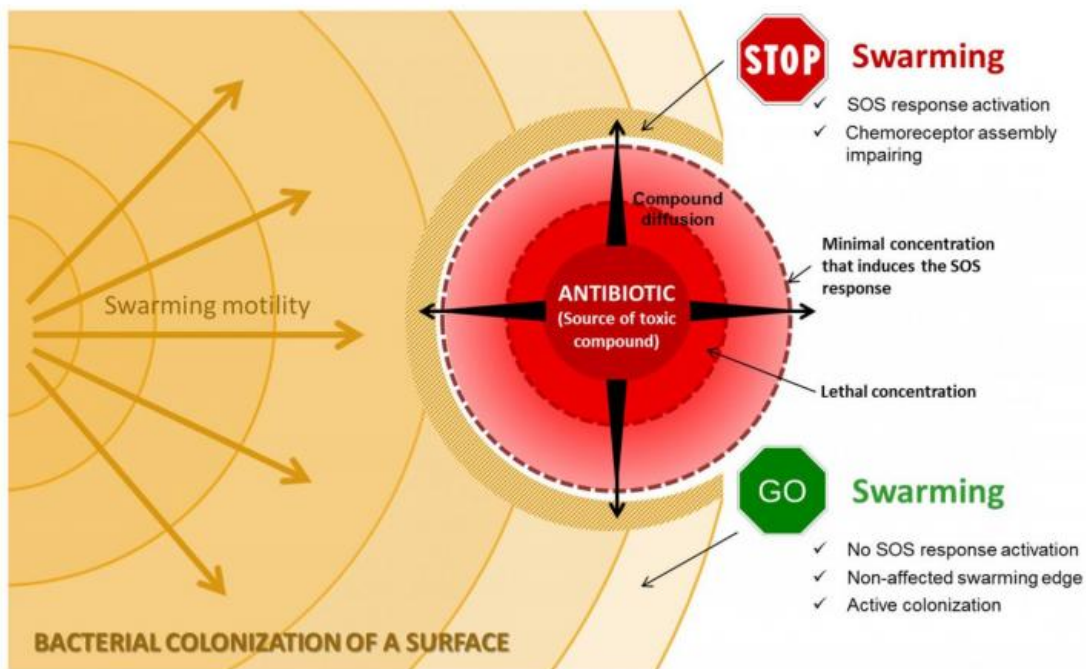
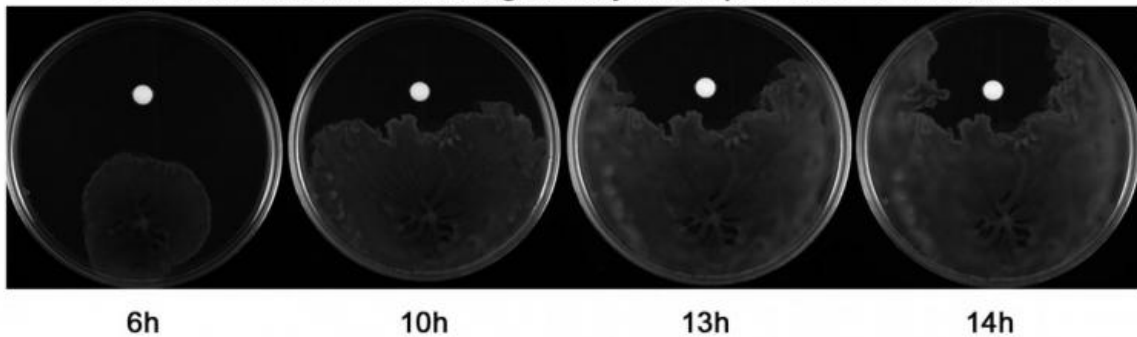


Discovery of mechanism that enables bacteria to elude antibiotics

January 29 2016



Salmonella enterica swarming motility in the presence of an antibiotic



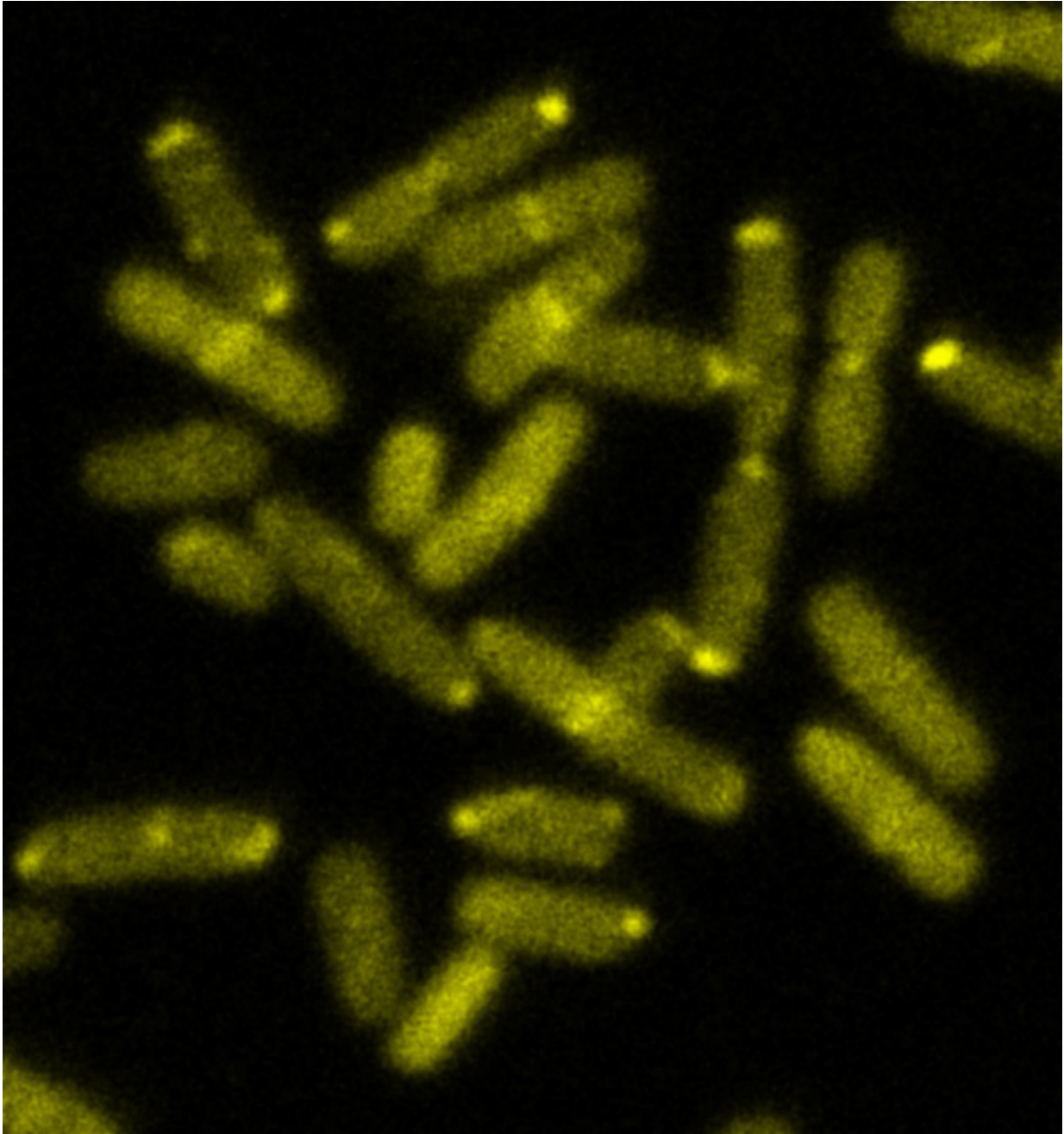
Model of the behavior of a bacterial colony of *Salmonella enterica* due to the presence of antibiotics. Credit: UAB

Researchers from UAB describe for the first time, in a work published in *PLOS ONE*, a model of the behaviour of a bacterial colony that shows how it protects itself against toxic substances like antibiotics during the colonisation process.

The Molecular Microbiology Research Group in the UAB's Department of Genetics and Microbiology has determined that alteration of the equilibrium between two proteins of *Salmonella enterica* in the presence of [antibiotics](#) leads to the disorganisation of the structures that allow the population to spread, which in turn stops the progress of the cells in the [bacterial colony](#) that are nearest to harmful concentrations of antibiotic, while the rest spread into areas with lower concentrations.

Bacterial populations move over surfaces in coordinated way known as swarming, which allows them to spread further over organs and tissues and increases the virulence of the infection. This movement is driven by the action of the flagella and the chemoreceptors, the systems responsible for identifying chemical compounds in the environment and which are anchored at the poles of their cells, forming highly organised structures, of which the protein CheW forms part.

The researchers have shown that activation of the SOS system, a cellular response in the bacteria in the presence of antibiotics, causes an increase in the concentration of the protein RecA, which interferes with the distribution of the CheW protein by altering the organisation of the chemoreceptors and stopping the swarming movement.



Fluorescence microscope image of the polar chemoreceptor clusters in *Salmonella enterica*. Credit: UAB

The imbalance between the concentrations of these two proteins makes

the bacterial colony avoid any areas of the surface they are colonising that present harmful concentrations of antibiotic, stopping the swarming movement in the regions nearest to the drug and allowing the colonization of the rest of the area.

The molecular balance between the RecA and CheW proteins is therefore seen to be crucial to the organisation of the chemoreceptors in the cells of the bacteria and so to their colonising movement.

This work also shows that if the dose of antibiotic in that area is reduced to non-harmful levels, the drop in the concentration of RecA and the re-establishment of equilibrium with CheW allows the chemoreceptors to be structured once more, restoring the swarming movement and, as a result, the colonisation of that area.

In the words of the researchers, the results show clearly that the bacterial populations move over the surfaces using specific mechanisms like that described in this work, in order to avoid contact with the compounds that damage their DNA.

Salmonella enterica is member of a bacterial group that includes several pathogenic species responsible for diseases in the digestive and respiratory system, such as septicaemia and systemic infections.

The work opens the door to the design of new compounds that can neutralise this bacterial strategy, which reduces the efficiency of treatment with antibiotics.

More information: Oihane Irazoki et al. SOS System Induction Inhibits the Assembly of Chemoreceptor Signaling Clusters in *Salmonella enterica*, *PLOS ONE* (2016). [DOI: 10.1371/journal.pone.0146685](https://doi.org/10.1371/journal.pone.0146685)

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