Leary, J.V. and A.M. Srb.

Giant spore, a new developmental mutant of N. crassa.

In the course of a mutation run utilizing N-methyl-N'-nitro-N-nitrosoguanidine to induce colonial mutants of N. crassa, a colonial isolate was obtained that produced giant ascospores when colonials of opposite mating type were crossed. The original isolate turned out to be a double mutant, inasmuch as by recombination the alteration in spore size could be obtained independent of colonial morphology. Further genetic analysis of the mutant ascospore attribute, designated "giant spore" (grp), revealed that it segregates as a single gene difference. Linkage data indicate that grp is situated on the left arm of linkage group I. Although a polygenic system controlling ascospore size has been reported for linkage group I by Lee and Pateman (1961 Heredity 14: 223), the characteristics of gsp appear to be distinct from those of the strain described by these workers.

With reference to phenotypic expression, gsp behaves as a zygote recessive; i.e., asci produced by +/gsp zygotes have the normal 8 spores while asci produced by gsp/gsp zygotes include giant spores. The phenotypic expression of gsp/gsp is variable. Perithecia resulting from the appropriate cross produce some asci containing 8 normal-sized spores, asci containing both normal-sized spores and one or more large spores, and asci containing a single giant spore, approximately the size of the ascus. The ratio of normal to abnormal asci from one perithecium to another appears to be irregular, even in the same crossing tube.

Cytological investigation of gsp/gsp asci suggests that the variant phenotype is accounted for by disruption of the normal timing of nuclear divisions vis-a-vis the initiation of arcorpore wall formation. Mature mutant asci seem always to include the normal number of 16 nuclei, but spore walls may be formed when only 2 or 4 rather than 8 nuclei ore present.

Also, in asci where the first mitosis has been completed but nuclear migration has not, examples of prematurely forming spore walls hove been observed. At least in the case of the largest giant spores, which are approximately whole-ascus size and include the total of the nuclear complement, the system that designates the outline of spores seems either to be at the cell membrane or is being substituted for by the membrane or something associated with it. This hypothesis is bored on observations of asci that ore double mutant for giant spore and for peak (also called biscuit). Typical peak asci ore balloon- or pew-shaped structures that include 8 normal ascospores. In the double mutants, the giant spores ore pear or balloon-shaped, the wall following essentially the outline of the oscus itself.

Initial data from experiments designed to study the effects of different environmental conditions on spore production in gsp/gsp crosses indicate that the mutant is much more sensitive both to elevated temperature (31°C) and to sorbose supplementation of the medium than is the +/+ cross. In addition, gsp/gsp crosses on Wertergoord-Mitchell crossing medium produce a significantly greater number of giant spores than is produced by similar crosses on corn meal agar. (JVL is on NIH Postdoctoral Fellow and previously hor been supported as a postdoctoral trainee by Grant T1 GM 1035; the research program is supported by Grant GM 12953, Notional Institutes of Health, USPHS)

- -Section of Genetics, Development and Physiology, Cornell University, Ithaca, New York 14850.