2P121 DFT calculations on attacking mechanism of radicals to DNA base pair

Naoko Okutsu, Hideaki Tamai, EtsuKe Shimizu, Noriyuki Kurita (Toyohashi University of Technology)

Recently, the influence of radiation on human body has been recognized as a serious problem. In particular, highly-reactive radicals produced by the radiation react with DNA, resulting in damage on its structure and electronic properties. It is thus important to investigate the reaction mechanism of radicals to DNA for elucidating the initial damage in DNA induced by the radiation. In the present study, we search for the transition states of the attacking mechanism between base-pair (G-C or A-T) and radical (OH and H radicals) in vacuum and in water, using the density functional theory calculations. The results elucidate that OH radical can cause mutation in A-T base pair, while H radical affects significantly on G-C base pair.

2P122 Condensed DNA is unfolded into elongated conformation at ethanol concentration around 80%

Yuki Oda1, Yuko Yoshikawa2, Tadayuki Imanaka2, Kenichi Yoshikawa1 (1Graduate School of Life and Medical Sciences, Doshisha University, 2Department of Biotechnology, College of Life Sciences, Ritsumeikan University)

We report that condensed DNA caused in ethanol solution becomes solvable at ethanol concentration around 80%. Through the observation of individual giant DNA molecules by use of fluorescence and bright microscopes, it becomes clear that DNA undergoes a reentrant coil-to-globule-to-coil transition with the increase of ethanol concentration. CD measurements indicate its secondary structure exhibits the step-wise change, B-C-A-form, corresponding to the observed reentrant transition. We will discuss the mechanism of the unfolding transition at ethanol concentrations around 80%, in relation to the possible occurrence of micro-phase segregation of the ethanol solution in the presence of DNA as a polyelectrolyte.

2P123 Effect of branched polyamine from hyperthermophile on the structure of genomic DNA

Akira Muramatsu1, Yuko Yoshikawa2, Naoki Umezawa3, ShinSuke Fujiwara1, Toshihiko Kambe1, Wakao Fukuda1, Tadayuki Imanaka2, Kenichi Yoshikawa1 (1Doshisha Univ., 2Ritsumeikan Univ., 3Nagoya City Univ., 4Kwansei Gakuin Univ., 5Nagoya Univ.)

Naturally occurring polyamines such as spermidine and spermine are present in both prokaryotic and eukaryotic cells and known to play important roles in various cellular processes. Interestingly, long- and/or branched-chain polyamines are found in thermophilic archaea and bacteria. These unique polyamines are considered to support the growth of thermophilic microorganisms under high temperature conditions. We studied the effect of these polyamines on the higher order structure of DNA by fluorescence microscopy together with atomic force microscopy. It is found that such specific polyamines exhibit the effect to bridge between the segments of genomic DNA molecule. We may discuss the role of such a bridging effect in relation to the thermordic properties.

2P124 Structural sampling of poly nucleosome by coarse-grained simulations

Hiroo Kenzaki1, Shoji Takada2 (1Advanced Center for Computer and Communications, RIKEN, 2Grad. Sch. of Sci., Kyoto Univ.)

In eucaryotes, the nucleosome is the fundamental repeating unit of chromatin, and the strings of nucleosomes take hierarchical structure. The choromatin structure may be essential for the searching mechanism of transcription factors to achieve the target sites on DNA duplex. Thus we performed structural sampling of poly nucleosome by coarse-grained protein and DNA model to investigate local structural and dynamical features of choromatin.

2P125 Action of tetrazolato-bridged dinuclear platinum(II) complexes with ester moiety on the higher order structure of DNA

Yuta Shimizu1, Akira Muramatsu1, Yuko Yoshikawa2, Takahiro Tsuchiya3, Hiroki Yoneyama4, Shinya Harusawa4, Seiji Komeda5, Tadayuki Imanaka2, Kenichi Yoshikawa1 (1Doshisha University, 2Ritsumeikan University, 3Suzuka University of Medical Science, 4Osaka University of Pharmaceutical Sciences)

Platinum-based complexes such as cisplatin and carboplatin are widely used in cancer chemotherapy. Unfortunately, their usage has been limited due to severe side effects. To minimize the side effect, various derivatives of platinum compound are actively under development. In this study, we investigated the effect of tetrazolato-bridged dinuclear platinum(II) complexes having ester group on the higher order structure of DNA by fluorescence microscopy. Single-molecule observation revealed that the potency for inducing DNA compaction was in the order propyl > ethyl > methyl ester derivatives. We will discuss the effect of DNA compaction by these platinum compounds in relation to cytotoxicity.

2P126 Three dimensional structure prediction of RNA-protein complexes by MD simulation

Kei Yura1, Junichi Ikawari2, Michiaki Hamada1, Kiyoshi Asai3,4, Tomoshi Kameda4 (1Grad. School of Humanities and Sciences, Univ. of Ochanomizu, 2Grad. School of Frontier Sciences, Univ. of Tokyo, 3Faculty of Science and Engineering, Waseda Univ., 4CBRC, AIST)

RNA-protein interactions play fundamental roles. To understand these interactions, it is necessary to know the three-dimensional structures of RNA-protein complexes. However, determining the tertiary structure of these complexes is often difficult, suggesting that an accurate prediction method for RNA-protein tertiary structures is needed. Previously, we propose a novel method based on docking for predicting three-dimensional structures of RNA-protein complexes, which had higher success rates than other methods. However, our method requires the apo form structure of both protein and RNA. Comparing with protein, quite few structures of RNA are determined. Thus, we developed a novel method based on MD simulation from protein structure and RNA sequence.