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Non invasive and invasive technologies for translational medicine applications

Francesco Crespi
Istituto Euro Mediterraneo di Scienza e Tecnologia, Italy

In preclinical studies, the feasibility of non-invasive analysis of brain activities is studied in the attempt to overcome the major limitation of actual *in vivo* methodologies i.e. invasiveness. Near-infrared spectroscopy (NIRS) is a non-invasive technique that can be used to monitor changes in oxygenation of hemoglobin (Hb). Importantly, the absorption spectra of near-infrared light differ for the oxygenation-deoxygenation states of Hb (O_2Hb vs. HHb, respectively) so that the two compounds can be directly monitored. The sum of HHb + O_2Hb is considered = blood volume and a recent work has demonstrated the feasibility of using NIRS to monitor these three parameters in the rat brain. Briefly, the effectiveness of such non-invasive methodology in preclinical studies has been tested via physiologic (i.e. with exogenous oxygen (O_2) or carbon dioxide (CO_2) inflated orally") or pharmacologic (i.e. with drugs of abuse such as cocaine or nicotine) experiments. Furthermore, coupling NIRS with a well established although invasive *in vivo* method such as electrophysiology allowing concomitant analysis of cerebral cell firing in discrete brain areas, was confirming the putative correlation between blood levels, brain metabolism and neuronal activities in rat CNS. Finally, the possibility that changes in brain metabolism as measured by NIRS might be a useful index of brain penetration of chemical entities has been investigated using different compounds from different chemical classes that were selected on the basis of their known brain penetration and overall pharmacokinetic profile. It appeared that *in vivo* non-invasive NIRS might contribute to assess brain penetration of chemicals, i.e. significant changes in NIRS signals could be related to brain exposure, or vice versa the lack of significant changes in relevant NIRS parameters could be indicative of low brain exposure. These data were supported by concomitant standard pharmacokinetic studies of brain penetration. Further improvement of NIRS hardware and software will allow shaping also the distribution of penetrating drugs within discrete brain areas and this could be potentially used to study neurobiological processes and psychiatric diseases in preclinical but also in a translational strategy from preclinical to clinical investigations.

Biography

Francesco Crespi has initiated his research work at the Istituto M Negri, Milano, Italy and completed a French PhD from Toulouse University (F) and an English PhD from Nottingham University (U.K.). With the role of Principal Research Scientist in GSK he has developed advanced technologies to study psychiatric disorders. He has published more than 100 papers in reputed journals and has been serving as an editorial board member of repute.

fm.crespi@libero.it