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Fast 2D NMR methods for quantitative metabolomics and fluxomics

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NMR metabolomics are increasingly employed for a variety of biomedical applications. However, the quantification of metabolites by 1D NMR is often made difficult by the high degree of spectral overlap in biological samples. Two-dimensional spectroscopy presents a high potential for accurately measuring concentrations in complex samples, as it offers a high discrimination between metabolite resonances. We recently proposed original approaches to perform fast quantitative analysis by 2D NMR. A first strategy relies on ^{1}H inadequate spectroscopy, an approach that we recently applied to determine absolute metabolite concentrations in breast cancer cell extracts. On the other hand, the NMR community developed a number of approaches to drastically reduce the duration of 2D NMR experiments. The most impressive is probably the "ultrafast 2D NMR" methodology. Based on this approach, we developed a quantitative strategy, capable of measuring absolute metabolite concentrations in complex mixtures with a high precision in a short time. The analytical performance of this methodology is much higher than one of the conventional 2D NMRs. Recent applications will be presented, such as the quantitation of metabolites in cell extracts, or the determination of site-specific isotopic ^{13}C enrichments for fluxomics studies by fast 2D and 3D methods. These methods offer powerful tool for an efficient discrimination between metabolic samples and for the determination of biomarkers.

Biography

Patrick Giraudeau is a permanent associate Professor at the University of Nantes (France). He is developing new NMR methodologies in high resolution liquid-state NMR. With his group, he highly improved the analytical performance of the ultrafast 2D NMR methodology.Their work opened numerous application perspectives for this promising methodology, in a variety of domains including metabolomics and fluxomics. In 2011, his research was acknowledged by a young investigator starting grant from the French National Research Agency. He is the author of 40 international publications, 20 invited lectures and 60 oral or poster communications in international conferences.

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