NEURAL BASIS OF MOTIVATED BEHAVIORS

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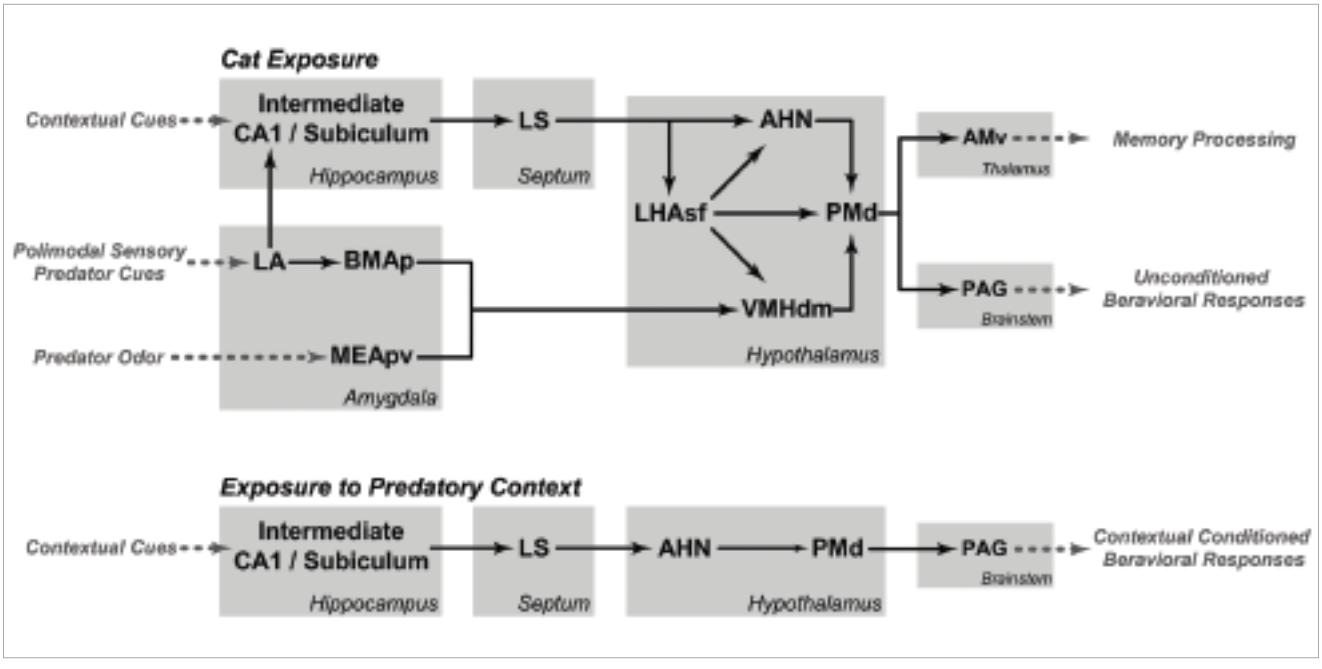

Schematic diagram showing the putative brain systems involved in processing unconditioned and contextual-conditioned predatory threats, as well as in organizing unconditioned and contextual-conditioned behavioral responses. Cezario et al., 2008

We have proposed a series of studies to deepen our understanding about the neural control of a number of motivated responses, such as defensive behavior, predatory hunting, and social aggression.

These studies include:

1. The study of the neural basis of the anti-predator defensive behavior. We will investigate the cortico-amygdalar paths involved in predator detection. Combining functional mapping and neuronal tract-tracing, we will identify the cortico-amygdalar paths putatively involved in predator detection. We will next determine how these cortical and amygdalar sites contribute to the defensive responses to a predator, by examining behavioral responses during direct exposure to the predator in animals bearing selective NMDA lesions in different elements of this pathway.

2. The role of the main thalamic and sub thalamic targets of the hypothalamic defensive circuit (i.e., nucleus reuniens, ventral part of anteromedial nucleus, and rostral part of zona incerta) in both unconditioned and contextual-conditioned responses to a predatory threat.

3. A comprehensive analysis of the projections from the dorsolateral part of the periaqueductal gray and the cuneiform nucleus, critical sites related to both unconditioned and conditioned responses to predatory threat.

4. The evaluation of the role of the ventrolateral part of caudoputamen in the motor pattern display seen during insect hunting.

5. Using the intruder x resident paradigm, we will study the hypothalamic pattern of activation during the agonistic encounter. We will next evaluate how NMDA lesions placed in the PMv or in the hypothalamic attack area interfere with agonistic responses in both intruder and resident.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

Our group has made considerable progress in the understanding of defensive behavior and predatory hunting through the development of this thematic project. For the defensive behavior, we have finished a series of studies investigating the role of the hypothalamic systems in organizing anti-predatory defensive responses.

For the systems involved in anti-predatory defensive behavior, we are now investigating the cortico-amygdalar paths involved in predator detection. In addition, we are also evaluating the role of the main thalamic and subthalamic targets of the hypothalamic defensive circuit (i.e., nucleus reuniens, ventral part of anteromedial nucleus, and rostral part of zona incerta) in anti-predatory defensive behavior.

During the study of agonistic interaction, using the intruder x resident paradigm, we had the chance to examine the neural basis of defensive response of the intruder, and found that the hypothalamus has a critical role in fear expression to rival conspecifics. We are currently working on a number of studies to investigate the neural circuits underlying social defensive responses.

We have started this project by evaluating the role of the ventrolateral part of caudoputamen in the motor pattern display seen during insect hunting. According to our observations, the ventrolateral part of caudoputamen is a possible candidate to organize the stereotyped sequence of actions – action syntax – observed during predatory hunting.

For the investigation of predatory hunting, we are currently improving our data on the role of the ventrolateral striatum, making NMDA lesions and observing the pattern of capture during roach hunting. In this project, we have also investigated the role of the Superior Colliculus during the insect hunting. We have found that the lateral part of the CS is critical for prey detection and influences the direction and speed of the movement during prey capture. In addition, the CS also influences motivation to start pursuing the prey.

MAIN PUBLICATIONS

Martinez RCR, Carvalho-Netto EF, Amaral VCS, Nunes-de-Souza RL, Canteras NS. 2008. Investigation of the hypothalamic defensive system in the mouse. *Behav. Brain. Res.*, in press.

Cezario AF, Ribeiro-Barbosa ER, Baldo MVC, Canteras NS. 2008. Hypothalamic sites responding to predator threats: the role of the dorsal premammillary nucleus in unconditioned and conditioned anti-predatory defensive behavior. *Eurp. J. Neurosci.*, submitted.

Canteras NS, Kroon JAV, Do-Monte FHM, Pavesi E, Carobrez AP. 2008. Sensing danger through the olfactory system: The role of the hypothalamic dorsal premammillary nucleus. *Neurosci. Biobehav. Rev.*, submitted.

Santos LM, Ferro MM, Mota-Ortiz SR, Baldo MV, da Cunha C, Canteras NS. 2007. Effects of ventrolateral striatal inactivation on predatory hunting. *Physiol. Behav*. **90**: 669–673.

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