Lethality of Neurospora arginine mutants associated with a factor from wild type

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Abstract
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Davis, R.H. Lethality of Neurospora arginine 
mutants associated with a factor from wild 
type.

In the course of an analysis of Neurospora mutants 
lacking ornithine transcarbamylase (arg-12: Davis 
and Thwaites, Genetics, in press, 1963), crosses of 
such mutants to our stock of wild type 73a regularly 
yielded ratios of 2 wild: 1 arg-12: 1 "lethal." The last class was able to germinate, but grew very little 
after isolation to medium containing 200 pgm arginine per ml. The progeny ratio suggested that another 
factor, derived from the wild type parent, was responsible for the "lethality" when associated with the 
arg-12 mutant.

We have been able to show that the 73a stock used is abnormal in having a low level of arginine, 
citrulline, and ornithine, and also in having a high ornithine transcarbamylase activity. The latter is 
probably a consequence of low arginine levels, by way of derepression. On the basis of high ornithine 
transcarbamylase, the progeny of a 73a x 74a cross was analyzed and segregation of 1 high to 1 low 
activity was observed. The factor responsible for all the effects described is denoted UM-300. The 
"lethal" category observed in crosses of a strain carrying UM-300 to an arg-12 mutant is the double mutant, 
UM-300, arg-12. Another absolute mutant in the arginine pathway (arg-11) also gives 1/4 "lethal" progeny 
when crossed to UM-300.

These results were consistent with the hypothesis that endogenously-synthesized arginine could not be 
maintained at a normal concentration (through loss or destruction) and exogenously-provided arginine 
could not be concentrated (because of an imperfect transport system or a rapid rate of destruction). We have 
been able to show that uptake is much slower in UM-300 than in our normal wild type; this was measured 
by disappearance from the medium and by the rate and extent of elevation of arginine in mycelia when 
added to the medium. These results suggest that an arginine concentration mechanism is deficient, and 
that rapid destruction is not the case. It should be noted that 1 mg arginine per ml medium will support 
the growth of UM-300, arg-12.

It is not clear whether UM-300 has a complete inability to concentrate arginine, since the internal 
concentrations of arginine have not been measured in the same units as external concentrations. Neither 
is it known yet how specific the transport system is for arginine; the only other amino acid studied in 
regard to uptake is ornithine, which UM-300 concentrates more poorly than does a normal wild type.

I should be interested to know whether other workers have had comparable experiences with arginine 
mutants or other mutants, and if possible, to exchange strains and test the genetic relationships between 
UM-300 and other mutants of this type. (A recent case reported by D. R. Stadler (Proc. XI Int. Cong. 
Genetics, vol. 1, p. 52) appears to have similarities with the one described above.) Because more data 
will be available on UM-300 soon, I should appreciate that investigators wishing to cite this note write 
for more recent results, and that the note be cited only with permission.--Department of Botany, University 
of Michigan, Ann Arbor, Michigan.

Emerson, S. Genetic nature of the slime 
variant of Neurospora crassa. 

At the time cultures of slime were supplied to the Fungal 
Genetics Stock Center (see Neurospora Information Con- 
ference, NAS-NRC Pub. 950, 1962) little was known of the 
genetic basis of the slime phenotype except that it separated cleanly together with parental genes in 
isolations from heterocaryons with hyphal phenotypes. It is now known that three independently inherited 
characters are essential to, yet insufficient for, the persistent expression of the slime phenotype. The 
characters involved are: osmotic (os, linkage group IR, which was present in the irradiated parent of slime), 
fuzzy (fz , linkage group unknown, a morphological mutant), and spontaneous germination (sg, linkage 
group unknown, germinates without heat activation, has extremely poor surface growth habit). Ascospore 
isolates carrying os, fz, and sg usually germinate by slime flows instead of germ tubes but eventually change 
to a miserable hyphal growth. From some os fz sg isolates it has been possible by vegetative selection to 
recover strains with persistent slime phenotypes. No genetic difference has yet been established between 
the hyphal and plasmodioid forms of such os fz sg isolates. A fuller account with descriptions of the unit 
characters is scheduled for publication in No. 3, Vol. 34 (1963/64) of Genetica. (Supported in part by an