134/06 - "The role of stress in cortico-basal ganglia loop processing and instrumental conditioning"

Instituição/*Institution*: Life and Health Sciences Research Unit, School of Health Sciences, University of Minho, Braga - Portugal

Duração/*Duration*: 2007/01 - 2010/02

Investigadores/*Researchers*: Prof. Doutor Nuno Jorge Carvalho de Sousa, Dr. Rui Manuel Fernandes da Costa, Dr. Eduardo Miguel Gonçalves Dias Ferreira, Prof. Doutor João José Cardoso Cerqueira, Dr. Pedo Alexandre Teixeira

Abstract: The ability to shift between different behavioral strategies is necessary for appropriate decision-making. In this project, we investigated if chronic stress biases decision-making strategies, affecting the ability of stressed rats to perform actions based on their consequences. Using two different operant tasks, we uncovered that choices made by rats, and now confirmed for mice, submitted to chronic stress become insensitive to changes in outcome value and resistant to changes in action-outcome contingency. Furthermore, we demonstrated that chronic stress caused opposing structural changes in the associative and sensorimotor corticostriatal circuits underlying different behavioral strategies, with atrophy of medial prefrontal cortex (mPFC) and the associative striatum (dorsomedial striatum, DMS), and hypertrophy of the sensorimotor striatum (dorsolateral striatum, DLS). Therefore, we recorded the simultaneous activity of neuronal ensembles in mPFC, DMS and DLS of control and stressed mice during behavioral training and testing to investigate if the changes in wiring observed in the associative and sensorimotor circuits after chronic stress cause changes in neural activity in these circuits that could explain the bias in behavioral strategies towards habit.

In conclusion, the results obtained throughout this project demonstrate that chronic stress influences decision-making processes, through changes in the structure and activity of corticostriatal networks.

Publications:

Papers:

1. Dias-Ferreira E, Sousa JC, Melo I, Morgado P, Mesquita AR, Cerqueira JJ, Costa RM, Sousa N. (2009) Chronic stress causes frontostriatal reorganization and affects decision-making. **Science 325**:621-625.

Abstracts in International Conferences:

1. Dias-Ferreira E, Sousa JC, Melo I, Mesquita AR, Cerqueira JJ, Costa RM, Sousa N. (2008) Chronic stress causes corticostriatal reorganization and affects decision-making. Society for Neuroscience Abstracts, 38th Annual Meeting, Washington, DC, USA.
2. Dias-Ferreira E, Melo I, Jin X, Sousa J, Cerqueira J, Sousa N and Costa R (2009) Chronic stress affects decision-making strategies: structural and physiological correlates. Frontiers in Systems Neuroscience. Conference Abstract: Computational and systems neuroscience. doi: 10.3389/conf.neuro.06.2009.03.348. Salt Lake City, UT, USA.
3. Dias-Ferreira E, Melo I, Jin X, Sousa JC, Cerqueira JJ, Sousa N and Costa RM (2009) Chronic stress affects decision-making strategies: structural and physiological correlates. Frontiers in Neuroscience.

Conference Abstract:

1. 11th Meeting of the Portuguese Society for Neuroscience. doi: 10.3389/conf.neuro.01.2009.11.008. Braga, Portugal.
2. Dias-Ferreira E, Sousa JC, Jin X, Melo I, Cerqueira JJ, Sousa N, Costa RM. (2009) Physiological correlates of chronic stress-induced bias in behavioral strategies. Society for Neuroscience Abstracts, 39th Annual Meeting, Chicago, IL, USA.

Keywords: corticosteroids, decision-making, plasticity, striatum, multielectrode-recordings