**Course Name:** New views on monoaminergic neurotransmission: Are transporters important?

**Course Director:** Lynette Daws, Ph.D. – Room 335D, Department of Physiology; Phone 7-4361.

**Scheduled Meetings:** TBD (depending on student's schedules)

**Where:** Large Physiology Conference Room

---

This micro-elective course will involve critical reading of the articles listed below and discussion of them. Students will be responsible for taking the lead on discussion of assigned papers and all students should be prepared to participate in discussion. Discussion should focus around the strengths and weaknesses of the paper and the relative merits and implications of the "take home message" from the study. You should be prepared to present your thoughts on how each paper impacts our current understanding of monoamine transporter function and regulation.

You will be required to write a 10 page (double spaced) review article focusing on any aspect of monoamine transporter structure, function and/or regulation, relation to disease etc. that you find particularly interesting. This may comprise a review based on the papers discussed in class or another aspect of biogenic amine transporter function that you find interesting. Remember, however, that because it is a review article you will need to read (and cite) many more articles than those discussed in class. I would suggest a minimum of 20 articles. The review article will be due three weeks after our last meeting. *You may submit via e-mail (daws@uthscsa.edu) or leave a hard copy in my mail box in the Department of Physiology.*

Assessment will be based on ability to critical discuss the reading material in class (40%) and the written review article (60%).

---

**Readings for class discussion**

*Original Articles:*

Butler J, Tannian M, Leonard BE. (1988) The chronic effects of desipramine and sertraline on platelet and synaptosomal 5HT uptake in olfactory bulbectomised rats. Prog Neuropsychopharmacol Biol Psychiatry. 12(5):585-94.

Zhou F-M, Lang Y, Salas R, Zhang L, De Biasi M, Dani JA. (2005) Corelease of dopamine and serotonin from striatal dopamine terminals. Neuron 46:65-74.

Baganz NL, Horton RE, Calderon AS, Owens WA, Munn JL, Watts LT, Koldzic-Zivanovic N, Jeske NA, Koek W, Toney GM, Daws LC. (2008) Organic cation transporter 3: Keeping the brake on extracellular serotonin in serotonin-transporter-deficient mice. Proc. Natl. Acad. Sci. 105(48):18976-18981.

Baganz N, Horton R, Martin K, Holmes A, Daws LC. (2010) Repeated swim impairs serotonin clearance via a corticosterone-sensitive mechanism: organic cation transporter 3, the smoking gun.
J Neurosci. 2010 30(45):15185-95.

Barr JL, Scholl JL, Solanki RR, Watt MJ, Lowry CA, Renner KJ, Forster GL. (2012) Influence of chronic amphetamine treatment and acute withdrawal on serotonin synthesis and clearance mechanisms in the rat ventral hippocampus. Eur. J. Pharmacol. Pp. 1-12, doi:10.1111/ejn.12050

Narayanaswami V, Thompson AC, Cassis LA, Bardo MT, Dwoskin LP. (2012) Diet-induced obesity: dopamine transporter function, impulsivity and motivation. Int. J. Obesity pp. 1-9, doi:10.1038/ijo.2012.178

Graf EN, Wheeler RA, Baker DA, Ebben AL, Hill JE, McReynolds JR, Robble MA, Vranjkovic O, Wheeler DS, Mantsch JR, Gasser PJ. (2013) Corticosterone acts in the nucleus accumbens to enhance dopamine signaling and potentiate reinstatement of cocaine seeking. J. Neuroscience 33(29):11800-11810.

Couroussé T, Bacq A, Belzung C, Guiard B, Balasse L, Louis F, Le Guisquet A-M, Gardier AM, Schinkel AH, Giros B, Gautron S. (2014) Brain organic cation transporter 2 controls response and vulnerability to stress and GSK3β signaling. Mol. Psychiatry e-pub ahead of print.

Baganz NL, Lindler KM, Zhu CB, Smith JT, Robson MJ, Iwamoto H, Deneris ES, Hewlett WA, Blakely RD. (2015) A requirement of serotonergic p38α mitogen-activated protein kinase for peripheral immune system activation of CNS serotonin uptake and serotonin-linked behaviors. Transl Psychiatry. 2015 Nov 3;5:e671.

---

***Useful additional readings:***

*Review Articles:*

Zahniser NR, Doolen S (2001) Chronic and acute regulation of $Na^+/Cl^-$ dependent neurotransmitter transporters: drugs, substrates, presynaptic receptors and signaling systems. Pharmacol. Therap. 92:21-55.

Torres GE, Gainetdinov RR, Caron MG (2003) Plasma membrane monoamine transporters: Structure, regulation and function. Nature Reviews Neuroscience 4:13-25.

Blakely RD, DeFelice LJ, Galli A (2005) Biogenic amine transporters: Just when you thought you knew them. Physiology 20:225-231.

Koepsell H, Lips K, Volk C. (2007) Polyspecific organic cation transporters: Structure, function, physiological roles and biopharmaceutical implications. Pharm. Res. 24(7)1227-1251.

Steiner JA, Carneiro AM, Blakely RD. (2008) Going with the flow: Trafficking-dependent and –independent regulation of serotonin transport. Traffic 9:1393-1402.

Daws LC (2009) Unfaithful neurotransmitter transporters: Focus on serotonin uptake and implications for antidepressant efficacy. Pharmacol. Ther. 121(1):88-99.

Robertson SD, Matthies HJ, Galli A (2009) A closer look at amphetamine-induced reverse transport and trafficking of the dopamine and norepinephrine transporters. Mol. Neurobiol. 39:73-80.

Caspi A, Hariri AR, Holmes A, Uher R, Moffitt TE. (2010) Genetic sensitivity to the environment: The case of the serotonin transporter gene and its implications for studying complex diseases and traits. Am. J. Psychiatry 167:509-527.

Rudnick G, Kramer R, Blakely RN, Murphy DL, Verrey F (2014) The SLC6 transporters: Perspectives on structure, functions, regulation and models for transporter dysfunction. Pflugers Arch. 466:25-42.