

# Introduction to Molecular Genetics of Retroviral Diseases

Yusuf Tutar\*

Department of Basic Science and Biochemistry, University of Health Sciences, Sivas, Turkey

## ABSTRACT

Molecular genetics is a branch of biology that studies how variations in DNA molecule structures or expression manifest as variation among species. Molecular geneticists often use genetic screens to assess the structure and/or role of genes in an organism's genome, using an "investigative approach".

**Keywords:** Molecular genetics; Biology; Central dogma; Mendelian inheritance; Retrovirus

## INTRODUCTION

Molecular genetics is a branch of biology that studies how variations in DNA molecule structures or expression manifest as variation among species. Molecular geneticists often use genetic screens to assess the structure and/or role of genes in an organism's genome, using an "investigative approach". The study of classical Mendelian inheritance, cellular biology, molecular biology, biochemistry, and biotechnology is focused on the convergence of many sub-fields of biology. To attach a gene sequence to a particular phenotype, researchers look for mutations in a gene or induce mutations in a gene. Molecular genetics is a powerful tool for connecting mutations to genetic disorders, which may help researchers find therapies and cures for a variety of genetic diseases [1].

The discovery of DNA as a way of transmitting life's genetic code from one cell to the next and through generations was crucial in determining the molecule responsible for heredity. Watson and Crick (along with Franklin and Wilkins) discovered the structure of DNA, which is the foundation of molecular genetics.

## THE CENTRAL DOGMA

The Central Dogma underpins all genetics and is crucial to molecular genetics research. DNA replicates itself, RNA is transcribed from DNA, and RNA is converted into proteins, according to the Central Dogma. The genetic code is used to explain how RNA is encoded into proteins, in addition to the Central Dogma. The mitochondria are responsible for DNA replication and transcription from DNA to mRNA, while the ribosome is responsible for translating RNA into proteins. The genetic code is made up of four base pairs: adenine, cytosine, uracil, and guanine, and it is redundant, meaning that the same amino acid can be produced by multiple combinations of these base pairs (read in triplicate [2]).

## RETROVIRAL DISEASES

A retrovirus is a type of virus that belongs to the *Retroviridae* family and that carries its genetic blueprint in the form of ribonucleic acid (RNA). The enzyme reverse transcriptase was discovered independently by American virologists Howard Temin and David Baltimore in 1971, giving retroviruses their name. Reverse transcriptase converts RNA to deoxyribonucleic acid (DNA), which is a reversal of the normal direction of cellular transcription (DNA into RNA). The enzyme reverse transcriptase allows genetic material from a retrovirus to be permanently integrated into the DNA genome of an infected cell; it is commonly used in biology to synthesize genes [3].

Retroviruses are linked to slow infections in animals, such as equine infectious anaemia, and cause tumour growth and some cancers. A retrovirus known as Human T-cell Lymphotropic Virus Type 1 (HTLV-1) causes Adult T-cell Leukemia in humans (ATL). It may also cause HTLV-1-associated myelopathy/tropical spastic paraparesis (HAM/TSP), a neurodegenerative disease. HTLV-2, a closely related virus, has been linked to relatively mild neurological disorders but has yet to be reported as a cause of human disease [4,5].

## CONCLUSION

The etiologic agent of acquired immune deficiency syndrome is now considered to be a novel human lymphotropic virus capable of disabling the immune system by infecting and killing T4 antigen-positive cells (AIDS). AIDS, also known as the Human Immunodeficiency Virus (HIV), is a retrovirus, a type of RNA virus. Molecular cloning of many HIV strains has shown that the proviral DNA genome is 9.7 kilobase pairs long, according to DNA sequence comparisons. The genome contains retrovirus-specific features such as structural genes flanked by long terminal repeats

**Correspondence to:** Yusuf Tutar, Department of Basic Science and Biochemistry, University of Health Sciences, Sivas, Turkey, Email: ytutar@cumhuriyet.edu.tr

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in the order gag, pol, and env, as well as four nonstructural genes, all of which appear to be important in virus replication regulation.

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