group of lysine. Similarly, lysine carboxyl groups accounted for 10 % of the radioactivity in the chaff.

Since conversion of [1,7-$^{14}C_2$]-α,α'-diaminopimelic acid to lysine by decarboxylation would be expected to give [1-^{14}C]lysine the above results provide convincing evidence that wheat plants are capable of carrying out this decarboxylation.

The authors are indebted to Mr. J. DYCK for the ^{14}C analyses and to Mr. G. COONEY for his technical assistance.

National Research Council of Canada,
Prairie Regional Laboratory,
Saskatoon, Saskatchewan (Canada)

A. J. FINLAYSON
W. B. MCCONNELL

1 E. WINDSOR, *J. Biol. Chem.*, 192 (1951) 607.
2 D. L. DEWEY AND E. WORK, *Nature*, 169 (1952) 533.
3 H. J. VOGEL, *Proc. Natl. Acad. Sci. U.S.*, 45 (1959) 1717.
4 L. E. RHULAND, *Nature*, 185 (1960) 224.
5 R. NATH AND W. B. MCCONNELL, *Can. J. Biochem. Physiol.*, 38 (1960) 903.
6 A. J. FINLAYSON AND W. B. MCCONNELL, *Chem. in Can.*, [4] 12 (1960) 55. Abstract of paper presented at 43rd Meeting of the Chemical Institute of Canada, 1960.
7 W. B. MCCONNELL AND L. K. RAMACHANDRAN, *Can. J. Biochem. Physiol.*, 34 (1956) 180.
8 C. H. W. HIRS, S. MOORE AND W. H. STEIN, *J. Am. Chem. Soc.*, 76 (1954) 6063.
9 E. F. GALE, in D. GLICK, *Methods of Biochemical Analysis*, Vol. 4, Interscience Publishers, Inc., New York, 1957, p. 285.
10 E. J. CONWAY, *Microdiffusion Analysis and Volumetric Error*, revised edition, Crosby, Lockwood and Son, London, 1947.

Received October 11th, 1960

Biochim. Biophys. Acta, 45 (1960) 622–623

Fatty acid synthesis in heart sarcosomes

Incubation of rat- or rabbit-heart sarcosomes with sodium [2-^{14}C]acetate, ATP, CoA, TPNH and an oxidizable substrate of the tricarboxylic acid cycle leads to the incorporation of the acetate into the long-chain fatty acids of the mitochondria (Table I). Practically no ^{14}C was found in the non-saponifiable fraction. The incorporation in the fatty acids is nearly completely dependent upon oxidizable substrate, and is appreciably less in the absence of added TPNH and CoA. Succinate is much more effective than glutamate, although the two substrates consume oxygen at about the same rate. This, together with the fact that Amytal inhibited the incorporation with succinate by 66 % and that malate gave a greater rate of incorporation than succinate suggests that oxaloacetate formed by the oxidation of succinate or malate is involved in the incorporation reaction. Oxaloacetate is also formed during the oxidation of glutamate[1,2] but is rapidly removed by transamination with the glutamate. The highest rate of incorporation was found with citrate (and isocitrate) as substrate. It is possible that oxalosuccinate has a role similar to that of oxaloacetate. Both compounds fulfil the structural requirements, suggested by SWICK AND WOOD[3], for transfer of CO_2

Abbreviations: ATP, adenosine triphosphate; CoA, coenzyme A; TPN^+, TPNH, oxidized and reduced triphosphopyridine nucleotide.

to acetyl-CoA to form malonyl-CoA. In the presence of TPNH, malonyl-CoA can be converted to long-chain fatty acids[4].

Gas chromatography showed that the label was present in a number of long-chain fatty acids. Details will be reported in a later publication.

TABLE I

FATTY ACID SYNTHESIS IN RABBIT-HEART SARCOSOMES

1 ml containing 9.5 m*M* KCl, 3 m*M* ethylenediaminetetraacetate, 50 m*M* potassium phosphate buffer, pH 7.5; 5 m*M* $MgCl_2$, 10 m*M* ATP, 3 m*M* [2-^{14}C]acetate (1 μC), 30 mg sarcosomal protein, and where indicated 30 m*M* hydrogen donor, 0.18 m*M* CoA or 0.2 m*M* TPN^+ + 10 m*M* glucose 6-phosphate + glucose 6-phosphate dehydrogenase, was incubated in a shaking manometer flask containing 10% KOH and filter paper in the centre well, in air at 25° for 30 min (except with malate (10 min), since longer incubations did not lead to increasing incorporation). The reaction was stopped by the addition of 1 ml 20 *N* KOH. 4 ml ethanol was added and the mixture saponified at 90° for 15 min. The mixture was acidified with HCl and twice extracted with pentane. The total organic phase was washed with water, plated and counted in a gas-flow counter with thin end window.

Hydrogen donor	*CoA*	*TPNH*	*mμmoles [2-^{14}C]acetate incorporated/h/mg protein*
None	+	+	0.33
Succinate	+	+	2.90
Succinate	—	+	0.94
Succinate	+	—	1.71
Succinate*	+	+	0.99
Glutamate	+	+	0.51
Malate	+	+	3.45
α-Ketoglutarate	+	+	1.30
Citrate	+	+	6.53

* In the presence of 1.7 m*M* Amytal.

The relationship between the system described in this paper and the anaerobic synthesis of fatty acids by rat-liver mitochondria, recently described by WAKIL *et al.*[5], remains to be determined.

The author wishes to thank Prof. E. C. SLATER for his interest and advice and Miss JET MOERDIJK for her skilful technical assistance.

Laboratory of Physiological Chemistry, University of Amsterdam (Netherlands) W. C. HÜLSMANN

[1] H. A. KREBS AND D. BELLAMY, *Biochem. J.*, 75 (1960) 523.
[2] P. BORST AND E. C. SLATER, *Biochim. Biophys. Acta*, 41 (1960) 170.
[3] R. W. SWICK AND H. G. WOOD, *Proc. Natl. Acad. Sci. U.S.*, 46 (1960) 28.
[4] S. J. WAKIL AND J. GANGULY, *J. Am. Chem. Soc.*, 81 (1959) 2597.
[5] S. J. WAKIL, L. W. MCLAIN AND J. B. WASHAW, *J. Biol. Chem.*, 235 (1960) PC 31.

Received November 3rd, 1960