Rational Design to Control the Binding of Biomolecular Receptors

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An important challenge in analytical chemistry in general, and in biosensors in particular, is to tune the dynamic range in order to be able to perform accurate measurements at a determined range of analyte concentrations. In response, the use of biomolecules as receptors in sensing technologies provides an opportunity to optimize the performance of biosensors. In particular, by exploring the biophysical mechanisms that govern the function of biological receptors we can find new ways to modulate their binding properties. In this talk, we will discuss some of the fundamental biophysics underlying biomolecular recognition. Then, through a few examples featuring proteins and nucleic acids, we will put these fundamental principles to use by exploring new design strategies to control binding. In particular, I will show strategies to design cooperative receptors, the higher responsiveness of which achieves more precise measurements [1]. In addition, I will discuss the role of dynamics as an allosteric regulator of binding, and its practical application to modulate binding affinity [2,3]. This ability to control rationally the behaviour of biomolecular receptors enables biosensor optimization to, for example, improve measurement precision or match the detection limits to the relevant range of analyte concentration.

References

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