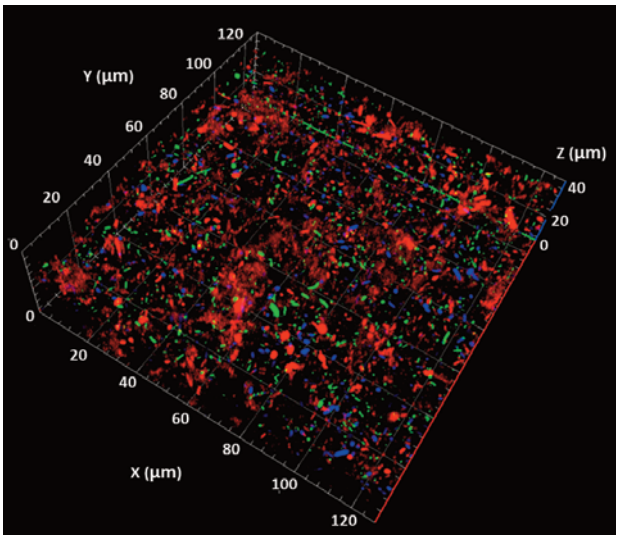
BACTERIAL COMPETITION: WHAT DOESN'T KILL THEM MAKES THEM STRONGER

Bacteria are social creatures that typically live in dense and diverse communities surrounded by other species. These mixed-species communities are often more virulent and tolerant to antibiotics than the different species in isolation, making them more difficult to treat. However, the underlying mechanisms are often poorly understood as it is technically challenging to study communities at the molecular level.

Therefore, I made use of a relatively simple model community based on the food pathogen *Salmonella* to study how bacteria change their behaviour in the presence of other species. This study (promoter Professor Hans Steenackers) showed that different species typically compete strongly for the available resources and actively harm each other to gain the upper hand. In order to protect themselves against the attacks of other species, bacteria induce defensive stress responses, including the production of sticky slime layers that shield them from harm.



▲ Microscopic image of a mixed-species community encapsulated in a slime layer. Each species is labelled with a different fluorescent protein.

I found that these defensive responses not only protect against bacterial competition, but also provide cross-protection against clinical antibiotics. Competition and not cooperation therefore appears to underlie the increased tolerance in mixed-species communities.

During my post-doc, I plan to study whether similar responses also occur in more complex gut communities containing *Salmonella*. To that end I will join forces with several PhD students in the MICA Lab and KU Leuven. We will try to extend our findings to *in vivo* gut infection models, as my previous work also showed that factors important for *Salmonella* invasion in the gut epithelium are induced in the presence of competing microbes. In parallel, we will investigate whether probiotics too cause pathogens to protect themselves in a manner that is important for virulence and antibiotic resistance, and most importantly whether there are probiotics that do not induce defensive responses. Combining these results will help us steer the microbiome towards optimal compositions that make pathogens easier to treat.

Dr. Bram Lories
Centre of Microbial and Plant Genetics
Department of Microbial and Molecular Systems