

The 2 species of *Tamiasciurus* ($2n = 46$; FN 80–88) display a considerable degree of cytological divergence from the $2n = 38$ –40 and FN 74–78 found in the majority of tree squirrels, which supports the tribal status of the *Tamiasciurini*^{28, 29, 32}.

Zusammenfassung. Chromosomensätze verschiedener Sciurinae sind: *Sciurus anomalus* ($2n = 40$), *S. grana-tensis* ($2n = 42$), *Callosciurus flavimanus* ($2n = 40$), *Dremomys rufigenis* ($2n = 38$) und *Menetes berdmorei* ($2n = 62$). Ein Vergleich mit früher beschriebenen Sciurinae-

Karyotypen ergibt als ursprünglich diploide Sätze 38–40, Spaltung, sowie Fusion zu grösseren und kleineren $2n$'s führend.

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Radioprotective Effect of Reticuloendothelial System Blockade in Mice

Reticuloendothelial system (RES) acts as a primary host defence mechanism against effete self substances, as well as against intruded foreign materials. There is good evidence that a large number of aged erythrocytes are trapped by RES in spleen and liver^{1, 2}. Our in vitro and in vivo observation, that erythrocytes treated with phenylhydrazine, saponin, or mercuric chloride were prone to adhere to peritoneal exudate cells, may be relevant to the scavenger activity of RES^{3, 4}. This scavenger activity of RES may have an important role also in the death of sublethally irradiated animals. As generally known, RES is radioresistant^{5–7}, and some authors have reported even the enhancement of phagocytosis after irradiation^{8, 9}. It was also reported that, after the exposure of animals to radiation, a lot of cell debris occurred in the blood stream and were sequestered by RES¹⁰. Of course the hematopoietic depletion is mainly responsible for the radiation-induced lethality, since radiation does not inflict great damages on the mature blood cells but suppresses the recruitment of blood cells. In this case, slightly injured cells, which still maintain a large part of their biological activity, may be assumed to function until cell recruitment is restored. In the sublethally irradiated animals, however, even these slightly injured but still potential cells would be cleared by RES, resulting in the remarkable leukopenia, and death of animals would be accelerated. If it actually proceeds in animal bodies, the 'blockade' of RES by 'overloading' with particulate material will provide the animal with a greater degree of tolerance of radiation by interfering the phagocytosis of slightly injured but still functional blood cells.

Material and method. 30-day-old male mice of ICR-JCL strain, weighing about 23 g, were used. They were divided into 4 groups of 25 mice respectively. Mice in groups 2 and 4 were injected i.v. with 10 mg of carbon particles (Pelikan ink, Günther-Wagner, Germany) suspended in 0.2 ml of physiological saline. 24 h later, mice in groups 3 and 4 were exposed to 600 R of X-ray, with a filter of 0.3 mm Cu and 0.5 mm Al, at the dose rate of 50.0 R per min, 200 KV, 20 mA. Mice in group 1 were left untreated. After the irradiation each mouse was weighed every other day for 30 days.

Results and discussion. Survival of the X-irradiated mice were shown in the Figure 1. Whole body irradiation with 600 R X-ray caused 17 in 25 mice to die in the following 14 days. On the contrary, all of the mice which had been injected with 10 mg of carbon particles prior to the irradiation escaped from death. Figure 2 shows the changes in the mean body weights of the surviving mice. In the 8 mice which escaped from death, 4 mice appeared to be completely resistant to radiation and continued to gain their body weights (S-2 in Figure 2).

Other 4 mice started losing their weights 10 days after irradiation until day 16 and then tended rapidly to recover their weights (S-1 in Figure 2).

Both lethal and wasting effects of radiation were almost completely prevented by the administration of carbon particles 24 h prior to irradiation. Mice injected with carbon particles behaved similarly to the control mice, and not a single mouse was observed to lose its weight at any time after exposure. Such a strong protective effect of carbon particles was also confirmed in another experiment in which 5 mg and 15 mg carbon particles were administered.

Although the mechanism of the protection by carbon particles from radiation-induced injury is still obscure, the present results seem to support our before-mentioned hypothesis. Concerning the divergent results on the phagocytotic response after the irradiation^{11, 12}, COTTIER¹⁰ suggested the possibility that increase in the amount of cell particles and damaged cells occurring in the irradiated animals might affect the activity of the phagocytotic cells. As RES usually shows no morphological damage⁵ and little change in phagocytotic capacity when tested in vitro^{6, 7}, one can suppose that the changes in the phagocytotic activity is not due to the direct effect of radiation but attributable to the enhanced capacity to remove damaged cells and their particles. Then the differences reported by many authors might well be explained as the results of the different level of requirement to clear denatured substances according to the degree of the injury of other tissues. In the case of animals exposed to the sublethal dose of X-ray, the 'partial blockade' with carbon particles might

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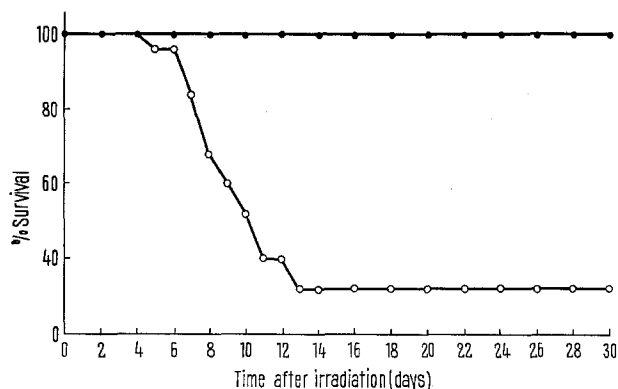


Fig. 1. Survival of X-irradiated mice which have received 10 mg of carbon particles 24 h before irradiation. ○—○, control (600 R-irradiated); ●—●, irradiated after carbon injection.

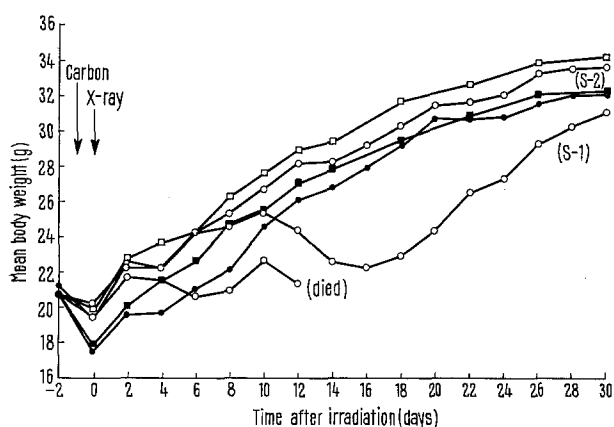


Fig. 2. Changes in the body weight of mice which have received carbon particles 24 h before irradiation. □—□, normal; ■—■, carbon-injected control; ○—○, X-irradiated; ●—●, X-irradiated after carbon injection. S-1, wasted but survived; S-2, survived without loss of body weight.

cause RES to overlook the cells which were somewhat injured but still maintain their nearly normal function.

Another possibility, however, should be taken into account: that carbon particles facilitate the recovery of hematopoietic system. This can be inferred from the observation of the radioprotective effect of carbon particles for the antibody response in rats¹³, and that of the carbon-induced hyperplasia of lymphoreticular tissue^{14,15}. In this respect, our using rapidly growing young adult mice might be of advantage, since KOJIMA et al.¹⁶ have observed, in a similar experiment, a favorable but not clearcut result as to the effect of carbon particles employing 8- to 9-week-old mice¹⁷.

Zusammenfassung. Die i.v. Injektion von Kohlepartikeln an Mäusen, 24 h vor einer Bestrahlung mit 600 R, bietet einen bemerkenswerten Strahlenschutz. Die Problematik der biologischen Schutzfunktion durch die Reticulo-histocytäre Systemblockade wird diskutiert.

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A New Interpretation of the Sex Determining Mechanism of the European Earwig, *Forficula auricularia*

It has long been known that some populations of *Forficula auricularia* L. are polymorphic for the number of male sex chromosomes. All previous authors have interpreted males with 24 chromosomes as $(22 + X_1Y)$ and males with 25 chromosomes as $(22 + X_1X_2Y)$. It follows that females in such populations should display a varying number of sex chromosomes corresponding to chromosome numbers of 24 ($22 + X_1X_1$), 25 ($22 + X_1X_1X_2$) and 26 ($22 + X_1X_1X_2X_2$). Early reports of chromosome counts from females were unreliable, usually in the expressed opinions of the authors¹⁻³. These results were the basis of the above interpretation of the sex chromosomes by some reviewers⁴, and by recent investigators^{5,6} who themselves found only 24 chromosomes in females. To clarify the issue both sexes of a suitable local population were investigated (the species has been introduced into Australia and is often common in gardens and parks).

Materials and methods. 25% of the males in a small area of the grounds of Melbourne University were found to have 25 chromosomes in 1964⁷. A quite exhaustive collection at this locality in December (early summer) 1968 yielded 188 males and 146 females from which material for this study was selected at random.

Testes from young adult males were hand-squashed in acetic-orcein, sealed and stored in the deep freeze.

Females were injected with 0.2 µl of a 0.05% solution of colcemid (CIBA) per mg of body weight, 12–16 h later the ovaries were dissected into hypotonic 1.0% sodium citrate for 5–10 min. Subsequent preparation was similar to that described for males except that the material was squashed in a hydraulic press at 600 to 800 lb in⁻².

Results and discussion. 11 females did not have the 10 or more scoreable divisions considered necessary for this study but the results in them were consistent with the results shown in Table I. The results in this table

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