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EDITORIAL

Advancing neuroscience applications to psychiatric and neurological disorders: more than ever, an interdisciplinary task

Despite great research advances in neuroscience in the past few decades, the tasks of unraveling the etiopathogeny of psychiatric and neurological disorders, and developing treatments truly capable of interfering with the pathological processes underlying the symptoms of these disorders, remain both highly challenging.

In order to foster top-level translational studies to face the above challenges, many research centers around the world have invested on strengthening interdisciplinary collaborations, combining the expertise of different, well-established laboratories.[1,2] Such collaborations allow the organization of multicentric, longitudinal studies with serial collection of multiple biomarker data in subjects with neuropsychiatric disorders. In addition, the use of animal models and other basic neuroscience methods allows the detailing of the molecular processes underlying the symptoms of these neuropsychiatric disorders and the clinical response of patients to the existing treatments. With that strategy, the integration between clinical research and experimental studies is expected to facilitate the identification of new therapeutic targets and novel pharmacological agents for the treatment of neuropsychiatric disorders.

In 2011, the office of the Provost for Research of the Universidade de São Paulo (PRP-USP) selected proposals for the creation of new Centers for Research Support, aimed at bringing together specialists from one or more institutes of USP to work on convergent interdisciplinary research programs. Taking into account the neuroscience challenges outlined above, a group of more than 40 academics with well-established lines of investigation proposed the creation of a Center for Research Support on Applied Neuroscience (NAPNA-USP). This group, liasing psychiatrists, neurologists, radiologists, basic scientists, pharmacologists, epidemiologists, psychologists, engineers and computer scientists from 10 different institutes and schools of USP, proposed a strategic interdisciplinary project to carry out translational research investigating a wide range of neuropsychiatric disorders. In order to accomplish that, we plan to facilitate access to the full range of equipment and human expertise of each of the research groups at USP, in a multilateral fashion. This aims to bring more uniformity to the methods of acquisition and processing of clinical and biological data across the participating institutes, with the ultimate purpose of creating a large data repository for shared use. We plan to prioritize the investigation of biomarkers that may be used in the future to inform diagnoses of neuropsychiatric disorders and to predict outcome in clinical practice, in an interdisciplinary fashion. In tandem with those clinical studies, we propose to carry out experiments using neuronal cultures and animal models *in vivo*, in order to validate the biomarkers investigated in humans and to carry out preclinical tests of novel therapeutic interventions.

For more than a year, the communication of the teams of NAPNA-USP has progressively increased, taking the form of a virtual institute of neuroscience (www.napnausp.org.br). We have also organized meetings to be carried out twice every year, and several novel interdisciplinary lines of investigation are now being started. Some of these novel research routes are exemplified in this Supplement, which has been organized by members of NAPNA-USP following the request by RBP Psychiatry.

The first article, a literature review by Benadiba et al., was prepared by basic neuroscientists, nuclear medicine physicians and psychiatrists from USP. It addresses novel functional neuroimaging applications based on PET and SPECT methods, illustrating how such well-established diagnostic techniques have recently moved forward taking advantage of findings from basic neuroscience research. Almost all of

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the new radiotracers discussed in this review have been developed to map brain molecular mechanisms that have been recently unraveled thanks to findings from basic research studies using sophisticated animal models. Such newly discovered molecular mechanisms are now established as critical to the pathophysiology of neurodegenerative disorders such as Alzheimer's disease and Parkinsons disease.

The same reasoning applies to the meta-analysis presented by Maia-de-Oliveira et al. The knowledge advances about intracellular mechanisms underlying synaptic neurotransmission, which emerged from studies of basic neuroscience over the past few years, have led psychiatrists to revise concepts and to engender more complex neurochemical models than the traditional theories that propose, quite simplistically, that neurotransmission abnormalities are sufficient to explain the emergence of mental symptoms. The authors highlight the limitations of theories that propose changes in dopaminergic system as the central pathophysiological basis for the symptoms of schizophrenia, and conversely discuss several recent studies that give support to nitric oxide as one other key element in the neurobiology of schizophrenia. Their argument is based on the well-established influence of nitric oxide over processes of intracellular activation of second-messenger systems, as well as the regulation of glutamate receptors. Similarly, the following article (by Ferretjans et al.) reviews recent evidence indicating that the endocannabinoid system is critically involved in the etiopathogeny of schizophrenia. It should be noted that this article was produced by neuroscientists from other Brazilian academic institutions that collaborate with groups from NAPNA. This exemplifies the aim of NAPNA-USP to remain actively engaged in helping to organize a wider research network involving other leading groups of Brazilian neuroscience.

The following article, by Torrão et al., was written by basic neuroscience groups from three different departments of the Institute of Biomedical Sciences at USP. Based on their use of several methodologies including morphology, pharmacology, physiology and neurochemical techniques, they describe their interdisciplinary efforts using animal models to investigate pathophysiological aspects of Alzheimer's disease and Parkinson's disease, contrasting their results with recent literature findings. The results discussed in this paper reveal potential therapeutic targets and mechanisms of neuroprotection that may be evaluated in future clinical studies.

The two final articles exemplify the strategy of bringing together neuroscientists from different specialties to investigate, in large and representative clinical samples, issues that are important to day-to-day clinical practice as well as to the elucidation of ethiopathogenic processes involved in neuropsychiatric disorders. The paper by Martinho et al. reflects the collaborative effort of clinical neuroscientists from different laboratories of the Medical School of USP in São Paulo, respectively from the fields of clinical psychiatry, epidemiology, neuropsychology and molecular biology; they were brought together to investigate the relationship of gene variants related to neuroplasticity with the clinical and cognitive profile of a large, population-based sample of patients with first-onset psychosis, who had been previously investigated using neuroimaging tecniques.[3] This collaboration underscores our current trend towards organizing data repositories containing information from multiple types of biomarkers collected in the same, representative cohorts of subjects with neuropsychiatric disorders, as opposed to the traditional model of conducting smaller-scale case-control studies, with one single methodological approach being applied in each sample. Finally, in the article by Kandratavicius et al., neurologists from the Medical School of Ribeirão Preto, who have recent experience in conducting multicentric studies on epilepsy,[4] have worked in collaboration with psychiatrists from the same medical school of USP to review a theme of great importance for both specialties: the comorbidity between mood disorders and epilepsies.

We believe that this volume highlights the ways in which the teams of NAPNA-USP aim to contribute to the advancement of neuroscience in Brazil over the next few years, and we hope that its reading will be profitable for the audience of RBP Psychiatry.

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