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A Metabolic Relationship Between the Aromatic Amino Acids

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Letters to the Editors

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The present work involves a further investigation of a *Neurospora* mutant, C-86, previously mentioned by Lein, Mitchell and Houlahan (1) as one that can utilize anthranilic acid, indole, tryptophan, kynurenine, 3-hydroxyanthranilic acid, and nicotinic acid as supplements for growth. Mutant C-86, when crossed to a "wild-type" strain, was found to differ from this wild type strain, with respect to tryptophan biosynthesis, by a mutation at a single locus.

A number of compounds were tested for growth-promoting properties for this mutant. These included: 3,4-dihydroxyphenylalanine, anthranil, benzoic acid, aniline, *p*-aminobenzoic acid, formylanthranilic acid, isatoic acid, *cis*-cinnamic acid, *trans*-cinnamic acid, phloroglucinol, phenylacetic

acid, *p*-aminophenylacetic acid, *β*-phenylethyl alcohol, phenyl-DL-*a*-alanine, *β*-phenylethylamine, salicylic acid, coumarin, coumaric acid, 2-carboxyindole, 3-carboxyindole, cinnamaldehyde, phenylalanine, and tyrosine. Of these compounds, phenylalanine, tyrosine, and *trans*-cinnamic acid were active in promoting the growth of C-86. The relative growths of this mutant on supplements of tryptophan, indole, anthranilic acid, phenylalanine, tyrosine and *trans*-cinnamic acid are given in Table I.

TABLE I

The Relative Growths of Neurospora Mutant C-86 in the Presence of Various Supplements

(The mold weights are for 20 ml. cultures grown at pH 4.6 and 25°C.)

μM	Dry wt. of mold—mg.—3 days growth						
	Tryptophan	Indole	Anthranilic acid	Phenyl-alanine	Tyrosine	*Trans*-cinnamic acid	
0.1	11	7	8	0	0	0	0
0.2	15	18	13	2	1	±	0
0.4	20	29	24	5	3	1	0
0.8	27	36	36	12	4	2	2
1.4	35	41	42	18	8	1	5
2.0	36	36	42	21	14	1	6
2.0	35	30	40	27	20	0	7

[a] Growth of mutant C-86 on supplements of *trans*-cinnamic acid at pH 5.6 and 25°C.

Neurospora mutant, 40008, which utilizes anthranilic acid, indole or tryptophan for growth, cannot use either phenylalanine, tyrosine, or *trans*-cinnamic acid. Apparently, strain C-86 has a genetic block which occurs at a point earlier in a reaction series involving tryptophan than does the block in strain 40008. This would imply that phenylalanine, tyrosine and *trans*-cinnamic acid are involved in the biosynthesis of tryptophan prior to the formation of indole or anthranilic acid in *Neurospora*. Another *Neurospora* strain, E-5212, utilizes phenylalanine for growth but none of the other substances found to promote the growth of strain C-86.

The evidence presented suggests the possibility of a common precursor to the aromatic amino acids.

Acknowledgments

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Reference

1. Lein, J., Mitchell, H. K. and Houlahan, M. B., *Proc. Natl. Acad. Sci.* U. S. 34, 435 (1948).

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