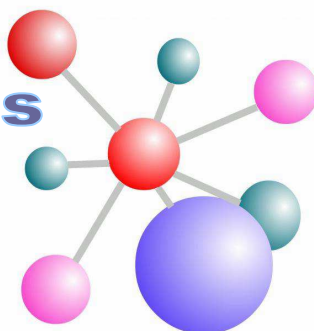


Inglês



Ciências Biológicas

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As questões de 01 a 05, cujas respostas deverão ser redigidas EM PORTUGUÊS, referem-se ao texto abaixo.

THE ORIGIN OF BIOLOGICAL INFORMATION AND PROGRAMMED PROTEIN SYNTHESIS

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ABSTRACT

Biological information is one of the most important characteristics of life, and it enables life to evolve to higher complexity and adapt to the environment by mutation and natural selection. However, the origin of this information recording and retrieval system remains a mystery. To understand the origin of biological information will lead us to one step closer to understand the origin of life on earth. Biological information is encoded in DNA and translated into protein by the ribosome in all free living organisms. The information has to be translated into proteins to carry out its biological functions, so the evolution of the ribosome must be integrated with the development of biological information. In this article, I propose that the small ribosomal subunit evolved from a ribozyme that acted as an RNA helicase in the ancient RNA world, and the involvement of tRNAs and the large ribosomal subunit evolved to enhance the helicase activity and to overcome the higher energy requirement for high GC content RNA helices. This process could have developed as a primitive recording mechanism: since Watson-Crick base pairing is a natural property of RNA, each time the proto-small ribosomal subunit came to a particular GC-rich helix, tRNA-like molecules and the proto-large ribosomal subunit would have to be engaged to generate the helicase activity, and consequently the same polypeptide would be synthesized as a by-product. Simple recorded messages then evolved into useful biological information through continuous mutation and natural selection. This hypothesis provides logical and incremental steps for the development of programmed protein synthesis. I also argue that the helicase activity is preserved in the modern ribosome and that from our knowledge of the ribosome, and we can deduce the possible mechanisms of the helicase activity.

Keywords: Ribosome; tRNA; Translation; Translocation; mRNA Helicase; Evolution; Origin of Biological Information

1. INTRODUCTION

Biological information is contained in all the genes and intergenic regions with signals for gene expression. There are two major types of genes: one encodes information that is expressed as functional RNA molecules such as rRNA, tRNA, and snRNA, and another encodes information for protein synthesis expressed as mRNA. The functional RNA genes are thought to be remnants of an ancient RNA world that existed prior to DNA and proteins, and their functions are involved in RNA editing or protein synthesis. The origin of the protein coding genes is unknown, and it is the major focus of this communication. Protein is one of the most important basic building blocks for life, and proteins are synthesized by the ribosome according to genetic information encoded in the genes of all living organisms. Since a gene can only carry out its biological function after it is translated into protein by the ribosome, the understanding of the evolution, structure and function of the ribosome should lead to an understanding of the origin of genetic information.

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Questão 1

Com base no texto, cite as razões que justificam a importância da informação biológica.

Espaço para Resposta

Questão 2

O que é necessário para que a informação biológica desempenhe suas funções?

Espaço para Resposta

Questão 3

No artigo é referido que a informação biológica está contida em todos os genes. Descreva os tipos mais importantes mencionados no texto.

Espaço para Resposta



Questão 4

O que, segundo o artigo, pode levar a um entendimento da origem da informação genética?

Espaço para Resposta

