An alternative to antibiotics

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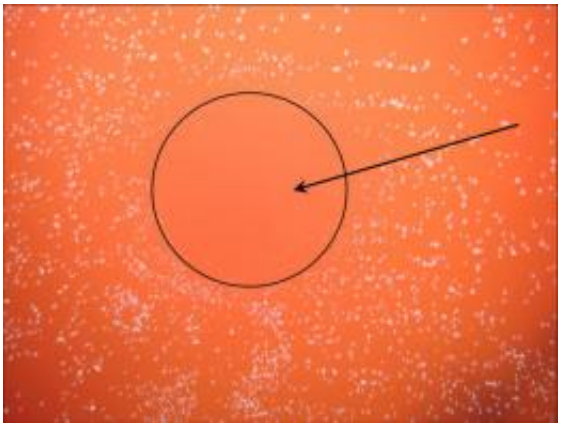

Here it can be clearly seen that the antimicrobial peptides have prevented the growth of bacteria, in this case Streptococcus mutans, which causes tooth decay. (© Fraunhofer IZI)

Antibiotics are among the greatest achievements of medical science. But lately the former multi-purpose weapon fails in the battle against infectious diseases. Bacteria are increasingly developing resistance to antibiotics. Researchers have now found a therapeutic equivalent which could replace penicillin and related phamaceuticals.

More and more pathogens are becoming immune to antibiotics. Some bacteria can no longer be combated. The World Health Organization WHO is warning about resistance to drugs which were once so potent. The WHO's director-general Margaret Chan has pointed out that if measures are not taken quickly, it may soon not be possible to treat many

frequently occurring infections. Figures released by the WHO show that in 2010 nearly half-a-million people were infected with a strain of tuberculosis which is resistant to many antibiotics – one third of those infected died. The Organization states that the growing spread of resistant pathogens is attributable to the indiscriminate use of penicillin and other antibiotics.

Research scientists at the Fraunhofer Institute for Cell Therapy and Immunology IZI in Leipzig have found an alternative to the established antibiotics. In the future, antimicrobial peptides will take up the battle against pathogens. “We have already identified 20 of these short chains of amino acids which kill numerous microbes, including enterococci, yeasts and molds, as well as human pathogenic bacteria such as Streptococcus mutans, which is found in the human oral cavity and causes tooth decay. Even the multi-resistant hospital bug Staphylococcus aureus is not immune, and in our tests its growth was considerably inhibited,” says Dr. Andreas Schubert, group manager at Fraunhofer IZI.

From familiar fungicidal and bactericidal peptides the research scientists produced sequence variations and tested them in vitro on various microbes. Putrefactive bacteria, for example, were incubated for an hour with the artificially produced antimicrobial peptides. As the new peptides contain cationic amino acid residues, they can bond with the negatively charged bacterial membrane and penetrate it. In their tests the research scientists compared the survivability of the pathogens with an untreated control. The experts focused on peptides with a length of less than 20 amino acids. “Antibiotic peptides unlock their microbicidal effect within a few minutes. They also work at a concentration of less than 1 µM, compared with conventional antibiotics which require a concentration of 10 µM,” states Schubert, summarizing the test results. “The spectrum of efficacy of the tested peptides includes not only bacteria and molds but also lipid-enveloped viruses. Another key factor is that the peptides identified in our tests do not harm healthy body

cells," the scientist explains.

The food sector could also benefit from the antimicrobial peptides given that the bacterial contamination of food products costs the industry billions every year. Fresh lettuce and other salad greens, for example, are badly contaminated by yeasts and molds. The shelf-life of foodstuffs could be improved by adding antimicrobial peptides during the production process. "This is a definite possibility because the short-chain peptides tested during the project do not exhibit any allergological risk on being added to foodstuffs," says Schubert. Magdeburg-based company ÖHMI Analytic GmbH is the project partner in the development of peptides for salad greens. The research scientist is convinced that many possible applications exist, including in machinery manufacture – for instance to keep hydraulic fluids free of microbes. As a next step the expert and his team are going to test the antimicrobial peptides in vivo on infection models.

Provided by Fraunhofer-Gesellschaft

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