Memorandum program of research with Professor E. L. Tatum at Stanford University -- February-March-April 1956

Genetics of Neurospora fragments

Preliminary note. As is probably familiar to you, I worked for my Ph.D. with Professor Tatum at Yale University in 1946-47. Prior to that time I had worked on Neurospora with Ryan at Columbia. While Tatum has continued Neurospora studies, we have concentrated on bacteria, but hope to use the experience accumulated in the bacterial work for a renewed attack on some problems for which Neurospora may be the best experimental material.

Program. It is not certain that all of the following lines will be followed, depending on the success of more preliminary work. However, as at least three people will be concentrating on the program, with the possible assistance of still others, it should be feasible to do at least the groundwork for most of the following.

1. Viability and fertility of hyphal fragments. Tatum had noted that after Neurospora mycelium is disrupted in a Waring blendor, fractions can be separated whose particles seem too small to be bits of hyphae, but still retain the ability to function in sexual fertilization. The fragments also retain some vegetative viability. It is proposed that these fragments may be, in effect, nearly naked nuclei, which needs to be tested by more direct microscopic control and chemical and physical analysis.

2. Before undertaking similar work with bacteria, in 1946 Ryan and I had attempted to transduce genetic markers to Neurospora by means of DNA-containing extracts. It is proposed to repeat such experiments, by treating the fragments, in the hope that these will be more permeable to macromolecular materials. The fragments will be tested as well for unusual susceptibility to other treatments

(especially chemical mutagens and DNA-ase) that can be expected to affect their genetic content. Various other means of achieving transduction, e.g., by limited ultrasonic disruption of heterokaryotic mycelia, will also be attempted.

3. An attempt will be made to develop a technique for direct intra-hyphal implantation, by means of micropipettes, of nuclei, cytoplasm and other fractions. This has an obvious bearing on the problems above, and also on the study of extranuclear hereditary factors (as in the cytoplasmic "poky" mutation in Neurospora).

In principle, any of this work could be done here, but I would not propose to do so. The advantages of Stanford are firstly, of course, Dr. Tatum's active collaboration, and his wealth of experience with the materials. In addition, there is available there an unexampled collection of stocks access to which would be awkward at a distance. Finally there is a laboratory and personnel set-up there already organized for this type of work on Neurospora, to duplicate which, for these exploratory studies, would entail a great deal of time and effort. It is hoped that these explorations can be substantially completed in three months; if not, the further division of labor between the two laboratories will have to be worked out.

Submitted by:

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