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Oligonucleotide-templated reactions: A nature-inspired process for sensing nucleic acid biomarkers. Towards high-throughput screening of circulating microRNAs

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Widespread in Nature, oligonucleotide-templated reactions (OTRs) of phosphodiester bond formation have inspired chemists who are now applying this elegant strategy to the catalysis of a broad range of otherwise inefficient reactions. The ability of OTR to direct product formation in a sequence-specific manner and in the presence of a complementary template can be applied to the detection of specific nucleic acid sequences (typically used as a template). Designing OTRs for sensing applications requires the development of reactions highly sequence-selective and that, preferentially, do not require any additional reactants other than the oligonucleotide probes themselves. Typically, such reagent-free reactions offer the advantages of being faster, more biocompatible and more selective than those requiring extra catalyst(s).

We will present two examples of OT fluorogenic reactions occurring between two oligonucleotide probes, both conjugated to non-fluorescent moieties that can form a fluorescent product when they covalently react with each other. These biosensors offer the advantage (over more traditional sensors) of a low (or absence of) background fluorescence, thus leading to a significantly improved S/N ratio.

Biography

Sylvain Ladame received his Ph.D. in Chemistry of Biomolecules from the University of Toulouse (France) in 2001 after working on enzyme inhibitors under the supervision of Dr. Michèle Willson. He then travelled to Cambridge (UK) to work for five years as post-doctoral researcher in the group of Prof. Shankar Balasubramanian. In 2006, he returned to France as a CNRS researcher and started his independent research career as a junior group leader with the Institute of Science and Supramolecular Engineering (ISIS, Strasbourg, France). Four years later, in 2010, he became a lecturer in the department of Bioengineering at Imperial College London (UK) where he is currently leading a research group interested in the molecular recognition of nucleic acids with engineered small molecules for sensing (probes) and therapeutic (drugs) applications.

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