the isomerization reaction. The 3-hydroxyl group may be involved in donating a hydrogen bond to a receptor in the enzyme, so helping to hold the substrate in a conformation with the enediol hydroxyl groups *cis*.

The C-2-substituted D-glucose 6-phosphates cannot be substrates for glucose phosphate isomerase because the 2-hydroxyl group is involved in the isomerization. These compounds were, however, competitive inhibitors, with K_i values as follows: 2-chloro-2-deoxy-D-glucose 6-phosphate, 0.3 mM; 2-deoxy-2-fluoro-D-glucose 6-phosphate, 9 mM; 2-deoxy-D-*arabino*-hexose 6-phosphate, 2 mM; 2-amino-2-deoxy-D-glucose 6-phosphate, 3 mM. Since there is no correlation of inhibitor binding with the size of the substituent, steric factors may not be important. It is possible that the inductive effect of the substituent affects the rate of ring-opening to the acyclic form of the sugar and determines the ability of the inhibitor to bind to the enzyme.

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The Effect of Substitution at C-2 of D-Glucose 6-Phosphate on the Rate of Dehydrogenation by Yeast Glucose 6-Phosphate Dehydrogenase

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A number of halogen-substituted analogues of D-glucose 6-phosphate are now available (Bessell & Thomas, 1972). The C-2-substituted compounds have been used in a study of the effect of electron-withdrawing substituents on the rate of dehydrogenation by yeast glucose 6-phosphate dehydrogenase (EC 1.1.1.49).

The rates of reaction of D-glucose 6-phosphate, 2-deoxy-D-*arabino*-hexose 6-phosphate, 2-amino-2-deoxy-D-glucose 6-phosphate, 2-chloro-2-deoxy-D-glucose 6-phosphate and 2-deoxy-2-fluoro-D-glucose 6-phosphate were investigated. 2-Deoxy-2-fluoro-D-mannose 6-phosphate and 2,2-difluoro-D-*arabino*-hexose 6-phosphate were not substrates for the enzyme. K_m values for the sugar phosphates and NADP^+ were calculated from the double-reciprocal plot of Lineweaver & Burk (1934). The K_m value determined for NADP^+ was $2 \times 10^{-5} \text{ M}$ in all cases whereas the K_m values for the sugar phosphates varied. The order of V_{max} obtained experimentally

was $\text{OH} > \text{Cl} > \text{H} > \text{NH}_3^+ > \text{F}$ for the C-2-substituted sugars.

To comply with a mechanism involving transfer of a hydride ion from C-1 of the sugar to the nicotinamide ring of NADP^+ , the rate of hydride transfer should be inversely proportional to the inductive effect of the substituent on C-2. The dissociation constants of analogous substituted aliphatic carboxylic acids (Kortüm *et al.*, 1961) correlate with an order of electronegativity of $\text{H} < \text{OH} < \text{Cl} < \text{F}$. Thus an order of V_{max} of $\text{H} > \text{OH} > \text{Cl} > \text{F}$ would be expected. The order obtained experimentally differs from the expected order only in the position of H (2-deoxy-D-*arabino*-hexose 6-phosphate). However, substrate inhibition was observed with this compound and the maximum velocity obtained experimentally is therefore less than the theoretical V_{max} . A theoretical V_{max} calculated for this compound is of the same order as that for D-glucose 6-phosphate. These observations are consistent with hydride ion transfer being the rate-determining step of the dehydrogenase reaction.

Investigations with 3-deoxy-3-fluoro-D-glucose 6-phosphate and 4-deoxy-4-fluoro-D-glucose 6-phosphate showed that each compound is a substrate for the dehydrogenase; the values of K_m ($1.25 \times 10^{-3} \text{ M}$) and V_{max} (0.12 with respect to D-glucose 6-phosphate) were identical.

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Effect of Diet and also Physiological State on some Enzymes of Carbohydrate Metabolism in the Liver of the Domestic Fowl

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Dietary lipid diminishes hepatic lipogenesis in the laying hen and the immature pullet (Balnave & Pearce, 1969; Pearce, 1971a). The present work was undertaken to examine the effects of dietary lipid on the activities of some of the key enzymes of glycolysis, gluconeogenesis and the pentose phosphate pathway.

Chemically defined diets (containing 0 or 10% lipid as corn oil) were fed to pullets (aged 3 weeks) for 7 days. The specific activity of phosphofructokinase was lower in liver extracts from birds fed on the