

**BISC 550a: Developmental Origins of Health & Disease  
(USC Fall Semester 2024)**

**Units 4**

**Lecture Day/Time:** T/Th, 10-11:50a

**Location:** TBD

**Instructor:** Rusty Lansford, Ph.D.

Office Hours: By appointment

**Contact:** E: lansford@usc.edu

**Course Description**

This course aims to introduce students to how susceptibility to many adult diseases such as cardiovascular, obesity, diabetes, respiratory, and certain cancers have pre- and peri-natal origins with multigenerational effects. Epidemiology studies have shown that nutritional, hormonal, metabolic, genetic, and environmental pollutants can significantly influence the chronic health conditions plaguing children and adults by affecting the structure and physiology of cells and organs. We will study the underlying molecular mechanisms, such as epigenetic processes, to gain a comprehensive perspective that traces how different life experiences shape health and disease risks over the entire life course.

This course uses Flipped Classroom Pedagogy to create a more active learning environment inside and outside the classroom that appeals to students' broad diversity of individual learning styles. The flipped class inverts the traditional sequence of presenting instructional material and application so that students come prepared to interact with a classroom of peers and an instructor as they share, test, apply and integrate the material with their prior knowledge. The students will be challenged to exchange their ideas in the classroom.

**Learning Objectives**

Students who successfully complete the course will be able to:

- Describe the molecular mechanisms that can affect lifelong health and disease
- Describe and develop a case study following an intrinsic, instrumental, or collective style
- Critique primary scientific literature relevant to the developmental origins of health & disease
- Describe how inter-related environmental and social factors can affect health across generations
- Develop practices and protocols to prevent or cure noncommunicable diseases

**Reading List and Supplementary Material**

*The Epigenome and Developmental Origins of Health and Disease (DOHaD)*

Cheryl S. Rosenfeld Academic Press (2015) ISBN-10: 0128013834

<https://www.sciencedirect.com/book/9780128013830/the-epigenome-and-developmental-origins-of-health-and-disease>

Web Site: Course materials, additional readings, and announcements will be posted to Blackboard. You are responsible for checking the website.

**Assessment**

<b>Assignments</b>	<b>Points</b>	<b>Percentage</b>
Midterm Exam 1	100	20%
Case Study 1	50	10%
Midterm Exam	100	20%
Case Study 2	50	10%

Final Exam	100	20%
Final Case Study	100	20%

*Case Study.* The case study approach allows in-depth, multi-faceted explorations of complex issues in their real-life settings. Students will learn to use DOOHD theory to underpin the design, selection, conduct and interpretation of case studies. Student will choose and develop their own Case Study type and topic relevant to DOOHD. The students will have the option to develop their Case Study using various means of communication including writing, audio, video, animation, or any combination thereof. Case Study Case Study 2 will build upon Case Study 1. The final Case Study builds upon Case Study 2. The final Case Study culminates in a presentation to the class and possible publication.

### In-Class Participation

Reading of the assigned materials prior to each class is expected. Students are expected to attend the entirety of class, listen attentively to the instructor and to each other, and engage in respectful debate and dialogue.

### Course Syllabus

Week	Lecture - discussion topics	Assignments (Posted in Blackboard)	Lab
1	The Developmental Origins of Health & Disease (DOHaD) Historical Perspective of DOHaD in Humans	Rosenfeld Ch1. The DOHaD Concept  Rosenfeld Ch 2 Historical Perspective of DOHaD in Humans	Understanding Case Studies
2	Epigenetic Mechanisms: The Common Thread DOHaD Effects	Rosenfeld Ch 4. Introduction to Epigenetic Mechanisms	
	Transgenerational Epigenetic Inheritance	Rosenfeld Ch 21. Transgenerational Epigenetic Inheritance	Case study: Epigenetics_Twins
3	Human Developmental Biology Sensitive Periconceptional Periods	Rosenfeld Ch 22. The Placenta and DOHaD Rosenfeld Ch 3. DOHaD and the Periconceptional Period	Case study: Hongerwinter
4	Epidemiology	Epidemiological Studies - made easy!.mp4	Cohort studies
5	Environmental Triggers	The impact of climate change.mp4	Case studies: Endocrine-disrupting chemicals
	<b>MIDTERM 1</b>		
6	Parental Nutrition and DOHaD	Rosenfeld Ch 6. Parental Nutrition	Effects of food insecurity
7	Developmental Origins of Metabolic Disorders	Rosenfeld Ch14. Metabolic Disorders and DOHaD	
8	Developmental Origin of Cardiovascular Disorders	Rosenfeld Ch 8. Epigenetics in Cardiovascular Disorders	Case study: Birthweight and coronary heart disease
9	Developmental Origins of Chronic Lung and Kidney Disease	Rosenfeld Ch 11. Developmental Origins of Childhood Asthma and Allergic Conditions	Case study: LA air pollution
10	<b>MIDTERM 2</b>		
11	Developmental Origins of Immune Disorders	Rosenfeld Ch 12. Immune Disorders, Epigenetics, and the DOHaD	Case study: Inflammation & aging

12	Neurobehavioral Disorders and DOHaD	Rosenfeld Ch 13. Neurobehavioral Disorders and DOHaD	Case study: Autism
13	Prenatal Stress and the Developmental Origins of Mental Health (Dias)	Neuroscience and Biobehavioral Reviews, 117 (2020) 26-64	Case study: Transgenerational stress
14	Cancer and DOHaD	Rosenfeld Ch 16. Cancer and DOHaD	Case study: Breast/prostate cancer origins
	Aging	Nat. Rev. Genet. 19, 371–384 (2018)	
15	Society and DOHaD	Rosenfeld Ch 23. The Moral and Legal Relevance of DOHaD	
	DOHaD Bioethics (S. Derrington, M.D. CHLA)		
16	<a href="#">Final Exam &amp; Presentation and final report</a>		

The syllabus may change slightly during the semester. Assignm

ent due dates are firm.

### Communication

Dr. Lansford will be available via email. There are no set office hours, but he will make himself available to meet with you via Zoom at a mutually agreeable time.

### Technological Proficiency and Hardware/Software Required

This course requires use of Blackboard. Assignments, announcements, and the discussion board will be hosted on the Blackboard platform. You will be required to access articles, movies, videos, and podcasts as necessary via a web browser.

### USC Technology Rental Program

If you need resources to successfully participate in your classes, such as a laptop or internet hotspot, you may be eligible for the university's equipment rental program. To apply, please submit an [USC Technology Rental Program Application](#).

### USC Technology Support Links

[Zoom information for students](#)

[Blackboard help for students](#)

[Software available to USC Campus](#)

### Course Policies

1) Exam dates are firm. There are no makeup exams in the course with prior written approval from the course instructor. Performance on the final may be prorated to substitute for a missing midterm exam, if an excuse considered valid by faculty is presented in a timely fashion. An acceptable written excuse or documentation must be provided to the faculty. The final exam will be administered only on the date and time set by the University.

2) Midterm exams will be returned to students within a week of the exam date. The final examination will not be returned but will be retained for one semester by the faculty.

3) Regrades: If you think an answer that you have provided was graded incorrectly or if there is an arithmetic error, you may seek a regrade. You must provide a written explanation of why you think your answer was graded incorrectly. Regrade requests are to be submitted to your TA. If a regrade is agreed upon, then the ENTIRE EXAMINATION may be subject to a regrade. Your grade may therefore go up, go down, or remain the same. Regrade requests must be received within one week of when the exam key is posted for midterms, or by the second week of classes the following semester for the final exam.

4) No special assignments for extra credit are permitted.

5) Academic integrity policies of the University will be strictly followed. Infractions can result in severe penalties. There may be assigned seating for exams. No student may be admitted to an exam after the first student has left the exam.

6) Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to one of the Professors as early in the semester as possible. DSP is in STU 301 and is open 8:30 AM – 5:00 PM, Monday thru Friday, Phone number: 213-740-0776.

7) It may be necessary to adjust the syllabus during the semester. Check the course web site or class announcements on Blackboard for updates. **Exam dates will not be changed.**

8) Any questions or concerns regarding these policies should be addressed to the faculty.