

Biologists discover bacterial defense mechanism against aggressive oxygen

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Bacteria possess an ingenious mechanism for preventing oxygen from harming the building blocks of the cell. This is the new finding of a team of biologists that includes Joris Messens of VIB, a life sciences research institute in Flanders, Belgium, connected to the Vrije Universiteit Brussel. The scientists made this discovery by modifying the DNA of the intestinal bacterium *Escherichia coli*.

By means of this [model organism](#), they have uncovered the existence of a mechanism that repairs proteins in the cell that have been damaged by oxygen. There are indications that a similar repair system is active in human cells. The research results are being published in the eminent scientific journal *Science*. At the same time, the researchers are posting an animation online that illustrates the finding.

Proteins are the most important components of our body's cells. They aid the chemical reactions in the cell, provide structure and support, and facilitate communication within the organism. However, proteins are particularly sensitive to harmful effects from oxygen (oxidation). This is certainly the case for proteins that contain sulfurous components, with the amino acid cysteine as the basis. This is why the cysteine building blocks often occur as pairs, in which the bond between the two sulfur atoms provides protection.

But the cell also contains proteins in which the cysteine building blocks appear alone. How these single cysteines have been protected against oxygen has been unclear. Until now. Studying *E. coli*, the team of

scientists, under the leadership of Jean-François Collet of the de Duve Institute (UCLouvain), has identified how two proteins - DsbG and DsbC - form the basis of an ingenious repair mechanism. Should the cysteine building block of a [protein](#) become damaged by oxygen, one of the two proteins takes care of repairing the damage.

Oxygen is vital to the respiration of almost all cells. Among other things, the [cells](#) use the gas in the process of burning sugars to produce energy. But [oxygen](#) is a very aggressive molecule and can do serious harm to the cell's building blocks. This damage can be compared to the rusting or oxidation of iron. "Sulfurous proteins are extra-sensitive to oxidation," explains Joris Messens (VIB / the Vrije Universiteit Brussel). "If they become oxidized, they lose their functioning. This research clarifies how the cell arms itself against this event. Scientists have wondered for a long time what the function of DsbG and DsbC is and the difference between them. Now, finally, we have an answer."

Source: VIB (the Flanders Institute for Biotechnology)

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