Specificity of the Aromatic Amino Acid Permeases of *Escherichia coli*

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Transport of aromatic amino acids into cells of *Escherichia coli* and *Salmonella typhimurium* is mediated by a general aromatic amino acid permease and three other permeases, each specific for a single aromatic amino acid (Ferroluzzi-Ames, 1964; Brown, 1970). These observations were confirmed and the specificity of the aromatic amino acid permeases of *E. coli* was investigated in detail. When chloramphenicol (150 µg/ml) was present during aromatic amino acid uptake, so preventing incorporation of amino acid into protein, only the general aromatic amino acid permease was functional; thus the substrate specificity of the general aromatic amino acid permease could be studied in the absence of interference from activity due to the specific enzymes.

The integrity of the alanine moiety was necessary for retention of substrate activity towards the general aromatic amino acid permease. Analogues not transported included compounds in which the carboxyl group of the alanine moiety was removed or replaced by a β -hydroxyalanine moiety or a glycine moiety. Analogues with substituents on the ring or compounds in which the ring structures of the aromatic amino acids were replaced by different rings were frequently good substrates, though often displaying lower affinities for the general aromatic amino acid permease than did the natural substrates.

2-Amino-4-methylhex-4-enoic acid, an unsaturated compound lacking a ring structure, was a competent substrate of the general aromatic amino acid permease, suggesting that a complete aromatic ring is not essential for interaction with the permease binding site. This observation is in accord with the claim (Ferroluzzi-Ames, 1964) that *O*-diazoacetyl-L-serine (azaserine) is also transported by the general aromatic amino acid permease of *S. typhimurium*.

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Regulation of the Acidic Amino Acid Permease of *Aspergillus nidulans*

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It was previously shown that an acidic amino acid permease is formed during germination of conidia of *Aspergillus nidulans* (Robinson *et al.*, 1971). The present communication presents some further observations on the regulation of this permease.

The kinetics of synthesis of the permease were measured during germination of conidia with glutamate or ammonia as sole source of nitrogen. Under both conditions of growth the rate of synthesis (per unit dry weight of organism) increased in a linear fashion during the initial 7 h of germination. After onset of exponential growth the kinetics of permease synthesis became similar to those described for synthesis of nitrate reductase in *Asp. nidulans* (Cove, 1966), i.e. the rate of synthesis per litre of medium was constant despite the continued increase in mycelial mass. The initial rate of permease synthesis with ammonia was only one-tenth of that measured with glutamate as sole source of nitrogen. This observation suggests that the low rate of glutamate uptake found after germination of conidia on ammonia (Robinson *et al.*, 1971) results from repression of permease synthesis. Induction by glutamate is unlikely because low activities of the permease were found after germination of conidia on a mixture of glutamate and ammonia.

Previous work indicated that this permease is also inhibited by ammonia. The graphic method of Monod *et al.* (1952) was therefore used to distinguish between a modification of activity and a modification of differential rate of synthesis of the glutamate-uptake system by ammonia. Ammonia was added to conidia germinating on glutamate (exponential phase) and the rate of glutamate uptake per ml of culture was plotted as a function of growth. Within 30 min this rate decreased to one-third, and then remained constant during a fivefold increase in mass. This demonstrates that ammonia (or a metabolite of ammonia) both inhibits activity of the permease and represses further synthesis. It also suggests that the permease is not degraded after synthesis.

The concentrations of glutamate and ammonia measured in mycelia grown on various nitrogen sources support the conclusion that intracellular ammonia (and not glutamate) is important in regulation of the acidic amino acid permease of *Asp. nidulans*.

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