Chargaff's Rules Encyclopedia Article

Chargaff's Rules

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Chargaff's Rules

Chargaff's rules are a series of statements that refer to the composition of the nucleotide bases in DNA. They were suggested by Erwin Chargaff in the late 1940s.

Prior to 1944, scientists did not know what material in the cell was the genetic material. At this time, biologist Oswald Theodore Avery and his collaborators showed that DNA was the principal component in microbial transformation. This prompted Chargaff, in 1947, to further investigate the composition of DNA.

DNA is a polymer made up of nucleotide monomers. The nucleotides are composed of a phosphate group, a pentose sugar, and a nitrogen containing base. There are four specific bases found in DNA including two purines, adenine and guanine, and two pyrimidines, thymine and cytosine.

Chargaff found a number of properties of DNA that were consistent throughout most organisms. First, he found that there was not an equal distribution of bases within an organism. Also, the ratio of bases vary from species to species. He found an interesting regularity to the ratio of bases. The number of adenine components equaled the thymine bases and the number of guanines were equal to the cytosines.

These observations became the basis for Chargaff's rules, also known as the base pairing rules. These include the following statements. Within an organism, the number of purine bases are equal to the pyrimidine bases. The number of adenines and thyamines are equal. Also, the number of cytosines and guanines are equal.

While Chargaff's rules were supported by evidence, the reasons for these relationships among nucleotides remained unknown until the discovery of the DNA double helix structure. These rules were a substantial clue used by Watson and Crick to determine the structure of DNA.