In other cases, the addition of the third component did not produce a rapid reaction of the di-isobutene, and the boron trifluoride did not combine with the added vapour. Examples of this class which we have studied are oxygen, hydrogen sulphide and hydrogen chloride. In each of these cases, the final addition of water vapour to the non-reacting mixture produced rapid reaction.

The addition of ammonia vapour to the non-reacting catalyst-monomer mixture results in the instantaneous combination of the ammonia with the boron trifluoride, in approximately equal molar quantities, but has no effect upon the di-isobutene reaction. The subsequent addition of water vapour to this mixture produces the rapid reaction of di-isobutene.

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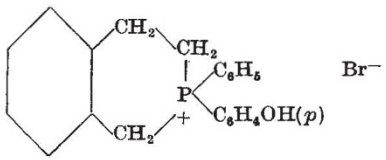
[1] Evans, A. G., Meadows and Polanyi, *Nature*, **158**, 94 (1946). See also Evans, A. G., Holden, Plesch, Polanyi, Skinner and Weinberger, *Nature*, **157**, 120 (1946). Evans, A. G., and Polanyi, *J. Chem. Soc.*, in the press. Plesch, Polanyi and Skinner, *J. Chem. Soc.*, in the press.

An Optically Active Quaternary Phosphonium Salt

OF organic derivatives of phosphorus (that is, containing C—P links), the only type which has hitherto been resolved into optically active forms is that represented by the general formula $R^1R^2R^3P \rightarrow X$, where R^1, R^2 and R^3 are different alkyl or aryl groups and X is either oxygen or sulphur: Meisenheimer *et al.*[1] have resolved tertiary phosphine oxides, for example, phenyl-benzyl-methyl-phosphine oxide, and Davies and Mann[2] have similarly resolved phenyl-*p*-carboxymethylphenyl-*n*-butyl-phosphine sulphide.



We have now developed a general synthesis of 2 : 2-diaryl-1 : 2 : 3 : 4-tetrahydro-*iso*-phosphinolinium salts. One member of this series, namely, 2-phenyl-2-*p*-hydroxyphenyl-1 : 2 : 3 : 4-tetrahydro-*iso*-phosphinolinium bromide (see formula), we have resolved through the *d*-camphor sulphonate and isolated in the optically pure state having $\alpha_D + 0{\cdot}34°$, $[M]_D + 32{\cdot}9°$. This bromide shows considerable optical stability and undergoes no perceptible racemization when boiled in alcoholic solution.

This, therefore, represents the first example of an optically active quaternary phosphonium salt, a compound which, in general structure, is closely related to 2-phenyl-2-*p*-chlorophenacyl-1 : 2 : 3 : 4-tetrahydro-*iso*-arsinolinium bromide, the resolution of which we have recently recorded[3].

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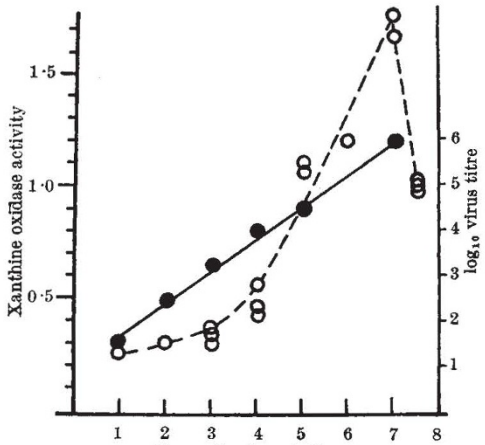
[1] *Ber.*, **44**, 356 (1911). *Ann.*, **449**, 224 (1926).
[2] *J. Chem. Soc.*, 276 (1944).
[3] *J. Chem. Soc.*, 550 (1943).

Xanthine Oxidase and Virus Growth

So far as is known, viruses appear to possess no enzyme activity; the virus particles, in order to multiply, must presumably utilize the enzyme-substrate reactions of the host cells, or else have a selective affinity for the products of host metabolism. It is thus possible that an investigation of the biochemical activities of tissues containing a growing virus might disclose an abnormality of enzyme action which would yield information upon the metabolic activities of the virus itself. With this object in view, preliminary studies have been carried out upon the xanthine oxidase content of the brains of mice with yellow fever encephalitis.

A group of mice were inoculated intracerebrally with 10^5 LD_{50} of the 17*D* strain of yellow fever virus. Each day after the inoculation a mouse was selected at random, the brain was removed, ground with 5 c.c. distilled water and centrifuged. The supernatant fluid was tested for xanthine oxidase activity by the Thunberg technique; a part of the supernatant liquid was also inoculated into mice in serial decimal dilutions in order to determine the titre of virus present. The results are shown in the accompanying graph.



●, virus titre. ○, xanthine oxidase activity

The titre of virus in the brain rises steadily to a maximum of 10^6 on the seventh day, when symptoms of encephalitis appear. Throughout this incubation period the amount of xanthine oxidase in the brain (expressed in arbitrary units) also rises. The normal level of enzyme activity in mouse brain lies between 0 and 0·2 in the units adopted; in the mouse brain infected with yellow fever virus, the activity rises to a value of 1·7 at the time of onset of symptoms. As paralysis increases the enzyme content falls, and reaches a value of 1 or less when the animal is moribund. Similar results were obtained with the neurotropic and Asibi strains of yellow fever virus, and with the virus of lymphocytic choriomeningitis.

The question naturally arises as to whether the observed increase of enzyme content in these virus infections is significant or purely a chance finding. As encephalitis develops, a round-cell infiltration of the brain appears, and it might be that these round-cells, presumably lymphocytes, attracted to the brain by an unknown stimulus, bring xanthine oxidase with them in an incidental manner. This point was investigated in two ways: