NeuroCampus – Inside Out:

Sâmia Joca

Group Leader at Department of Biomedicine

Joca's Lab investigates the stress-induced molecular mechanisms associated with vulnerability to psychiatric disorders and how they can be affected by different pharmacological treatments. Her group is currently interested in understanding how stress affects the endocannabinoid system and the effects of cannabinoids in neuropsychiatric disorders.

Can you describe your research in a nutshell?
Our research focuses on understanding how stress can induce chemical, molecular and structural changes in the brain, and how these effects can be modulated by drugs used to treat neuropsychiatric disorders. We are also interested in understanding the mechanisms behind the individual differences in vulnerability to stress consequences and response to pharmacological treatment. By doing so, we aim to better understand the neurobiology of stress-related psychiatric disorders (e.g. depression, anxiety and PTSD), and unravel novel targets for drug development. Within that context, our current research evolves around understanding the function on the endocannabinoid system in health and disease and the effects of cannabinoids in stress-related neuropsychiatric disorders. We use translational approaches, combining different animal models of psychiatric disorders with pharmacological, neurochemical and molecular techniques.

More than 10 years ago, we were the first ones to show that cannabidiol (CBD), a non-psychoestimulant cannabis-derived compound induces antidepressant-like effects. Since then, we have investigated CBD´s pharmacological properties and therapeutic potential. The acute effects of CBD have been associated with the rapid modulation of neuroplasticity and the epigenetic machinery. We have also shown that the inhibition of DNA methylation induces fast-antidepressant effects in animal models, by increasing neuroplasticity. Therefore, our current focus is to depict CBD-induced epigenetic changes in the stressed brain and the mechanisms involved in neuroplasticity regulation.

How did you end up where you are today?
I graduated as a pharmacist from Federal University of Parana, in Brazil, and due to my strong interest in understanding how drugs act in the brain, I decided to take a PhD in Pharmacology, at the Medicine School in the University of Sao Paulo (USP), with a thesis focused on serotonin effects in stress adaptation and depression neurobiology. During my postdoctoral training under the supervision of Prof Guimaraes, a world recognized expert in cannabinoids, I learned about the therapeutic potential of cannabidiol and proposed the investigation of its antidepressant properties, given its known serotonergic mechanisms. After I left his lab, I carried on this investigation, in collaboration with his group and other experts in the field.
A strong collaboration established with the Translational Neuropsychiatry Unit (TNU), Aarhus University (AU), over the past 10 years, and my enrollment as a fellow at the Aarhus Institute of Advanced Studies (AIAS) allowed me to experience the excellent research environment at AU and served as a strong motivation to apply for academic positions here. In 2020, after being hired as associate professor at the Department of Biomedicine, I relocated to Denmark and established a new research group .

What is the potential translational impact of your research?
Getting a better understanding of the therapeutic potential of cannabinoids could bring some important new possibilities for treating depression and other stress-related psychiatric disorders. This could be particularly important for cases of treatment-resistant depression, where patients do not respond to the conventional monoaminergic antidepressants.
I am happy to see that our original findings in animal models have been confirmed by other groups and results from human studies are already popping up in the literature. Still, there is an unmet need of clinical trials with depressed patients, which we hope can be possible soon. Studies in humans are essential for getting a full understanding of the therapeutic potentials of cannabidiol. Working with animal models gives us the possibilities of studying the underlying mechanisms in depth, but we have to rely on indirect measures of depression e.g. behavioral patterns, which has several limitations.

What does a (local) strong neuroscience research network mean for you and your research?
Here in Aarhus we have a diverse neuroscience community, which bring excellent opportunities for collaboration with groups with different expertise, skills and methods. There is almost no limit to the kind of projects you can think of, if you have the money and the right collaborator. In our projects, we collaborate with research groups at TNU, as well as at the Department of Biomedicine, and can significantly benefit from expertise ranging from behavioral experiments in animals, molecular neurobiology, omics in psychiatry, cell signaling and epigenetics.

If you had unlimited resources to conduct a big, multidisciplinary neuroscience project, what would you like to do?
I would like to conduct experiments with a "real" translational approach, where we could investigate drug effects in patients (mood, brain imaging, biomarker detection), while performing a similar approach in animal models to dissect brain mechanisms associated with the rapid-antidepressant effect (brain imaging, multiomics in brain tissue, circuit neuroscience).

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