GULBENKIAN CIÊNCIA

PRESS RELEASE

Bursts of diversity in the gut microbiota: evolution of bacteria with the mutagenic power of cancer cells.

Oeiras, 12 march 2020 - Scientists catch in real time the emergence of bursts of diversity in the microbiota, caused by bacterial cells with mutation rates similar to those of cancer.

The diversity of bacteria in the human gut is an important biomarker of health, influences multiple diseases, such as obesity and inflammatory bowel diseases and affects various treatments. How such diversity is maintained remains a mystery.

Scientists have been realizing that bacteria can mutate and evolve in our intestines much faster than previously thought. But know, researchers from the Instituto Gulbenkian de Ciência, have found that certain bacteria cells can evolve to mutate at rates 1000-fold higher than normal - called mutators - and thus generate bursts of diversity at unprecedented amounts. Using laboratory mice and focusing on a gut bacteria that colonizes all humans, they show that amongst sea of rubbish, caused by many mutations which reduced the fitness of the mutators, a ruby was found: a beneficial mutation that increases the ability of the bacteria to eat a specific sugar in the gut and is responsible for the burst of diversity observed. This finding helps to explain the uniqueness of the microbiome within each person and the variation observed after some therapeutic interventions.

The study, published in **PLoS Biology**, carried out at Instituto Gulbenkian de Ciência. Ricardo Ramiro, first author of the study, states “we colonized mice with bacteria isolated from humans and observed the natural emergence of bacteria with extremely high mutation rates, which was perplexing to us.” Akin to “bacterial cancer”, these bacteria evolve at high speed but will carry hundreds of harmful mutations. The latter should render them unable to compete with the other microbiota members. However, these speedy bacteria could persist for long periods of time. “This was because the effect of the harmful mutations is much weaker than previously thought, but also because the lineages that acquire beneficial mutations do not become dominant”, concluded Ricardo Ramiro.

Isabel Gordo, leader of the research group at IGC, states that “in the future, we want to find ways to modulate the effects of mutations, via diet interventions or chemical compounds, so that we can make harmful mutations more harmful for pathogenic bacteria and beneficial mutations more beneficial to help keeping the good bacteria in our guts.”