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**