

DNA

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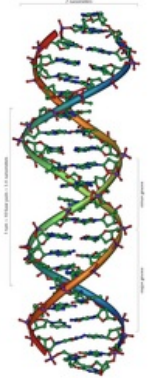
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Last update: Monday, 08 Dec 2014 at 6.45 pm.

DNA (deoxyribonucleic acid) is the molecule containing the primary genetic information in the form of a linear sequence of nucleotides in groups of three (codon). A nucleotide is composed of a phosphorylated sugar and base. DNA bases are adenine, cytosine, guanine and thymine. The bases form complementary bases pairing, with two hydrogen bonds between cytosine and guanine, and three hydrogen bonds between thymine and adenine. DNA consists of a large number of repeats 100-6500 bp (base pairs).

Structure

Phosphorylation of nucleosides gives DNA a negative charge. DNA is negatively charged, it forms bonds with positively charged histones. Histones are responsible for compacting DNA. The structure formed is 8 histone proteins together in one unit with the DNA double helix wound twice around it.



Helix of DNA occur in three forms; α -helix, β -helix and z-helix. α -helix and β -helix are right handed. z-helix is left handed.

Major and Minor grooves

The DNA double helix forms minor and major grooves. Minor grooves have two highly hydrophilic components, whereas major grooves allow bases to be accessed by enzymes and proteins (an example being transcription factors).

Modifications

DNA modifications can be methylation, acetylation, ubiquitination, and phosphorylation. Acetylation activates chromatin, allowing protein synthesis to occur. Methylation deactivates DNA. Modification of DNA results in it being expressed more or less (via transcription), these are essential processes in both the differentiation and the growth of cells. On top of modifications of the DNA itself modifications of the histones it is associated with can also result in differences in expression, acetylation and methylation are the mostly commonly observed modifications. Modifications to the DNA that don't alter the sequence of nucleotides such as the ones just described are collectively referred to as epigenetic modifications. Conversely modifications to DNA that involve the altering of the nucleotide sequence are referred to as a mutation.

DNA forms

sDNA (satellite DNA) contains tandem repeats of nucleotide sequences of different lengths. sDNA can be separated from the main DNA in gradient centrifugation, after which it appears as one or several bands separated from that of the main body of the DNA. Microsatellites are small (2-10) tandem repeats of DNA nucleotides. Minisatellites are tandem repeats of about 20-100 base pairs.

cDNA is a reverse transcriptase product. DNA can be naturred and renatured continuously because it has a highly ordered structure.

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References

Bibliography

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