Effect of γ-Irradiation on Blood Lipids

Six albino rats weighing about 100 g were exposed individually to 800 roentgen γ-irradiation from a CO^{60} source. Food was given *ad libitum*. The animals were killed 24 h after irradiation by decapitation and the blood was collected in oxalated containers. Control samples from six non-irradiated animals were also collected in the same way.

Whole blood was used for the determination of total lipids, cholesterol, and phospholipids. Total lipids were estimated by the method of BRAGDON[1] on individual blood samples and the results are expressed as mg of $K_2Cr_2O_7$ reduced by 100 ml of blood. Cholesterol was determined by the method of ABBEL[2] on pooled samples. After extraction and digestion of phospholipids with perchloric acid, phosphorus was estimated by the method of KING[3] on pooled samples.

	Total lipids mg $K_2Cr_2O_7$/100 ml of blood	Total cholesterol mg/100 ml of blood	Phospholipid P mg/100 ml of blood
Normal	8 686 ± 580	95	9.9
Irradiated	12 063 ± 480	103	9.8

Results. ROSENTHAL[4] noted the occurrence of opalescence in serum of rabbits exposed to X-irradiation. This was ascribed to an increase in lipids and was correlated with the death of the animal. Since then many reports have appeared on the changes of blood lipid fractions due to irradiation[5-10]. These changes depend upon the species of the animal, the irradiation dose, and the post-irradiation period. Working with different species, ENTENMAN *et al.*[10] have shown a rapid change in rabbit plasma as compared with those of other animals. Phospholipid phosphorus (PLP) levels have been found to increase rapidly in rabbit plasma within 8 to 24 h; 2nd to 3rd day in the case of rats, and 9th to 11th day in the case of dogs following irradiation. In the present study, although we have observed a rapid increase up to the extent of 38.8% in total lipids, no increase is observed in PLP level. A slight increase is noted in cholesterol level. The latter two fractions may increase after a longer post-irradiation period.

KOHN[5] has reported no change in PLP in rats 1–4 days after irradiation. BUCHANAN *et al.*[7] have reported an increase in PLP 48 h after irradiation, but they report that the increase in PLP is roughly proportional to the increase due to white blood cell (W.B.C.) destruction by the irradiation. If the slight increase in initial stages is due to W.B.C. destruction and subsequent release of lipid fractions in plasma, such an increase will not be observed in our study, as whole blood was used for the assay. Work carried out in our laboratory has shown an increase of 10–11% of total body lipids in carcasses of the animals. However, at the present stage of our studies, it is too early to say whether the increase in total lipids in blood is due to increased synthesis of fat or due to mobilisation of fat from the fatty depots to the tissue on account of the irradiation injury. Work on this line is in progress in our laboratory.

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Zusammenfassung

Der Einfluss einer Ganzkörperbestrahlung mit CO^{60}-γ-Strahlen auf die Blutlipoide von Ratten wurde untersucht. Die Gesamtblutlipoide waren 24 h nach der Bestrahlung um 38,8% erhöht. Die Cholesterin- und Phospholipoidkonzentration des Bluts blieb unverändert.

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Das allgemeine Bauprinzip des Lamellarsystems der Chloroplasten[1]

Kürzlich hat HEITZ[2] in dieser Zeitschrift nachdrücklich darauf hingewiesen, dass die als Schichten bezeichneten Lamellenpakete in den Chloroplasten aussen von Lamellen begrenzt werden, die dünner sind als die Lamellen im Inneren des Lamellenpaketes. In granaführenden Chloroplasten erscheinen ausserdem die Lamellen zwischen den Grana dünner als die Lamellen in den Grana. Die Erklärung für diese Tatsache ergibt sich zwanglos aus dem Bauprinzip des Lamellensystems der Chloroplasten, welches kürzlich durch Untersuchungen über die Morphogenese der Chloroplastenstruktur aufgeklärt wurde[3]. Dieses Bauprinzip hat sich inzwischen als allgemein gültig erwiesen, wenn es im einzelnen auch mancherlei Abwandlungen erfährt.

Die Bauelemente des Lamellensystems sind in sich geschlossene Doppellamellen. Diese besitzen in ausgewachsenen granafreien Chloroplasten etwa den gleichen Durchmesser wie die Chloroplasten. Im Chloroplasten bilden je zwei oder mehr Doppellamellen ein Lamellenpaket (Fig. 1a und b). Dabei sind die Doppellamellen so eng zusammengelagert, dass im Inneren des Lamellenpaketes je zwei einzelne Lamellen als eine dicke Lamelle erscheinen können. Chloroplasten mit Granastruktur enthalten ausser den grossen, durchgehenden Doppellamellen, den sogenannten Stromalamellen, noch Granalamellen, welche den Durchmesser der im Lichtmikroskop sichtbaren Grana besitzen. Diese sind ebenfalls in sich geschlossene Doppellamellen. Bei typischer Ausbildung der Lamellarstruktur wechseln innerhalb eines Lamellenpaketes Stromalamellen und Granalamellen miteinander ab. Durch dichte Packung nähern sich die Lamellen auch hier so sehr, dass in den Grana sich je eine einzelne Granalamelle und eine einzelne Stromalamelle

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berühren. Infolgedessen erscheinen die Lamellen in den Grana etwa doppelt so dick wie die Lamellen in den Bereichen zwischen den Grana (Fig. 1c). Chloroplasten, deren Lamellensystem noch nicht voll entwickelt ist, zeigen jedoch eindeutig, dass die dicken Lamellen aus je zwei einzelnen Lamellen bestehen (Fig. 2). Dort, wo sich nämlich zwei Doppellamellen oder Lamellenpakete vereinigen, kann man das Entstehen der dicken Lamellen direkt beobachten. Auch nach der Zusammenlagerung lässt sich in den dicken Lamellen eine helle Trennlinie wenigstens andeutungsweise erkennen.

Ob die Packung der Doppellamellen in den Chloroplasten lebender Zellen ebenfalls eine so dichte ist wie in elektronenmikroskopischen Präparaten, werden erst Untersuchungen über die Verteilung des Wassers in den Lamellenpaketen zeigen.

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Summary

The lamellar system of chloroplasts consists of close double lamellae. In electronphotomicrographs, the walls of two adjacent double lamellae can be seen as one thick lamella. Because of this, the lamellae in the inner portion of a lamellar packet appear about twice as thick as those at the boundary of the packet and, in chloroplasts that contain grana, the granalamellae appear twice as thick as the stromalamellae.

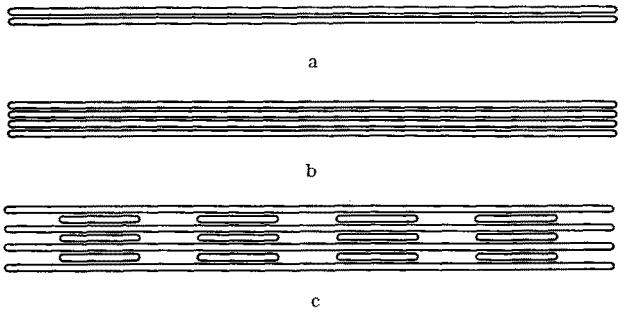

Fig. 1. Lamellenpakete aus Chloroplasten in schematischer Darstellung a) Schicht aus zwei Doppellamellen. b) Schicht aus vier Doppellamellen. c) Schicht aus einem granahaltigen Chloroplasten.

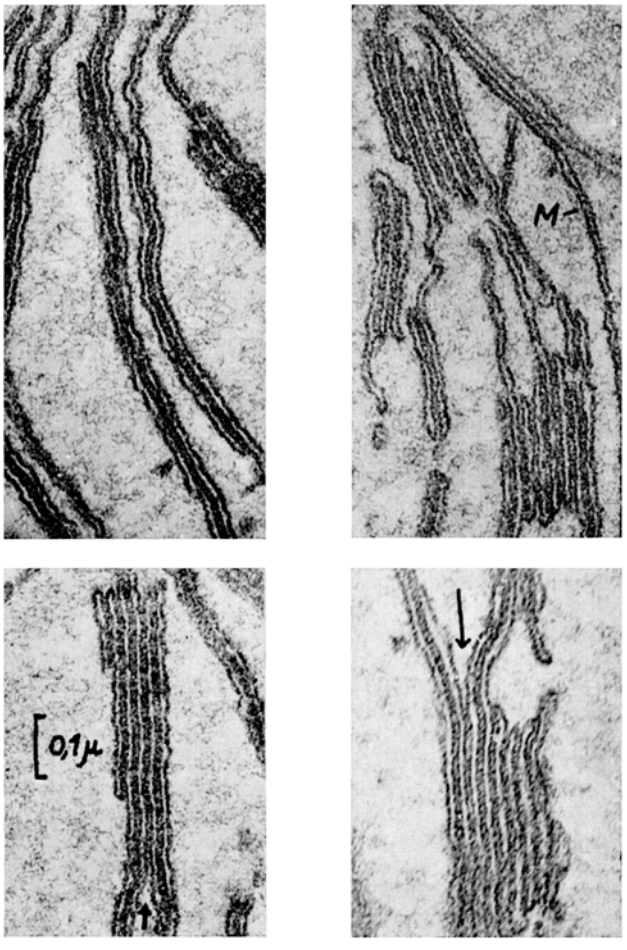

Fig. 2. In Entwicklung begriffenes Lamellensystem in Chloroplasten von *Elodea canadensis*. Chloroplasten aus dem oberen Teil eines 5 mm langen Blättchens. An den durch Pfeile gekennzeichneten Stellen vereinigen sich zwei einzelne Lamellen zu einer dicken Lamelle. M Plastidenmembran. Kaliumpermanganatfixierung.

The Uptake of Coumarin by Helianthus Hypocotyl Segments

In a previous paper, an auxin-like action was ascribed to coumarin[1]. From interaction studies of coumarin with indoleacetic acid (IAA), it has been concluded that the mode of action of coumarin differs from that of IAA in promoting extension growth in the plant tissues[2]. The uptake studies which will be reported here seem to support this view.

Hypocotyl segments of *Helianthus annuus* were prepared and used as previously described[2]. Coumarin was determined either spectrophotometrically at 277 mμ, or colorimetrically using the diazotisation reaction[3,4]. The last method can be used specifically for lactones. Generally the concentration of coumarin used was 1.3×10^{-3} *M*, which was found previously to be optimal for the stimulation of growth of sunflower segments. Coumarin uptake by the sunflower segments, as measured by following the changes in coumarin concentration of the external solution, gives the following results:

The rate of uptake declines strongly with time and stops entirely after about 10 h. At this time, the internal concentration equals the external one.

The Q_{10} of the uptake of coumarin between 3°–26°C is less than 1.2, both for the first 3 h and for the period of 3rd–12th h.

The rate of uptake of coumarin by the segments, under nitrogen, is the same as under air, although there is a clear reduction in the rate of their growth.

NaCN at 5×10^{-3} *M*, a concentration which stops growth entirely, does not reduce the rate of uptake of coumarin.

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[7] The author wishes to express his thanks to Dr. ALEXANDRA POLJAKOFF-MAYBER, under whose supervision this work was carried out, for her guidance and interest.

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