

M) Brain and Nervous System

Autoradiographic Study on the Origin of Positive Brain Scan

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The exact causes of positive brain scan in tumor and non-tumorous conditions are still obscure.

The purposes of present paper is to study the mechanisms by which the radiomolecules commonly used for brain scanning and extracellular tracers are accumulated in brain tumors, hypoxic brains and brain edemas by means of autoradiography.

Twenty brain tumors were produced in mice using methylcholanthrene and studied with radioactive neohydrin, sucrose and inulin by light and electron microscopic autoradiography. By light microscopic autoradiography, ^{203}Hg -neohydrin was found mostly in the tumor cells, which was confirmed to be in the cytoplasm associated with vacuolar system on electron microscopic examination. On the other hand, ^{14}C -inulin and sucrose were seen almost exclusively in the enlarged extracellular space.

Severe, acute hypercapnic hypoxia was produced in 12 rats by induced hypoventilation and deposition of ^{203}Hg -neohydrin and extracellular tracers in the brain was studied. Light microscopic autoradiograms revealed that inulin and sucrose remained in moderately dilated extra-

cellular space, while neohydrin was found to be incorporated into damaged neurons and swollen astrocytes.

The uptake of ^{203}Hg -neohydrin and ^{131}I -RISA in cold induced brain edema of rats and dogs was studied by macroscopic and light microscopic autoradiography. The uptake of both radiomolecules was well corresponded to the extension of the edema. RISA showed to accumulate more in the white than grey matter, while neohydrin did diffusely over the edematous area which was also mainly incorporated in the damaged neurons and swollen astrocytes.

From these studies, it might be concluded that the pinocytotic activity of tumor cells and existence of enlarged extracellular space are the most important factors for a scanning agent to be accumulated in tumor tissue and therefore to make positive scan.

On the other hand, the cause of positive scan with non-tumorous conditions such as brain edema and hypoxic brain might be attributed to passive diffusion of tracers through damaged cell membrane of neurons and glial cells.