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Editorial Open Access

Human Toxicity Photodynamic Therapy Studies on DNA/RNA Complexes as a Promising New Sensitizer for the Treatment of Malignant Tumors Using Bio-Spectroscopic Techniques

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Editorial

DNA/RNA complexes play an important role in many biological and catalytic systems. The variety of their functions is due in part to the diversity of metals that bind in the "pocket" of the DNA/RNA complexes system. In this editorial, we discuss synthesis and recognition of DNA/RNA complexes and argue group theory of them. Upon metalation the DNA/RNA complexes system deprotonates, forming a dianionic ligand. The metal ions behave as Lewis acids, accepting lone pairs of electrons from the dianionic DNA/RNA ligand. Unlike most transition metal complexes, their color is due to absorption(s) within the DNA/RNA ligand involving the excitation of electrons from π to π^* ($\pi \rightarrow \pi^*$) DNA/RNA complexes orbitals. Most DNA/RNA complexes contain a metal ion in the center of the planner DNA/RNA complexes system, resulting in a kinetically inert complex. If, however, the ionic radius of the metal ions is too large to fit into the hole in the center of the macro cycle, they are located out of the ligand plane, distorting it. These kinetically labile Sitting–Atop (SAT) complexes display characteristic structural and photo induced properties that strongly deviates from those of the regular DNA/RNA complexes [1-26].

In addition, DNA/RNA complexes functional unit is located in the photosynthetic reaction center and play an important role in biological process such as light energy conversion, Oxygen transport and catalysis. Studies on water–soluble and insoluble DNA/RNA complexes have elucidated aspects of the mechanisms of metal ion incorporation into DNA/RNA to form DNA/RNA complexes. Neglecting the overall charge of the macro cycle, monomeric free–base DNA/RNA complexes in aqueous solution can add protons. The composition of the complex was recognized by bio–spectroscopic techniques such as Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR–FTIR), FT–Raman, UV–Vis, HR Mass, ^{1}HNMR, ^{13}CNMR and ^{31}PNMR bio–spectroscopies. The equilibrium constant (K) was found to be 6–12. It should be noted that a possible mechanism is discussed in details.

On the other hand, DNA/RNA complexes are biochemically important, medically useful and synthetically interesting compounds. In general, there are several routes that can be followed to afford DNA/RNA complexes such as tetramerization, synthesis of DNA/RNA complexes, condensation of DNA/RNA complexes and cyclization of open chain DNA/RNA compounds. The mechanism of Photodynamic Therapy (PDT) has been mentioned as well.

Furthermore, the synthesis of water–soluble DNA/RNA complexes has been discussed. This synthesis includes condensation, followed by metal insertion, oxidation, demetallation and deboronation reactions. This compound accumulated within human glioblastoma U87MG cells to a significant higher extent than structurally related DNA/RNA complexes and localized preferentially in the cell lysosomes. Human toxicity studies are shown that both compounds are non–toxic even at a dose of 250 mg/kg. It is concluded that the DNA/RNA complexes is a promising new sensitizer for the treatment of malignant tumors.

Moreover, reducing agents hydroxylamine hydrochloride and metallic Rhenium (Re) have catalytic effect on the rate of the Rhenium (Re) incorporation into DNA/RNA complexes. These reactions was studied at pH 2–6 and 20–30°C. Rhenium (Re) in one oxidation has large ionic radius and cannot incorporate well into the DNA/RNA complexes core. Rhenium (Re) deforms the DNA/RNA complexes plane favorably for attack of Rhenium (Re) from the back side. It should be noted that the mechanism is described in details.

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