

Central Dogma

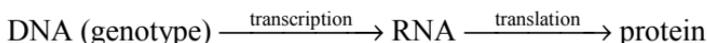
2.1 INFORMATION FLOW PATHWAY IN BIOLOGICAL SYSTEM

In 1868, Fredrich Miescher treated pus cells and selmon sperm cells with digestive enzymes and observed that the nuclear contents were not digested. To this undigested portion he gave the name nuclein. As nuclein exhibit acidic properties it was called nucleic acid.

Nucleic acids which were found to be associated with various proteins in combinations are called nucleoproteins. Nucleic acids are the largest and fascinating molecules found in living systems. These are mainly found in the nucleus but also present in the cytoplasm of the cell. There are two kinds of nucleic acids. The Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

Central dogma explains how DNA (genetic instructions) determined the phenotype. According to the central dogma, an index offered by F. Crick, the genetic instructions are stored as DNA. The message in the DNA is converted to RNA during a process called transcription. The message in the RNA is then used to make a protein during a process called translation.

We can represent this process as follows:



sequence into an RNA sequence, i.e., messenger RNA.

2. Translation: Infonnation is transferred from the mRNA to protein sequence.
3. Proteins carry out the final actions in the expression, e.g., enzyme activity, structure of cell or organism, etc.

This dogma tells us that DNA is used to synthesize RNA and that RNA is used to synthesize proteins. It was known that this is the only order in which information flows.

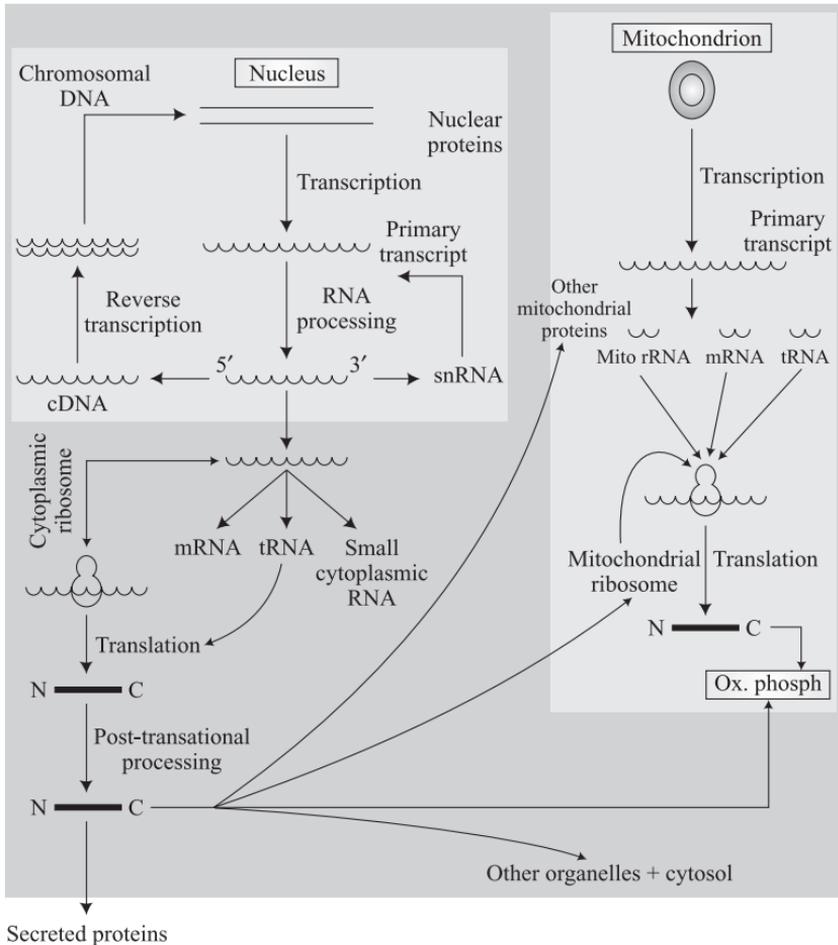


Figure 2. Diagram represents the directional flow of information. Arrows represent probable transfer and represent possible transfer', which are (a) DNA → DNA (b) DNA → RNA (c) RNA → Protein (d)

RNA→RNA

2.1 MODIFIED CENTRAL DOGMA

Now, researchers have documented modified information about the flow of genetic information and it is referred as updated or modified central dogma.

Some important modifications of central dogma includes

1. In case of RNA virus (Retrovirus, Rous sarcoma virus, AIDS virus) genetic information is stored as RNA. Here RNA is a template for DNA synthesis and RNA-dependent DNA polymerase, often referred to as reverse transcriptase, synthesizes a DNA strand complementary to the viral RNA. This is a kind of backflow with respect to central dogma concept.
2. The process of self-replication of RNA has been observed in RNaphages.
3. B.J. Maccarthy and J.J. Holland in mid 1960s showed that under experimental conditions denatured or single strand DNA could bind to ribosomes and translated into proteins.
4. Self-splicing reactions taking place in some RNA organisms leads to the formation of self-replicating RNA that may proceed to DNA duplex.