DNA TRANSCRIPTION

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RNAs have a broader range of functions, and several classes are found in cells. **Ribosomal RNAs (rRNAs)** are components of ribosomes, the complexes that carry out the synthesis of proteins. **Messenger RNAs (mRNAs)** are intermediaries, carrying genetic information from one or a few genes to a ribosome, where the corresponding proteins can be synthesized. **Transfer RNAs (tRNAs)** are adapter molecules that faithfully translate the information in mRNA into a specific sequence of amino acids. In addition to these major classes there is a wide variety of RNAs with special functions,

Messenger RNAs Code for Polypeptide Chains

Expression of the genetic information that it contains.

RNA, the second major form of nucleic acid in cells, has many functions. In gene expression, RNA acts as an intermediary by using the information encoded in DNA to specify the amino acid sequence of a functional protein.

Given that the DNA of eukaryotes is largely confined to the nucleus whereas protein synthesis occurs on ribosomes in the cytoplasm, some molecule other than DNA must carry the genetic message from the nucleus to the cytoplasm. As early as the 1950s, RNA was considered the logical candidate: RNA is found in both the nucleus and the cytoplasm, and an increase in protein synthesis is accompanied by an increase in the amount of cytoplasmic RNA and an increase in its rate of turnover. These and other observations led several researchers to suggest that RNA carries genetic information from DNA to the protein biosynthetic machinery of the ribosome.

In 1961 François Jacob and Jacques Monod presented a unified (and essentially correct) picture of many aspects of this process. They proposed the name “messenger RNA” (mRNA) for that portion of the total cellular RNA carrying the genetic information from DNA to the ribosomes, where the messengers provide the templates that specify amino acid sequences in polypeptide chains. Although mRNAs from different genes can vary greatly in length, the mRNAs from a particular gene generally have a defined size. The process of forming mRNA on a DNA template is known as transcription

- Genes specify the kinds of proteins that are made by cells. However DNA is not the direct template for protein synthesis. Rather the templates for protein synthesis are RNA (ribonucleic acid) molecules.
- A class of RNA molecules called *messenger RNAs (mRNAs)* are the information carrying intermediates in protein synthesis. Other forms of cellular RNA are part of the protein-synthesizing machinery

- All cellular RNA molecules are synthesized by RNA polymerases according to instructions given by DNA templates. The activated monomer substrates are ribonucleoside triphosphates. The direction of RNA synthesis is 5' to 3' as in DNA synthesis

- RNA polymerases do not need a primer and do not possess proofreading nuclease activity. The DNA template is fully conserved in RNA synthesis, whereas it is semi-conserved in DNA synthesis

RNA is a long, unbranched macromolecule consisting of nucleotides joined by 3'→5' phosphodiester bonds. The sugar unit in RNA is ribose. The four major bases are adenine, uracil, guanine and cytosine

- DNA templates contain regions called promoter sites that specifically bind RNA polymerase and determine where transcription begins.

In bacteria, two sequences on the 5‘ (upstream) side of the first nucleotide to be transcribed are important. One of them, called the pribnow box, has the consensus sequence TATAAT and is centred at -10 (10 nucleotides on the 5‘ side of the first one transcribed which is denoted by +1). The other called the -35 region has the consensus sequence TTGACA

Eucaryotic genes encoding proteins have promoter sites with a TATAAA consensus sequence centred at about -25. This TATA box is like the prokaryotic pribnow box except that it is farther upstream. Many eukaryotic promoters also have a CAAT box with a GGNCAATCT consensus sequence centered at about -75