Genomics 101: Gaining Understanding of Genomics in Research

Dr. Brittany Butts, PhD, RN, FAHA

August 16 & 17, 2022
8:00 am – 12:00 pm each day

Agenda

Part I. Genetics and Epigenetics Primer

8/16/2022 8:00 am – 12:00 pm (with one 15-minute break)

In the first session, we will review the basics of genetics and gene expression. In addition, we will review technologies used in genetic research and healthcare.

A. Genetic control of cell function
   1. DNA Structure and Function
      a. Double Helix and Base Pairing
      b. Packaging of DNA
      c. DNA Repair
      d. Genetic Variability
   2. From Genes to Proteins
      a. RNA Structure and Function
      b. Transcription
      c. Translation
      d. Regulation of Gene Expression

B. Chromosomes
   1. Cell Division
   2. Chromosome Structure

C. Patterns of inheritance
   1. Definitions
   2. Genetic Imprinting
   3. Mendel Laws
   4. Pedigree

D. Gene Technology
   1. Genetic Mapping
      a. The Human Genome Project
      b. Genetic Mapping Methods
      c. Haplotype Mapping
   2. Recombinant DNA Technology
      a. Gene Isolation and Cloning
      b. Pharmaceutical Applications
      c. DNA Fingerprinting
      d. Gene Therapy
   3. RNA Interference Technology

Part I Learning Objectives:
After completing this session, the learner will be able to meet the following objectives:

1. Compare and contrast the structure and function of DNA and RNA.
2. Explain how the DNA code is transcribed into RNA and translated into protein.
3. Describe ways in which gene expression is regulated.
4. Describe the processes of mitosis and meiosis.
5. Describe when a karyotype might be used for.
6. Discuss how a pedigree is used.
7. Compare the two types of cell division in humans.
8. Discuss the different patterns of inheritance.
9. Describe genetic technologies used in research and healthcare.

Part II. Using Genetics in Research
8/17/2022 8:00 am – 12:00 pm (with one 15-minute break)

In the second session we will use research papers as exemplars of how to apply genetics in research. We will also discuss how to include genetics in your research through collaborations and outside laboratories.

A. Genome-wide association studies (GWAS)
   1. Applications of GWAS studies
   2. Exemplar: applying GWAS

      Discussion paper: Park JY, Lengacher CA, Reich RR, et al. Translational Genomic Research: The Association between Genetic Profiles and Cognitive Functioning or Cardiac Function Among Breast Cancer Survivors Completing Chemotherapy. Biological Research for Nursing. May 2022. doi:10.1177/10998004221094386

B. Gene expression studies
   1. Applications and types of gene expression studies
   2. Exemplar: using gene expression in research

      Discussion paper: Dungan JR, Conley YP, Langaee TY, et al. Altered Beta-2 Adrenergic Receptor Gene Expression in Human Clinical Hypertension. Biol Res Nurs. 2009/07/01 2009;11(1):17-26. doi:10.1177/1099800409332538

C. Epigenetics
   1. Types of epigenetic modifications
   2. Exemplar: using epigenetics in research

      Discussion paper: Nowak AL, Anderson CM, Ford JL, et al. DNA Methylation Patterns of Glucocorticoid Pathway Genes in Preterm Birth Among Black Women. Biological Research for Nursing. May 2022. doi:10.1177/10998004221099253

D. Accessing genetic applications in your research
   1. Discussion – incorporating genetics in research through collaborations
   2. Using outside labs for genetics analyses.

Part II Learning Objectives:
After completing this session, the learner will be able to meet the following objectives:

1. Identify potential applications for GWAS in research
2. Identify types of gene expression studies and potential applications.
3. Identify applications for epigenetics in research.
4. Discuss resources available for incorporating genetics in research.

Disclosures

Learner Outcome:
After attending both half-day sessions, participants will have a general understanding of the role of genetics in human health and disease and research applications geared towards improving clinical practice.

Nursing Continuing Professional Development

7.5 NCPD contact hours will be provided.

Participants must attend at least 90% of both half-day sessions and complete an evaluation survey to receive continuing nursing professional development contact hours.

UNC Charlotte School of Nursing is approved as a provider of nursing continuing professional development by the North Carolina Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

The evaluation survey link will be sent to participants after the event is completed. The certificate will be attached to the end of the survey.