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Ultrasonic Cleavage of Nicked DNA

Dmitry Nechipurenko,*Irina Il'icheva, Sergei Grokhovsky****

*) Dep. of Physics, Moscow State University, Moscow, Russia

**) Engelhardt Institute of Molecular Biology RAS, Moscow, Russia

Nicks represent the most common damage in DNA which occurs naturally in living cells. Structural properties of nicked DNA fragments have been an object of numerous studies due to its special role in reparation processes. Here we report experimental results covering ultrasound irradiation of nicked DNA solutions. Several single-stranded nicks were produced into one strand of dsDNA fragments by the nicking enzyme Bst9I. We have quantitatively estimated the ultrasonic cleavage rates in nicked DNA fragments with known sequences using the polyacrylamide gel electrophoresis. Computer analysis of the cleavage pattern in the 3'-end labeled and primarily intact strand reveal cleavage enhancement in the regions of about 10 b. p. up and down the nicks which were initially produced into complementary strand. The intensity of cleavage near the nicks is (in average) about 20 times higher than cleavage in the same sites of the intact dsDNA fragments. At the same time, the cleavage rates in positions beyond the regions of the nick markedly grow weak even comparing to the sequence-specific cleavage of intact double-stranded DNA fragments [1]. Thus, the presence of the nick serves as an expressive structural indignation, which exceeds modulation of the structure caused by the base-pair sequence and is capable of absorbing mechanical stresses applied to the nearby sites of the molecule.

[1] S. L. Grokhovsky, I. A. Il'icheva, D. Yu. Nechipurenko, L. A. Panchenko R. V. Polozov, and Yu. D. Nechipurenko, Ultrasonic Cleavage of DNA: Quantitative Analysis of Sequence Specificity, *Biophysics (russ)*, Vol. 53, No. 3, 2008, pp. 208–209.