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Abstract

DNA Obtained by Ab Initio Synthesis Forms Hyperbranched Net-like Structure †

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Abstract: Ab initio DNA synthesis refers to the unusual synthesis of dsDNA (with a length ranging from tens of bp to kbp) by thermophilic DNA polymerases from free dNTPs in the complete absence of added DNAs. As commonly believed, the reaction product is a linear double-stranded DNA in the B form. However, an extremely low efficiency of cloning and the failure to hydrolyze high-molecular-weight DNA, as well as the presence short repeats, palindromes, and AT-rich repeats in the sequence, mean that a more complex spatial structure of this DNA can be assumed. The AFM coupled with nuclease analysis revealed that high-molecular-weight dsDNA products branched and formed net-like structures. The DNA contained single-stranded and triple-stranded segments. These net-like structures may be assumed to be three-dimensional (3D). The present work was the first detailed investigation of ab initio synthesis products. The results may be useful to develop techniques requiring the synthesis of large amounts of DNA with complex spatial structures.

Keywords: template/primer-independent DNA synthesis; DNA structures; atomic force microscopy

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