'Amberlite IR-120' and 'IR-4B'. The effluent was evaporated under reduced pressure to a syrup, which contained 2-deoxy-D-ribose and unchanged 3-deoxy-D-glucose. This was fractionated by chromatography on several large sheets of Whatman No. 1 filter paper⁸ (solvent, butanol : ethanol : water, 40 : 11 : 19 v/v). The 2-deoxy-D-ribose was eluted from the appropriate strips of paper with cold water and the aqueous solution evaporated to a syrup (80 mgm.), $[\alpha]_D^{20} - 31^\circ$ (c, 1.0 in water). The syrup was characterized by the formation of N-phenyl-2-deoxy-D-ribosylamine prepared by refluxing it in ethanolic solution with one equivalent of aniline¹. The product, after two recrystallizations from ethanol, had melting point and mixed melting point 169–170°, $[\alpha]_D^{20} + 141^\circ$ (12 min.) $\rightarrow + 47^\circ$ (72 hr., constant value) (c, 0.40 in pyridine); and analysis gave C, 63.3; H, 7.2; N, 6.2 per cent; calculated for $C_{11}H_{16}O_3N$: C, 63.2; H, 7.2; N, 6.7 per cent.

One of us (P. A. J. G.) wishes to thank the City of Bristol Education Committee for a maintenance grant.

P. A. J. GORIN
J. K. N. JONES

Department of Chemistry,
University, Bristol.
Aug. 13.

¹ Deriaz, R. E., Overend, W. G., Stacey, M., Teece, E. G., and Wiggins, L. F., *J. Chem. Soc.*, 1879 (1949).

² Prins, D. A., *Helv. Chim. Acta*, **29**, 1 (1946).

³ Fried, J., and Walz, D. E., *J. Amer. Chem. Soc.*, **74**, 5468 (1952).

⁴ Barker, G. R., and Smith, D. C. C., *Chem. and Indust.*, **30**, 1035 (1952).

⁵ Hemming, J., and Ollis, W. D., *Chem. and Indust.*, **31**, 85 (1953).

⁶ Flood, A. E., Hirst, E. L., and Jones, J. K. N., *Nature*, **160**, 86 (1947).

Amount of Gamma-Benzene Hexachloride picked up by Resistant Houseflies bred on a Medium containing Benzene Hexachloride

NEW information on the nature of resistance of the housefly, *Musca domestica*, to benzene hexachloride (BHC) was obtained in the course of experiments comparing the pick-up of gamma-benzene hexachloride by normal flies (Hawthorndale stock) with that by a strain having very high resistance to this insecticide.

The resistant flies originated in Uruguay, but had since been reared through many generations to yield a strain the larvæ of which were able to tolerate 0.5 per cent gamma-benzene hexachloride in their food. Those here considered had been reared throughout their larval life on a diet containing this amount of toxicant. The pupæ were removed by flotation, and the flies, which were allowed to emerge in clean jars, were fed on uncontaminated milk and sugar.

Three days after emergence the adult flies were exposed to deposits of carbon-14 labelled gamma-benzene hexachloride on filter paper inside a Petri dish for periods varying from 15 min. to 16 hr. The benzene hexachloride picked up was separated as two fractions, 'outside' and 'inside', using a technique similar to that described by Armstrong, Bradbury and Britton¹. The 'outside' fraction, obtained by rinsing the insects with carbon tetrachloride, we regard as being in the superficial layers of the epicuticle; the 'inside' fraction, obtained by grinding

Table 1. AMOUNT OF GAMMA-BEN ENE HEXACHLORIDE PICKED UP BY FLIES (IN μ GM./GM. FLY) DETERMINED RADIOCHEMICALLY

Time of exposure (hr.)	Non-resistant			Resistant			Difference between totals
	'Out-side'	'In-side'	Total	'Out-side'	'In-side'	Total	
$\frac{1}{2}$	13	11	24	5	1	6	18
1	19	21	40	13	8	21	19
2	17	26	43	15	15	30	13
4	19	34	53	20	32	52	1

the rinsed insects with anhydrous sodium sulphate and extracting with carbon tetrachloride, comprises the insecticide in the internal insect tissues. Both fractions were determined by combustion to carbon dioxide, which was isolated as barium carbonate for counting. Results of several experiments, each with twenty female flies, are summarized in Table 1.

It is clear that in the first two hours, resistant flies picked up less carbon-14-labelled benzene hexachloride than normal flies, both 'outside' and 'inside'.

As it was possible that the resistant flies already contained benzene hexachloride transmitted from earlier stages (Hoskins³ has observed such an effect with DDT-resistant flies), adults and puparia from larvae reared on a medium containing benzene hexachloride were analysed, using the colorimetric method described by Armstrong, Bradbury and Standen². It was found, from two determinations on a total of 150 puparia and 150 female flies, that gamma-benzene hexachloride was present in the intact puparia to the average amount of 40 μ gm./gm. fly and in the adults to 17 μ gm./gm. fly. This is enough in the adult to account for the difference between that picked up by the resistant and non-resistant flies.

It may be argued from these results that: (1) resistance to gamma-benzene hexachloride by houseflies is not due to resistance to penetration of the insecticide; (2) a detoxification mechanism is unlikely in flies resistant to benzene hexachloride, since these carry over in their tissues from the larval stage enough insecticide to kill normal flies in a few minutes.

A detailed account of this work will appear elsewhere. We are indebted to our colleagues at Widnes Laboratory, Messrs. R. Hill, F. P. Johnson and C. Whimpenny, for the synthesis of benzene hexachloride from carbon-14-labelled benzene and the separation of the isomers by chromatography. Mr. H. Standen carried out the colorimetric analyses.

F. R. BRADBURY
P. NIELD

Research Department,
General Chemicals Division,
Imperial Chemical Industries, Ltd.,
Widnes.

J. F. NEWMAN

Hawthorndale Laboratories,
Jealott's Hill Research Station,
Central Agricultural Control,
Imperial Chemical Industries, Ltd.,
Bracknell, Berks.
Aug. 19.

¹ Armstrong, G., Bradbury, F. R., and Britton, H. G., *Ann. App. Biol.*, **39**, 4, 548 (1952).

² Armstrong, G., Bradbury, F. R., and Standen, H., *Ann. App. Biol.*, **38**, 3, 555 (1951).

³ Hoskins, W. M., "Conference on Insecticide Resistance and Insect Physiology", National Academy of Sciences—National Research Council, Pub. No. 219, Washington, D.C., 1952, p. 33.