DNA interacts with metal ions and their complexes

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Metal ions play critical roles in the biological functions of DNA (e.g., replication, transcription, etc.). Here we describe our recent efforts in investigating novel metal complexes as potential artificial metallonucleases or anticancer agents, as well as their mechanisms of action. Simple Copper(II)-L-histidine complexes can promote efficient cleavage of plasmid DNA and dideoxynucleotide dApdA under physiological pH and temperature *via* a hydrolytic path. [1] A Mg(II) diethylenetriamine (Mg-dien) complex can also act as a novel artificial nuclease by promoting DNA hydrolysis under similar conditions. [2] Our findings may shed lights on developing more effective artificial metallonucleases as well as in elucidating the mechanisms of natural nucleases. Organometallic complexes of Ti(IV) and Sn(IV) show pronounced antitumor activities and is currently under clinical development as novel anticancer drugs.[3] Our mechanism studies show that they bind strongly to the phosphate group of DNA, in contrasts with that of cisplatin which binds predominately to nitrogen atoms of nucleobases.[4] We have also developed novel metal complexes of Sn, Ti, Ru, Ni, Co, Cu, showing promising cytotoxicity against various experimental tumor cell lines *in vitro*. A new complex $[Co(phen)_2tpphz]^{3+}$ has been synthesized and it can bind calf thymus DNA. When irradiated at 254.7nm, it induced strand scissions in plasmid DNA.[5]

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