were medial edema and hemorrhagic dissection of the media in every instance when rupture occurred. In some cases, minimal to marked focal intimal thickening due to fibroblastic proliferation was also evident.

It has been possible to confirm the observation that *Lathyrus* factor will promote the production of aortic aneurysms. When casein was fed at a 10-percent level with the *Lathyrus* factor, aneurysms developed in 17 of 28 rats.

Fig. 1. Rat 135 died of aortic rupture after 68 days on crude pea meal. Left lateral view of heart and lungs with trachea at the top (×1.5). The massive periaortic hemorrhage extends from the arch to the thoracic aorta.

Fig. 2. Rat 136 died of aortic rupture after 43 days on the test diet. Weigert's elastic tissue stain of the aortic arch (×75). The right-hand border illustrates the poorly developed adventitia which contains minimal fat. Note the separation of elastic fibers and the dissecting medical hemorrhage.

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Relationship between Blood Lipids and Radiation Injury in Rabbits

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Hewitt (*1*) and his associates reported that the lipoproteins of rabbit serum were markedly increased after exposure to 800 to 900 r of total body x-irradiation and that the degree of hyperlipoproteinemia was related to the survival of the animal. Entenman, Neve, and Olmstead (*2*) noted increased blood phospholipid levels in several species after whole body x-irradiation. It was reported from this laboratory that 24 hr after local exposure of the right hind limb of an otherwise completely shielded rabbit to 30,000 r of x-irradiation, a pronounced hyperlipoproteinemia and hyperlipemia can be observed. The blood lipid changes are accompanied by an increased cholesterol concentration in the irradiated muscle tissue and a significant change in the electrophoretic characteristics of the soluble rabbit muscle protein (*3*). The total data suggest that the extent of blood lipid alteration may be some direct function of the degree of radiation injury in this species. It was decided, therefore, to subject separate groups of rabbits to varying doses of local x-irradiation up to 30,000 r and determine the plasma lipid and lipoprotein concentration at each radiation level (*4*).

Ninety-eight male albino rabbits of the New Zealand strain, each weighing approximately 2 kg, were divided equally into seven groups designated A through G. Each of the rabbits in groups B, C, D, E, F, and G were subjected to local x-irradiation of the distal portion of the right hind limb in dosages of 5000, 10,000, 15,000, 20,000, 25,000 and 30,000 r, respectively, at a rate of 1000 r/min, the animals in group A serving as controls. The irradiation equipment and techniques employed were exactly as have been previously described (*3*). Immediately following exposure the rabbits were weighed, placed in individual cages in an air-conditioned animal room, and maintained on Purina rabbit chow and water, *ad*

libitum, for a period of 8 days. On the eighth day all animals were sacrificed after reweighing, blood sampling by cardiac puncture, and removal of the tibialis anticus muscle of the right hind limb under mild pentothal anesthesia. A small portion of each lightly heparinized blood sample was taken for a packed cell volume determination, and the remainder was processed to plasma by low-speed centrifugation. Plasma concentrations of cholesterol (*5*), phospholipid (*5*), and lipoproteins of the S_f 0–20 and 20–400 classes were determined (*6, 7*). The results are shown in Table 1 and Fig. 1.

The excised tibialis anticus muscles were separately fixed in 10-percent formalin, and longitudinal histologic sections were prepared for microscopic examination. Subjective analysis of the sections demonstrated an increasing continuum of muscle-tissue injury over the dose range. Although such results are not easily amenable to quantitation, they might be described as ranging from a mild dissolution of muscle cells to include the appearance of isolated nuclei at the 5000-r level to a complete disruption of muscle fibers and apparent phagocytosis at 30,000 r. The data recorded in Fig. 1 indicate that, in general, the plasma lipid and lipoprotein components measured show changes over the dose range corresponding to the increasing continuum of muscle injury.

Table 1. Auxiliary rabbit group data (means).

Number of rabbits	Dose	Net change of weight (g)	Packed cell volume (% cells)
14	0	+100	45
14	5	+ 50	43
14	10	0	45
14	15	0	43
14	20	−150	43
14	25	−150	40
14	30	−100	38

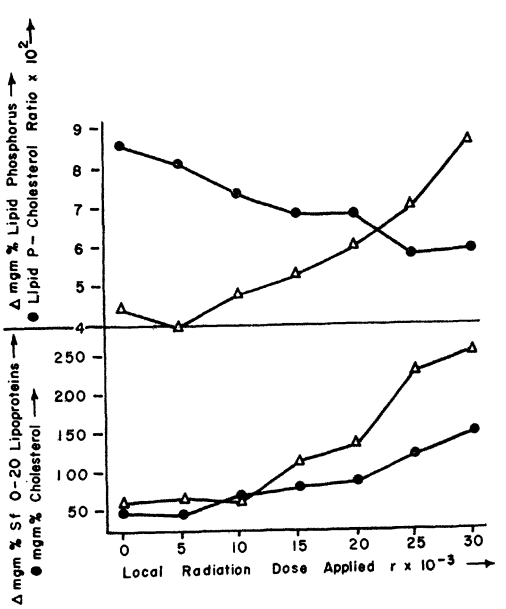

Fig. 1. Rabbit group means for plasma lipid variables versus local radiation dose applied.

If the data are viewed critically, each plasma variable reported demonstrates some unique merit. The ultracentrifugal lipoprotein determination is characterized by a mean increase of 400+ percent over the injury range, indicating high sensitivity at the more severe injury levels. The plasma cholesterol measurement is increased 20 percent on the average at the 10,000-r level—a more striking change than might be expected on the basis of the microscopic tissue section for that level of injury.

The lipid phosphorus analysis and resultant calculation of the lipid phosphorus-cholesterol ratio provide additional information from a slightly different point of view. In a series of studies in this laboratory (*3*) involving local injury inflicted by cold, heat, ischemia, crushing, or repeated injections of boiling saline, increased concentrations of plasma cholesterol and plasma lipid phosphorus were invariably observed. The increases recorded were obviously interrelated, because the ratio of two variables remained at control levels. In the present experiment, a change in the lipid phosphorus-cholesterol ratio has been noted for the first time. It would seem that this response is a specific characteristic of radiation injury.

Although dietary controls were not exercised in this study, the data in Table 1 indicate that nutritional factors were of minor import at best. The greatest mean weight change recorded for any rabbit group was of the order of 7½ percent, and the dose function of weight variation could not be correlated with any of the biochemical measurements. Similarly, the apparent mean hemodilution observed in the rabbit group exposed to 30,000 r tends, if anything, to increase the validity of the high concentration of lipid and lipoprotein plasma components recorded for that group.

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