The area scanning shows two dimentional maps of distribution of radioisotopes deposited in internal organs. The whole body scanning should be a time-consuming procedure, requiring more than two or three hours for a scintigram of whole body when a conventional scanner is used. Such a whole body scintigram should demonstrates an inaccurate map of radioactivity if the distribution of radioisotopes changes fast as compared with the scan.

We have constructed a new whole body scanner of high speed. Using a special mechanical device, two detectors of the scanner can be moved in synchronous with high speed, up to 500 cm/min. The scanner consists of two opposed detectors, each having a 5-inch in diameter by 2-inch thick NaI crystal, and the mechanical dot recording system. This scanner can make a whole body scintigram in less than 10 min with maximum speed. The quantitative measurement of radioactivity deposited in internal organs will be attainable by proper analysis of the scan record, which is made from oopposite sides of the patient. (Cf Journal of Nuclear Medicine Vol 10, Pp. 265-269) The repeats of scan in a short interval bring the useful information about the dynamic changes of distribution of radioisotopes in the body. These procedures using the whole body scanner will make fundamental data required not only in medical tracer study but also in calibulation of exposure dose of radioisotopes and assessment of its hazard.

The bone or bone marrow is one of tissues dispersing in whole body. The whole body scanning has an advantage over a partial one if the systemic diseases of the bone and bone marrow are concerned. The scintigrams of bone and bone marrow are presented and discussed in details.

Whole Body Autoradiography

O. Matsuoka

Division of Radiation Hazards, National Institute of Radiological Sciences, Chiba

Freezing whole body autoradiography (W-B autoradiography) has become very useful tooles for the metabolic studies on drugs and other radioactive materials. However, it is necessary to apply this technique with full knowledge of its advantage and also disadvantage. The major information which will be expected to obtain by this technique is the relative concentration of the isotope in various organs, and it will be expected poor information as to the retention an fraction of isotope in each organ. It should be, therefore, to employ with other supplemental methods.

In generally, W-B autoradiography is considered to be superior to other autoradiographic techniques in its no translocation and releasing of target radioactive materials from the specimen during its preparation, in the possibility of the making considerably large specimen, and in the relative high resolution.

The advantages of this technique from the point of view in whole body distribution studies are as follows; 1) The largest information in quality and quantity which is expected to be obtained from single animal. 2) The relative concentration gradient of the isotope in various organs is clearly demonstrate and be able to distinguish the local distribution in the organ simultaneously. 3) The information of the special istribution for which it is impossible or very difficult to be caught by other techniques such as in the case of intraperitoneal or subcutaneous injection and fetus in utero can exactly demonstrate. 4) The possibility of the checking of the own experimental proceure in view of physico-chemical character of the material and administration method. 5) Expanded application field to the region of radioactive material by the activation autoradiography.

On the other hand, the disadvantage of this methods are as follows; 1) The time consuming procedure in its specimen preparation and long exposure. 2) The difficult identifying of

the distribution of the target substance and its metabolite separately upon the autoradiogram. 3) The technical difficulties of the quantitative measurement of radioactivity in organs especially in absolute measurement.

Several technical developments which aim to reduce the disadvantage above mentioned were explained by showing results of this experiment. These are activation autoradiography, ultra high speed autoradiography and color autoradiography.

The applications of this technique into the field of nuclear medicine were demonstrated using some experimental results.

Whole Body Autoradiography Using the Larger Animals

M. SAKUMA and Y. SATO

Biological Research Laboratory, Tanabe Seiyaku Co., Ltd.

Whole body autoradiography is able to provide a direct picture of the distribution of the given radioactive compounds in almostly all organs and tissues of the body.

The great majority of cases judging from the literatures, whole body autoradiographic studies are carried out on mice. However, it is essential that various kinds of animals including cats, dogs and monkeys should be employed in the investigations. In addition, by employing those larger animals we can more easily analyze the distribution of radioactive compounds in detail at the macro-level and more easily treat the experimental animals for proper procedure such as lumbar anesthesia.

For those reasons we have been tried to extend the scale of the whole body autoradiographic technique and have successed in cutting whole body sections, at 60 to 80μ in thickness, suitable for autoradiographic studies from animals with body weight up to about 2 Kg.

The animals treated with the proper radioactive compound are anesthetized with ether and frozen by immersion in a mixture of dry-ice and acetone or liquid nitrogen. Then the frozen animals are fixed on the stainless steel stages attached with the microtome, type Leitz 1300, and mounted with carboxy methyl cellulose paste. The whole body sections at 60 to 80μ in thickness are performed with the microtome at $-20°C$ in a cryostat and are kept at the same temperature for 3 to 5 days in it for drying them. Autoradiographic exposure is made by apposition the sections against the Sakura X-ray film, type N, in a refrigerator for necessary period.

Example 1. The distribution of ^{203}Hg-mercury compounds in cynomolgus monkeys

The comparative studies on the distribution of ^{203}Hg-mercuric chloride (^{203}Hg-MC) and ^{203}Hg-ethylmercuric chloride (^{203}Hg-EMC) in cynomolgus monkeys weighing about 1 Kg are carried out by whole body autoradiography. The compounds are administered intraperitoneally in 50% ethanolic solution in a dose of 800μg as Hg (96 μCi) per Kg of body weight. The animals are anesthetized with ether at 20 hours after the administration and are frozen in a mixture of dry-ice and acetone. The whole body sagittal sections at 80μ in thickness are performed.

The autoradiograms prepared from the monkeys treated with ^{203}Hg-MC indicated the high radioactivity in the liver, renal cortex, spleen, adrenal cortex, bone marrow, lymph nodes, alimentary mucosa, mesentery and peritoneum, while the radioactivity is low in the skeletal and heart muscle, lung, salivary gland, thymus and pancreas. The blood and skin (including the hair) showed a moderate radioactivity. The incorporation of the radioactivity into the central nervous system is negligible except existing marked radioactivity at the choroid plexus and brain blood vessels. In the blood, the radioactivity is detected only in the plasma but not in corpuscles.

The noteworthy difference in the autoradiograms of ^{203}Hg-EMC is that the concentration of mercury in the central nervous system