UNIVERSIDADE FEDERAL DO PARANÁ
SETOR DE CIÊNCIAS BIOLÓGICAS
DEPARTAMENTO DE FISIOLOGIA

Updates in Physiology and Physiopathology –*Endocrine Disruption*

FISL 7026
Coordinator: Prof. Dr. Anderson Joel Martino Andrade - UFPR
Collaborator: Prof Dr Shanna Helen Swan – Icahn School of Medicine at Mount Sinai (New York, USA)

Syllabus 2019 – Credits: 02 (30 hours)

Classes:
Nov 25 – Dec 02
10:00 AM – 12:00PM and 2:00PM – 5:00PM
Department of Physiology (*Auditório*)

Course Description: This course will offer an overview of endocrine disruption science, including history, experimental and epidemiological evidence linking exposure to endocrine disrupting chemicals and health effects, controversies, and future perspectives.

Course Learning Objectives: Upon completion of this course, students shall be able to: understand the basic concepts associated with endocrine disruption from a historical and current perspective; discuss different developmental windows of sensitivity and main health outcomes linked to endocrine disruption; give an account of main classes of endocrine disruptors as well as of emerging compounds and health effects that warrant further investigation.

Date	Topic	Reading (before classes)	Additional reading	Lecturer
Monday - Nov/25 morning	Principles of Endocrine and Reproductive Physiology	1	2	Anderson
Monday - Nov/25 afternoon	Endocrine Disrupting Chemicals – History TDS and temporal trends in male reproductive health	2 (chapter 1)	2, 3, and 4	Shanna
Tuesday - Nov/26 morning	Free time for reading			
Tuesday - Nov/26 afternoon	The timing makes the poison – endocrine disruption and the developmental origins of health and disease	5	6, 7, 8	Anderson
Wed - Nov/27 morning	Free time for reading			
Wed - Nov/27 afternoon	Epidemiological evidence of endocrine disruption – the case of phthalates	9, 10	11	Shanna
Thu - Nov/28 morning	Experimental evidence of endocrine disruption – the case of phthalates	12	13	Anderson
Thu - Nov/28 afternoon	Other effects: behavioral changes, metabolic disruption, immunological effects			Students
Fri - Nov/29 morning	Controversies on endocrine disruption; regulatory aspects	14, 15	16, 17, 18	Shanna/Anderson
Fri - Nov/29 afternoon	Free time for reading			
Monday – Dec/02 morning	Free time for reading			
Monday – Dec/02 afternoon	Epigenetics and adverse effects across generations	19, 20, 21	22	Anderson/Shanna

Reading list:

1. Goodman, H.M., 2001. Endocrinology concepts for medical students. Advances in physiology education 25, 213-224.

2. WHO/IOMC, 2012. State-of-the-Science of Endocrine Disrupting Chemicals. WHO Press, Geneva.

3. Levine, H., Jorgensen, N., Martino-Andrade, A., Mendiola, J., Weksler-Derri, D., Mindlis, I., Pinotti, R., Swan, S.H., 2017. Temporal trends in sperm count: a systematic review and meta-regression analysis. Human reproduction update 23, 646-659.

4. Skakkebaek, N.E., Rajpert-De Meyts, E., Buck Louis, G.M., Toppari, J., Andersson, A.M., Eisenberg, M.L., Jensen, T.K., Jorgensen, N., Swan, S.H., Sapra, K.J., Ziebe, S., Priskorn, L., Juul, A., 2016. Male Reproductive Disorders and Fertility Trends: Influences of Environment and Genetic Susceptibility. Physiological reviews 96, 55-97.

5. Sharpe, R.M., 2006. Pathways of endocrine disruption during male sexual differentiation and masculinization. Best practice & research Clinical endocrinology & metabolism 20, 91-110.

6. Herbst, A.L., Anderson, S., Hubby, M.M., Haenszel, W.M., Kaufman, R.H., Noller, K.L., 1986. Risk factors for the development of diethylstilbestrol-associated clear cell adenocarcinoma: a case-control study. American journal of obstetrics and gynecology 154, 814-822.

7. Martino-Andrade, A.J., Liu, F., Sathyanarayana, S., Barrett, E.S., Redmon, J.B., Nguyen, R.H., Levine, H., Swan, S.H., 2016. Timing of prenatal phthalate exposure in relation to genital endpoints in male newborns. Andrology.

8. Welsh, M., Saunders, P.T., Fisken, M., Scott, H.M., Hutchison, G.R., Smith, L.B., Sharpe, R.M., 2008. Identification in rats of a programming window for reproductive tract masculinization, disruption of which leads to hypospadias and cryptorchidism. The Journal of clinical investigation 118, 1479-1490.

9. Swan, S.H., Main, K.M., Liu, F., Stewart, S.L., Kruse, R.L., Calafat, A.M., Mao, C.S., Redmon, J.B., Ternand, C.L., Sullivan, S., Teague, J.L., 2005. Decrease in anogenital distance among male infants with prenatal phthalate exposure. Environmental health perspectives 113, 1056-1061.

10. Swan, S.H., Sathyanarayana, S., Barrett, E.S., Janssen, S., Liu, F., Nguyen, R.H., Redmon, J.B., 2015. First trimester phthalate exposure and anogenital distance in newborns. Hum Reprod 30, 963-972.

11. Swan, S.H., Liu, F., Hines, M., Kruse, R.L., Wang, C., Redmon, J.B., Sparks, A., Weiss, B., 2010. Prenatal phthalate exposure and reduced masculine play in boys. International journal of andrology 33, 259-269.

12. Foster, P.M., 2006. Disruption of reproductive development in male rat offspring following in utero exposure to phthalate esters. International journal of andrology 29, 140-147; discussion 181-145.

13. Albert, O., Jegou, B. 2014. A critical assessment of the endocrine susceptibility of the human testis to phthalates from fetal life to adulthood. Hum Reprod Update 20, 231-49.

14. Lagarde, F., Beausoleil, C., Belcher, S.M., Belzunces, L.P., Emond, C., Guerbet, M., Rousselle, C., 2015. Non-monotonic dose-response relationships and endocrine disruptors: a qualitative method of assessment. Environmental health : a global access science source 14, 13.

15 Lyons, G. 2013. Position paper of ChemTrust on hazard versus risk within the context of the current debate on endocrine disrupting chemicals (EDCs) management in the EU.

16. Futran Fuhrman, V., Tal, A., Arnon, S., 2015. Why endocrine disrupting chemicals (EDCs) challenge traditional risk assessment and how to respond. Journal of hazardous materials 286, 589-611.

17. Rhomberg L.R., Goodman, J.E. 2012. Low-dose effects and nonmonotonic dose-responses of endocrine disrupting chemicals: has the case been made? Regulatory Toxicology and Pharmacology 64, 130-3.

18. Vandenberg, L.N., Colborn, T., Hayes, T.B., Heindel, J.J., Jacobs, D.R., Jr., Lee, D.H., Shioda, T., Soto, A.M., vom Saal, F.S., Welshons, W.V., Zoeller, R.T., Myers, J.P., 2012. Hormones and endocrine-disrupting chemicals: low-dose effects and nonmonotonic dose responses. Endocrine reviews 33, 378-455.

19. Wagner, C. R. 2010. Germ Cells and Epigenetics. Nature Education 3(9):64.

20. von Meyenn, F., Reik, W., 2015. Forget the Parents: Epigenetic Reprogramming in Human Germ Cells. Cell 161, 1248-1251.

21. Xin, F., Susiarjo, M., Bartolomei, M.S., 2015. Multigenerational and transgenerational effects of endocrine disrupting chemicals: A role for altered epigenetic regulation? Seminars in cell & developmental biology 43, 66-75.

22. Saitou, M., Kagiwada, S., Kurimoto, K., 2012. Epigenetic reprogramming in mouse pre-implantation development and primordial germ cells. Development 139, 15-31.