TABLE 1

MEDIAN LETHAL CONCENTRATIONS ($\mu g/cm^2$) FOR DDT-RESISTANT AND SUSCEPTIBLE DROSOPHILA

	Females			Males		
	Resistant (R)	Control (C)	Ratio (R/C)	Resistant (R)	Control (C)	Ratio (R/C)
DDT	2670	830	3.22	2460	550	4.47
Other chlorinated insecticides						
DDD	48.1	28.1	1.71	43.0	27.0	1.63
Lindane	0.141	0.0611	2.30	0.105	0.0447	2.34
118	0.0237	0.0199	1.19	0.0207	0.0148	1.40
Toxophene	2.98	1.85	1.61	1.66	1.09	1.53
Methoxychlor	23.9	15.9	1.50	21.7	14.2	1.52
Nonchlorinated insecticides						
Parathion	0.251	0.206	1.16	0.217	0.212	1.02
Sabadilla	1.11	1.18	0.94	1.12	1.10	1.02
Pyrethrum	122	127	.97	118	112	1.06
Nicotine	18.5	20.1	.92	18.6	17.1	1.09
TEPP	10.0	10.1	0.99	9.74	9.70	0.99

midity are responsible for great fluctuations in mortality; humidity was therefore kept constant at about 56%. At the end of 6 hr, the flies were removed and placed in food vials, and mortality counts were recorded 24 hr later. The reason for selecting 6 hr as the time of treatment is the peculiar shape of the dosage-response curves with DDT at longer periods of exposure, a relation which makes quantitative interpretation difficult.

Tests were made with 10 insecticides other than DDT. These were DDD, Lindane (benzene hexachloride), 118 ("Aldrin"), toxophene, methoxychlor, parathion, sabadilla, pyrethrum, nicotine, and TEPP (tetraethylpyrophosphate). Commercial grades were used. The DDT was a highly purified product furnished by E. I. du Pont de Nemours & Co.

The results of these tests are shown in Table 1 and Fig. 1. The median lethal dose was determined for most insecticides by Karber's method, which under certain assumptions provides a maximum likelihood solution (*6*). When this method was not applicable, the Fisher-Bliss maximum likelihood method was used (*7*). The LD_{50} is given in μg of insecticide/cm^2 of filter paper area.

About 4 times the DDT concentration was required for the resistant strain as for the susceptible strain from which it was derived. As can be seen from the table, the first 5 of the other insecticides tested showed a similar, but lesser, differential mortality between the 2 strains. All these are chlorinated compounds. On the other hand, there was no significant difference in the response of the 2 strains to the 5 nonchlorinated compounds. Thus it appears that when flies are selected for resistance to DDT there is some carry-over of resistance to other chlorinated compounds, but very little, if any, to other contact insecticides.

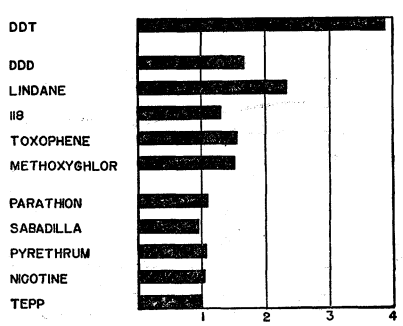

FIG. 1. Ratio of median lethal concentrations for resistant and control strains of Drosophila (av of both sexes).

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The Relation of Oxygen Uptake to Hemoglobin Synthesis[1]

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During an as yet unpublished investigation of the capacity of bone marrow of normal and x-radiated rabbits to form hemoglobin, measurements of oxygen consumption during the first 3 hr of a 24-hr incubation period were carried out. Bone marrows of normal rabbits and of rabbits exposed to 800 r of x-rays were

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removed at varying time periods after exposure to radiation. Homogenates were prepared from these marrows and incubated at 38° C in the presence of α-C^{14}-glycine[2] as a hemoglobin precursor, as previously described (*1, 2*). Oxygen consumption of these homogenates was determined by means of the usual Warburg-Barcroft technique using modified 300-ml Warburg vessels. After incubation, hemoglobin was isolated by precipitation with 2.8 *M* phosphate buffer according to Green (*3*); from this preparation protoporphyrin dimethyl ester was isolated according to Grinstein (*4*) and globin according to Anson and Mirsky (*5*). The C^{14}-activity of the products isolated was determined as described briefly in a previous publication (*6*). The relationship between oxygen consumption and hemin and globin synthesis under conditions which result in changes in the ability of the marrow to synthetize hemin and globin is apparent from the data presented in Table 1.

TABLE 1

Time after exposure to 800 r of x-radiation*	O_2-uptake in μl/g wet wt of marrow/3 hr	mM of hemin synthesized × 10^{-6}/mM of hemin isolated	mM of globin synthesized × 10^{-3}/mM of globin isolated
No radiation	218	6.2	3.3
0 hr	640	31.2	6.7
48 "	120	2.1	9.7
72 "	82	1.4	3.6
1 week	.....	0.7	2.1
2 weeks	71	1.6	1.3
3 "	151	4.0	0.5
4 "	261	8.6	3.0

* The animals were sacrificed and bone marrows removed at the time indicated.

The number of millimoles of hemin and globin synthesized was calculated on the basis of the following considerations. The capacitance of the ionization chamber used for C^{14}-analysis was determined. The change in voltage per minute permitted calculation of the number of radioactive atoms decaying per minute by use of the number of ion pairs produced by each particle. The number of atoms decaying per minute was related to the number of radioactive atoms present in accordance with the decay function. By correcting this number by a dilution factor, the number of atoms synthesized was obtained.

The results indicate a difference in the time relation between oxygen consumption and the synthesis of hemin and globin, respectively. It can be seen from Table 1 that hemin synthesis as well as oxygen consumption increases considerably in a parallel manner in homogenates from bone marrows removed immediately after radiation. Furthermore, oxygen consumption and hemin synthesis appear to reach a minimum about 1 week after exposure to radiation at a time when marked degenerative changes prevail in the marrow. Globin synthesis also increases after radiation, but, in contrast to hemin synthesis, it reaches a maximum 48 hr after radiation at a time when oxygen consumption already approaches a minimum value. However, the decay curve of globin resembles in its shape that of oxygen consumption and hemin synthesis. Recovery of all three functions begins 2–3 weeks after radiation, which agrees well with histological findings.

A detailed investigation of the unexpected finding of increased oxygen consumption and hemin and globin synthesis in the early period following radiation is now in progress.

[2] We are indebted to the Isotopes Branch, Oak Ridge National Laboratory, for supplying the α-C^{14}-glycine (C^{14}-activity: 11.36 μc/mg glycine) used in these experiments.

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Extensibility and Minimum Number of Polypeptide Chains in the Collagen Micelle[1]

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The orderly pattern in which collagen diffracts x-rays is believed to depend on the presence of constituent ribbonlike units, or "micelles" (*1, 2*). Their accepted thickness is estimated to consist of about 4–6 parallel polypeptide chains (*3*), but neither the minimum total number of polypeptide chains forming each collagen micelle nor the number of chains lying in continuity within the micellar length is, to my knowledge, mentioned in the literature. Hence, in an attempt to estimate these figures, data on the physicochemical structure of collagen will be correlated.

From the study of the x-ray diffraction pattern of silk fibroin (*4, 5*) it is possible to infer that the polypeptide chain is probably the structural backbone in the molecule of the proteins of the fibrous class, to which both silk and collagen belong. In silk, where this chain is practically fully stretched and where the angles between bonds are almost planar, the individual amino acid residues take origin at a distance of 3.5 A from each other (*5*). The length of an amino acid residue in collagen is about 2.85 A (*6*), and this indicates that in this polypeptide chain the angles between bonds are smaller than the corresponding ones in

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