Releasing our inner jellyfish in the fight against infection

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Mucus is able to protect us from infection thanks to ancient genes that have been conserved throughout 350 million years of evolution—dating back to our days as a jellyfish.

Now scientists are hoping to unlock the secret of how mucus fights infection and pave the way for developing new antibacterial substances in the future.

Led by a team from Newcastle University, UK, the study is published this month in the Nature journal *Biofilms and Microbiomes* highlights the evolutionary importance of mucus.

Despite the important role it plays as a first line of defense against infection, the way in which the mucin glycoprotein—which makes up mucus—interacts with bacteria is still poorly understood.

"The mucus in our bodies today is essentially the same blue print as that developed by the corals and jelly fish from millions of years ago," explains lead author Professor Grant Burgess.

"It's found all over our body—in our gut, our eyes, our lungs—and is nature's own bacterial barrier cream.

"But whilst it is good at stopping bacteria in their tracks, we don't fully understand how it does this. We do know that mucus has binding sites for the bacteria convincing them that they are bound to the cell surface below the mucus layer.

"Consequently the bacteria will stick to the mucus and be prevented from reaching and infecting the cells—unlocking the complete mechanisms of how mucus works as an antibacterial barrier could provide useful insights into developing new antibacterial substances of the future."

Tackling the rise in Anti-Microbial Resistance (AMR)

Worldwide, concern is growing over the threat from bacteria that are

resistant to the so-called "last resort" class of antibiotics known as Carbapenems.

The emergence of resistant and untreatable bacteria and limited new antibiotic discovery means the race is on to find new ways of fighting infection.

The secretion of a mucus layer is the first line of defence for many organisms.

First evolving in the cnidaria (anemones, corals and jellyfish) and ctenophores (comb jellies), these organisms are some of the most distant relatives of humans.

"Considering this, it's incredible that we still share similar genes," says Professor Burgess.

"Creatures less evolved than corals and jellyfish, such as the sponges, do not have a mucus barrier and so bacteria live throughout their tissues.

"But what we are seeing here are genes that are vital not just to our survival but to the survival of all metazoans on the planet, that is multicellular animals made up of different tissues and organs.

Studying the fight between bacteria and coral mucus, for example, might help us to discover new drugs or strategies to cure major human diseases.

"While mucus plays a role as a barrier to microbes, it is also vital for moving particulates, such as clearing dust and debris from the lungs, and this same process is used by early animals such as corals and jellyfish for feeding and cleaning their surfaces" says Professor John Bythell a co-author on the paper.

"Understanding the different roles of mucins and how and why they evolved may help us understand how pathogens can overcome these defences."

More information: Cassie R Bakshani et al. Evolutionary conservation of the antimicrobial function of mucus: a first defence against infection, *npj Biofilms and Microbiomes* (2018). DOI: 10.1038/s41522-018-0057-2

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