containing this system have been purified from the supernatant obtained after centrifuging a 20% (w/v) homogenate of fresh rat or pig spleen in 0.1 M-acetate buffer, pH 5.0, at 100 000 g_{av} . at 2° for 45 min. The supernatant was heated to 60° for 5 min., cooled rapidly before centrifuging to remove precipitated material, and then chromatographed on CM-cellulose in 0.1 M-acetate buffer, pH 5.0.

The substrates used in the study of the purified system included *N*-re-[35 S]sulphated heparin, authentic potassium 2-deoxy-2[35 S]-sulphoamino-D-glucose (Lloyd, Wusteman, Tudball & Dodgson, 1964) and the following compounds isolated by gel-filtration on Sephadex G-10 after the depolymerization of *N*-re-[35 S]sulphated heparin with extracts of *Flavobacterium* enzymes freed from bacterial sulphamidase by treatment with protamine sulphate: 2-deoxy-2[35 S]-sulphoamino-D-glucose 6-*O*-sulphate; 4,5-dehydroglucopyranosyl-uronic acid-2-deoxy-2[35 S]-sulphoamino-D-glucose *O*-sulphate (see Lloyd, Fowler, Law & Embery, 1968). Inorganic $^{35}\text{SO}_4^{2-}$ ion liberation was again followed by the method of Dodgson, Lloyd & Tudball (1961).

The properties of the mammalian enzyme were compared with those of the sulphamidase induced in *F. heparinum* (Lloyd, Law, Fowler & Embery, 1968), partially purified by gel filtration on Sephadex G-200 but still containing trace amounts of the depolymerizing enzymes (Linker & Hovingh, 1965) plus a sugar sulphate sulphohydrolase (EC 3.1.6.3) analogous in properties to the enzyme that can be induced in *Trichoderma viride* (Lloyd, Large, Davies, Olavesen & Dodgson, 1968). Several differences in the mode of action of the mammalian and bacterial sulphamidases were revealed. Thus the mammalian enzyme acted optimally at pH 5.0, whereas the optimum for the bacterial system was pH 7.2. Secondly, the mammalian enzyme liberated inorganic $^{35}\text{SO}_4^{2-}$ ions only from [35 S]heparin (optimum substrate concentration 50 mg./ml.): on the other hand, the bacterial enzyme preferentially degraded authentic 2-deoxy-2[35 S]-sulphoamino-D-glucose (optimum substrate concentration 16 mM; K_m 5.26 mM), also cleaving the [35 S]sulphamate groupings of 2-deoxy-2[35 S]-sulphoamino-D-glucose 6-*O*-sulphate and the unsaturated uronic acid disaccharide [35 S]sulphamate, as well as the intact ^{35}S -labelled polymer to a limited extent. The following substances (each at 0.1 M) all inhibited the action of the mammalian enzyme on [35 S]heparin: inorganic SO_4^{2-} ions, inorganic PO_4^{3-} ions, 2-deoxy-2-sulphoamino-D-glucose, L-serine *N*-sulphate (I), D-cycloserine *N*-sulphate (II) and phenyl sulphamate (III). Increasing concentrations of inorganic PO_4^{3-} and SO_4^{2-} ions inhibited the action of the bacterial enzyme on 2-deoxy-2[35 S]-sulphoamino-D-glucose but I, II and III (at 0.1 M) were without effect.

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Lysine Control of α -Aminoadipate and Penicillin Synthesis in *Penicillium Chrysogenum*

By S. A. GOULDEN and F. W. CHATTAWAY. (*Glaxo Laboratories Ltd., Ulverston, Lancs., and Department of Biochemistry, University of Leeds*)

It was observed by Demain (1957) that lysine was a potent inhibitor of penicillin production and that α -aminoadipate could reverse this inhibition. He also showed that α -aminoadipate could stimulate penicillin production in the absence of lysine. The elucidation of the α -aminoadipate route for lysine biosynthesis in yeast (Strassman & Ceci, 1965, 1966; Maragoudakis & Strassman, 1966) showed the connexion between these two compounds, but their relationship with penicillin biosynthesis remained obscure.

Arnstein & Morris (1960) isolated a tripeptide, α -aminoadipoyl-cysteiny-l-valine, and postulated that it was an intermediate in penicillin biosynthesis. The subsequent isolation of isopenicillin N by Flynn, McCormick, Stamper, de Valeria & Godzeski (1962), with an α -aminoadipoyl side chain, added further circumstantial evidence for the involvement of α -aminoadipate in penicillin biosynthesis.

Demain (1966) suggested that the inhibition of penicillin production by lysine is caused by the end-product control exerted by lysine decreasing the availability of α -aminoadipate for penicillin biosynthesis.

The present work has been concerned with lysine-requiring auxotrophs of *Penicillium chrysogenum*; it has been found that a mutant blocked before α -aminoadipate can only make penicillin when α -aminoadipate and lysine are added to the medium. Mutants blocked after α -aminoadipate only require the addition of lysine.

α -Aminoadipate has been found to accumulate in the latter group of mutants, but in an inverse relationship to the lysine concentration present in both the intracellular amino acid pool and the medium. As growth decreases the quantity of lysine initially added to the medium to support growth, the α -aminoadipate content in the pool rises. Similarly, if mycelium is starved, the lysine pool concentration is reduced, and the α -aminoadipate content rises. These findings show clearly that lysine end-product control decreased the availability of α -aminoadipate and explains the inhibition of penicillin production by lysine.

We are currently working with cell-free systems in an attempt to show whether this effect is enzyme repression or feedback inhibition.

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Phosphoglucose Isomerase Variation in Man

By LINDA I. FITCH, C. W. PARR and S. G. WELCH.
(Department of Biochemistry, The London Hospital Medical College, London, E. 1)

A staining procedure for the specific detection of the enzyme phosphoglucose isomerase (PGI) after electrophoresis in starch gels was recently described, and inherited variations in the isoenzymes of PGI were reported in the mouse (Carter & Parr, 1967). We now report a similar type of variation in man.

Most human haemolysates, when subjected to electrophoresis in a phosphate buffer system at pH 7.4, or in tris at pH 8.0, gave a single major band migrating cathodically (called for the present the 'PGI-Usual' type). However, a random survey of 1292 patients and students, predominantly English, revealed four variant types of erythrocyte PGI, each showing three major bands but distinguishable from one another in mobility. Two ('PGI-Ducek' and 'PGI-Phillips') occurred in Englishwomen, one ('PGI-Ferguson') in an Englishman, and two examples of another variant ('PGI-Singh') occurred in a male Sikh student and in a Ceylonese woman.

We also subjected to electrophoresis 358 haemolysates from Asian Indians resident in London, of

whom 294 were Sikhs. Three of these Sikhs (two females and one male) were found to be of 'PGI-Singh' type, and a single example of yet another triplet variant ('PGI-Rajan') was found in a Malayalee woman from Kerala State in Southern India.

In all five variant triplet patterns one of the major bands (either the most cathodic or the most anodic) was identical in electrophoretic mobility with the single major band of 'PGI-Usual' type. This sort of occurrence of triplet patterns in other situations, e.g. for mouse PGI (Carter & Parr, 1967) and for human phosphogluconate dehydrogenase (Carter, Fildes, Fitch & Parr, 1968) has been taken to indicate that the enzyme is at least dimeric in structure and autosomally linked, and the present evidence points to similar conclusions for human PGI.

The finding that one type of PGI variation occurs in Sikhs, with an incidence of something greater than one per cent, whereas other types of variation were detected in Londoners, and with a lower overall incidence, suggests that PGI variation is dependent on ethnic grouping, and provides another source of data that may be of value in the study of human anthropology.

Very recently, an independent report has appeared on PGI variation in man (Detter *et al.* 1968).

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The Effect of Actinomycin D and Cycloheximide on the Activation by Prolactin of Lipoprotein Lipase in the Mammary Gland

By I. R. FALCONER and T. J. FIDDLER. (Department of Applied Biochemistry and Nutrition, University of Nottingham)

The activity of the lipoprotein lipase of mammary gland increases markedly just before parturition (McBride & Korn, 1963; Robinson, 1963). The mechanism whereby these changes in enzyme activity are achieved is obviously of interest. The lactogenic hormone prolactin was used to investigate the relationship between lipoprotein lipase activity and lactogenesis.

Pseudopregnancy was induced in oestrus virgin rabbits by a single injection of 50 i.u. of chorionic gonadotrophin. Lactation was initiated by the intraductal injection of 50 μ g./duct N.I.H.-P-S6 prolactin (Chadwick, 1962). Mammary tissue was