

Aptamer-based nanosensors for the detection of small organic molecules

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Aptamers are single-stranded oligonucleotides recognizing specifically a pre-determined target (small molecule, protein, live cell, ...). They are identified from a randomly synthesized library containing about 10^{15} different sequences thanks to a method named SELEX. They rival antibodies for applications in the analytical, diagnostic or therapeutic area and offer multiple advantages: chemical synthesis and thermal stability among others. Aptamers are easily converted into tools notably for the detection of target molecules. They can be fluorescently labelled and immobilized on biochips or particles.

We select, characterize and functionalize structure-switching aptamers taking advantage of our NOVAswitch technology. Our aptaswitches adopt two different structures in the absence and in the presence of the target, respectively. This structural change is associated to a signal quantitatively related to the target concentration.

The detection of contaminants is of interest for the agri-food industry, as well as the environment and health sectors. We develop aptamer-based sensors (aptasensors) in particular for the on-site detection of pesticides and drug residues.

The selection of aptamers to small molecules is challenging due to the limited potential of interaction of such targets. We successfully selected aptaswitches against a range of fungicides and antibiotics. These aptaswitches were carefully characterized with respect to their affinity and their specificity. They were optimized leading to oligomers less than 40 nucleotides long. Then, they were either conjugated to a fluorophore or grafted on gold nanoparticles for the detection of the cognate target by fluorescence or colorimetry. Optical responses (fluorescence and absorption) were measured by a simple, affordable and portable spectrophotometer (Indigo), making the assays suitable for quantitative on-site detection.

Novaptech develops aptamers and engineers aptasensors for other targets of interest for pharma, agri-food and environment.

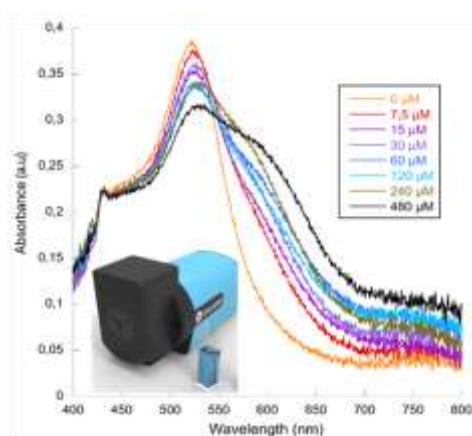


Figure: Response of the colorimetric aptasensor to benzimidazole, measured with portable Indigo. For this application, Indigo was developed in collaboration with Goyalab, Pessac, France (<https://www.goyalab.com/fr/>)