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IN VITRO STUDIES ON DECORPORATION OF POLONIUM-210 FROM BLOOD CELLS

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When ions of ^{210}Po enter the blood stream, they disappear quickly from the plasma and are bound to erythrocytes. Therefore, an in vitro method for evaluating the efficiency of various chelating agents in mobilizing ^{210}Po bound to blood cells was developed. Thus, the in vitro effects of chelating agents could be compared with those observed in vivo.

Female Wistar rats (180 220g) were injected intravenously (iv) with ^{210}Po (8 kBq/rat). After a defined time interval blood was collected and washed out three times with the incubation solution and then incubated with added chelating agents at 37 ^{o}C. After centrifugation, alpha radioactivity in the supernatant was measured by the liquid scintillation method and compared with that of the control supernatant without chelating agents. Sodium salts of the following chelating agents were used in 3 mM concentration: 2,3-dimercaptopropane-1-sulphonate (DMPS, Unithiol), meso-dimercaptosuccinate (meso-DMSA), rac-dimercaptosuccinate (rac-DMSA), N,N'-diethylamine-N-carbodithioate (diethyldithiocarbamate, DDTC), N,N'-dimethyl-ethylenediamine-N,N'-biscarbo-dithioate (MeTTC), N,N'-diethylethylenediamine-N,N'-biscarbodithioate (EtTTC) and N,N'-di(2-hydroxyethyl)-ethylenediamine-N,N'-bis-carbodithioate (HOEtTTC).

In the first series of experiments blood collected 2 days after iv injection of ^{210}Po with an incubation time of 5 h was used. The most efficient chelators were vicinal dithiols rac-DMSA and DMPS, which released 72% and 63 % of ^{210}Po bound to blood cells, respectively, whereas the control supernatant contained only 2% and 1 % of bound ^{210}Po. meso-DMSA released only 6 % of bound ^{210}Po. From dithiocarbamates EtTTC and MeTTC released 24% and 21 % of bound ^{210}Po; DDTC and HOEtTTC were inefficient. The latter two chelators released 3 and 2 % of bound ^{210}Po, respectively.

In the second series of experiments the influence of incubation time on the amount of released ^{210}Po was investigated using DMPS. In the case of blood collected 2 days after injection of ^{210}Po, nonsignificant differences in the released radioactivity of ^{210}Po were found at incubation times of 1, 3, 5, 7 and 9 h. When blood collected 7 days after injection of ^{210}Po was used, dependence of the amount of released ^{210}Po on the incubation time was observed. After 1 and 9 h incubation 45% and 53% of bound ^{210}Po were released, respectively.

Our results indicate a difference in the ability of chelating agents to mobilize ^{210}Po from the body in vivo and from the blood cells in vitro. Bisdithiocarbamate HOEtTTC and its parent compound DDTC, which were effective in mobilizing ^{210}Po from the body in vivo, are not able to mobilize ^{210}Po bound to blood cells in vitro.

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