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RADIOBIOLOGY

Removal of Internally Deposited Americium by Chelating Agents

DURING recent years there has been considerable interest in the use of chelating agents to remove certain radioelements deposited in the body. Ethylenediamine tetraacetic acid has been investigated extensively, and more recently there have been reports that diethylenetriamine pentaacetic acid is more effective than ethylenediamine tetraacetic acid for the removal of deposited plutonium¹, and that it also increases the excretion of thorium from the body². We have studied the effect of these two chelating agents on the removal of americium-241 from the rat. Preliminary experiments showed that both reagents significantly increased the excretion of this nuclide and that diethylenetriamine pentaacetic acid was approximately twice as effective as ethylenediamine tetraacetic acid.

Groups of three young male hybrid rats of the F_1 generation bred from Marshall and August parents were injected intravenously with 0.2 μ c. americium-241 as the citrate complex. Treatment with 0.3 m.mole diethylenetriamine pentaacetic acid and 0.2 m.mole calcium gluconate, given by intraperitoneal injection in 2 ml. of solution, was started at times varying from 1 hr. to 7 days after the injection of americium-241 and repeated at weekly intervals. The rats were killed 21 days after the injection of americium-241 and the alpha activities of the liver, femur, carcass and excreta were measured by the technique described by Turner, Radley and Mayneord³.

In Fig. 1 the distribution of americium-241 twenty-one days after administration to a normal animal is compared with that in animals treated with diethylenetriamine pentaacetic acid at various intervals. The untreated animals contain approximately 40 per cent of the injected activity in the skeleton, 25 per cent in the soft tissues, and excrete about 35 per cent. When treatments with diethylenetriamine pentaacetic acid were commenced at 1 hr., 6 hr. and 7 days after the administration of americium-241, the levels in the skeleton were 7, 10 and 20 per cent, respectively, and the amounts in the soft tissues were reduced to less than 1 per cent of the

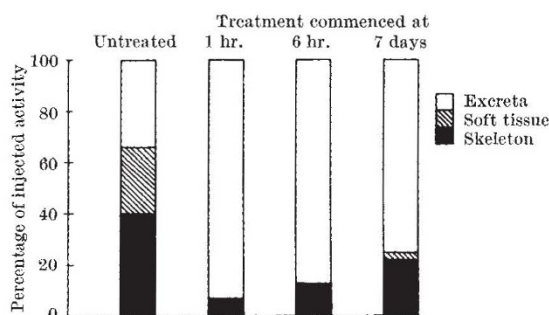


Fig. 1. Effect of diethylenetriamine pentaacetic acid on the distribution and excretion of americium in rats

injected activity. Most of the americium-241 that was removed was excreted in the urine.

It is concluded that diethylenetriamine pentaacetic acid can remove americium-241 from the skeleton and soft tissues, and that an appreciable reduction in the body burden can be achieved, particularly when the agent is administered within a few hours after exposure.

This work will be more fully reported in a later publication, which will include a comparison of the effects of multiple and single doses of chelating agent, and the effects of oral and intraperitoneal administration.

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Radiosensitivity of Mouse Kidney undergoing Compensatory Hypertrophy

WE have been interested in assessing the degree or extent of acute radiation damage to the kidneys, particularly as it may relate to late radiation effects on this organ, namely nephrosclerosis^{1,2}. Significant acute changes in renal morphology (that is, during the first month), following whole-body irradiation in the lethal dose-range, have not in general been observed^{3,4}. In this connexion, it is well known that the kidney of the normal adult exhibits only minimal mitotic activity. Therefore it was thought of interest to ascertain whether the kidney becomes radiosensitive when mitotic activity is stimulated by unilateral nephrectomy. Mitotic activity of the kidney following unilateral nephrectomy has been shown by Rollason⁵ and by Sulkin⁶ to be largely restricted to the period 48-72 hr. post-surgery.

Female mice of the ($C57L \times A$) F_1 hybrid strain were employed. A total of eighty 10-week-old animals were subjected to left unilateral nephrectomy under ethyl ether anaesthesia. The left adrenal gland was dissected free from the kidney with its blood supply intact, and spared. The excised kidney was gently