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DESIGN, ANTITUMOR AND OTHER BIOLOGICAL ACTIVITY OF QUADRUPLE-BONDING CLUSTER DIRHENIUM(III) COMPOUNDS AND THEIR SYNERGISM WITH CISPLATIN

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Abstract: Among known metal-based anticancer drugs and drug candidates dirhenium(III) compounds differ profoundly due to their strong antiradical and antioxidant properties stipulated by quadruple bond unsaturation. Such opportunities that metal complexes have as their versatile redox chemistry should be exploited for creating more efficient anticancer drugs. Combination of drugs leads to synergistic effects and/or to lowering toxicity of platinides and is very promising in cancer chemotherapy. Dirhenium(III) quadruple-bonded compound of 6 classes with organic, haloid or phosphate ligands and their linkage are presented. Cluster formation stabilized unusual for rhenium state of oxidation +3. Position of the absorption bands in the area of $\delta \rightarrow \delta^*$ transition is dependent from the quantity of conjugated circles around cluster fragment. Encapsulation of dirhenium(III) compounds to liposomes led to additional activation of the quadruple bond. Quadruple bond with δ-component is able to scavenge an unpaired electron and to diminish oxidative stress that presents a new type of antioxidants. Dirhenium(III) compounds have their own anticancer activity that is mainly conditioned by dirhenium cluster fragment but depends on the nature of the ligands, bind to different targets in cancer cells exploiting both the redox regulation potential of the cluster fragment and its coordination ability as well. The synergistic effect in application of cisplatin and dirhenium(III) cluster compounds showed eliminated tumor growth and provoke cancer cells death with high efficiency. Combination of two metal based compounds switched some additional signal transduction pathways crucial for cancer cells survival or death and overcome resistance to cisplatin. Dirhenium(III) compounds as mighty antioxidants behaved themselves as antihemolytics, hepato- and nephroprotectors. Some modern trends in the field of anticancer therapy are also considered regarding their connection to the rhenium-platinum system efficiency: use of combinational therapy and nanomaterials; involvement of some biologically active ligands and redox-activation strategy, etc.

Key words: Dirhenium(III) compounds, cisplatin, combinational anticancer therapy, antioxidants, antihemolytics, hepato- and nephroprotectors.

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