DNA: Not Merely the Secret of Life
ADN: Algo Más que el Secreto de la Vida

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Abstract

Introduction: DNA is well-known as the genetic material of living organisms. Its most prominent feature is that it contains information that enables it to replicate itself. This information is contained in the well-known Watson-Crick base pairing interactions, adenine with thymine and guanine with cytosine. The double helical structure that results from this complementarity has become a cultural icon of our era. ***Material and Methods:*** To produce DNA species more diverse than the simple double helix, we use the notion of reciprocal exchange, which leads to branched molecules. The topologies of these species are readily programmed through sequence selection; in many cases, it is also possible to program their structures. Branched species can be connected to one another using cohesion by molecules tailed in complementary single-stranded overhangs, known as 'sticky ends.' Structural DNA nanotechnology is based on using stable branched DNA motifs, tailed with sticky ends. ***Results and Discussion:*** We have been working in this area since the early 1980's to combine these DNA motifs to produce target species. We have built stick polyhedra where the edges are double helices and the vertices are branch points of DNA junctions. We have built 2D lattices characterized by atomic force microscopy and 3D crystals whose structures have been determined by X-ray diffraction. Nanomechanical devices have advanced from controlled structures to a DNA-based nanoscale assembly line. Both clocked and autonomous nanorobotic walkers have also been developed. ***Conclusion:*** Branched DNA combined with sticky ends provides a versatile approach to construction on the nanometer scale.

Keywords: nanotechnology, DNA, branched DNA, DNA objects, DNA crystals, DNA nanomechanical devices, nanorobotics.