

A solution to sinusitis from the sea

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A team of scientists and surgeons from Newcastle are developing a new nasal spray from a marine microbe to help clear chronic sinusitis.

They are using an enzyme isolated from a marine bacterium *Bacillus licheniformis* found on the surface of seaweed which the scientists at Newcastle University were originally researching for the purpose of cleaning the hulls of ships.

Publishing in *PLOS ONE*, they describe how in many cases of [chronic sinusitis](#) the bacteria form a biofilm, a slimy protective barrier which can protect them from sprays or antibiotics. In vitro experiments showed that the enzyme, called NucB dispersed 58% of biofilms.

Dr Nicholas Jakubovics of Newcastle University said: "In effect, the enzyme breaks down the extracellular DNA, which is acting like a glue to hold the cells to the surface of the sinuses. In the lab, NucB cleared over half of the organisms we tested."

Sinusitis with or without [polyps](#) is one of the most common reasons people go to their GP and affects more than 10% of adults in the UK and Europe. Mr Mohamed Reda Elbadawey, Consultant of Otolaryngology Head and Neck Surgery, Freeman Hospital – part of the Newcastle Hospitals NHS Foundation Trust – was prompted to contact the Newcastle University researchers after a student patient mentioned a lecture on the discovery of NucB and they are now working together to explore its medical potential.

Mr Elbadawey said: "Sinusitis is all too common and a huge burden on the NHS. For many people, symptoms include a blocked nose, nasal discharge or congestion, recurrent headaches, loss of the sense of smell and [facial pain](#). While steroid nasal sprays and antibiotics can help some people, for the patients I see, they have not been effective and these patients have to undergo the stress of surgery. If we can develop an alternative we could benefit thousands of patients a year."

In the research, the team collected mucous and sinus biopsy samples from 20 different patients and isolated between two and six different species of bacteria from each individual. 24 different strains were investigated in the laboratory and all produced biofilms containing significant amounts of extracellular DNA. Biofilms formed by 14 strains were disrupted by treatment with the novel bacterial deoxyribonuclease, NucB.

When under threat, bacteria shield themselves in a slimy protective barrier. This slimy layer, known as a biofilm, is made up of bacteria held together by a web of extracellular DNA which adheres the bacteria to each other and to a solid surface – in this case in the lining of the sinuses. The biofilm protects the bacteria from attack by antibiotics and makes it very difficult to clear them from the sinuses.

In previous studies of the [marine bacterium](#) *Bacillus licheniformis*, Newcastle University scientists led by marine microbiologist Professor Grant Burgess found that when the bacteria want to move on, they release an enzyme which breaks down the external DNA, breaking up the biofilm and releasing the [bacteria](#) from the web. When the enzyme NucB was purified and added to other biofilms it quickly dissolved the slime exposing the bacterial cells, leaving them vulnerable.

The team's next step is to further test and develop the product and they are looking to set up collaboration with industry.

Provided by Newcastle University

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