Non-protein coding genes, also known as non-coding genes, refer to segments of DNA that are transcribed into RNA molecules but do not encode proteins. While the majority of the human genome is composed of non-coding DNA, it was initially believed that much of this DNA was "junk" or without functional significance. However, advances in genomic research have revealed that non-coding genes have important regulatory roles and contribute to various biological processes.

Non-coding genes can be classified into different categories based on their functional characteristics. Here are a few examples:

Ribosomal RNA (rRNA): rRNA genes code for RNA molecules that are essential components of the ribosomes, the cellular structures responsible for protein synthesis. Although rRNA does not encode proteins, it plays a critical role in translation by facilitating the assembly and functioning of ribosomes.

Transfer RNA (tRNA): tRNA genes encode RNA molecules that act as adapters between messenger RNA (mRNA) and amino acids during protein synthesis. tRNAs are responsible for carrying specific amino acids to the ribosomes, where they are incorporated into growing polypeptide chains.

MicroRNAs (miRNAs): miRNAs are short RNA molecules that regulate gene expression by binding to specific messenger RNAs (mRNAs) and inhibiting their translation or promoting their degradation. miRNAs play important roles in developmental processes, cell differentiation, and the regulation of various cellular pathways.

Long Non-Coding RNAs (IncRNAs): IncRNAs are RNA molecules that are longer than 200 nucleotides and do not encode proteins. They are involved in diverse regulatory processes, such as chromatin remodeling, transcriptional regulation, and post-transcriptional regulation. Some IncRNAs have been implicated in diseases, including cancer and neurological disorders.

Enhancer RNAs (eRNAs): eRNAs are short RNA transcripts that are synthesized from enhancer regions of the genome. They are thought to play a role in the activation of gene expression by facilitating the interaction between enhancer elements and target genes.

Piwi-interacting RNAs (piRNAs): piRNAs are small non-coding RNAs that are predominantly expressed in the germline cells. They are involved in silencing transposable elements, protecting genome integrity, and regulating gene expression during germ cell development.

These are just a few examples of non-coding genes, and the field of non-coding RNA research is continually evolving as more functions and regulatory mechanisms are discovered. Non-coding genes have demonstrated their importance in gene regulation, development, and disease, and studying them provides valuable insights into the complexity of genome function.

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