

of the sections in the γ -globulin region gave two precipitin lines, only one line was obtained at each end of the precipitin range, corresponding to the line produced by the 7 μ component (for the sections nearer to the starting point) and the 20 μ component (for the sections nearer to the cathode). It will be noticed that the distance between the precipitin lines was not constant, indicating that the relative concentration of the two antibodies was different in each section. The corresponding precipitin line pattern obtained by the method of Grabar and Williams is shown alongside.

Evidence is also being accumulated which shows that stepwise precipitation of immune serum with increasing concentrations of ammonium sulphate yields fractions which contain the two precipitating antibodies in proportions different from that in which they are present in the original serum. There can be little doubt, therefore, that the two precipitin lines obtained when suspensions of the virus of foot-and-mouth disease are diffused towards homotypic immune serum are due to the presence of distinct antibodies in the serum.

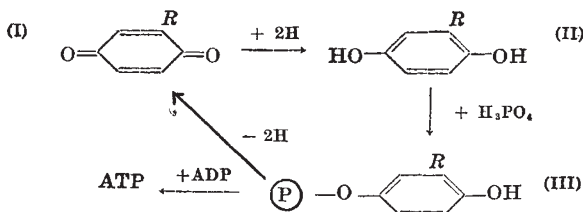
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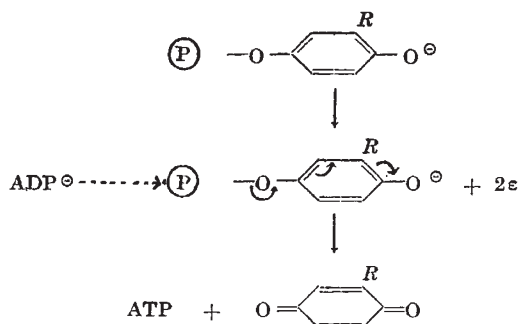
- ¹ Brown, F., and Crick, J., *Nature*, **179**, 316 (1957).
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A Theory of Oxidative Phosphorylation

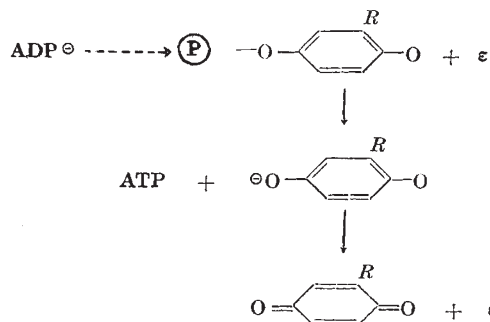
EVIDENCE has been put forward that naphthoquinone derivatives take part in the phosphorylation of adenosine diphosphate to adenosine triphosphate by animal tissues¹, chloroplasts² and bacteria³. A similar role in phosphorylation by animal tissues has been proposed for α -tocopherylquinone⁴. It is therefore possible to formulate an earlier suggestion⁵ in more general terms, as follows:



A substituted quinone (I) is reduced to the hydroquinone (II) and phosphorylated (III). Regarded as an attack by adenosine diphosphate[⊖] the reaction (III)→(I) can be written:



If this scheme is correct, a function of ferric ions in (for example) cytochrome *c* may be to trap electrons liberated by the hydroquinone derivative during its oxidation. A two-stage process, involving a semi-quinone anion, is perhaps more likely than not:



There is a formal similarity between the removal of electrons from compounds of type (III) by oxidizing agents and the activation of phosphoramidic esters by protonation; these esters have been shown⁶ to phosphorylate adenosine diphosphate to the triphosphate.

Although vitamin K₁ could affect metabolism in more than one way, chemical considerations would seem to point to coupled phosphorylation as the first choice.

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Constitution of Verdohæm

VERDOHÆM is an interesting intermediate through which the conversion of hæmin into biliverdin was first achieved¹. In a recent paper², Rackow discusses its structure. He refers only to my first paper¹, but not to later papers³⁻⁵ in which a modified formula with a ring containing an oxygen atom instead of one carbon atom of the porphyrin ring was suggested on the basis of new evidence. The structure suggested by Rackow is that of a pyridinium salt of an α -hydroxyporphyrin-iron complex carrying on its iron atom one molecule of pyridine and one molecule of oxygen bound as in oxyhæmoglobin.

The structure proposed by Rackow cannot be accepted for the following reasons:

(1) It does not account for the liberation of carbon monoxide, which has been demonstrated by Drabkin *et al.*⁶ to occur during verdohæmochrome formation, not during its conversion into biliverdin. The previous inability to demonstrate this carbon atom was one of the main arguments of the Fischer school in favour of an intact porphyrin ring in verdohæm. Such compounds, of α -hydroxyporphyrin-hæm character, are indeed formed during the reaction as precursors of verdohæmochrome, and their spectroscopic similarity to verdohæmochrome explains Drabkin's