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The biochemical genetics of certain structural genes of the regulation enzymic function 3-deoxy-D-arabino-heptulosonate 7-Phosphate synthetase

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Abstract

Regulation of DAHP synthetase

Halsall, D. M. and C. H. Doy. The biochemical genetics of certain structural genes of the regulatow enzymic function 3-deoxy-D-arabino-heptulosonate 7-phosphate synthetase.

Extracts of wild type Neurospora crassa 74A contain at least three isoenzymes of DAHP synthetase. One of these is inhibited by tryptophan (DAHP synthetase (Trp)), one by tyrosine (DAHP synthetase (Tyr)) and the third by phenylalanine (DAHP synthetase (Phe)). These isoenzymes were separated by agarose bead column chromatography and have characteristically different estimated molecular weights (approx. 150-165,000; 79,000 and 48,000, respectively).

A mutant defective in DAHP synthetase (Tyr) was induced with ultra-violet light and selected by filtration enrichment on the basis of its ability to grow on Vogel's minimal medium but not in the presence of phenylalanine and tryptophan, unless tyrosine was also present. A second mutation was induced in this strain and selected for failure to grow in the presence of tryptophan, unless tyrosine and phenylalanine were both present. The double mutant locked DAHP synthetase (Tyr) and (Phe). These mutations have been separated and the genotypes named. The structural gene (others could exist) of DAHP synthetase (Tyr) has been designated arom-6. Preliminary mapping studies show that it is probably located on linkage group III or VI, not II, the site of the arom gene cluster. Similarly the structural gene of DAHP synthetase (Phc) has been named arom-7. It is unlinked to arom-6, but otherwise the location is unknown. Thus, different polypeptides are concerned with the different isoenzymes.

A result of the mom-6 mutation was to create a requirement for p-aminobenzoate in the presence of the three aromatic amino acids. Whether this is a direct result of the loss of DAHP synthetase (Tyr), or an indication that the arom-6 polypeptide is concerned also with a specific function of the p-aminobenzoate pathway, is unknown. As part of a survey for evidence of intergenic and therefore possible physical interaction between components of the aromatic pathway, alleles of the various genes are being surveyed for hitherto unrecognizedeffects on DAHP synthetase. So far alleles of arom-1, arom-2, arom-3, arom-4, mom-5, tryp-1 (alleles of the two complementation groups affecting anthranilate synthetase) and a mutant lacking chorismate mutase have normal DAHP synthetase activity. More recently, a mutant defective in DAHP synthetase (Trp) has been obtained by analogous techniques. - - - Research School of Biologic.1 Sciences, The Australian National University, Box 475 P.O., Canberra, A.C.T., 2601, Australia.