

# Seeking fresh air in biofilms through an oxygen-sensitive toxin-antitoxin system

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O. Marimon<sup>I</sup>, J.M. C. Teixeira<sup>I</sup>, T.N. Cordeiro<sup>II</sup>, V. Orekhov<sup>III</sup>, T. Wood<sup>IV</sup>, **M. Pons<sup>I</sup>**

<sup>I</sup>University of Barcelona, Barcelona, Spain, <sup>II</sup>ITQB NOVA, Oeiras, Portugal, <sup>III</sup>Gothenburg University, Gothenburg, Sweden, <sup>IV</sup>Pennsylvania State University, Pennsylvania, United States of America

Classical toxin-antitoxin regulatory systems in bacteria are based on the formation of stable complexes in which the toxin activity is masked. Degradation of the labile antitoxin under appropriate conditions releases the toxin.

We shall describe a new toxin-antitoxin system formed by Hha (acting as a toxin) and TomB (the antitoxin). The antitoxin catalyses the oxidation by molecular oxygen of the single cysteine residue in the toxin to charged sulphinic/sulphonic acid forms. This causes an imbalance of a tight electrostatic network in Hha and results in the loss of structure, and therefore, inactivation of the toxin.

The interaction between toxin and antitoxin, which could only be mapped by paramagnetic relaxation enhancement NMR, is transient.

The structure of the antitoxin was solved by NMR but required special acquisition conditions as this proteins is also slowly oxidized by air.

The Hha-TomB system is the first example of a new class of toxin-antitoxin systems.

The Hha-TomB pair contributes to regulate the spread of biofilms, probably through the presence of oxygen gradients inside the biofilm, allowing selective dead of only the cells buried in the biofilm interior and creating channels through which nutrients may enter and bacterial cells released to colonize new sites.

Reference.

Marimon et al. Nature Commun., 7. 13634 doi: 10.1038/ncomms13634 (2016).