XI. Metabolic Tracer II

Comparative Studies on the Distribution of $Na^{131}I$, ^{131}I-HSA, ^{131}I-AA, and ^{131}I-MAA by the Freezing Wholebody Macroradioautography

O. MATSUOKA, M. KASHIMA and E. MURAMATSU

Division of Radiation Hazards, National Institute of Radiological Sciences

Microradioautographic studies in mice were carried out to clarify the effect of physico-chemical state, especially of particle size of ingested isotopes on their distribution.

Four isotopes, $Na^{131}I$, ^{131}I-HSA, ^{131}I-AA ^{131}I-MAA, were chosen as test materials which represent ionic, molecular, colloidal and macro-particlar states respectively.

F_1 hybrid mice of CF#1 and RF strain (30-35 g of body weight) were employed in all experiment. Animals which were intravenously injected above isotopes under the condition of thyroid block by NaI solution or non-block were serialy sacrified 10 min., 30 min., 1 hr., 3 hrs. and 24 hrs. after injection.

Freez-dried whole-body tissue section (40 μ thick) were exposed to high speed industrial X-ray film.

Radioautogram showed that $Na^{131}I$ was highly accumulated in thyroid, salivary gland, stomach, seminal vesicle, bladder and skin at 30 min. after injection.

It was demonstrated that ^{131}I-HSA showed a distribution pattern independent on time which seems to represent the normal blood distribution in whole body level. This distribution pattern is very useful to evaluate the contribution from the isotopes retained in the determination of incorporated isotopes by various organs.

^{131}I-AA was mainly accumulated in liver, and also at considerably high level in bone marrow of whole body and in spleen.

In ^{131}I-MAA, maximum deposition was observed initialy in lung and slightly in liver and spleen, but at 24 hrs. after injection, it was demonstrated that initialy deposited isotope in lung was gradually transfered to the liver or spleen and deposited therein.

In all animals in which thyroid was not blocked, high uptake of ^{131}I in thyroid were observed in all types isotopes.

Pre-treatment by thyroid blocking agent did not produce a reduction of salivaly gland uptake.

A Study on the Capacity of Permeability and Absorption in the Pulmonary Cavities and Lesions

— with Special Reference to the Analysis of Blood Radioactivity Curves and Autoradiography —

I. HIRAMA

The First Department of Internal Medicine, Nihon University School of Medicine

Examinations have been made on the pearmeability and absorptive capacity of various kinds of pulmonary cavities and lesions of experimental (172 rabbits in all) tuberculosis, suppuration, candidiasis, Brown-Pearce cancer, edema of pleural origin, and normal lung tissues, by employing ^{32}P, from a special viewpoint of analyzing blood radioactivity curves, primarily, and autoradiography. The following are the results thus

obtained.

1. The pursuit of ^{32}P (injected into varied pulmonary inflammatory diseases—tuberculosis, suppuration and candidiasis), transferred into blood flow, reveals that any tissues of those diseases has presented higher values (prompt type) than those of normal lung tissues but that in such noninflammatory diseases as Brown-Pearce pulmonary cancer and pulmonary edema values obtained have been lower (delayed type) than those of normal lung tissues.

2. The ^{32}P transfer from experimental cavities of pulmonary tuberculosis, suppuration and candidiasis, into blood flow, has formed gentle reductive curves with peaks around the 10th to the 25th minute, the pulmonary suppurative cavities showing the fastest permeability and in decreasing order of the pulmonary candida cavities and pulmonary tuberculous ones. Compared with cases in which ^{32}P injections were made into lesions, cases in which that were made into cavities has produced delayed transfer into blood flow; a marked difference has been observed between the two.

3. In reduction half time ($T\frac{1}{2}$), derived from the analysis of blood radioactivity curves, differences have been obtained between various diseases and cavities: in pulmonary suppurative lesions its average is 2′ 55″ which is the shortest, in Brown-Pearce pulmonary cancer 5′ 42″ which is the longest.

4. Correlationship has been observed to a considerably large extent between characters of each lesion and cavity, and the ^{32}P transfer into blood flow. Cases of fresh lesion and cavity and of thin wall cavity have presented rapid permeability and absorption, especially in pulmonary suppuration the difference has been conspicuous. The $T\frac{1}{2}$ also has showed the similar result.

5. Difference in the category of ^{32}P solvent has produced difference in the rate of ^{32}P transfer into the blood flow, giving varied blood radioactivity curves. Hypotonic solvents (distilled water, 5% glucose solution, physiological NaCl solution) have presented curves of reductive type with peaks at early parts of the period, while hypertonic solvents (25% and 50% glucose solution) produced curves of gradual increase type in which the blood radioactivity is seen to rise gradually.

6. Examination of the route of liquid absorption from the lung tissues, through the lymphatic vessel has shown a marked difference in lymph radioactivity between normal lung tissues and pulmonary edema, the later giving a marked transfer of ^{32}P in the lymph and presenting higher values than those of the blood radioactivity.

7. In macroautoradiogram ^{32}P activity has been found out from the intracavity to the pericavity lesion through the cavity wall, and in microautoradiogram gradual decrease of ^{32}P uptake has been observed in decreasing order of the internal layer of the cavity wall, the external layer of the cavity wall, the surrounding lesion and then to normal lung tissues. This observation has substantiated the permeability of the cavity wall, and a cytological characteristic of intracellular uptake of ^{32}P has been seen though to a slight degree.

Distribution of Cerebral Blood Flow in Dogs During CO_2 Inhalation Measured by the Use of ^{131}I and ^{125}I Macroaggregated Alubumin

H. Ueda, S. Hatano and T. Gondaira

The Second Department of Internal Medicine, the University of Tokyo, Tokyo

Distribution of cerebral blood flow was estimated using autoradiography after infusion of ^{131}I monojod methane by Kety et al. and also using ^{85}Kr or ^{133}Xe clearance method by Lassen et al. It is well known that CO_2 increases cerebral blood flow. However, by these techniques, little is known whether the response to CO_2 is different in various cerebral tissue components or not. Regional distribution of myocardial blood flow was measured using ^{131}I macroaggregated albumin (MAA) by Ueda et al. This method was