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Cationic porphyrin induced B-Z transition of AT-rich DNA

Yun Jung Jang and Seog K Kim
Yeungnam University, Republic of Korea

Cationic porphyrins interact with DNAs. Binding mode of porphyrins depends on various factors including nature of DNA sequences and the periphery substituents. Trans-bis(N-methylpyridium-4-yl) diphenyl porphyrin (trans-BMPyP) also bind to DNAs. Upon binding to poly[d(A-T)2], typical circular dichroism (CD) spectrum in the DNA absorption region for B-form was reversed, suggesting formation of left-handed helical structure (Z-form). The formation of Z-form was confirmed by 31P NMR, in which a single 31P peak of B-form was split into two peaks, reflecting two distinctive environments for the DNA phosphate groups, which is typical for Z-form DNA. Trans-BMPyP-induce B-Z transition occurred specifically for polynucleotide having alternated AT sequences. No other combination of nucleobase sequence produced similar B-Z transition. This observation is in contrast with typical DNA sequence, alternating GC sequence (poly[d(G-C)2]), that exhibits the B-Z transition. Cationic porphyrin has been known to intercalate between GC base pairs, while they stack along AT-rich DNAs. Pattern of stacking along DNA stem may be an important factor for this alternating AT sequence-specific B-Z transition. B-Z transition of alternating AT sequence requires at least 14 base-pairs, supporting the importance of porphyrin stacking along AT stem. The position of cationic ion on the periphery methyl pyridine ion also takes an essential role. When the methyl group locates at meta- or para-position, both cationic porphyrins similarly induce B-Z transition, while that at ortho-position, in which free-rotation of pyridine ring is sterically prevented, did not. This observation also indicated the importance of stacking of porphyrins along poly[d(A-T)2] stem, because the former two porphyrins can be planar, therefore can stack each other. On the other hand, ortho-trans-BMPyP cannot be planar and stacking is inefficient.

Biography

Yun Jung Jang has her expertise in ligand-DNA interaction and synthesis of metal complexes that interact with DNA. She has her PhD degree at Daedu Catholic University and worked in Yeungnam University as a Research Assistant Professor in the DNA-drug interaction field. Presently, she is Assistant Professor in the College of Basic Education, Yeungnam University.

mailto:jyj5014@ynu.ac.kr