

Psychology, Neuroscience & Behaviour 720:
Contemporary Problems Module 7: Physiological Psychology
March 16, 23 & 30, 2009

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Module Objectives

We will examine some current topics in behavioural neuroendocrinology, discussing hormonal and neurochemical processes that interact with one another and with behaviour. Much of our discussion will address the dynamics of stress and adaptation, considering impacts on emotion and the capacity to learn.

Required Readings

- Foy M, Baudry M, Thompson R (2004) Estrogen and hippocampal synaptic plasticity. *Neuron Glia Biology*, 1:327-338.
- Ikemoto S, Panksepp J (1999) The role of nucleus accumbens dopamine in motivated behavior: A unifying interpretation with special reference to reward-seeking. *Brain Research Reviews* 31:6-41.
- Kudielka BM, Kirschbaum C (2005) Sex differences in HPA axis responses to stress: A review. *Biological Psychology* 69:113-132.
- Lanfumey L, Mongeau R, Cohen-Salmon C, Hamon M (2008) Corticosteroid-serotonin interactions in the neurobiological mechanisms of stress-related disorders. *Neuroscience and Biobehavioral Reviews* 32:1174-1184.
- Lucki I (1998) The spectrum of behaviors influenced by serotonin. *Biological Psychiatry* 44:151-162.
- Mangiavacchi S, Masi F, Scheggi S, Leggio B, De Montis MG, Gambarana C (2001) Long-term behavioral and neurochemical effects of chronic stress exposure in rats. *Journal of Neurochemistry* 79:1113-1121.
- McGaugh JL & Roozendaal B (2002) Role of adrenal stress hormones in forming lasting memories in the brain. *Current Opinion in Neurobiology* 12:205-210.
- Sapolsky RM (1999) Glucocorticoids, stress, and their adverse neurological effects: Relevance to aging. *Experimental Gerontology* 34:721-732.
- Viau V (2002) Functional cross-talk between the hypothalamic-pituitary-gonadal and -adrenal axes. *Journal of Neuroendocrinology* 14:506-513.

Other Recommended Readings

- deCatanzaro D, Beaton EA, Khan A, Vella E (2006) Urinary oestradiol and testosterone levels from novel male mice approach values sufficient to disrupt pregnancy in nearby inseminated females. *Reproduction* 132:309-317.
- deCatanzaro D, Khan A, Berger RG, Lewis E (2009) Exposure to developing females induces polyuria, polydipsia, and altered urinary levels of creatinine, 17 β -estradiol, and testosterone in adult male mice (*Mus musculus*). *Hormones and Behavior* 55:240-247.
- McEwen BS (1999) Stress and hippocampal plasticity. *Annual Reviews of Neuroscience* 22:105-122.
- Meaney MJ, Brake W, Gratton A (2002) Environmental regulation of the development of mesolimbic dopamine systems: A neurobiological mechanism for vulnerability to drug abuse. *Psychoneuroendocrinology* 27:127-138.
- Shekhas A, Truitt W, Rainnie D, Sajdyk T (2005) Role of stress, corticotrophin releasing factor (CRF) and amygdala plasticity in chronic anxiety. *Stress* 8:204-219.

Schedule

March 16: Denys deCatanzaro will present a broad overview of hormonal and neurochemical systems that interact closely with behaviour. This will include discussion of the hypothalamic-pituitary-adrenal (HPA) and hypothalamic-pituitary-gonadal (HPG) axes; dopaminergic, noradrenergic, and serotonergic systems in the brain; and chemical dynamics in the brainstem, hypothalamus, and limbic system.

March 23: There will be two main topics, each given approximately half of the class. Each discussion will be led by a student (or D. deCatanzaro if necessary).

1) Cortisol We will focus on its roles in stress and the modulation of learning and memory in both healthy and pathological conditions.

2) Dopamine We will focus on its roles in reward mechanisms and how its dynamics can be altered by stress in interaction with HPA activity.

March 30: Again there will be two topics, each involving half of the class time. The first will be led by a student, and the second by D. deCatanzaro.

1) Serotonin Our focus will be on interactions with the HPA axis and how this influences affective behaviour.

2) Estradiol We will examine the potential role of the HPG in memory. We will also discuss data indicating that estradiol can pass between individuals and act as a "pheromone".