

Genetics of Compulsive Behavior (01:447:460)
Spring Semester

- Class: begins on the first Tuesday of Spring Semester, ends on the last Thursday of Spring Semester.
- Class meets from 3:20pm to 4:40pm, on Tuesdays and Thursdays in Hill Room 009.

Credits: 3

Prerequisites: Genetics 01:447:380 or Genetic Analysis I 01:447:384 and General Biology Lab 01:119:117 or 01:119:102

Course Description

Compulsive urge can be channeled toward productive endeavors such as a strong drive to succeed in competitions, schooling, and career. On the other hand, improper handling of compulsive urge may lead to problematic behaviors such as alcoholism, drug use, gambling, and other undesirable behaviors. There is evidence that genetics contribute to compulsive behavior in humans, and research in animal models has begun to unravel the molecular factors that underlie the genetic basis of compulsive behavior. This class will involve extensive class participation and discussion, and will examine scientific literature relating to the genetics of compulsive behavior. The focus will be on developing skills in critical thinking and effective writing, as well as critical evaluation of written materials.

Departmental Learning Goals:

<https://genetics.rutgers.edu/academics/undergraduate/learning-goals>

Objectives:

1. Knowledge specific goals: Know the terms, concepts and theories in genetics.
2. Integrate the material from multiple courses and research. That is, to think holistically and to see the whole as well as the parts.
3. Develop critical thinking skills by studying primary research literature.
4. Develop scientific writing skills:
 - Communicate complex ideas effectively, in standard written English, to a general audience;
 - Communicate effectively in modes appropriate to genetics research: in-class presentation, questions and answers with course instructor and other students;
 - Evaluate and critically assess sources and use the conventions of

- attribution and citation correctly: written summary of assigned reading;
- Analyze and synthesize information and ideas from multiple sources to generate new insights: written critiques based on assigned reading, with emphasis on generating one's own synthesis of the research topics.

Exams, Assignments, and Grading Policy

- Research literature will be assigned for reading and critique writing;
- During the class, most time will be devoted to discussion of assigned reading and evaluation of student's writing;
- 20% on-time attendance and class participation;
- 80% written literature summary, peer review critique, and on-time submission of writing assignments.

Course Materials

- Primary research literature – journal articles assigned by the instructor

Academic Integrity - Students must adhere to the University Policy:

1. <http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers/>
2. <http://academicintegrity.rutgers.edu/resources-for-students/>

Faculty course instructor:

Dr. Lei Yu

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**All information is subject to change at the discretion of the course instructor.

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Course Syllabus

- 1) Overview: Compulsive Behaviors
 - a) What are compulsive behaviors
 - b) The good, the bad, and the ugly
 - c) How the study of compulsive behaviors has evolved
- 2) Classification of Compulsive Behaviors
 - a) The impulsivity – compulsivity continuum: impulse control disorders
 - b) Movement-related
 - i) ADHD / ADD
 - ii) Tourette's syndrome
 - iii) Motor control disinhibition
 - iv) Intolerance to delayed gratification / sensitive to reward
 - c) Eating-related
 - i) Anorexia nervosa
 - ii) Bulimia nervosa (& orthorexia nervosa)
 - iii) Food addiction: binge eating & compulsive over-eating
 - d) Drug-related
 - i) Alcohol dependence and alcoholism
 - ii) Psychostimulants: cocaine, amphetamine, methamphetamine
 - iii) Opioids: morphine, heroin, prescription pain medicine addiction
 - iv) Hallucinogens
 - v) Barbiturates
 - vi) Nicotine & smoking
 - e) Non-drug addictions
 - i) Pathological gambling
 - ii) Trichotillomania
 - iii) Kleptomania, pyromania
 - iv) Compulsive shopping
 - v) Compulsive hoarding
 - vi) Sex addiction
 - vii) Video game/internet addiction
 - f) Behavioral stereotypy
 - i) Motor stereotypy
 - ii) Inappropriate persistence, persistent responding
 - g) Overlap with other psychiatric disorders
 - i) Autism
 - ii) OCD
 - iii) Comorbidity with psychiatric disorders

- 3) Neurobiological Basis of Compulsive Behaviors
 - a) Focus on the brain
 - i) Neuroanatomical sites involved in compulsivity
 - ii) Neurotransmitter systems involved in reward
 - iii) Brain lesion studies: human clinical cases and animal models
 - b) Distinction of cognitive functions involved in compulsivity
 - i) Psychological tests to quantify behavioral compulsiveness
 - ii) Neurophysiological measurements for physiological responses during psychological tests
 - iii) Human brain imaging studies: with and without drugs
 - iv) Voluntary vs. involuntary
 - v) Craving vs. intension
- 4) Genetics of Compulsive Behaviors
 - a) General approaches to study genetics of compulsive behaviors
 - i) Genetic studies in human populations: "guilt by association"
 - ii) Gene-based studies in animal models: cause-effect analysis
 - b) Animal models for compulsive behaviors
 - i) Validity vs. inadequacy of animal models
 - ii) Spontaneous animal models: "OCD" mice as an example
 - iii) "Designer mouse" type of models: targeted gene editing
 - c) Neurochemical systems and their genes involved in compulsive behaviors
 - i) Norepinephrine (NE): arousal/excitation control
 - ii) Serotonin (5-HT): behavior initiation/cessation control, mood regulation
 - iii) Dopamine (DA): reward, reinforcement control
 - iv) Opioids: pleasure/sense of doom control
 - d) Genes for neurotransmitter/neuropeptide synthesis and metabolism
 - e) Genes for neurotransmitter/neuropeptide receptors
- 5) Gene vs. Behavior
 - a) Nature vs. nurture debate: innate or acquired? Born to be or environmental?
 - b) Trait vs. state: key issue in genetic research