requirement for the four ribonucleoside triphosphates, which are more than twice as effective as the corresponding diphosphates, as well as the inhibition by pyrophosphate but not by inorganic phosphate, suggests that the reaction mechanism resembles that described for DNA formation[5] rather than RNA synthesis by polynucleotide phosphorylase.[6,7]

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CAPROYL COENZYME A DEPENDENT MALONYL COENZYME A—BICARBONATE EXCHANGE REACTION

Sir:

Enzyme preparations of *Clostridium kluyveri* catalyze an exchange reaction between malonyl CoA and $HC^{14}O_3^-$. Experiment I (Table I) indicates complete dependence of the reaction upon enzyme, malonyl CoA and boiled extract, and partial dependence upon acetyl CoA and glutathione.

Labeled malonyl CoA was identified by (1) conversion to the hydroxamate derivative which chromatographed with authentic malonyl monohydroxamate[1]; and by (2) alkaline hydrolysis and chromatography with authentic malonate.[2]

Malonyl CoA is not decarboxylated by this enzyme preparation and C^{14}-acetyl CoA is not incorporated into malonyl CoA. This plus the dependence of the reaction upon malonyl CoA indicate an exchange phenomenon rather than a net carboxylation of acetyl CoA.

The factor in boiled extract has been isolated by steam distillation and chromatography on a silica gel column and identified as caproic acid by Duclaux distillation.[3] Experiment II (Table I) indicates that 10^{-4} M sodium caproate replaces boiled extract. Experiment III (Table I) shows that caproyl CoA at levels of 10^{-4} M replaces boiled extract and acetyl CoA, suggesting that acetyl CoA functions by transfer of its CoA to caproate.

TABLE I

FIXATION OF $HC^{14}O_3^-$ INTO MALONYL CoA

Complete systems contained: (I) 100 μmoles of potassium phosphate buffer, *p*H 6.7, 25 μmoles of $KHC^{14}O_3$ (2.5 μc.), 0.2 μmole of malonyl CoA, 0.4 μmole of acetyl CoA, 6 μmoles of glutathione, 0.1 ml. of boiled extract, and 1.5 mg. of enzyme in a final volume of 1.0 ml.; (II) same as (I) except 0.1 μmole of sodium caproate replaced the boiled extract; (III) same as (I) except 0.1 μmole of caproyl CoA replaced both boiled extract and acetyl CoA. Experiments were incubated at 30° for 2 hours. Reactions were stopped with perchloric acid. Aliquots of the supernatant solutions were counted directly.

Experiment	Component omitted	C.p.m.
I	None	4,550
	None (boiled control)	44
	Malonyl CoA	90
	Boiled cell extract	350
	Acetyl CoA	2,930
	Glutathione	3,250
II	None	4,460
	Sodium caproate	242
	Acetyl CoA	1,300
III	None	4,200
	Caproyl CoA	370
	Acetyl CoA	4,300

Valerate is as effective as caproate, whereas butyrate, caprylate and caprate are less effective in this reaction.

The observed exchange reaction is consistent with a reaction mechanism involving a reversible condensation between malonyl CoA and caproyl CoA coupled with a decarboxylation

$$HOOC^{14}\text{—}CH_2\text{—}COSCoA + CH_3\text{—}(CH_2)_4\text{—}COSCoA \rightleftarrows$$

$$CH_3\text{—}(CH_2)_4\text{—}CO\text{—}CH_2\text{—}COSCoA + C^{14}O_2 + CoASH$$

or

$$CH_3\text{—}CO\text{—}(CH_2)_5\text{—}COSCoA + C^{14}O_2 + CoASH$$

With the recent implications of malonyl CoA in fatty acid biosynthesis,[4,5] such a reaction sequence could be involved in the pathway of long chain fatty acid synthesis.

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(1) R_f 0.5 in pyridine:2-butanol:water (1:1:1); R_f 0.27 in pyridine:isoamyl alcohol:water (3:4:1.9).

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