Disease Mechanisms from Genetic Disorders to Autoimmune Reactions with Personalized Medicine

Albertine Coralie[*]

Department of Oncology, Lausanne University Hospital, Lausanne, Switzerland

[*]**Corresponding author:** Albertine Coralie, Department of Oncology, Lausanne University Hospital, Lausanne, Switzerland, E-mail: albcor@LUH.edu.ch

Citation: Coralie A (2024) Disease Mechanisms from Genetic Disorders to Autoimmune Reactions with Personalized Medicine. J Clin Exp Pathol. 14:514.

Description

Disease mechanisms are the fundamental biological and molecular processes that cause disease. Understanding these processes is essential in medicine and biomedical research because it enables scientists and doctors to detect, cure, and prevent diseases more efficiently. Disease mechanisms are studied from a variety of perspectives, including molecular biology, genetics, immunology, and pathology. Disease mechanisms are based on the concept that diseases are frequently caused by disturbances in normal biological processes. A wide range of variables can contribute to these problems.

Cystic fibrosis, Huntington's disease, and sickle cell anemia are caused by genetic mutations. These mutations can result in the generation of aberrant proteins or enzymes, which affect cellular function. For example, in sickle cell anemia, a mutation in the hemoglobin gene causes red blood cells to be distorted, resulting in blood transmit blockages, discomfort, and organ damage. Exposure to toxic chemicals, radiation, or pollution can result in cancer or respiratory ailments. For example, smoking is a well-known cause of lung cancer and Chronic Obstructive Pulmonary Disease (COPD) because the carcinogenic chemicals in tobacco smoke harm lung tissue and produce aberrant cell growth. Bacteria, viruses, and fungi can infiltrate the body and cause disease by destroying tissues or eliciting negative immune responses. For example, the Human Immunodeficiency Virus (HIV) attacks the immune system, resulting in Acquired Immunodeficiency Syndrome (AIDS), a disease in which the body becomes susceptible to opportunistic infections. In autoimmune illnesses, the immune system misidentifies and destroys healthy tissues. This group includes diseases such as rheumatoid arthritis, lupus, and type 1 diabetes. Chronic inflammation and tissue damage are common symptoms of many disorders, which occur when the body's immune system attacks its own cells.

Metabolic illnesses, such diabetes and metabolic syndrome, are caused by problems with the body's capacity to digest carbohydrates, fats, and proteins. Insulin resistance in type 2 diabetes causes high blood glucose levels, which can result in long-term consequences such as cardiovascular disease, renal damage, and neuropathy. Diagnostics can help identify the complex interaction of molecular, cellular, and systemic components that support each of these disease methods.

Pathologists can spot anomalies at both the microscopic and molecular levels in diseased tissues, providing valuable insights into disease progression. Genetic mutations, chromosomal abnormalities, and infectious organisms can be detected using techniques such as Polymerase Chain Reaction (PCR), Fluorescence *In Situ* Hybridization (FISH), and Next-Generation Sequencing (NGS). Molecular diagnostics is essential for determining the genetic basis of diseases such as cancer and hereditary disorders, as well as detecting pathogens in infectious diseases. Clinical pathology uses these diagnostic tools not just to identify diseases, but also to better understand the underlying mechanisms that produce them. For example, in cancer, discovering specific mutations in oncogenes or tumor suppressor genes could bring light on the molecular mechanisms causing uncontrolled cell proliferation.

The recent development of targeted cancer medicines is an important example of how experimental pathology and disease mechanisms interact. Experimental pathologists have developed medications that target changed molecular pathways in cancer cells, such as tyrosine kinase inhibitors for Chronic Myeloid Leukemia (CML). The first stage in disease management is to accurately diagnose the condition. Pathologists provide essential data by determining the exact kind and stage of a disease. Pathologists can also provide prognosis based on illness features. Pathology's interaction with modern technologies like as Artificial Intelligence (AI), machine learning, and rapid sequencing is transforming the field of pathology. These advances improve the accuracy and timeliness of disease diagnosis while also allowing for more precise characterization of disease causes.

As a result, pathology will soon have an even larger part in customized medicine, in which treatments are modified to individual patients based on their disease causes. Additionally, the growing field of immunopathology and microbiome research provides new possibilities for studying how the immune system and the body's microbial ecology contribute to disease mechanisms. This is especially important for situations such as autoimmune disease, chronic inflammatory disorders, and cancer. Disease processes are important to understanding how diseases begin, progress, and respond to treatments.