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LETTER TO THE EDITOR

Reaction of *cis*-Diamminedichloroplatinum(II) with Arabinogalactan. The Identification and Therapeutic Effect of the Product Obtained

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Abstract—A reaction of *cis*-diamminedichloroplatinum(II) with the natural polysaccharide arabinogalactan gave a product characterized by X-ray powder diffraction, IR spectroscopy, UV spectrophotometry, and thermogravimetry. It was demonstrated that *cis*-diamminedichloroplatinum(II) is bound to arabinogalactan by a linkage between its –C–O–C– bond and the hydrogen atom of the NH_3 group of the starting complex. The product can suppress tumor growth with no toxic effect on the organism.

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cis-Diamminedichloroplatinum(II) is a first-generation anticancer drug used to treat malignant tumors; it is moderately toxic and poorly soluble [1, 2]. To improve its characteristics, we carried out a reaction of *cis*-diamminedichloroplatinum(II) with the natural polysaccharide arabinogalactan. Having improved bioavailability and exhibiting gastroprotective, membranotropic, and immunomodulatory properties [3, 4], this polysaccharide can be employed as a biologically active matrix for *cis*-diamminedichloroplatinum(II). This enhances the pharmacological properties of the drug, making it more efficient and selective but less toxic; in addition, the drug has a longer beneficial aftereffect, its side effects being diminished.

The modified drug was obtained as described in [5]. A 50% solution of arabinogalactan (4.68 mL) was added to a vigorously stirred 0.156×10^{-3} M aqueous solution of *cis*-diamminedichloroplatinum(II) (30 mL). The reaction mixture was kept at room temperature for 30 min, heated on a water bath in a neutral medium for 15 min, and filtered through a paper filter (blue ribbon). The product obtained was isolated and purified (to remove low-molecular-weight impurities) by precipitation into ethanol. The yield of the product was 85% (platinum content 1.05%). The product was characterized by X-ray powder diffraction, IR spectroscopy, UV spectrophotometry, and thermogravimetry.

The IR spectrum of the starting compound *cis*-diamminedichloroplatinum(II) shows two absorption bands at 3286 and 3205 cm^{-1} (N–H stretching vibrations). In the IR spectrum of the product obtained, the absorption bands are shifted to the lower frequencies ($\nu_{NH} = 3192$ cm^{-1}) characteristic of amino complexes of platinum(II) [6]. The absorption bands at 1100–1000 cm^{-1} (–C–O–C– stretching vibrations [7]) are also shifted from 1078 and 1042 cm^{-1} in arabinogalactan to 1058 and 997 cm^{-1} in the product, respectively. These data suggest that the starting complex is bound to arabinogalactan in the product obtained.

According to thermogravimetric data, *cis*-diamminedichloroplatinum(II) begins to decompose at 300°C; the product obtained shows an endothermic peak at 340°C, which is not exhibited by arabinogalactan. It is known that the arabinose content of arabinogalactan is 12% [7]. The ^1H NMR spectra [8] show a relatively narrow line ~6 kHz wide against the background of a wide line due to dipolar couplings that cannot be averaged in solids. Most likely, the narrow line relates to fragments of the arabinogalactan macromolecule (probably, its side chains). The integral intensity of this line is about 15% of the number of ^1H nuclei in the sample. All the data presented above lead us to a conclusion that the reaction of *cis*-diamminedichloroplatinum(II) with arabinogalactan yields a product in which *cis*-diamminedichloroplatinum(II) may be bound to arabinogalactan by a linkage between its –C–O–C– bond and the hydrogen atom of the NH_3 group of the starting complex. The *cis*-diamminedichloroplatinum(II) content of the product is 1.61% (platinum analysis data).

Testing of the product obtained for anticancer effect on the growth of Ehrlich ascites carcinoma revealed its ability to suppress the tumor cell growth with no toxic effect on the organism. The product obtained is 3.5 times more efficient than *cis*-diamminedichloroplatinum(II), being three times as soluble as the latter.

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