ANBI 189
Evolution of Human Disease
Spring 2018

INSTRUCTOR: **Pascal Gagneux Ph.D. (Professor, Departments of Pathology and Anthropology)**

GOAL: **The course will explore the major epidemiological transitions from ape-like ancestors to foraging tribes, farmers and pastoralists, to the global metropolitan primate we now are. We will focus on how diseases have shaped humans and how humans have shaped disease over time.**

FORMAT: 1 hour 20 minute lectures

READING: Review article or book chapter,
Evolutionary Medicine, 2016, Stearns and Medzhitov.
posted on the course webpage in advance of each class

DAY: **TUESDAY and THURSDAY**

TIME: **9:30 to 10:50 AM**

LOCATION: **Solis Hall 109**

EXAMS: A) Midterm, multiple choice, 1 hour on TBD
B) Final: two hours, multiple choice & simple sentence replies to questions, TBD

OFFICE HOURS: Friday, 1:30 to 3pm, CARTA Office, UCT 202:

GRADES: Grades will be based on student participation throughout and midterm and final exam performances.

CLASSES

April 3

Lecture 1: **What is disease and how sick are we?**
Causes of sickness and mortality, unrealized potential, under and over-nourished, stunted, polluted, poisoned, mentally traumatized, culturally deprived etc. Obesity from status symbol to disease. Disease now: heart disease, cancer, respiratory disease (COPD), diabetes type 2, influenza/pneumonia, Alzheimers, traffic accidents, renal failure, septicemia, gun violence.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 1: **Evolutionary Thinking**

April 5

Lecture 2: **From the inside or from the outside (Virchow vs Pasteur/Koch)**
Theories on the origin of maladies. The germ theory vs Virchow's inner balance/ cell driven disease. Humors, Qi, Bingdu, Krimi and Miasmas, Malaria, Plague and leprosy**.**

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 2, part 1 p 28 to p57: **What is a patient?**

April 10

Lecture 3: **The Evolution of Virulence**
Why would a pathogen cause harm? How much harm is best from the point of view of the bug?

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 2, part 2 p 58 to p857: **What is a patient?**

April 12

Lecture 4: **Immunity and immune system & the cost of an effective defense**
Evolved defenses of longer-lived, multicellular hosts. Life-saving reactions and life threatening over-reactions. Harnessing immunity for prevention and cure.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 3: **What is a disease?**

April 17

Lecture 5: **Host-Pathogen co-evolution**
Arms races and truces between hosts and their pathogens and parasites. Foes become symbionts and symbionts can become foes.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 5: **Pathogen Evolution**

April 19

Lecture 6: **(Hu)Man-made diseases & iatrogenic disease**
Ways of life and cultural practices can create disease. Humans can culturally define/invent diseases. Pellagra, HCV along Nile, Puerperal fever, Toxic shock syndrome, Medication over- and misuse, drug abuse DES (diethylstilbestrol) daughters.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 5: **Defenses**

April 24

Lecture 7: **Eco-Health/ Emerging Diseases**
Human encroachment on and disruption of wild ecosystems generates novel diseases. The latest epidemiological Transition?

READING: The Puzzling Origins of AIDS. 2004. James J. Moore, ***Sci. American***

April 26

Lecture 8: **The emperor of all maladies (Cancer)**
If you have more than one cell, you might get cancer. Cancer perfectly combines nature and nurture.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 6: **Cancer**

May 1

Lecture 9: **Uniquely human diseases**
Humans seem to be susceptible to a number of diseases not or only rarely seen in any other primates. The role of evolutionary mismatch.

READING: Biomedical Differences Between Human and Nonhuman Hominids: Potential Roles for Uniquely Human Aspects of Sialic Acid Biology. 2011. Nissi Varki et al., ***Annual Reviews of Pathology***

May 3

Lecture 10: **Reconstructing Past Disease, Major Epidemiological transitions**
Paleopathology: how much can we find out about diseases in the distant past?

READING: **No reading, review for Midterm**

May 8

Lecture 11: **MIDTERM (one hour)**
Domesticated Animals and disease
The high cost of living with and using other animals.

READING: The Changing Disease Scape in the Third Epidemiological Transition. 2010. Kristin Harper and George Armelagos ***Int. J. Environ. Res. Public Health***

May 10

Lecture 12: **Domesticated disease? Endogenous retroviruses, Transposons etc.**
Past disease can become future opportunity.

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 8: **Mismatch**

May 15

Lecture 13: **Disease as a weapon, unintentional and intentional**
Humans have inadvertently and intentionally used disease as a powerful weapon**.**

READING: History of biological warfare and bioterrorism. 2014. Barras and Greub, Clinical ***Microbiology and Infection***

May 17

Lecture 14: **Diseases of other primates**
What diseases do our closer and more distant evolutionary relatives suffer from?

READING: Primates and the Ecology of Their Infectious Diseases: How will Anthropogenic Change Affect Host-Parasite Interactions? 2005. Chapman et al. ***Evolutionary Anthropology*****.**

May 22

Lecture 15: **Reproductive disease**
Evolution acts mostly on differential reproduction. What are reproductive diseases?

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 7: **Reproductive Disease**

May 24

Lecture 16: **Cultural attitudes to disease**
Attempts to make sense of disease. From blaming the victim to patient-interest groups. How culture, technology and commerce can become a viruses' best friends**.**

READING: The Anthropology of Infectious Disease. 1990. Inhorn and Brown. ***Ann. Rev. Anthropol*.**

May 29

Lecture 17: **Affluenza and SESitis?**
Do modern humans suffer from microbe deficit disorder. How socio-economic status (SES), affluence or poverty can make you sick.

READING: Sick of Poverty/ 2005 Robert Sapolsky**. *Scientific American*.**

May 31

Lecture 18: **The mind/brain, our most fail-prone organ?**
No other organ has such a high failure rate as the human brain. How costly is our most unusual organ?

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 9, **Mental disorders**

June 5

Lecture 19: **Violence as an infectious disease.**
Diseased behavior? Can societies have diseases? Epidemics of suicide?

READING: The Transmission of Gun and Other Weapon-Involved Violence Within Social Networks, 2016 Tracy et al. ***Epidemiologic Reviews***

June 7

Lecture 20: **Hygiene Hypothesis, Old Friends etc.**

READING: Evolutionary Medicine, 2016, Stearns and Medzhitov. Chapter 11: **Open Questions**

June 12

Final Exam: **FINAL EXAM**