PANTOTHENIC ACID STUDIES. V. REVERSAL OF 2-CHLORO-4-AMINOBENZOIC ACID INHIBITION IN *E. coli*. BY PANTOTHENIC ACID[1]

Sir:

Wyss, Rubin and Strandskov[2] and Shive and Roberts[3] have demonstrated that the growth inhibition which takes place when *E. coli* cells are incubated with 2-chloro-4-aminobenzoic acid (CAB), can be reversed by either *p*-aminobenzoic acid (PAB) or methionine. From an analysis of the inhibition data, the latter authors concluded that CAB interfered with the synthesis of methionine, which was normally formed through the action of a PAB-containing enzyme system.

We have found that CAB inhibition of *E. coli* can also be reversed by pantothenic acid (PA). This vitamin is even more effective than PAB, as may be seen from the accompanying table. The growth medium used contained glucose and minerals, including ammonium chloride. Sterilization was accomplished by autoclaving except for the CAB solutions, which were filtered and added aseptically. Cultures were incubated for nineteen hours at 37°.

At high levels of CAB, reversal was more nearly complete when combinations of methionine and PA or methionine and PAB were employed. No growth depression was produced by 10 mg. of CAB per tube in the presence of 100 γ of methionine and 2 γ of PA or PAB. The pantothenic acid conjugate recently described in this laboratory[4] is at least as active as PA in effecting reversal of CAB inhibition. However, folic acid, which is normally synthesized from PAB, has no reversing power.

TABLE I

REVERSAL OF 2-CHLORO-4-AMINOBENZOIC ACID (CAB) INHIBITION BY PANTOTHENIC ACID (PA), *p*-AMINOBENZOIC ACID (PAB) AND METHIONINE IN *E. coli*.

	PA				PAB			Methionine		
	γ per 10 ml. of culture									
CAB, mg. per 10 ml.	0	0.02	0.2	2.0	0.02	0.2	2.0	10	100	1000
	Optical density (2-log G)									
0.0	0.465	0.465	0.455	0.470	0.475	0.460	0.470	0.460	0.455	0.475
0.3	.050	.270	.450	.470	.230	.240	.420	.460	.450	.470
1.0	.010	.210	.410	.440	.140	.180		.420	.460	.470
3.0	.020	.100	.270	.380	.075	.160		.400	.460	.470
10.0	.015	.010	.080	.290	.020	.070	.125	.280	.350	.360

On the basis of the present findings, it would appear that an interrelationship exists between methionine and pantothenic acid in *E. coli*. Further experiments are in progress to determine their relative positions, as well as the possible relationship between this system and PAB.

(1) Presented before the 114th meeting of the American Chemical Society, Portland, September 14, 1948. Published with the approval of the Monographs Publications Committee, Oregon State College, Research Paper No. 128, School of Science, Department of Chemistry. This work was supported by research grants from the Division of Research Grants and Fellowships of the National Institute of Health, U. S. Public Health Service, The Nutrition Foundation, Inc., and Swift and Co., Inc.

(2) O. Wyss, M. Rubin and F. B. Strandskov, *Proc. Soc. Expll. Biol. Med.*, **52**, 155 (1943).

(3) W. Shive and E. C. Roberts, *J. Biol. Chem.*, **162**, 463 (1946).

(4) T. E. King, L. M. Locher and V. H. Cheldelin, *Arch. Biochem.*, **17**, 483 (1948); T. E. King, I. G. Fels and V. H. Cheldelin, THIS JOURNAL, in press.

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RECEIVED OCTOBER 15, 1948

NEW BOOKS

Detoxication Mechanisms. The Metabolism of Drugs and Allied Organic Compounds. By R. TECWYN WILLIAMS, Ph.D. (Wales). D.Sc. (Birmingham). Senior Lecturer in Biochemistry, University of Liverpool. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1947. viii + 288 pp. 14 × 22.5 cm. Price, $5.50.

In this excellent reference text, the author has collected and organized most of the available information on detoxication mechanisms published before 1945 and much of that published in 1945 and 1946. The subject is treated broadly as being concerned primarily with qualitative and quantitative studies of the metabolism of foreign organic compounds. The necessity of obtaining quantitative information for any critical analysis of the pathways of metabolism has been justifiably stressed. In the first chapter there is given a general survey of oxidative and reductive changes and processes of conjugation. The following twelve chapters present details of the metabolism of aliphatic compounds, cyclohexane derivatives, aromatic hydrocarbons, derivatives of aliphatic and aromatic hydrocarbons, terpenes, camphor, heterocyclic compounds and organic compounds of arsenic. The collection of data is compiled in such a way that it will be useful as a basis for predicting the metabolic fate of compounds similar to those listed. The author indicates that in addition to the use of such analogies, predictions will be aided by an increased knowledge of the specificity of enzyme systems in the animal under study. The bibliography and index are well prepared. Some errors and certain omissions, such as the use of spectrophotometric procedures, are inevitable in a first edition. Considering the difficulties in collecting