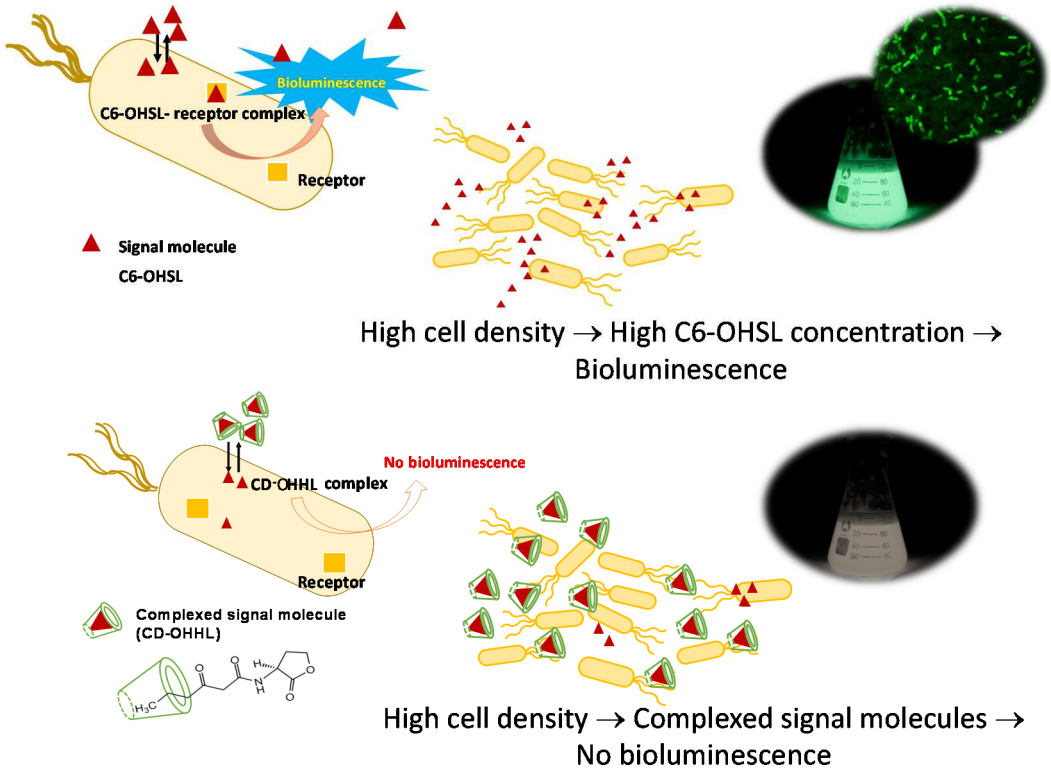
Quorum sensing

Cyclodextrin-based traps to control cooperative action of bacteria

The cooperative action of the unicellular organisms, such as bacteria and fungi can be beneficial or detrimental in human perspective. One of the possibilities for controlling the cooperativity between the cells is the inhibition/stimulation of quorum sensing, the language bacteria use for cell-to-cell communication: they produce signaling molecules. Bacteria sensing that the concentration of the signaling molecules is above a threshold start to behave as a multicellular organism, form biofilms, discharge light, produce toxins, etc.
Deeper knowledge in this field can open new perspectives in fighting against antimicrobial-resistant organisms, biofouling on medical devices, etc. Our approach of utilizing cyclodextrin-based traps for capturing the signaling molecules is a scarcely studied field, although it has a great potential. Cyclodextrins of plant origin (no virus! No prion!) are cyclic sugars with cavities able to entrap other molecules, such as the signaling molecules of bacteria. These sugars are nontoxic and used in foods and drug formulations as solubilizers, stabilizers, etc. Their activity as traps for the signaling molecules of bacteria can be highly improved by chemical modifications attaching either hydrophobic moieties to modulate the hydrophilicity of the rim, or targeting groups to improve the bioavailability and/or fluorescent groups to make them visible under the microscope. These modifications may result in tailor-made traps designed for binding specifically the signaling molecules of certain bacteria. All the traps will be studied by various bacteria including those of high virulence and resistance to conventional antibiotics.



Scheme of the mechanism how cyclodextrins reduce the bioluminescence of *A. fischeri* via capturing the signal molecules