Uptake and Binding of Gallium and Selen in Malignant Tumors

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Many clinical investigations on the uptake of gallium in malignant tumor have been performed since the first report of Hayes and Edwards in 1969, and the evaluation on its applicability and on its limit have been well recognized. However, no fundamental mechanism of its uptake has been understood as yet. In this presentation the results on experimental approach by way of solid experimental tumor of rat and mouse are reported.

The uptake of gallium by solid Yoshida sarcoma of rat increases rapidly and gets its highest value 12-20 hrs after intraperitoneal injection, and the visualization by scintillation camera is possible at this point where higher radioactivity was found in tumor as well as in liver and spleen, in contrast to brain and muscle which contained little radioactivity. By subcellular fractionation radioactivity was distributed mainly in 105,000g supernatant in tumor as well as in normal tissue, and no specific localization of radioactivity was found in tumor tissue. In supernatant fraction gallium-protein binding of different intensity was found by Sephadex column chromatography eluted with 4M KCI and 6M urea, which revealed the presence of a gallium-protein binding not ionic, non hydrogen-bond in nature, i.e., no radioactivity was released from the peak. In respect to the relationship of gallium uptake and tumor growth, uptake by solid tumor treated with nitrogen mustard-N-oxide was compared with that of control, and it was found that no decrease in its uptake was observed in treated tumors. X-irradiated tumor gave the same results. These findings, togather with the results obtained in regenerating rat liver (no increase of uptake after partial hepatectomy) suggests that the uptake of gallium by tumor may be independent on tumor growth processes. Selen-selenite, in contrast to gallium, does not concentrate to tumor as gallium does, and the biological half life is relatively long. This fact may not favor its use as a scanning agent. In virto study of gallium and selen is in progress.

Comparative Study of the Distribution of ^{67}Ga-Citrate, ^{111}In-Chloride and ^{75}Se-Selenite in Tumor Bearing Mice Using a Semiconductor Detector

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Numerous recent reports have indicated that ^{67}Ga-citrate is readily taken up by malignant tissues. In addition there has been recent evidence that ^{111}In-chloride and ^{75}Se-selenite are also preferentially incorporated into tumors. In order to evaluate the above findings, the authors have studied the uptake of these isotopes by Ehrlich's tumor bearing mice. Because of the difficulty inherent in detecting these three isotopes with a conventional Nal (Tl) detector, the experiments were performed with a Ge (Li) semicondutcor detector.