

Chapter 1

Introduction to Genomics Sequencing

ABSTRACT

At the outset, we defined genome, and explored the initiation of the Human Genome Sequencing project (HGSP). A synopsis of the various national and international experts and pioneers who were involved in the sequencing project were identified. This team eventually became the International Human Genome Sequencing Consortium (IHGSC). The nations that collaborated and contributed toward the successful sequencing were basically the United States (U.S.), France, the United Kingdom, Japan, Italy, and China. The accomplishment of the human genome sequencing was completed at ahead of schedule and by March 25, 2003 the project had accomplished all the publicized objectives of the project. The potential career paths and employment opportunities associated with the human genome sequencing were identified.

Having read this chapter, the reader should be able to:

- Define genomics, public health genomics and genomic epidemiology
- List some pioneers of modern genomic science
- List centers which are members of the Human Genome Sequencing Consortium
- Outline career paths in public health in the age of genomic science

WHAT IS GENOMICS?

In order to develop insights into genomics, it is relevant to understand how the human body consists of trillions of cells. These cells contain the entire genome. The complete set of inherited genetic materials is encoded in our deoxyribonucleic acids (DNA). During reproductive behavior, the parents' sperm and egg (DNA) combine to contribute a genome entire amount of genetic information to the fertilized embryo. Scientifically, since the same amount of genetic information is present in the cells which eventually make up an organism, humans are usually at risk of having single gene diseases inherited

DOI: 10.4018/978-1-4666-8559-8.ch001

from parents or carry complex diseases which parents have in their genes. The U.S. Institute of Medicine (IOM) in the twenty-first century defines genomics as the “study of the entire human genome”.

Based on ongoing scientific analysis there are numerous untapped potential benefits of genomics regarding:

- Improving the health of the public (not only the actions of single genes, but also the interactions of multiple genes with each other and with the environments.
- Differentiating genomics from genetics (functions and effects of single genes). Hartwell’s (2004) definition of genomics is “the study of the whole genome.”
- Developing and the application of more effective mapping, sequencing and bioinformatics computational tools.
- Seamless corporation among genomic scientists which include molecular biologists who are familiar with the techniques for linkage analysis, physical mapping, and the sequencing of genomes to generate detailed data which are subjected to analysis using high-speed computer facility and the understanding of genome which is the entire collection of chromosomes which are present in the nucleus of each cell of an individual organism (Hartwell, 2004).

MODERN PIONEERS IN GENOMIC SCIENCE

What scientists know today about the accomplishment of the human genome sequencing will be incomplete without being aware of the contributions of these prominent scientists and scientific research centers where several dedicated scientists sacrificed so much time to conduct scientific research on the application of genomic science in medicine, preventive sciences, public health microbial scientific research, environmental health, archeological science and knowledge about demography and other related disciplines.

The Pioneers in Genomic Science Include

1952: Rosalind Franklin is a British Chemist who developed and used the X-ray diffraction to capture the first high-quality images of the DNA molecule with so much precision.

1953: James D. Watson an American Zoologist who played a significant role in the characterization of the DNA. In 1978, he described parasitic diseases in Sub-Saharan Africa as the one public enemy.

1953: Francis Crick, a British biophysicist worked assiduously on the structure of the DNA.

1953: Francis Crick and James D. Watson not serendipitously, but collaboratively concluded that the DNA is a double helix-two spiral strands that wind around each other like a twisted rope ladder.

1962: Francis Crick, James D. Watson, and Maurice Wilkins were awarded the Nobel Prize in medicine and physiology for the discovery which transparently demonstrates that the DNA molecule has a double-helical structure. Rosalind Franklin, whose knowledge of the images of the DNA led to the discovery of DNA, unfortunately died of cancer in 1958, and in compliance with the rules of Nobel Prize awarding committee, Rosalind Franklin was not eligible.

1966: Marshall Nirenberg and colleagues explained and cracked the genetic code by demonstrating that specific sequence of three nucleotide bases (a codon or nucleotide codes for and specifies each of the 20 amino acids used by the cells to produce proteins).

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/introduction-to-genomics-sequencing/148489

Related Content

Educational Research Narratives of Healing

Jennifer Lynne Bird and Eric T. Wanner (2014). *Handbook of Research on Adult and Community Health Education: Tools, Trends, and Methodologies* (pp. 262-279).

www.irma-international.org/chapter/educational-research-narratives-of-healing/113624

Addressing the Public Health Epidemic of Childhood Obesity Using Public Schools as Health Education Learning Laboratories

Darrell Norman Burrell, Jorja B. Wright, Clishia Taylor, Tiffany Shockley, April Reaves and Judith-Jolie Mairs (2021). *Research Anthology on Public Health Services, Policies, and Education* (pp. 230-243).

www.irma-international.org/chapter/addressing-the-public-health-epidemic-of-childhood-obesity-using-public-schools-as-health-education-learning-laboratories/281978

A Non Invasive Heart Rate Measurement System for Multiple People in the Presence of Motion and Varying Illumination

Humaira Nisar, Muhammad Burhan Khan, Wong Ting Yi, Yeap Kim Ho and Lai Koon Chun (2016). *International Journal of Disease Control and Containment for Sustainability* (pp. 1-11).

www.irma-international.org/article/a-non-invasive-heart-rate-measurement-system-for-multiple-people-in-the-presence-of-motion-and-varying-illumination/170382

Social Challenges Faced by Health Service Providers in Managing COVID-19

S. S. M. Sadrul Huda, Segufta Dilshad, Hamida Mosharraf and Md. Ishtiaq Uddin (2022). *International Journal of Applied Research on Public Health Management* (pp. 1-6).

www.irma-international.org/article/social-challenges-faced-by-health-service-providers-in-managing-covid-19/313439

Polyhydroxyalkanoates: An Indispensable Alternative

Javid A. Malik and Monika Bhaduria (2020). *Handbook of Research on Environmental and Human Health Impacts of Plastic Pollution* (pp. 370-387).

www.irma-international.org/chapter/polyhydroxyalkanoates/233363