

In vivo and ex vivo metabolic profiles as a clinical supporting molecular diagnosis tool.

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Metabolic profiles for tissues, biofluids and cells lines can provide relevant biochemical information related to phenotypic and epigenetic alterations in model systems and in organisms. In addition, it has been shown that the metabolic profiles can directly contribute to the study of pharmacokinetics and pharmaceutical effects of different types of drugs. Noteworthy, metabolite biomarkers can be and are used for supporting diagnosis and prognosis clinical decisions. Therefore, metabolic profiles can be considered as molecular tool with direct biomedical and clinical applications. Nuclear Magnetic Resonance (NMR) is a singular and unique technique for providing metabolic profiles. NMR has a large broad range of applications, from in vivo organisms to ex vivo and in vitro systems and biological models, is non destructive, hence the samples can be used for additional studies, as pathology, genomics and transcriptomics. Likewise, is robust, with a very high level of reproducibility and the acquisition, analysis and interpretation of the NMR spectra can be automated, reducing and almost avoiding the operator dependence of the whole process.

A set of different examples of the applications of NMR as clinical supporting tool for the diagnosis and prognosis of different pathologies by using metabolic profiles we will presented in this communication. The cancer is an important clinical area in which the in vivo NMR spectroscopy (MRS) and ex vivo High Resolution NMR at Magical Angle Spinning (HR-MAS) are frequently used, in particular, for improving the diagnosis and prognosis of : i) brain tumours (1-3); ii) prostate cancer (4) and iii) colon cancer (5). In addition, MRS and HR-MAS can be used for providing basic information about metabolic alterations in different an important neurodegenerative pathologies as: i) Alzheimer (6); ii) Multiple Sclerosis (7,8) and iii) Hepatic Encephalopathy (9). Finally, an example of the MRS application in a relevant psychiatric pathology as schizophrenia will be as well discussed (10).

In summary, NMR is an easy, quick, robust, reproducible and potentially automated tool for obtaining metabolic profiles which can provide basic biochemical information for a better understanding of the basis of the pathologies under study and for supporting the clinical diagnosis and prognosis for an significant number of diseases.

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