possible that these different forms of carbonic anhydrase are artifacts of the preparation procedure, extracts from more than 12 plants in diverse Families all showed multiple forms of carbonic anhydrase. In a number of dicotyledons the size of both the major isoenzymes is close to that of the enzyme from parsley, which has a molecular weight of 180 000 (Tobin, 1970). The isoenzymes from the monocotyledons examined had molecular weights of less than 40 000. Like erythrocyte and parsley carbonic anhydrases, the enzymes from *T. albiflora* contained zinc.

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Histochemical Localization of Enzymes in Heart Muscle

By D. R. JARVIE and J. H. OTTAWAY (*Department of Biochemistry, University of Edinburgh Medical School, Teviot Place, Edinburgh EH8 9AG, U.K.*) and J. NOLTE and D. PETTE. (*Fachbereich Biologie der Universität Konstanz, Jakob-Burckhardt Strasse, 7750 Konstanz, West Germany*)

Histochemical localization by formazan deposition, in an agarose gel-film medium, by using phenazine methosulphate to reduce interference from tetrazolium reductases, has been used for extensive studies on the localization of mitochondrial and cytoplasmic enzymes in rat liver (Pette & Brandau, 1966), rabbit skeletal muscle (Sigel & Pette, 1969) and insect flight muscle (Brandau & Pette, 1966). This variant of the tetrazolium localization method has not been used to study the distribution of soluble enzymes in heart muscle.

We now report the results of studies on the distribution of succinate dehydrogenase (EC 1.3.99.1), glutamate dehydrogenase (EC 1.4.1.2), glutamate-oxaloacetate transaminase (EC 2.6.1.1) and lactate dehydrogenase (EC 1.1.1.27) in rat heart muscle. The muscle fibres were caused to relax by soaking the organ in iso-osmotic potassium chloride solution before freezing and sectioning. This pretreatment made it possible to detect the striations of the myofibrils, normally invisible in freshly excised heart tissue. All the enzymes showed a banded distribution, but that for the purely mitochondrial enzymes succinate dehydrogenase and glutamate

dehydrogenase was coarser and more irregular, in keeping with the expected localization of these enzymes in mitochondria, which are concentrated, but not exclusively located, opposite the I-bands of the fibrils (Klingenberg, 1964). The picture for glutamate-oxaloacetate transaminase, which is known to occur in both cytoplasm and mitochondria in this tissue, was similar to that for the purely cytoplasmic enzyme lactate dehydrogenase.

It cannot at present be proved conclusively that the 'soluble' enzymes are located within the myofibrils, but the localization pattern appears to be in accord with the hypothesis of a concentrated distribution of many glycolytic and related enzymes around the isotropic zone of skeletal-muscle fibres, which has been put forward by Brandau & Pette (1966) and Sigel & Pette (1969).

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Isoenzymes of Glutamine Synthetase in Rat Tissues

By M. P. GONZALEZ (*Department of Biochemistry, Faculty of Pharmacy, University of Madrid, Madrid, Spain*) and J. H. OTTAWAY. (*Department of Biochemistry, University of Edinburgh Medical School, Teviot Place, Edinburgh EH8 9AG, U.K.*)

It was recently shown (Iqbal & Ottaway, 1970) that glutamine synthetase from rat muscle has different kinetic properties from that from kidney. In particular, product inhibition by P_i is competitive with respect to ATP. This is incompatible with the reaction mechanism proposed by Meister and co-workers (see Meister, 1968), but is compatible with a mechanism involving binding of P_i to the enzyme and random release of P_i and ADP as products. This latter mechanism predicts that P_i will be an uncompetitive inhibitor of the muscle enzyme with respect to hydroxylamine. It has been possible to show that this is indeed the case, and a semi-random mechanism is now regarded as established for rat muscle glutamine synthetase.

The inhibition of kidney glutamine synthetase by P_i was also studied. P_i was found to inhibit uncompetitively with both hydroxylamine and glutamate as variable substrates; the K_i is about 5 mM in each case. These observations are not in accord with the Meister mechanism, which predicts