NOTES

THE CITRIC ACID CYCLE AND BACTERIAL OXIDATION OF AROMATIC ACIDS

S. DAGLEY AND A. RODGERS

Department of Biochemistry, University of Leeds, England

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Studies of the oxidation of benzoic and phenylacetic acids by a vibrio have suggested that production of keto acids to satisfy requirements of growth is achieved by reactions of the tricarboxylic acid cycle (Dagley, Fewster, and Happold, J. Bact., **63**, 327, 1952). Citrate, however, was oxidized at a much slower initial rate than other members of the cycle by vibrios grown at the expense of the aromatic acids, indicating either that the compound did not lie directly on the metabolic route or that its entry into the cell was prevented by permeability factors. That the latter view probably is correct is supported by preparation of extracts that oxidize 1 mole of citric acid with the uptake of 1 mole of O_2 without initial lag. Cells were grown with aeration in 10 liters of defined medium (Dagley *et al.*, 1952), and after harvesting 5 to 10 g of cell paste were crushed in the Hughes press previously cooled on solid CO_2 (Hughes, Brit. J. Exptl. Pathol., **32**, 97, 1951), taken up in 20 ml of 0.02 M phosphate buffer (pH 7.0), and centrifuged at 7,000 G for 20 minutes to give a translucent extract. Rates of O_2 uptake were determined in the Warburg respirometer: flasks contained 1 ml extract; 0.1 ml $MgSO_4$, 0.02 M; 5 micromoles of citrate; and phosphate buffer to give a total volume of 3.0 ml. In table 1, rates of respiration for suspensions (ca 5 mg dry weight cells per flask) also are given and show that initially the whole cells oxidize citrate at only a small fraction of the rate of oxidation for the substances that served as carbon source for growth. A similar comparison for extracts is not possible since the latter, in all cases, did not oxidize the growth substrates. Adipic acid is included in table 1 since its behavior is typical for dibasic acids of chain length >4 C. Intact cells grown at the expense of these compounds give very low initial rates of oxidation of citrate; about 1 mole O_2 is readily taken up per mole of citrate in the presence of extracts.

TABLE 1

ORGANIC ACID UTILIZED IN GROWTH	OXYGEN UPTAKE* (μL O_2 PER 30 MIN)			
	Whole cells			Extract
	Growth substrate (S)	Citrate (C)	C/S	Citrate
Benzoic	81	8	0.10	40
p-Hydroxybenzoic	154	2	0.01	36
Phenylacetic	86	18	0.21	123
Adipic	110	5	0.05	102

* Corrected for endogenous uptake.

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