**GENE 4400/6400**

**Tu/Th 11:00-12:15 Spring 2015 Life Sciences B118**

**Epigenetics & Genetic instability**

**Instructors: Mike McEachern and Rich Meagher**

**Tu Jan. 6 Genetic instability in cancer 1:** Introduction to cancer and its hallmark characteristics

**Th Jan. 8 Genetic instability in cancer 2:** Cancer genomes. Basic forms of genetic instability in cancer. Increased mutation rates from alterations in DNA polymerases, nucleotide excision repair (NER) and base excision repair (BER).

**Tu Jan. 13 Genetic instability in cancer 3:** Cancer and mismatch repair (MMR), double strand break repair and interstrand crosslink repair.

**Th Jan. 15 Genetic instability in cancer 4:** Telomeres and replicative senescence in cancer. Sources of chromosomal instability (CIN) in cancer.

**Tu Jan. 20 Genetic instability in cancer 5:** Tetraploidy and CIN. Chromosome shattering (Chromothripsis). Chromosome fragile sites.

**Th Jan. 22 Genetic instability in cancer 6:** Immune system function including activation induced deaminases (AID) and cancer. Localized hypermutation (Kataegis). Somatic mosaicism.

**Tu Jan. 27 Exam 1 (MM)**

**Th Jan. 29 Introduction to Epigenetics and this class- Intro PPT. Meagher 2010,** Zovkick, 2012

**Tu Feb. 3 Genotype predisposes epitype for multigenerationally inherited phenotypes –Meagher 2012, Lecture PPT**

**Th Feb. 5 Genotype predisposes epitype for multigenerationally inherited phenotypes - continued. Meagher, 2012**

**Tu Feb. 10 Epigenetic reprogramming of somatic cells and somatic cell inheritance of epigenetic information –** Cropley, 2012

**Th Feb. 12 Guest speaker**

**Tu Feb. 17 A six months exercise intervention influences the genome-wide DNA methylation pattern in human adipose tissue.** Ronn 2013.

**Th Feb. 19 Exam 2 (RM)**

**Tu Feb. 24 Prions and amyloids 1:** Human and animal PrP prion diseases. Fungal prions and their unusual genetics.

**Th Feb. 26 Prions and amyloids 2:** Amyloids and amyloid diseases, and their relationship to prions.

**Tu Mar. 3 Rapid genetic change in bacteria 1:** Bacterial diseases and genomes. Overview of horizontal gene transfer (HGT). Roles of phage and site-specific recombinases in HGT. Antibiotic resistance. Gene transfer agents.

**Th Mar. 5 Rapid genetic change in bacteria 2:** Acquisition of pathogenicity through HGT (Cholera, *E. coli*, *S. aureus*). Secretion systems. Bacterial toxins and toxin/antidote systems and their connection to HGT.

**Tu Mar. 10 Spring Break**

**Th Mar. 12 Spring Break**

**Tu Mar. 17 Rapid genetic change in bacteria 3:** Plasmids, integrative conjugative elements, and self transfer. Natural competence and its functions. Integrons.

**Th Mar. 19 Rapid genetic change in bacteria 4:** Phase variation. Simple sequence repeats and rapid genetic switching.Gene amplification. CRSPR/CAS systems of bacterial immunity. Genetic noise, phenotypic bistability and persisters.

**Tu Mar. 24 Exam 3 (MM)**

**Th Mar. 26 Cell type specific epigenetics: The seven leukocyte cell types differ dramatically in their epigenetic profiles.** Reinius, 2012

**Tu Mar. 31 The advantage of cell type specific epigenetic profiling to study Lupus disease.** Whole blood in Javierre, 2010 vs CD4+ T cells in Jefferies, 2011.

**Th Apr. 2 INTACT: (isolation of nuclei tagged in specific cell types) to perform cell type specific epigenetic analysis.** Deal, 2012

**Tu Apr. 7 Epigenetic programming of neurogenesis, neural plasticity, learning and memory, and defects in Alzheimer’s Disease.** Zovkick, 2012 & Graff, 2012

**Th Apr. 9 Molecular Turnover Rates of Seemingly Stable Epigenetic Information.** Meagher, 2015.

**Tu Apr. 14 Exam 4 (RM)**

**Th Apr. 16 Student presentations**

**Tu Apr. 21 Student presentations**

**Th Apr. 23 Student presentations**