The distortion of the coordination around the molybdenum atoms arises mainly from displacements of the metal atoms from the centres of the polyhedra (octahedra or pentagonal bipyramids) in the $+z$ or $-z$ direction towards the oxygen atoms at the apices. Accordingly, these Mo-O distances are short, the mean value being 1.764 ± 0.017 Å. The mean value of the distances to the opposite oxygen atoms is 2.193 ± 0.017 Å. The individual distances fall within the ranges $1.66 - 1.86$ Å and $2.30 - 2.09$ Å, respectively, but the deviations from the above mean values scarcely have statistical significance owing to the large standard deviations of the z coordinates ($0.034 - 0.102$ Å for the oxygen atoms).

Mo₇ is coordinated by seven oxygen atoms at the corners of a pentagonal bipyramid. The distances to the apical oxygen atoms discussed above are in this case 1.75 and 2.21 Å (± 0.04 Å). The distances to the remaining five oxygens situated at the corners of a pentagon are 1.94 , 2.03 , 2.00 , 2.02 and 2.02 Å (± 0.03 Å) respectively. The corresponding five O-Mo-O angles subtended at the molybdenum atom by neighbouring oxygen atoms range from 70.0° to 73.1° ($\pm 1.2^\circ$). The oxygen-oxygen contacts within this pentagon remain rather close; they range from 2.26 to 2.41 Å (± 0.04 Å). All other oxygen-oxygen distances in the structure are greater than 2.47 Å.

The oxygen atom O₂₀ is bound only to the molybdenum atom Mo₈ and the separation, 1.67 Å (± 0.04 Å), is shorter by 0.08 Å than the value previously obtained. It is in close agreement with the value of 1.671 Å (± 0.008 Å) found for the distance between the molybdenum atom and the singly bonded oxygen atom in MoO₃⁶.

Acknowledgements. I wish to thank Professor G. Hägg and Professor A. Magnéli for their continuous support. This work has been sponsored by the *Swedish Natural Science Research Council*. The computers BESK and FACIT EDB were used by permission of the *Swedish Board for Computing Machinery*.

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Received June 8, 1963.

The Existence of Short- and Long-chain Acyl-CoA:Carnitine Acyltransferases in Heart Mitochondria

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Results have recently been obtained in this laboratory indicating that carnitine acts as a carrier of activated acyl groups through the mitochondrial membrane¹⁻⁴. The acyl group is bound to carnitine by means of an ester linkage. The acylcarnitines were found to be formed according to the reaction: acyl-CoA + carnitine $\rightleftharpoons$ acylcarnitine + CoA (1)

and the reaction was found to be reversible.

It was suggested that acylation of carnitine with long-chain acyl groups is catalyzed by an enzyme which is different from the enzyme catalyzing the acylation of carnitine with short-chain acyl groups. The suggestion was based on the following criteria: (1) In the rat there are organ differences in the utilization of different acylcarnitines as measured by oxygen uptake². (2) There is no acetyl-CoA:carnitine acetyltransferase activity in the rat liver microsome fraction³, whereas this fraction has significant palmityl-CoA:carnitine palmityltransferase activity⁵. (3) Indications for a specific acetyl transfer enzyme were obtained when different α -keto acids were used as substrates for the mitochondrial acylation of carnitine⁴.

In the present communication results are reported which prove the existence of two different acyl-CoA:carnitine acyltransferases in ox heart mitochondria, one catalyzing the transfer of acetyl groups and the other catalyzing the transfer of palmityl groups.

Ox heart mitochondria were obtained as follows: The heart was removed immediately after death, cut into pieces and cooled on crushed ice. Fat and pericard were removed, and the heart muscle was homogenized in a Waring blender in four volumes of 10 % sucrose containing 5 mM TRIS (pH 7.4) and 5 mM EDTA. The mitochondria were isolated by differential centrifugation, washed once, and

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Fig. 1. The distribution of palmityl-CoA: carnitine palmityltransferase (open columns) and of acetyl-CoA: carnitine acetyltransferase (hatched columns) in four protein fractions obtained by ammonium sulphate precipitation of supernatant from sonicated ox heart mitochondria. The amount of enzymes in each fraction is expressed as per cent of total enzyme activities present in the original solution.

finally suspended in the homogenizing medium. The protein concentration in this mitochondrial suspension was 7.6 mg per ml. The mitochondria were disintegrated by means of ultrasonic vibration in the cold for 5 min in a MSE Mullard ultrasonic disintegrator. The sonicated mitochondrial suspension was centrifuged at $25\,000 \times g$ for 15 min. The clear supernatant, the protein concentration of which was about 5 mg per ml, contained most of the enzyme activity. The proteins were fractionated by ammonium sulphate precipitation. Four fractions were prepared, fraction I: 0–25 % saturation, fraction II: 25–45 %, fraction III: 45–60 %, and fraction IV: 60–90 %. Fractions I–III were obtained by adding neutralized saturated ammonium sulphate solution of 4°C, fraction IV by the further adding of solid salt. The precipitate from each fraction were suspended in 0.1 M TRIS (pH

7.4). The suspensions were centrifuged and the supernatants were tested for enzyme activity. The acetyl-CoA:carnitine acetyltransferase activities were measured as previously described⁴. The palmityl-CoA:carnitine palmityltransferase activity was measured by means of the CoA-dependent incorporation of ¹⁴C-carnitine into palmitylcarnitine⁵ (Reaction (1)). Under the prevailing conditions the incorporation of labelled carnitine into palmitylcarnitine was found to be proportional to the amount of enzyme present.

Fig. 1 shows the relative distribution of the two enzyme activities in the four protein fractions obtained by the ammonium sulphate precipitation. The palmityltransferase is precipitated at a lower salt concentration than is the acetyltransferase, indicating the presence of two transferases in the ox heart mitochondria, one transferring acetyl groups and the other transferring palmityl groups.

The main bulk of protein was obtained in fraction II. The specific activity of the palmityl transfer enzyme in this fraction was only about 1.2 times of that in the supernatant from the sonicated mitochondrial suspension, i.e. no significant purification of this enzyme had taken place in the ammonium sulphate fractionation. However, a purification of the acetyl transfer enzyme was obtained in fraction III, in which the specific activity was 4.7 times higher than that in the supernatant from the sonicated mitochondrial suspension. The results are in accordance with the results recently published by Fritz and Schultz⁶. In a preliminary note they have reported that carnitine acetyltransferase purified from pig heart shows no palmityltransferase activity.

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Received May 24, 1963.