal disease

The link between periodontal disease and a range of systemic health conditions such as cardiovascular disease, Type 2 diabetes and rheumatoid arthritis is well established at this point. Researchers from the University of Birmingham are in the process of developing a rapid test for identifying the presence of periodontal disease in the hope of benefiting the overall health of patients with these comorbidities. The device is being developed by Prof. Tim Albrecht from the university's School of Chemistry, together with Dr Melissa Grant from the university's School of Dentistry. It consists of a specialised probe and detector that provides a measurement of certain protein-based biomarkers that indicate both the presence and progression of periodontal disease. This biomarker panel was discovered and validated in a study published in the *Journal of Clinical Periodontology* by a team of researchers led by Dr Grant earlier this year. "We believe the device we are prototyping will be the first dental probe that can identify periodontal disease in this way," Prof. Albrecht said in a press release. "It will detect periodontitis quickly and easily in a variety of healthcare settings, opening up opportunities for monitoring and early intervention in the patients with comorbid disease, who would benefit most from rapid treatment for periodontitis."



"The ability to detect and profile disease biomarkers in real time will allow monitoring for disease severity, and in particular the transition between milder and more severe forms of gum disease," added Dr Grant. "This will benefit not only dental health, but also reduce costs and capture patients for whom periodontal treatment may, in the long run, be life-saving." The researchers recently received funding from UK Research and Innovation's Engineering and Physical Sciences Research Council impact acceleration account, and they plan to develop a prototype of this device within a year. In the long term, they hope to develop a probe small enough to be inserted into interdental spaces that will allow dental and other healthcare professionals to collect saliva and gingival crevicular fluid and measure the periodontal disease's progression.

Source: Dental Tribune International