

Honks,* D. L. and A. S. Sussman, The relationships of trehalose and its metabolism to conidiation in *Neurospora*.

When *N. crassa*, strain 69-1 113A, is grown in standing culture on liquid & medium at 24°C, the accumulation of trehalose in the vegetative mycelium begins during the second day. Rapid accumulation of this sugar follows, attaining a maximum on the third day. Conidiation begins during the third day, following which a rapid decrease in the trehalose of vegetative mycelium occurs. That this decrease is closely related to conidiation is evident from the following observations. If conidial production is delayed, mycelial trehalose continues to accumulate until spores are formed. Likewise, the trehalose concentration in aconidial strains steadily increases beyond the time when conidiation normally occurs in other strains. Moreover, trehalose levels in the conidia are much higher than those found in the vegetative mycelium as considered separately from the mycelium.

The trehalase activity per unit dry weight of the vegetative mycelium of strain 69-1 113A when grown under standard conditions remains low for three days. Beginning with the fourth day, it increases rapidly until the tenth day of growth. Concomitant with

the increase in mycelial trehalase activity on the fourth day is the cessation of mycelial growth and the rapid production of aerial hyphae and conidia. These events occur 24 hours prior to the depletion of the carbohydrate supply from the growth medium. In contrast, if the same strain is grown under conditions of suppressed conidiation, trehalase activity does not increase until the exogenous carbon supply has become depleted. Total trehalase activity produced by heavily conidiating strains is six-to ten-fold greater than that produced by aconidial or slowly conidiating strains or strains in which conidiation is suppressed. A comparison was made of the activities of 6 different enzymes from the mycelial fraction of strains 60-1 13A, B106a and STL6A during the ten-day growth period, including trehalase, β -galactosidase, alkaline phosphatase, ornithine transcarbamylase, tryptophan synthetase and invertase. The results indicate that trehalase is the only enzyme of those studied that appears to be correlated with conidiation.

The regulation of mycelial trehalase activity under the conditions of this study appears to be by catabolite repression. Evidence for this is as follows:

(1) The derepression of mycelial trehalase which is associated with conidiation occurs when the carbon supply is only partially depleted. However, this increase in activity coincides with a period of extremely rapid growth and, presumably, results from the decreased concentration of the repressor at this time.

(2) The derepression of trehalase in the absence of conidiation does not occur until the complete exhaustion of the carbon source in the growth medium.

(3) An aconidial mutant, strain STL6A, grown in media containing various sugars or L-amino acids as the sole carbon source, exhibits varying levels of trehalase activity. In each instance, a reciprocal relationship is found between the amount of derepression and growth rate upon the substrate used.

(4) The retardation of growth alone does not derepress trehalase. When the growth rate of various strains is severely retarded by any of several methods which do not involve the depletion or limitation of the exogenous carbon supply, trehalase remains repressed.

(5) The complete removal of exogenous carbon supply from rapidly growing mycelium of strain STL6A results in the rapid derepression of trehalase.

(6) When sucrose is added to the growth medium of strain STL6A, in which the trehalase activity per unit weight is high as a result of previous growth in mannitol, rapid repression follows.

An indication that trehalase may play a major role in the development of conidia in *Neurospora* is its presence in higher quantity in young aerial hyphae before the appearance of conidia. Trehalase activity per unit weight in these structures is three- to four-fold greater than is found in the vegetative mycelium. The derepression of mycelial trehalase during conidiation does not appear to be a primary factor in the developmental process. Rather, it seems to arise as a consequence of the effects of conidiation upon the vegetative mycelium.

Labeling and inhibitor experiments indicate that trehalase derepression represents *de novo* synthesis of the enzyme rather than activation of existing protein. - - - Department of Botany, University of Michigan, Ann Arbor, Michigan 48104. * Present address: Department of Botany, Brigham Young University, Provo, Utah.