Week 1 Jan 4-8 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Intro to Cancer Biology (Setting the stage)- Rick Ash	Histopath Lab 1- Intro to Cancer Pathology lab – Fred Clayton, Rick Ash, Angelic Putman		Medical Arts	Protein sorting, secretion, Lysosomes & lysosomal storage diseases– Tim Formosa
9 am	Chromosome Structure – Tim Formosa		Protein Translation– Tim Formosa		Problem session- Sickle cell and thalessemia (input from Hassan Yaish, Mohommad Salama, David Spence, John Carey or Dave Vischochil
10 am	Basic Concepts of Genetics; Mutations and consequences Lynn Jorde	Basic Concepts of Genetics (continued) -Lynn Jorde	Diseases of Autosomal Inheritance- Lynn Jorde	Enzyme Catalysis & Kinetics– Janet Lindsley	
11 am	Cancer epidemiology & basic terminology- Fred Clayton	Transcriptional Regulation– Tim Formosa	Protein Structure– Janet Lindsley		Wrap-up

Introduction to Cancer Biology – Rick Ash

The introduction will depend on contributions from everyone involved. This is a brand new section and that will warrant some explanation. I imagine it will contain at least the following four objectives:

1. To describe how both normal development and the maintenance of many adult tissues depend on molecular control systems that regulate cellular proliferation and differentiation.
2. To explain that cancers result from alterations of genes responsible for these control systems.
3. To explain that malignant cancers usually develop incrementally and slowly.
4. To describe the broad differences between normal and cancerous cells.

Chromosome Structure – Tim Formosa

1. To describe the basic chemical and physical properties of DNA
2. To predict how changes in temperature, pH, ionic strength and solvent characteristics will alter the stability of the interaction between the two strands of duplex DNA.
3. To be familiar with the different classes of sequence elements found in the human genome and which are repeated the most frequently.

Basic Concepts of Genetics; Mutations and consequences-Lynn Jorde

1. To be conversant with the basic terminology of human genetics.
2. To be able to differentiate the major classes of disease-causing mutations.
3. To be able to list and explain the molecular consequences of mutation.
4. To be able to explain the causes and clinical consequences of mutation, particularly in terms of the expression of genetic disease.
5. To be able to describe and explain the major factors that cause genetic variation in populations.

Cancer epidemiology & basic terminology-Fred Clayton

Histopath Lab 1- Intro to Cancer Pathology lab – Fred Clayton, Rick Ash, Amy Lowichik

Basic Concepts of Genetics (continued) -Lynn Jorde

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Transcriptional Regulation– Tim Formosa

1. to identify the important differences between RNA and DNA.
2. to name the parts of a transcription complex.
3. to describe the components of nucleosomes and how this structure organizes DNA into chromatin in human cells.
4. to describe how some chemical modifications of nucleosomal components lead to altered rates of transcription.

Protein Translation– Tim Formosa

1. to name the various functional pieces of the translation machinery.
2. To identify translational regulation as a key component of gene expression.
3. to describe the basic steps in protein synthesis, and the common classes of antibiotic drugs that interfere with these steps.

Diseases of Autosomal Inheritance- Lynn Jorde

1. To measure the prevalence of genetic disease in populations in terms of gene and genotype frequencies.
2. To differentiate dominant and recessive traits, and you will know how to estimate

gene and genotype frequencies of dominant and recessive genes using the Hardy-Weinberg formula.
3. To identify and characterize an autosomal dominant disease pedigree.
4. To estimate recurrence risks for individuals at risk for an autosomal dominant disorder.

Protein Structure– Janet Lindsley

1. To utilize the basic bioinformatics tools available at http://www.ncbi.nlm.nih.gov/ to align protein or nucleic acid sequences and to visualize 3 dimensional protein structures.
2. To interpret the meaning of the aligned sequences and protein structural images.
3. To list the forces that stabilize and destabilize protein structures and the potential effects that mutations have on protein structure and function.
4. To describe the functions of protein chaperones.
5. To define amyloid, identify its structure and recognize diseases associated with amyloid.
6. To identify a few significant unknowns about protein folding, unfolding and structure.

Medical Arts

Enzyme Catalysis & Kinetics– Janet Lindsley

1. To identify the need for enzymes and predict, in general terms, the potential results of missing or mutated enzymes.
2. To describe in general terms the structure (including vitamin and mineral cofactors) of enzyme active sites, and what occurs at these active sites.
3. To define the terms K_m, V_{max}, and k_{cat}.
4. To identify types of alterations (mutations, post-translational modifications, changes in gene expression) that are likely to alter enzyme activity.
5. To interpret product concentration vs. time and rate vs. initial substrate concentration kinetic curves, and predict how alterations in enzyme activity would affect these curves.
6. To list common ways in which enzyme activity is modulated in cells of the body.
7. To describe common ways in which inhibitors (drugs) alter the K_m and/or V_{max} of enzymes.
8. To identify a few significant unknowns about enzyme function and regulation.

Protein sorting, secretion, lysosomes & lysosomal storage diseases– Tim Formosa

1. to describe a basic set of post-translational covalent modifications that affect the localization, activity, and longevity of proteins.
2. to describe how proteins, lipids, and other cellular components are sorted out and transported to specific locations within the cell by membranous vesicles.

3. to describe normal pathways for degradation of macromolecules and disorders that occur when these pathways are disrupted.

Problem session

1. Objectives to come. Proposed clinical problems to focus on:
2. Sickle cell anemia
3. Thalessemia

Wrap-up

Week 2 Jan 11-15 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Assessment & Review	Basic cancer histopathology- Fred Clayton	Introduction to Cancer Chemotherapy- Phil Moos	Medical Arts 2 – Discrepancies in care, differentials in outcome and incidence – Peter Deschweinitz?	Chemotherapeutics (alkylators & antimetabolites)- Phil Moos
9 am		Histopath Lab 2 Fred Clayton, Rick Ash, Amy Lowichik (proliferative markers, grading and staging concepts, including mitotic index)	Nucleotide metabolism– Janet Lindsley		Problem session (reserve HSEB 4300) Focus on oncogenes and tumor suppressors (inheritance patterns and biochemistry); neoplasias secondary to treatment
10 am	Diseases of Autosomal Inheritance - Lynn Jorde	Diseases of Autosomal Inheritance - Lynn Jorde	Non-Mendelian inheritance- Lynn Jorde	DNA replication, repair & recombination– Tim Formosa	
11 am	Cell cycle & Signaling– Tim Formosa	Cell cycle & Signaling – Tim Formosa	Cytoskeleton & Cell division– Tim Formosa		Wrap-up

Diseases of Autosomal Inheritance - Lynn Jorde

1. To measure the prevalence of genetic disease in populations in terms of gene and genotype frequencies.
2. To differentiate dominant and recessive traits, and you will know how to estimate gene and genotype frequencies of dominant and recessive genes using the Hardy-Weinberg formula.
3. To identify and characterize an autosomal dominant disease pedigree.
4. To estimate recurrence risks for individuals at risk for an autosomal dominant disorder.

Cell cycle & signaling– Tim Formosa

1. To list the major events of the cell cycle and the checkpoints which monitor them.
2. To explain the role of cyclin-dependent kinases in regulating cell cycle progression
3. To differentiate between the ways that proto-oncogenes and tumor suppressor genes contribute to cell cycle progression.
4. To list common steps in signal transduction pathways that allow a cell to obtain information, summarize it, and alter behavior appropriately.

Basic cancer histopathology-Fred Clayton

Histopath Lab 2- Proliferative markers, grading and staging concepts – Fred Clayton, Rick Ash, Amy Lowichik

Diseases of Autosomal Inheritance - (continued) -Lynn Jorde

1. To explain (with disease examples) the concepts of incomplete penetrance and variable expression (and the molecular causes of these, when they are known).
2. To differentiate the concepts of pleiotropy, locus heterogeneity, and allelic heterogeneity.
3. To distinguish an autosomal dominant pedigree from an autosomal recessive pedigree.
4. To give accurate recurrence risk estimates to families affected by autosomal dominant and autosomal recessive diseases.

Cell cycle & signaling– Tim Formosa

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Introduction to Cancer Chemotherapy- Phil Moos

1. To distinguish the uses of chemotherapy and identify general targets for therapeutic intervention.
2. To be able to explain models of tumor growth and how this relates to chemotherapy to a peer or patient.
3. To be able to explain how the cell cycle, doubling time and growth fraction relate to therapy to a peer or patient.
4. To be able to explain limitations of therapy due to heterogeneity, resistance, and patient status to a peer or patient.

Nucleotide Metabolism – Janet Lindsley

1. To outline the basic biosynthetic pathways for purines and pyrimidines.
2. To identify uric acid as a product of purine catabolism.
3. To identify the most common causes of hyperuricemia and gout.
4. To match the clinical symptoms of Lesch-Nyhan syndrome with a lack of functional HGPRTase.
5. To explain why ribonucleoside diphosphate reductase and thymidylate synthase must be expressed prior to S phase of the cell cycle.
6. To identify folates and vitamin B12 as essential for the synthesis of purines and dTTP.

7. To explain why acyclovir and its derivatives only kill cells infected with herpes virus.

Non-Mendelian inheritance- Lynn Jorde

1. To explain, at the molecular level, why some important diseases do not follow classical Mendelian modes of inheritance.
2. To demonstrate how genomic imprinting can cause parent-of-origin effects to occur in disease-gene transmission.
3. To identify genetic anticipation in pedigrees and you will be able to relate anticipation to an important molecular cause (trinucleotide expansion).
4. To distinguish mitochondrial inheritance from nuclear inheritance.

Cytoskeleton & Cell division– Tim Formosa

1. To identify the components of microfilaments, intermediate filaments, and microtubules.
2. To identify the roles of each cytoskeletal element
3. To interpret the effects of drugs which alter the dynamic growth and collapse of microtubules on cell division.

Medical Arts 2 Discrepancies in care, differentials in outcome and incidence – Peter Deschweinitz?

DNA Replication, repair and recombination – Tim Formosa

1. To identify the steps which occur during replication and the key enzymes that promote these steps.
2. To identify replication factors that are targets for pharmaceutical intervention
3. To interpret results from diagnostic tests based on DNA content and replication factor levels.
4. To list the main mechanisms that lead to alterations of DNA sequences
5. To explain why the ends of linear DNA molecules require a distinct replication mechanism, and the consequences of this mechanism for extended cell proliferation.
6. To identify the main mechanisms that prevent or repair DNA damage and to predict the circumstances in which each mechanism will be most useful.
7. To recognize the consequences of inadequate DNA repair.

Chemotherapeutics (alkylators & antimetabolites)- Phil Moos

1. Identify the properties of these drug classes.
2. Distinquish the mechanisms of action of these agents.
3. Identify the common toxicities, particularly the dose-limiting toxicity.
4. Identify notable ADME characteristics.

Problem session

Wrap-up

Week 3 Jan 18-22 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Martin Luther King Holiday	Assessment & Review	Hematopoiesis lecture– Alejandro Sanchez	Medical Arts – Advocacy, reflecting on MLK, Jr – Larry Reimer??	Induced pluripotent stem cells)- Tim Formosa
9 am			Hematopoiesis lab (Histopath lab 3) –Alejandro Sanchez, Mohamed Salama, Rick Ash	Acute Promyelocytic Leukemia (translocation, transcription, differentiation)- Tim Formosa	Problem session (include therapies that drive differentiation-Phil Moos)
10 am		Sex-linked inheritance- Lynn Jorde		Cytogenetics- Lynn Jorde	
11 am		Tissue maintenance (stem cells, renewal) – Alejandro Sanchez	Consanguinity and its health consequences - Lynn Jorde	Burkitt's lymphoma (c-myc, translocation, transcription, etc)- Ken Grossman	Wrap-up

Week 4 Jan 25-29 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Assessment & Review	Diagnostics/ Histopath Lab 4 (FISH, PCR, oncogene diagnostics) – Fred Clayton, Rick Ash		Medical Arts 4 High-risk cancer syndromes – Vickie Venne??	Chemotherapeutic agents: natural and hormonal – Phil Moos
9 am			Proteasomal regulation (VHL, HIF) – Tim Formosa		Problem session
10 am	Cytogenetics (continued)- Lynn Jorde	Cytogenetics (continued)- Lynn Jorde	Gene mapping: linkage analysis- Lynn Jorde	Gene mapping: linkage analysis (continued)- Lynn Jorde	
11 am	p53, cell cycle control, transcription, DNA damage, apoptosis – Tim Formosa	Retinoblas-toma (cell cycle checkpoints) – Tim Formosa	Life & death of a cell (colon, for example)- Matt Topham	Bcl2 & apoptosis (Follicular B cell lymphoma) – Tim Formosa	Wrap-up

Week 5 Feb 1-5 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Assessment & Review	Genetics Lab – Genetic variation- Lynn Jorde in HSEB1700	Intro to Pharmacogenetics Andrea Bild	DNA repair & telomerase activation: (HNPCC, BRCA1/2, Lynch syndrome) – Ken Grossman	Melanoma (Raf/p16); cancer immunology – Ken Grossman
9 am			APC, β-catenin (FAP, Gardner's) – Matt Topham	MLL & epigenetic regulation – Tim Formosa	Problem session
10 am	Gene mapping: cloning disease genes - Lynn Jorde	EGFR – Lung Cancer (receptor tyrosine kinases, k-ras) – Andrea Bild & Bryan Welm	Immunogenetics- Lynn Jorde	Medical Arts 5 Miller Syndrome - Lynn Jorde	
11 am	Her2-Breast cancer (receptor tyrosine kinases, Akt, PTEN) – Andrea Bild & Bryan Welm	Neurofibromatosis family – Dave Viskochil	Basal Cell Carcinoma: (Hedgehog, Smoothened, Patched signaling) –Matt Topham		Wrap-up

Week 6 Feb 8-12 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Assessment & Review	Diagnostics (Histopath Lab 5) Cytology, FNA/ Analysis of clinical research findings (Science of Medicine) – Fred Clayton, Amy Lowichik, Rick Ash, Grant Cannon	Breast Cancer – Clinical cancer presentation– John Ward	Diagnostics (Histopath Lab 5) Cytology, FNA / Analysis of clinical research findings (Science of Medicine) – Fred Clayton, Amy Lowichik, Rick Ash, Grant Cannon	Changes in Metabolism (Warburg effect, etc) – Janet Lindsley
9 am			Multi-step tumorigenesis (inflammation) –Alana Welm		Problem session
10 am	Cancer Genetics 16- Lynn Jorde	Multifactorial inheritance- Lynn Jorde	Genetics of common diseases- Lynn Jorde	Metastasis– Alana Welm	
11 am	Clinical Cancer overview – John Ward	Cell immortalization- Bryan Welm	Angiogenesis– Alana Welm	Targeted therapies & combination regimens- Phil Moos	Wrap-up

Week 7 Feb 15-19 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	President's Day Holiday	Assessment & Review		Medical Arts – Communication -Anne Rich?	Pathologic consequences of cancer (Why cancer kills us, cachexia, etc) Saundra Buys
9 am			Colorectal Cancer Clinical overview – Randy Burt		Problem session
10 am		Histopath Lab 6- Practical aspects of tumor diagnosis-Fred Clayton, Rick Ash	Genetics of common diseases (continued)– Lynn Jorde	DNA-based genetic diagnosis– Lynn Jorde	
11 am			Cancer Prevention & Screening – Saundra Buys	Lung Cancer Clinical overview – Matt Topham, Wallace Akerley?	Wrap-up

Week 8 Feb 22-26 2010

	Monday	Tuesday	Wednesday	Thursday	Friday
8 am	Pediatric cancer clinical overview – Steve Lessnick	Palliative care & Hospice – Faculty?	**Tumor Board** Lor Randall, David Gaffney or Lynn Miller for radiation, Phil Moos for pharmacology, Other faculty? Social worker, pathologist	Problem session & Wrap-up	
9 am	Histopath lab 7- practical aspects of pediatric tumor diagnosis– Amy Lowichik, Rick Ash	Bench to Bedside : development of a targeted chemotherapeutic – Ken Grossman			Cumulative assessment
10 am	DNA-based genetic diagnosis– Lynn Jorde	Intro to Pharmacogenomics Andrea Bild			
11 am	Prostate Cancer Clinical overview-Blake Hamilton	Clinical Genomics – Lynn Jorde		Gene Therapy -Lynn Jorde	Wrap-up