

Therapeutic Action of Glutathione and Mercaptoethylamine against a Lethal Dose of X-Rays

It has been shown that the shielding of the liver *in situ* protects 73 per cent of a group of rats against a dose of X-rays which is 100 per cent lethal after fifteen days for the control animals¹. E. S. G. Barron² showed that glutathione had a protective action in mice when injected before the lethal irradiation. Bacq and his co-workers³ have shown that β -mercaptoethylamine protects mice against a lethal dose of X-rays when this compound is injected into the animals immediately before the total body irradiation. We have been able to confirm these results in rats⁴. On the other hand, the β -mercaptoethylamine is completely inactive when given even immediately after the exposure to a lethal dose.

The purpose of this short communication is to show the therapeutic action of reduced glutathione and of β -mercaptoethylamine against a lethal irradiation when the rats have the liver area shielded during the exposure. Six groups of twenty-four rats each have been irradiated over the entire body with a dose of 1,130 r. measured with the Victoreen X-ray condenser r.-meter. The apparatus used is a 250-kV. Maximar X-ray machine of the General Electric Co. The distance anticathode-animal is 55 cm., the voltage 180 kV., 15 m.amp., with no secondary filter. The first group of rats was irradiated over the entire body. A second group received the same dose, the liver area being shielded with a lead foil of 5 mm. thickness protecting an area of 5 cm. \times 3 cm. corresponding to the liver region. A third group was irradiated as the second group (liver region protected); but the animals were injected immediately after the irradiation, 6 hr. and 12 hr. later, with an intraperitoneal dose of 7 mgm. of β -mercaptoethylamine. The fourth group was irradiated over the whole body like the first group but injected with β -mercaptoethylamine as the animals of the third group. The fifth group was irradiated as the second group (liver region protected), but the animals were injected intraperitoneally with 12 mgm. of reduced glutathione immediately after the irradiation, 6 hr. and 12 hr. later. The sixth group was irradiated over the whole body like the animals of the first group, but were injected with reduced glutathione as were the animals of the fifth group. The number of survivors is shown in the accompanying table.

This type of experiment was carried out twice with the same general results, and shows that reduced

glutathione and β -mercaptoethylamine have a therapeutic action when injected into rats exposed to a lethal body-dose of X-rays if the liver area is shielded during the exposure.

We have repeated the experiment with rats having an equivalent area of the costal region protected during the irradiation. In such conditions β -mercaptoethylamine has practically no therapeutic action.

J. H. MAISIN
G. LAMBERT
M. MANDART
H. MAISIN

Department of Radiobiology,
Cancer Institute,
University of Louvain.
Nov. 6.

¹ Mandart, M., Lambert, G., Maisin, H., and Maisin, J., *C.R. Soc. Biol.*, **146**, 1647 (1952).

² Barron, E. S. G., Manhattan District Declassified Document 484. (Oak Ridge: Atomic Energy Commission, Technical and Information Division, 1946.)

³ Bacq, Z. M., and Herve, A., *Bull. Acad. R. Med. Belg.*, **17**, 19 (1952).

⁴ Lambert, G., Maisin, J., and Mandart, M., *C.R. Soc. Biol.*, **146**, 1434 (1952).

A Simple Tissue Freeze-drying Apparatus using the Principle of Short-path Sublimation

WITH increasing recognition of the advantages of the freezing and drying of tissues for cytochemical studies, it is of interest to describe a cheap and efficient drying apparatus which has been in continuous use during the past two years.

The dryer works on the principle of short-path sublimation¹ and is constructed of 'Pyrex' glass. The quenched tissue is placed in the bottom of the drying chamber (A), which is immersed in an ethyl oxalate/solid carbon dioxide mixture giving a temperature of -40°C . The top of the chamber is then placed in position and the system evacuated by a commercial diffusion pump and a rotary pump. The condensing finger is then filled with liquid air or nitrogen, which cools the condensing surface B, placed 3 cm. away from the tissues. The operating pressure is 10^{-4} to 10^{-5} mm. mercury, giving a mean free path for the water molecules of about 50 cm. This permits straight-path sublimation of the water molecules from the specimens to the condenser. At the end of the drying time, the drying chamber is slowly warmed by hot water to a temperature just above the melting point of the embedding wax used. The

Group	I	II	III	IV	V	VI
Dose	1,130 r. alone	1,130 r. + lead shield on liver	1,130 r. + lead shield on liver + 3 \times 7 mgm. β -mercaptoethylamine	1,130 r. + 3 \times 7 mgm. β -mercaptoethylamine	1,130 r. + lead shield on liver + 3 \times 12 mgm. glutathione	1,130 r. + glutathione
No. of animals	24	24	24	24	24	24
Days after X-rays						
7	4	16	20	3	24	1
14	0	8	18	0	18	0
21	0	7	15	0	17	0
30	0	5	14	0	11	0

