

AP Lab 8: Population Genetics and Evolution

(Adapted from the 2001 Student Lab Manual)

Purpose: In this lab, you will:

1. learn about the Hardy-Weinberg law of genetic equilibrium
2. study the relationship between evolution and changes in the allele frequency by using your class to represent a sample population

Prelab questions:

1. What is the Hardy-Weinberg equation?
 - a. The Hardy-Weinberg equation is " $p^2+2pq+q^2=1$ " and it is used to calculate the genetic variation of a population at equilibrium by calculating the frequency of the alleles in the population.
2. Which part of the equation represents: the homozygous dominant, the heterozygotes, and the homozygous recessive?
 - a. The heterozygotes is represented by " $2pq$ "
 - b. The homozygous recessive is represented by " q^2 "
 - c. The homozygous dominant is represented by " p^2 "
3. How does the equation $p+q=1$ relate to Hardy-Weinberg?
 - a. This relates to the Hardy-Weinberg equation because the sum of the alleles (dominant and recessive) must combine to form the genotype in 1 population, making the sum 1 (100%).
4. What are the 5 conditions for Hardy-Weinberg equilibrium to exist?
 - a. No mutation
 - b. Random mating
 - c. No natural selection
 - d. Large population size
 - e. Must be isolated; no migration or emigration

Exercise A: Estimating Allele Frequencies for a Specific Trait Within a Sample Population

For this exercise, you will use the class as a sample population to find the allele frequencies for PTC tasting. For a person expressing the dominant allele, T, PTC has a bitter taste. If a person is homozygous recessive, s/he cannot taste PTC.

1. Using the PTC taste-test papers, tear off a short strip and press it to your tongue tip. Tasters will sense a bitter taste.
2. Calculate the frequency of the taster population by dividing the total number of tasters by the total number of students in the class.
3. Calculate the frequency of the non-taster population by dividing the number of non-tasters by the number of students in the class.
4. Use the Hardy-Weinberg equation to determine the frequencies (p and q) of the two alleles.

Data for Exercise A:

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RD Boyd



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Exploring Physical Anthropology Laboratory Manual & Workbook Suzanne E. Walker-Pacheco, 2017-02-01

Exploring Physical Anthropology is a comprehensive full color lab manual intended for an introductory laboratory course in physical anthropology. It can also serve as a supplementary workbook for a lecture class particularly in the absence of a laboratory offering. This laboratory manual enables a hands on approach to learning about the evolutionary processes that resulted in humans through the use of numerous examples and exercises. It offers a solid grounding in the main areas of an introductory physical anthropology lab course: genetics, evolutionary forces, human osteology, forensic anthropology, comparative functional skeletal anatomy, primate behavior, paleoanthropology, and modern human biological variation.

American Book Publishing Record, 2002 **The AGT Cytogenetics Laboratory Manual** Marilyn S.

Arsham, Margaret J. Barch, Helen J. Lawce, 2017-04-24 Cytogenetics is the study of chromosome morphology, structure, pathology, function, and behavior. The field has evolved to embrace molecular cytogenetic changes now termed cytogenomics. Cytogeneticists utilize an assortment of procedures to investigate the full complement of chromosomes and/or a targeted region within a specific chromosome in metaphase or interphase. Tools include routine analysis of G banded chromosomes, specialized stains that address specific chromosomal structures, and molecular probes such as fluorescence in situ hybridization (FISH) and chromosome microarray analysis, which employ a variety of methods to highlight a region as small as a single specific genetic sequence under investigation. The AGT Cytogenetics Laboratory Manual, Fourth Edition, offers a comprehensive description of the diagnostic tests offered by the clinical laboratory and explains the science behind them. One of the most valuable assets is its rich compilation of laboratory tested protocols currently being used in leading laboratories, along with practical advice for nearly every area of interest to cytogeneticists. In addition to covering essential topics that have been the backbone of cytogenetics for over 60 years, such as the basic components of a cell, use of a microscope, human tissue processing for cytogenetic analysis, prenatal constitutional and neoplastic laboratory safety, and the mechanisms behind chromosome rearrangement and aneuploidy, this edition introduces new and expanded chapters by experts in the field. Some of these new topics include a unique collection of chromosome heteromorphisms, clinical examples of genomic imprinting, an example driven overview of chromosomal microarray, mathematics specifically geared for the cytogeneticist, usage of ISCN's cytogenetic language to describe chromosome changes, tips for laboratory management, examples of laboratory information systems, a collection of internet and library resources, and a special chapter on animal chromosomes for the research and zoo cytogeneticist. The range of topics is thus broad yet comprehensive, offering the student a resource that teaches the procedures performed in the cytogenetics laboratory environment and the laboratory professional with a peer reviewed reference that explores the basis of each of these procedures. This makes it a useful resource for researchers, clinicians, and lab professionals as well as students in a university or medical school setting. **Nonhuman Primates in**

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Diagnostic Molecular Pathology William B. Coleman, Gregory J. Tsongalis, 2023-10-18 Diagnostic Molecular Pathology A Guide to Applied Molecular Testing Second Edition assembles a group of experts to discuss the molecular basis and mechanisms of major human diseases and disease processes and how the molecular features of disease can be harnessed to develop practical molecular tests for disease detection diagnosis and prognosis The book explains how molecular tests are utilized in the treatment of patients in personalized medicine highlights new technologies and approaches of applied molecular pathology and discusses how this discovery based research yields new and useful biomarkers and tests As it is essential to stay up to date on new molecular diagnostics in this changing field this book covers critically important areas in the practice of personalized medicine and reflects our understanding of the pathology pathogenesis and pathophysiology of human disease Includes new material on mass spectrometry for infectious diseases microbiome homology directed repair for PARPi whole genome sequencing for constitutional testing and much more Provides insights on the value of the molecular test in comparison to traditional methods which include speed precision sensitivity and clinical impacts for the patient Focuses on the menu of molecular diagnostic tests available in modern molecular pathology or clinical laboratories that can be applied to disease detection diagnosis and classification in the clinical workup of a patient Explains how molecular tests are utilized to guide the treatment of patients in personalized medicine guided therapies and for the prognostication of disease **Russian Journal of Genetics** ,1999

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