

**UNDER EMBARGO until May 21, 2009, 8pm (French time)**

Paris, May 20, 2009

Press release

## **Antibiotic multiresistance: why bacteria are so effective**

**In an article due to be published in *Science*, teams from the Institut Pasteur and the University of Limoges, associated with the CNRS and Inserm, decipher for the first time the molecular mechanism that enables bacteria to acquire multiresistance to antibiotics, and that even allows them to adapt this resistance to their environment. This discovery highlights the difficulties that will have to be tackled by public health strategies if they are to address the problems created by multiresistance.**

Multiresistance of bacteria to antibiotics is a phenomenon that appeared when these drugs began to be used in the 1950s. It was subsequently discovered that resistance genes were easily captured, disseminated and exchanged from one bacterium to another by a system involving genetic "copying and pasting" of the structures containing these genes, known as integrons. But the dynamics of these exchanges, which governs the multiresistance development in bacteria, remained unknown.

The work of researchers from the Institut Pasteur associated with the CNRS (Bacterial Genome Plasticity unit, CNRS URA 2171) and from Inserm, within the Limoges Faculty of Medicine (EA3175, Inserm, Avenir Team), in cooperation with Spanish teams, reveals for the first time today how bacteria acquire these multiresistance properties. It is actually the antibiotics themselves that trigger the synthesis of the bacterial enzyme that captures the resistance genes and enables their expression in the integron.

This enzyme also promotes the random rearrangement of the resistance genes within the integron. The order of these genes in the integron determines the degree of priority for their expression: the first are expressed most highly and give the bacteria the corresponding resistance. The last remain silent, although they are kept in reserve. When a new rearrangement occurs, triggered by taking an antibiotic, for example, they are likely to be

moved to the first positions, and give the bacteria the required resistance to this drug. The bacteria with the right "combination" of genes will therefore be able to survive and ensure that the resistance potential is maintained from generation to generation.

This work shows the extent to which strategies of bacterial adaptation to antibiotics are effective, in both the short and the long term. It therefore clearly demonstrates the difficulties associated with bacterial genetics that future public health measures will have to take into account if they are to tackle the problem of multiresistance.

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## Source

*The SOS response controls integron recombination*, **Science**, May 22, 2009.

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