was easily recovered, leaving no trypsin contamination of the chymotrypsin; and with proper precautions, the derivative was re-usable. Similar applications could be suggested for other enzymes.

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Distribution of Coenzyme Q in Rat Liver Cell Fractions

COENZYME Q (CoQ), which is widely distributed in animal, plant and microbial sources, has been implicated in electron transport¹ and generally assumed to be associated with mitochondria. However, it has also been found in non-mitochondrial fractions of green leaves, although it appears to be concentrated in mitochondria². A similar distribution has now been demonstrated in rat liver cell fractions.

Livers of stock colony rats were homogenized and fractionated by Schneider's method³. The following determinations were made: coenzyme Q by the decrease in absorption at 275 mμ on addition of sodium borohydride⁴, succinic dehydrogenase by the reduction of dichlorophenol indophenol⁵, CoQH₂ oxidation⁶ (which is sensitive to antimycin and cyanide and therefore a measure of cytochrome oxidase), acid phosphatase⁷ after pre-incubation for 1 hr. at 37° C., esterase activity with menadiol diacetate as substrate (Ramasarma, T., unpublished results), and protein by the biuret method⁸.

Determinations of the distribution of coenzyme Q in rat liver cell fractions, giving a set of typical results of a number of experiments, are presented in Table 1. The mitochondrial fraction contained only 41 per cent of the total coenzyme Q and the rest of it was distributed in other fractions. The presence of coenzyme Q in all the fractions was confirmed by reverse phase paper chromatography. The large proportion of coenzyme Q present in the nuclear fraction (37.5 per cent) does not appear to be due to contamination of whole cells or mitochondria, since the acid phosphatase, CoQH₂ oxidation and esterase activities were low. But, since 30 per cent of the total succinic dehydrogenase was recovered in this fraction, the possibility of contamination by mitochondrial fragments cannot be excluded. The amount of coenzyme Q present in the fraction of sub-microscopic particles, the total as well as on the protein basis, was about one-third of that in the mitochondria, but the activities of succinic dehydrogenase and CoQH₂ oxidation in this fraction were several times lower in content and specific activity in comparison to mitochondria. Therefore the coenzyme Q in this fraction cannot be of mitochondrial origin, but appears to be partly constitutive and thus a wider role for coenzyme Q is suggestive. Whether the coenzyme Q present in sub-microscopic particles participates in the two oxidative enzyme

Table 1. DISTRIBUTION OF COENZYME Q IN RAT LIVER CELL FRACTIONS

	Nuclei	Mitochondria	Sub-microscopic particles	Supernatant
Coenzyme Q μmole/gm. protein (per cent)	0.570 37.5	0.940 41	0.330 14.5	0.071 7
Succinate dehydrogenase activity (per cent)	0.0095 30	0.0240 50	0.0040 6	0.0030 14
CoQH ₂ oxidation activity (per cent)	0.0007 9	0.0095 78	0.0008 5	0.0004 8
Acid phosphatase activity (per cent)	0.0040 10	0.0340 56	0.0150 21	0.0035 13
Esterase activity (per cent)	0.005 4	0.285 17	0.925 46	0.240 33
Protein (gm.) (per cent)	0.425 27	0.280 18	0.228 14	0.630 41

The enzyme activities are expressed as μmoles substrate-change per min. per mgm. protein at 37° C. The total quantity present in all the four fractions is taken as 100 per cent.

systems—reduced diphosphopyridine nucleotide-cytochrome c reductase and the oxidation of L-gulonolactone—will be of interest, particularly in view of the observation of an involvement of a lipid co-factor in the latter system⁹. It is interesting to note that vitamin K, also a lipid-quinone, was found to be similarly distributed: nuclei 24 per cent, mitochondria 61 per cent, and sub-microscopic particles and supernatant 15 per cent, as tested by its biological activity¹⁰.

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Conversion of DL-m-Tyrosine to Dopamine in the Rat

THE formation of catecholamines *in vivo* has been demonstrated using phenylalanine¹, tyrosine^{2,3}, 3,4-dihydroxyphenylalanine (dopa)^{3,4}, and 3,4-dihydroxyphenylserine⁵ as precursors. *m*-Tyrosine (3-hydroxyphenylalanine) has been considered in this laboratory as another possible precursor, for it is decarboxylated by mammalian organs *in vitro*⁶ and *in vivo*⁷, and its decarboxylation product, *m*-tyramine, is found in normal⁸ and phenylketonuric⁹ urines, and in urine of subjects who have received an inhibitor of monoamine oxidase¹⁰. The recent characterization of leptodactyline as the trimethyl-ammonium salt of *m*-tyramine¹¹ suggests that at least some animal species can form *m*-tyrosine, although this amino-acid has not yet been identified in any natural source.