

Difference Between Coding and Noncoding DNA

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Key Difference - Coding vs Noncoding DNA

A [genome](#) of an organism is defined as the complete set of [DNA](#) including all of its genes. The genome is represented by the whole set of [chromosomes](#) present in the nucleus of a cell. DNA comprises specific nucleotide sequences which have different structural and functional properties. Some of the DNA sequences contain genetic information for synthesizing proteins while some have other functions such as regulation, promotion, etc. Coding DNA and noncoding DNA are two components of an organism's DNA. **The DNA sequences which encode for proteins are known as coding DNA. The sequences which do not encode for proteins are known as noncoding DNA.** This is the key difference between coding and noncoding DNA. In the human genome, only about 1.5 % coding DNA and rest of the 98 % is represented by the noncoding DNA.

What is Coding DNA?

The DNA sequences in the genome that [transcribe and translate](#) into proteins are known as coding DNA. Coding sequences are found within the coding region of the genes. The coding region is composed of sequences known as [exons](#). Exons are portions of genes which have the genetic code for the production of specific proteins. Exons are interspersed within the noncoding sequences known as [introns](#) in the genes. In humans, coding DNA accounts for a small percentage. Only about 1.5 % of the entire genome length corresponds to coding DNA which translates into proteins. This coding DNA has more than 27000 genes and produces all the proteins which are essential for cellular processes.

Proteins encoding sequences of the genes are transcribed into [mRNA](#) sequences first. Then these mRNA sequences are translated into amino acid sequences which turn into polypeptide chains. Every three nucleotide set in the exon sequence is termed as a [codon](#). One codon has genetic information for an amino acid. Codon sequence gives an amino acid sequence. Amino acid sequence collectively makes the protein which is encoded by the sequence.

Coding sequences usually begin with a start codon ATG and terminate with a stop codon TAA TAA.

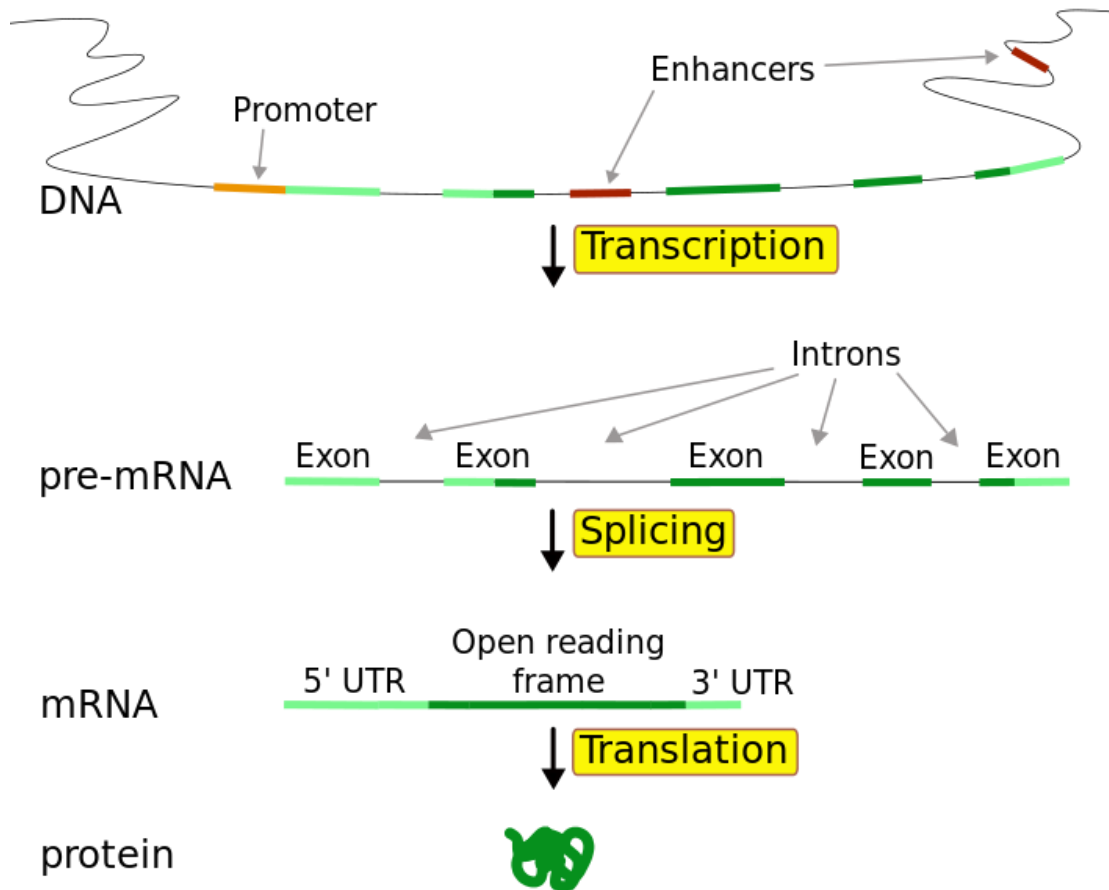


Figure 01: Coding DNA

What is Noncoding DNA?

The DNA sequences of the genome that do not encode for proteins are known as noncoding DNA. They are components of an organisms' DNA. The major part of the genome of an organism is comprised of noncoding DNA. It accounts for more than 98% length of the genome. The total amount of genomic DNA varies among the organisms. The proportions of coding and noncoding DNA also vary between organisms. The amount of noncoding DNA differs greatly among species as well. However, in each species, only a small percentage is responsible for coding DNA; the rest is noncoding DNA. This is the opposite in prokaryotes. In prokaryotic genome, coding DNA is the majority DNA while only 20% is accounted for noncoding DNA.

Different types of noncoding DNA can be identified in the organisms' genome. They are introns, [repetitive DNA](#), regulatory DNA, etc. Repetitive DNA is different types such as telomeres, tandem repeats, and interspersed repeats. Introns

are noncoding DNA found within the genes. They are segments of DNA which do not code for proteins. Some of the noncoding DNA transcribe into functional noncoding RNA such as transfer RNA, ribosomal RNA, and regulatory RNA. Some noncoding DNA function as transcriptional and translational regulation of coding sequences. The research in genetics shows that some noncoding DNA are involved in epigenetic activity and complex network of genetic interactions.

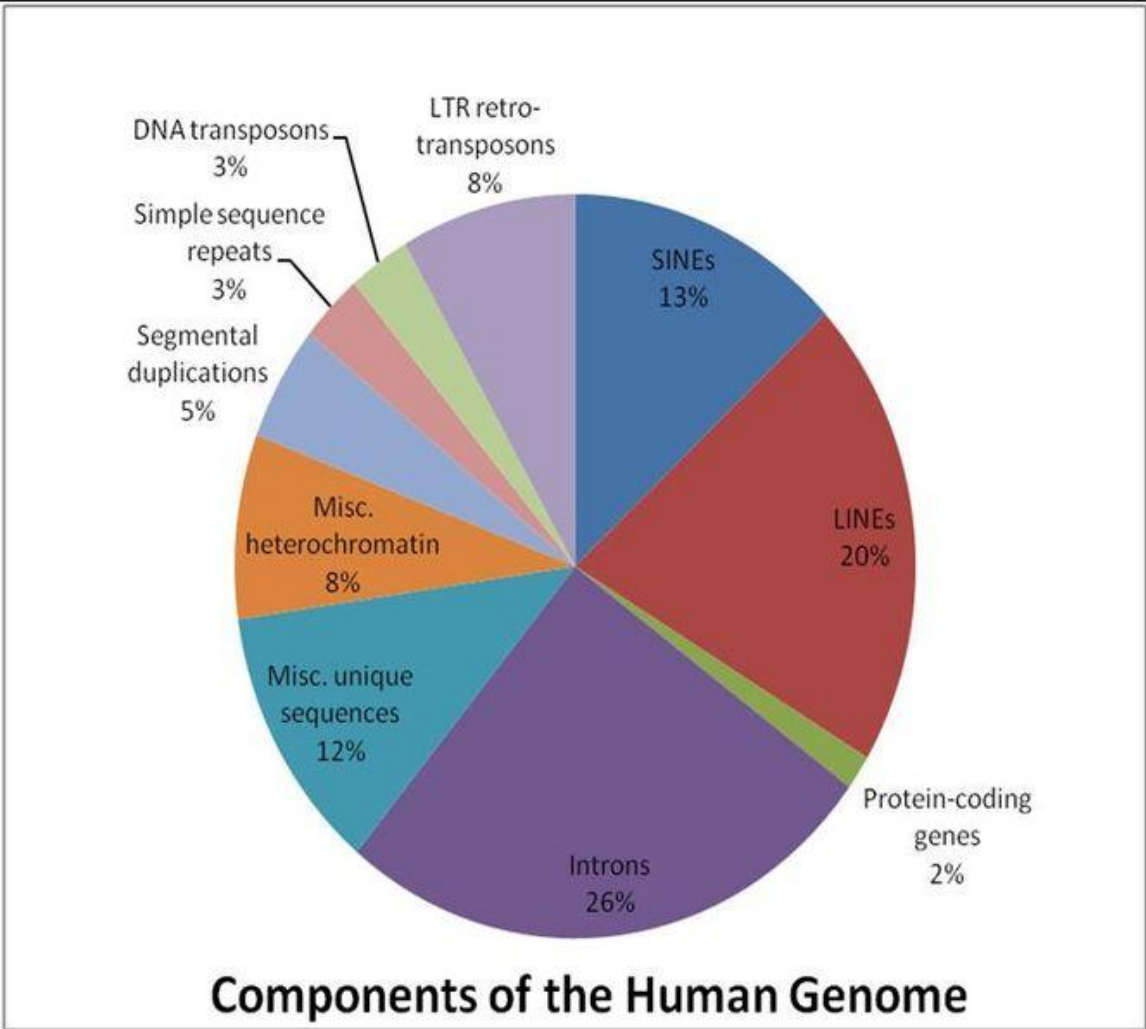


Figure 02: Noncoding DNA in the human genome

What is the difference between Coding and Noncoding DNA?

Coding vs Noncoding DNA

Coding DNA are the DNA sequences which encode for proteins.

Noncoding DNA are the sequences which do not encode for proteins.

Types

Exons are types of coding DNA.

There are different types of noncoding DNA such as introns, repetitive DNA and regulatory DNA.

Percentage in Human Genome

Coding DNA accounts for about 1.5 % length of the human genome.

Noncoding DNA accounts for over 98% length of the human genome.

Function

Coding DNA transcribes and translates into proteins.

Noncoding DNA has different functions such as regulation, epigenetic activity etc.

Summary - Coding vs Noncoding DNA

Coding and noncoding DNA are two components of organisms' genome. Both DNA sequences are made up of nucleotide sequences. Coding DNA are the DNA sequences which encode for proteins necessary for cellular activities. Noncoding DNA are the DNA sequences which do not encode for proteins. This is the difference between coding and noncoding DNA. In general, the amount of coding DNA is low compared to noncoding DNA in the genome. In the human genome, percentages of coding and noncoding DNA are 1.5% and 98% respectively.

References:

1. "Noncoding DNA." Wikipedia. Wikimedia Foundation, 07 June 2017. Web. [Available here](#). 24 June 2017.
2. "Noncoding DNA - Boundless Open Textbook." Boundless. Boundless, 26 May 2016. Web. [Available here](#). 24 June 2017.

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