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DETERMINATION OF GALLIUM IN BIOLOGICAL SAMPLES. K.Nakamura & H.Orii. Tokyo Metropolitan Institute of Medical Science.

To clarify the effect of carrier on the accumulation of Ga-67 to the tumor cells, it is necessary to know the content of stable Ga, as well as Ga-67, in the cell or tissues. We report the comparison the several methods for the determination of stable Ga in biological samples. Spectrophotometric methods; all three methods (Rhodamine B, Oxine, and PAN methods) are those by the solvent extraction, and therefore, it is possible to measure directly from homogenized solution without the wet digestion. In Rhodamine B method, 0.3 µg of Ga can be detected, however, HNO_3 gives interference on the determination. PAN and Oxine methods have less sensitivity but better reproducibility than Rhodamine B method. Atomic Absorption Spectrometry (AAS) : Results are obtained in several seconds. In the flame-AAS, 1 ml of 4 ppm of Ga should be supplied in the state of soluble. In the flameless-AAS, all state (either liquid or solid) of sample can be supplied for analysis and 0.2 ng of Ga is detectable. Electron Probe Microanalyzer (EPMA) ; In this system, three factors; what elements, how much, and where in the cell, are analyzed at the same time. 6pg of Ga can be detected with 5% deviation. By this method, it is possible to clarify the localization and distribution of Ga in the cell.

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MECHANISM OF GA-67 INCORPORATION TO CULTURED CELLS. K.Nakamura & H.Orii. Tokyo Metropolitan Institute of Medical Science.

The mechanism of tumor uptake of GA-67 has been studied on cell culture systems. The uptake in cells is influenced by such factors as pH, culture medium composition and culture vessel materials. Our results obtained indicated the presence of a fundamental mechanism which dictates GA-cell incorporation.

Materials & methods; L5178Y cells were cultured in fischer's medium supplemented with 10 % calf serum. Incorporation was studied while the cells are in stationary phase. GA-67 strongly attached to the glass surface under pH dependence, and showed the similar pattern to that of cell incorporation, i.e., the maximum at pH 4.5. ultracentrifugation study revealed the presence of GA-aggregates at this pH. Inhibition to glass surface absorption was identical to the inhibition to cell incorporation by addition of chelating agents such as edta and citrate. pH dependent changes of cell incorporation and glass absorption was reversible.

These results indicate that GA attaches to the cell surface before it is incorporated in the cell. So far, it supports the Glickson's hypothesis that GA makes polymers to be incorporated in cells.

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UPTAKE AND EXCRETION OF Ga-67 AND Tl-201 IN CULTURE CELLS (THIRD REPORT). A.Muranaka. T.Kaji.Y.Ito.N.Otsuka.K.Nagai.I.Narabayashi. T.Yokobayashi.H.Terashima and M.Hashimoto. Kawasaki Medical School and Kawasaki Paramedical School. Kurashiki.

To assess the accretion mechanisms of Ga-67 citrate and Tl-201 chloride in tumors,the effects of sera on kinetics of both nuclides were studied in vitro. Ga-67 uptake by HeLa S3 in MEM containing 1% normal human serum (HS) was 3 to 4 times greater than that in MEM only. But the uptake gradually decreased as the concentration of HS increased . In fetal calf serum(FCS) Ga-67 uptake did not tend to increase. Tl-201 uptake was markedly inhibited by HS and FCS. With human transferrin(hTF),Ga-67 uptake increased along with increase of concentration of hTF and reached a peak at 50 µg/ml-medium. But Ga-67 uptake gradually decreased as the concentration of hTF increased. Effect of hTF was similar to that of HS. Ga-67 was clearly associated with hTF by equilibrium dialysis. From these results it seemed that the binding of Ga-67 to hTF played an important role in Ga-tumor deposition. However,Ga-67 uptake was markedly stimulated with 0.01~0.1 mM $FeCl_3$ regardless of the absence or presence of serum. In the same condition Ga-67 binding to hTF was inhibited and Fe-Ga complex was formed,which was not dialyzed through the cellulose membrane. The results indicate that there is another Ga-accretion mechanism probably involved in Fe-Ga complex, being not mediated by transferrin.

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COMPARISON OF THE UPTAKE OF GA-67 AND Fe-59 BOUND TO PLASMA BY RETICULOCYTES. S.Nakano, Y.Hasegawa, K.Shiomura, and K.Ibuka. The Center for Adult Diseases. Osaka.

The uptake by rabbit reticulocytes of Ga-67 bound to rabbit plasma was compared with that of Fe-59. Reticulocyte uptake of Ga-67 was 5-7 % that of the Fe-59 after a 60 min incubation at 37 C. The process was temperature dependent. After incubated for 60 min at 37 C with either Ga-67 or Fe-59 bound to plasma, washed reticulocytes were reincubated in unlabeled plasma. Upto 95 % of Ga-67 and 6-8 % of Fe-59 in the reticulocyte were released. Uptake by rabbit reticulocyte of Ga-67 or Fe-59 from heat inactivated human serum of various percent saturation of iron was compared with control normal serum using Fletcher's method as follows;

labeled patient serum		labeled control serum
+		+
control serum		patient serum
+		+
reticulocytes		reticulocytes
uptake rate (P)		uptake rate (C)

Ratio P/C of Fe-59 correlated with percent saturation of patient serum iron, but that of Ga-67 was about 1. Uptake rate P (= C) of Ga-67 related inversely to percent saturation of patient serum iron. The behavior of the two isotopes showed a significant difference.