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 µgm 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-1) 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. I, 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.