

TRANSCRIPTION: RNA AND TYPES

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The copying process, during which a DNA strand serves as a template for the synthesis of RNA, is called **transcription**.

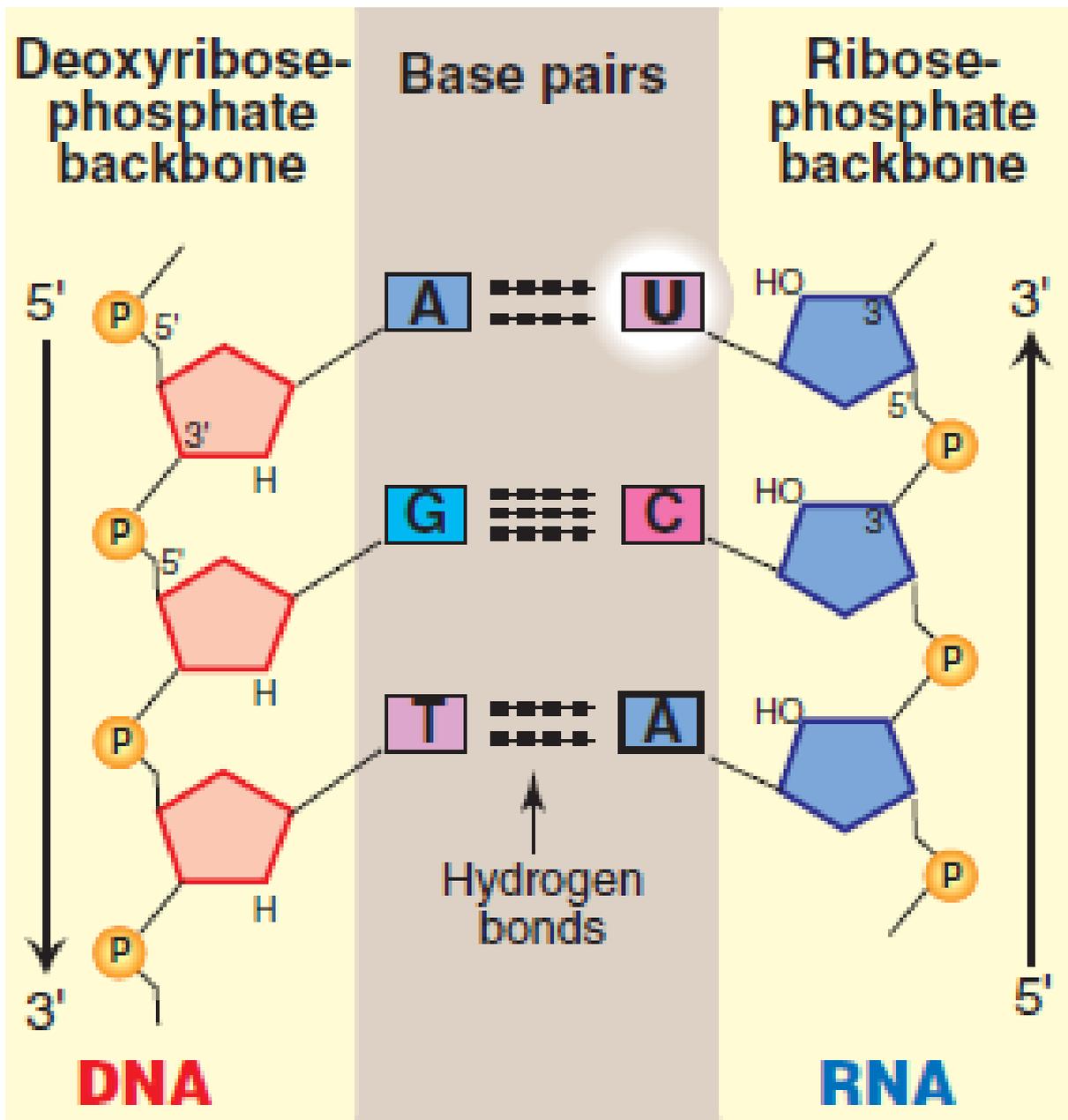
Transcription produces **messenger RNAs** that are translated into sequences of amino acids (polypeptide chains or proteins), and **ribosomal RNAs, transfer RNAs**, and additional **small RNA** molecules that perform specialized structural, catalytic, and regulatory functions and are not translated, called that is, they are noncoding RNAs (ncRNAs).

Ribonucleic acid (RNA)

RNA is a polymer of nucleotides similar to DNA.

RNA differ from DNA in several ways:

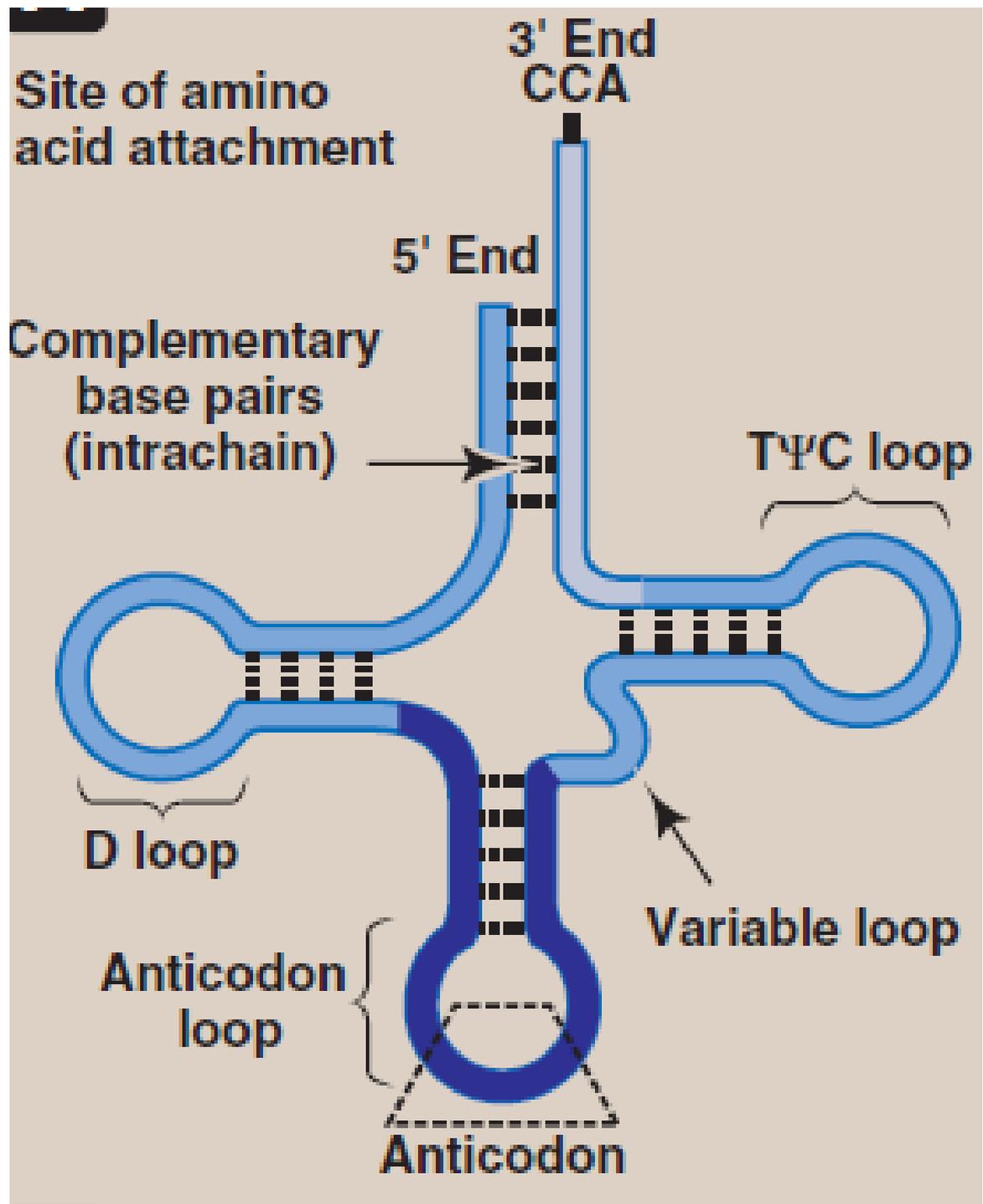
- RNA is smaller than DNA,
- contain ribose instead of deoxyribose and
- Uracil instead of thymine, and exist as single strands that are capable of folding into complex structures
- Through internal homologies, RNA species fold and loop upon themselves to take on as much of a double-stranded character as possible.
- RNA can also pair with complementary single strands of DNA or RNA and form a double helix.
- There are several types of RNAs found in the cell.
- Ribosomal RNA, messenger RNA, transfer RNA, and small nuclear RNAs have distinct cellular functions.
- RNA is copied, or **transcribed**, from DNA **Type of RNA**
- There are several types of RNAs found in the cell:
 - 1- ribosomal RNA (rRNA),
 - 2- transfer RNA (tRNA),
 - 3- messenger RNA (mRNA)



Ribosomal RNA

- rRNAs are found in association with several proteins as components of the ribosomes—the complex structures that serve as the sites for protein synthesis.
- There are three distinct size species of rRNA (23S, 16S, and 5S) in prokaryotic cells.
- In the eukaryotic cytosol, there are four rRNA species (28S, 18S, 5.8S, and 5S).
- Together, rRNAs make up about 80% of the total RNA in the cell. **Transfer RNA**
- tRNAs are the smallest (4S) of the three major types of RNA molecules. There is at least one specific type of tRNA molecule for each of the 20 amino acids commonly found in proteins.

- Together, tRNAs make up about 15% of the total RNA in the cell.
- The tRNA molecules contain a high percentage of unusual bases (e.g dihydro uracil, and have extensive intrachainbase-pairing that leads to characteristic secondary and tertiary structure



- Each tRNA serves as an “adaptor” molecule that carries its specific amino acid—covalently attached to its 3'-end—to the site of protein synthesis.
- There it recognizes the genetic code sequence on an mRNA, which specifies the addition of its amino acid to the growing peptide chain

Messenger RNA

- mRNA comprises only about 5% of the RNA in the cell, yet is by far the most heterogeneous type of RNA in size and base sequence.
- The mRNA carries genetic information from the nuclear DNA to the cytosol, where it is used as the template for protein synthesis.
- If the mRNA carries information from more than one gene, it is said to be polycistronic. Polycistronic mRNA is characteristic of prokaryotes.
- If the mRNA carries information from just one gene, it is said to be monocistronic and is characteristic of eukaryotes.
- In addition to the protein coding regions that can be translated, mRNA contains untranslated regions at its 5'- and 3'-ends.
- Special structural characteristics of eukaryotic (but not prokaryotic) mRNA include a long sequence of adenine nucleotides (a “poly-A tail”) on the 3'-end of the RNA chain, plus a “cap” on the 5'-end consisting of a molecule of 7-methylguanosine attached “backward” (5'→5') through a triphosphate linkage