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BIOFILMS

The architect of the biofilm

> RbmA forms a dimer that undergoes a binary structural switch between two states

Vibrio cholerae, the causative agent of cholera, can switch between single cell and biofilm lifestyles. Biofilm formation has been proposed to enhance the growth and survival of the pathogen in aquatic environments and to enhance transmission between human hosts during the intestinal phase of its life cycle. *V. cholerae* biofilms consist of an extracellular matrix that is composed of *Vibrio* exopolysaccharides (VPS), lipids, nucleic acids and matrix proteins, including RbmA. RbmA is thought to be crucial for the establishment of *V. cholerae* biofilms by facilitating cell–cell adhesion and the formation of cell clusters, and by contributing to biofilm maturation; however, the molecular mechanisms that underlie these processes are unknown. In a recent study, Fong *et al*. investigated the structural dynamics of RbmA and how this protein modulates the architecture of *V. cholerae* biofilms.

Nuclear magnetic resonance (NMR) spectroscopy revealed that RbmA forms a dimer that undergoes a binary structural switch between two states at the dimer interface; RbmA adopted either a disordered loop (D-loop) conformation or an ordered loop (O-loop) conformation. In the O-loop conformation, several interactions were found to stabilize the dimer, whereas these interactions were absent in the D-loop conformation. The authors hypothesized that these two conformations at the dimer interface may affect the dynamics of RbmA and, consequently, the architecture of *V. cholerae* biofilms. By mutating RbmA, the authors were able to lock the protein in either the D-loop or the O-loop conformation. Mutations that lock the protein in the O-loop conformation were found to promote dimerization, whereas mutations that lock RbmA in the D-loop conformation resulted in monomeric RbmA.

To test whether the structural binary switch regulated biofilm formation, the authors analysed biofilm development and architecture for each of the mutants. Mutants that locked RbmA in the closed O-loop dimer state were substantially defective in biofilm formation, whereas mutants that were locked in the monomeric D-loop state were able to form biofilms that closely resembled wild-type biofilms, which suggests that the switch regulates biofilm development. The authors hypothesized that an interaction between RbmA and VPS could be important for determining the structural properties of *V. cholerae* biofilms and that this interaction may differ depending on the dimerization state of RbmA. Indeed, the dimerization state was found to influence the formation of higher-order aggregates with VPS, which suggests that the binding of RbmA to VPS is determined by the structural dynamics of the binary switch.

The authors propose a model in which the switch and oligomerization state of a single component of the *V. cholerae* biofilm matrix (RbmA) determines the architecture and plasticity of the biofilm by influencing its ability to form higher-order structures with VPS.

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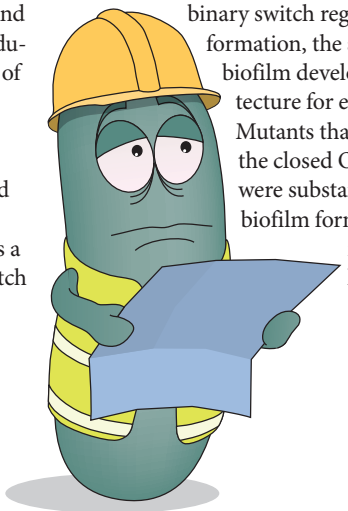

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ORIGINAL ARTICLE Fong, J. C. N. *et al.* Structural dynamics of RbmA governs plasticity of *Vibrio cholerae* biofilms. *eLife* **6**, e26163 (2017)
FURTHER READING Teschler, J. K. *et al.* Living in the matrix: assembly and control of *Vibrio cholerae* biofilms. *Nat. Rev. Microbiol.* **13**, 255–268 (2015)