

Isolation of a Catalytically Active Flavoprotein from Liver

WE have obtained from pig liver a flavoprotein in highly purified form which catalyses specifically the oxidation of aldehydes to their corresponding acids. The prosthetic group of this enzyme is flavinadenine dinucleotide. In the presence of acetaldehyde the enzyme is rapidly reduced to its leuco form, and the leuco form is autoxidizable in air. The mechanism of the catalysis, therefore, involves a cycle of reduction of the flavoprotein by the substrate followed by oxidation of the leuco form by molecular oxygen or any other suitable hydrogen acceptor. One molecule of the enzyme catalyses the oxidation of about 550 molecules of acetaldehyde per minute at 38°. Our best preparations of the enzyme transfer 2700 $\mu\text{l.H}_2$ per mgm. protein per hour ($Q_{\text{methylene blue}}$ 2700). The flavinphosphate content of the preparation as determined by direct estimation is 0.17 per cent. There appears to be some coloured grouping other than flavin which is associated with the enzyme molecule.

The above enzyme is not identical with xanthine-aldehyde oxidase either of milk or liver.

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Synthesis of Myristicin

ALTHOUGH it is now many years since myristicin was first isolated from the oils of nutmeg and mace, its synthesis has not previously been recorded. Its constitution was established by H. Thoms in 1903¹ as 3-methoxy-4:5-methylenedioxy-1-allylbenzene, a molecule suitably orientated for its use as the starting point in the successful syntheses of cotarnine by Salway² and by Becker and Decker³.

Allylation of pyrogallol 1-methyl ether gave, in good yield, a mixture of two liquid monoallyl ethers (I and II) which were separated by fractional distillation and characterized by the preparation of their 3:5-dinitrobenzoates (m.p. 111/2° and 134° respectively). I (most probably 1-hydroxy-2-allyloxy-3-methoxy-benzene) readily rearranged on pyrolysis to give 3-methoxy-4:5-dihydroxy-1-allylbenzene, and this on methylenation with methylene iodide and anhydrous potassium carbonate in acetone (Perkin and Trikojus⁴) gave a 30 per cent yield of pure myristicin (b.p._{0.2} = 95-7°). The synthetic product was characterized by the preparation of dibromo-myristicin dibromide (m.p. 127-8°), *iso*-myristicin (m.p. 43.5°) and dibromo-*iso*-myristicin dibromide (m.p. 158.5°). The melting points of all three compounds were not depressed by admixture with the corresponding derivatives prepared from a specimen of natural myristicin isolated from oil of nutmeg.

The other monoallyl ether (II) did not give the expected 2:3-dihydroxy-4-methoxy-1-allylbenzene after pyrolysis, but a mixture which, on methylenation and subsequent bromination, yielded mainly dibromo-myristicin dibromide. This rearrangement is being further investigated.

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- ¹ Thoms, H., *Ber.*, **36**, 3446 (1903).
² Salway, J., *Chem. Soc.*, **97**, 1208 (1910).
³ Decker and Becker, *Annalen*, **335**, 328 (1913).
⁴ Perkin and Trikojus, *J. Chem. Soc.*, 1663 (1927).

Points from Foregoing Letters

X-RAY photographs of zinc insulin crystals in several immersion media have been obtained by D. Crowfoot and D. Riley. The wet crystal unit cell is found to be a moderately expanded version of that previously found for the air-dried crystals. Preliminary calculations show that the striking differences in the X-ray intensities given by the different crystal structures is to be correlated mainly with a reorientation of the molecules relative to the crystal axes which takes place on drying.

A number of cloud chamber photographs of cosmic ray particles have been taken by H. J. J. Braddick and G. S. Hensby under 30 m. of London clay. Most of the photographs show mesons, some show electronic showers. In five photographs out of 2,300 there is evidence of the simultaneous passage of two penetrating particles, and these are interpreted as associated mesons.

A. W. G. Kingsbury and J. Newton Friend report that the rare mineral greenockite (cadmium sulphide), seldom found in England, has been discovered in small quantity as thin layers in blende near Chewton Mendip. A. W. G. Kingsbury also describes a new locality for small quantities of fluorite in a disused quarry near Axbridge.

Paul G. 'Espinasse reports a possibly pseudo-estrogenic effect, which appears to be localized, of arachis oil upon the vaginal epithelium of the mouse. He suggests that the local action of some oestrogens may be due to their remaining in the oil at the site of injection in preference to going into the body fluids.

After adrenalectomy, rats show changes in the behaviour of the different sugars in the blood (parallel to changes in sugar absorption) and also disturbances in potassium metabolism. F. Verzàr and J. C. Somogyi present observations suggesting that the connexion between these two phenomena is due to a phosphorylation process leading to the formation of glycogen or intermediary substances.

E. C. Bate Smith describes a possible titration method for the determination of anserine in muscle. The determination can be carried out in a few hours as compared with the several days needed for Zapp and Wilson's method.

A new flavoprotein has been obtained from pig liver by V. Subrahmanyam, D. E. Green and A. H. Gordon, which has the property of catalysing the oxidation of aldehydes to their corresponding acids. It has been found to contain flavinadenine dinucleotide.