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Commentary

Role of Transcription and its Factors

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DESCRIPTION

Transcription is defined as the synthesis of single stranded RNA from a double stranded DNA template. Transcription Factors (TFs) are the proteins involved in the process of transcribing or converting DNA to RNA. The function of transcription factors is to control genes throughout the lifespan of the cell and organism. TFs regulate cell migration and organization during embryonic development as well as occasionally in response to signals from outside the cell, such as hormones. TFs also control cell division, growth, and death throughout life. There are up to 1600 transcription factors in the human genome. Both the regulome and the proteome contain transcription factors. TFs acting alone or in conjunction with other proteins in a complex either activate or inhibit the binding of RNA polymerase to particular genes. A distinguishing feature of TFs is the presence of at least one DNA-binding domain. TFs are grouped based on the DNA-binding domains they possess. In addition to coactivators, chromatin remodelers, histone acetyl transferases, histone deacetylases, kinases, and methyl transferases, there are other proteins that control gene expression but lack DNA-binding domains. TFs mutations can cause some diseases.

An organism internal population of transcription factors increases in direct proportion to the size of its genome. The human genome contains about 2800 proteins and 1600 of these are thought to function as transcription factors. As a result, transcription factors are the largest class of human proteins and are encoded for by around 10% of the genes in the genome. Additionally, genes usually have several transcription factor binding sites on either side, making the collaboration of numerous transcription factors necessary for the expression of each of these genes. A particular class of protein called transcription factors reads and deciphers the genetic information in DNA. They bind to DNA and help to promote or decrease gene transcription. They significantly contribute numerous biological activities.

The technologies used to analyze transcription factors are numerous. At the genomic level, DNA sequencing and database research are widely used. The protein form of the transcription factor can be found using certain antibodies. The sample is identified using a western blot technique. Electrophoretic mobility shift testing can be used to evaluate the activation profile of transcription factors. TF chip device is used for activation profiling which can simultaneously detect many unique transcription factors. The most frequent method for identifying transcription factor binding sites is chromatin immuno precipitation. This procedure entails chemically fixing chromatin with formaldehyde, followed by the co-precipitation of DNA and the target transcription factor with a specialized antibody. The DNA sequences can be found utilizing high-throughput sequencing to find transcription factor binding sites.

Gene duplications have played a significant role in the evolution of living organisms. With regard to transcription factors, this is especially true. Once they become duplicates, accumulating mutations encoding for one copy can take place without having an effect on the regulation of downstream targets. The single-copy Leafy transcription factor, which is present in the majority of terrestrial plants, has recently been found to change its DNA binding preferences. By passing *via* a promiscuous intermediate, a single copy transcription factor can alter its specificity without losing function.

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