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

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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

is very remarkable. The radioactive concentration is also remarkable in the heart muscle, skeletal muscle, lung, tongue, mucosa of oral cavity and of throat, salivary gland, spleen, mucosa of digestive canals, but it is not observed in the digestive canals and cavities of the glands. In the blood, the radioactivity is detected in the corpuscles but not in plasma contrary to the case of ^{203}Hg-MC.

Example 2. The distribution of ^{3}H-Quatacaine administered intrathecally in cats

Whole body autoradiographic studies are made on the distribution of a radioactive local anesthetic, ^{3}H-Quatacaine administered intrathecally in cat. Spinal anesthesia is experimentally induced in cats, weighing about 900g, by injection of 2.5% solution of ^{3}H-Quatacaine into the spinal canal at the fifth lumbar interspace. Whole body sagittal and transverse sections at 60μ in thickness are performed with the microtome, type Leitz 1300, at 5 and 20 minutes after the administration.

It is demonstrated that ^{3}H-Quatacaine and/or its metabolites are distributed in most of the tissues and organs soon after the administration. The highest radioactivity in vein from vena azygos to vena dorsalis showed that the venous drainage might be the main route of departure of ^{3}H-Quatacaine.

In the spinal canal, Considerably high radioactivity is found in the dura mater, the periphery of the spinal cord and dorsal nerve root at subarachnoid space. The concentration of radioactivity is higher in the grey mater especially at the posterior horn than in the white mater of the cord. The ganglion cells showed higher accumulation of radioactivity than the nerve fibers of the spinal ganglion.