# Life's origins were easier than was thought

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An international team of scientists, leaded by Universitat Autònoma de Barcelona researchers, has discovered that RNA early molecules were much more resistant than was thought until now. According to the conclusions of the study, they may have developed enough to contain around 100 genes, which is considered to be the minimum quantity required for the most basic forms of primitive life, similar to the bacteria we have today. The research was published in *Nature Genetics*.

In the primordial soup that produced life on earth, there were organic molecules that combined to produce the first nucleic acid chains, which were the first elements able to self-replicate. According to one of the more accepted theories, these molecules were ribonucleic acid (RNA) chains, a molecule that is practically identical to DNA and that today has the secondary role in cells of copying information stored in DNA and translating it into proteins. These proteins have a direct active role in the chemical reactions of the cell. In the early stages of life, it seems that the first RNA chains would have had the dual role of self-replicating (as is today the case with DNA) and participating actively in the chemical reactions of the cell activity. Because of their dual role, these cells are called ribozymes (a contraction of the words ribosome and enzyme). But there is an important obstacle to the theory of ribozymes as the origin of life: they could not be very large in length as they would not be able to correct the replication errors (mutations). Therefore they were unable to contain enough genes even to develop the most simple organisms.

An investigation led by Mauro Santos, from the Department of Genetics and Microbiology at the Universitat Autтnoma de Barcelona (Spain),

alongside two Hungarian scientists, has shown that the error threshold, that is, the maximum number of errors that may occur during the replication process of ribozymes without this affecting its functioning, is higher than was previously calculated. In practice, this means that the first riboorganisms (protocells in which RNA is responsible for genetic information and metabolic reactions) could have a much bigger genome than was previously thought: they could contain more than 100 different genes, each measuring 70 bases in length (bases are the units that constitute the genes and codify the information), or more than 70 genes, each measuring 100 bases. It is worth remembering that tRNAs (essential molecules for the synthesis of proteins) are approximately 70 bases long.

The discovery has greatly relaxed the conditions necessary for the first living organisms to develop. "This quantity of genes would be enough for a simple organism to have enough functional activity", according to the researchers. Recent analysis into the minimum number of DNA genes required to constitute bacteria, the most simple organism today, considers that around 200 genes is sufficient. But in riboorganisms there can be much fewer genes, since DNA genomes include a number of genes that have the role of making the RNA translation system (which enables proteins to be produced) work, which would not be required in RNA-based organism.

Source: Universitat Autonoma de Barcelona