Effect of X-Ray Single Whole-Head Irradiation on Glycolysis and Hormonal Function and Their Modifying Factor

A. Tsuya, S. Suzuki and T. Sugawara

Department of Radiology Cancer Institute Hospital, Tokyo

A. Shigematsu

Department of Radioisotopes Research Institute of Tuberculosis, Tokyo

The following results were obtained.

1. Glycolysis was depressed dose-dependently, mainly in anerobic phase (macroautoradiographic finding in mouse). Biochemical studies are in progress to confirm these findings.

2. High O₂-inhalation increased the radiation effect remarkably, but hypothermia exert minimum modifying effect.

3. Macroautoradiographical, blood biochemical and histological findings supported the above findings, which was generally considered as stress reaction after Selye and combined brain demage.

Analysis of the Sector Pattern Depending on Expiratory ¹⁴CO₂ Produced in Mouse Organs

S. Suzuki and A. Tsuya

Department of Radiology, Cancer Institute Hospital, Tokyo

K. Tomono, A. Shigematsu and M. Toyohara

Research Institute of Tuberculosis, Tokyo

N. Tokunaga

Japan Radiation & Medical Electronics, Inc.

In previous papers, a counting system was reported for continuous counting and recording of the radioactive flow stream¹ⁱ,¹². A mouse was injected with ¹⁴C-glucose.

¹⁴C-radioactivity in the fluid could increase as the time elapsed. When the radioactive increase in the fluid was recorded, the pattern must be a cumulative curve. The curve was differentiated for observing variations of the expiratory ¹⁴CO₂ after the injection and ¹⁴CO₂ yield in a few organs mainly contributing to the respiration of the whole body. The differential sector pattern consists of a peak and two shoulders, one located at the left side of the peak and the other at the right side.

In order to elucidate a correlation of the sector pattern and ¹⁴CO₂ yield in the main organs as the time elapsed, 3 experiments were performed.

Macroautoradiographs were made from freeze, dried whole body sections prepared from mice 30, 45, 60 and 160 minutes after the injection of 4 µCi of ¹⁴C-glucose, because the left shoulder of the expiratory ¹⁴CO₂ sector pattern was...
found at 30 minutes, the peak was at 45 minutes, and the right shoulder was at 60 minutes. Extreme accumulation of silver grains was found in the brain and central nervous cord 30 minutes after the injection, and the accumulation was cleared up as the time elapsed. The accumulation in the organs was found on the autoradiograph from a mouse 45 minutes after the injection, and the radioactive concentration arrived at a maximum level at 60 minutes. Therefore, these data show a shoulder or a peak of the sector pattern depending on a defined organ.

When the right carotid artery of a mouse was ligated without any anesthesia, the expiratory $^{14}$CO$_2$ sector pattern was much different from that of the non-ligated mouse. The remarkable difference was found on the left shoulder, and the shoulder was very low and postponed. The shoulder could be dependent on the brain respiration, because a major respiration of the right semisphere of the brain was inhibited by the above surgical operation.

The right shoulder of the expiratory $^{14}$CO$_2$ sector pattern was lost by ligating 4 legs. The muscle volumes in 4 legs are about 70% of the whole body muscle. Therefore, producing of $^{14}$CO$_2$ in muscle might be most active about 60 minutes after the injection.

Radioactivity in several organs of mice 0, 5, 10, 30 and 60 minutes after the injection of $^{14}$C-glucose was counted by a liquid scintillation counting method, because autoradiographic results could given a semiquantitative information but not quantitative one.

The counting results could give completely support to the previous 2 experimental findings. References
