FINAL TECHNICAL REPORT

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John R. Raper and Robert M. Hoffman

Department of Biology
Harvard University
Cambridge, Massachusetts

Research pursued during the final year of support by AEC contract AT(11-1)-3223 was directed to two main objectives:

1. A continuing analysis of the incompatibility system in Schizophyllum commune. The four genes of this system serve as regulatory genes for a critical phase in the development of the organism, i.e. the mating process that leads to the establishment of the dikaryophase, which is essentially a physiological and genetic equivalent of the diplophase of other organisms. A significant portion of the results of this work are presented in the paper "Mutational Analysis of a Regulatory Gene from Morphogenesis in Schizophyllum (Technical report HUX-3875-17 or COO-3223-17, attached to this report). This report deals with a number of mutations in the one of the four incompatibility genes that has been most intensively investigated. Additional mutations in one of the other incompatibility genes have been isolated and partially characterized, and in addition to these, a very large number of mutations affecting the morphogenetic process but lying

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outside the incompatibility genes have been recovered and again only partially characterized. A more formal report on mutations of these two types can only be made after further investigation.

The work to date on the mutations of the incompatibility factors and other genes affecting their expression, however, has delineated a regulatory system ^{the genetics of which} A I think without doubt is the most clearly defined in any eukaryotic organism. The most significant feature, perhaps, is the recognition of the incompatibility factors as regulatory genes, and their accessibility in a very wide variety of wild and mutant states emphasizes their utility for further dissection of the basis of genetic control of development.

2. A second line of research has sought the biochemical consequences of development in Schizophyllum. An earlier aspect of this, previously reported as HUX-3875-13 (for which a reprint is attached), dealt with the changes in electrophoretic mobilities of proteins and a number of specific enzyme activities at different stages in the organism's development.

More recent biochemical work has dealt almost exclusively with a malfunction in the organism's energy metabolism controlled by one of the incompatibility factors the B factor. Two distinct genotypes, one a heterokaryon having different B factors and the other a homokaryon with a mutated B factor, share a single phenotype commonly known as "flat." The mycelium of either of

these two genotypes is a poorly growing, sickly plant that produces a very small amount of cell material compared to the homokaryotic wild type. It respirees at a higher level than does the wild type but is only about 1/9 as efficient as is wild type in converting the substrate consumed into cell material. A preliminary paper on this was submitted as HUX-3875-15. More recent work to the present is reported in two additional papers "Lowered Response to Adenosine Diphosphate of Mitochondria Isolated from a Mutant B Strain of Schizophyllum commune" by Hoffman and Raper (HUX-3875-16 or COO-3223-16) and "Genetic Impairment of Energy Conservation in Development of Schizophyllum: Efficient Mitochondria in Energy-Starved Cells" by Hoffman and Raper (HUX-3875-18 or COO-3223-18) of which copies are attached to this report.

A number of mutations are known in various organisms that affect energy metabolism in one way or another and as such the mutant incompatibility factor here that elicits the malfunction would of itself be of limited interest. The significant aspect of the phenomenon in this particular case, however, is the remarkable mimicry by the mutant homokaryon of the heterokaryon having different B factors and which is a normal feature of the developmental history of the organism. To our knowledge no other case has been reported in which the interaction of wild type genes brings about such a serious metabolic malfunction.

The four papers listed above, three of which have been pub-

lished and the fourth submitted for publication to the Journal of General Microbiology, contain essentially the publishable results achieved under the AEC contract since the submission of our last progress report. There is a considerable body of additional information that has been gleaned, but all of it requires further study before it can be reported even in a preliminary manner.