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Discoveries in Cell Fusion Augur Advances in Biology

SOMATIC CELL genetics is rapidly becoming established as a new and powerful experimental tool for attacking important problems in cell biology. The key to its widespread adoption was the discovery that animal tissue cells could be made to fuse, in laboratory cultures, by exposing them to certain viruses.

Prof. Henry Harris of the school of pathology at Oxford University carried this observation one step further by showing that the virus could be made noninfective with ultraviolet light and still enable cells to fuse. This avoided the complication of carrying the virus along in further manipulations of fused cells.

Prof. Harris's announcement, about three years ago, that cells of different animal species—man and mouse, for example—could be fused attracted considerable attention. Since then, these observations have been confirmed and extended as the basis for some important analyses for which no other method was available.

THE FUSED somatic cell lines start out with a complement of 86 chromosomes (46 from human, 40 from the mouse). But as they are cultivated, the cells tend to lose chromosomes. Although the reasons for this irregular dropping out are not understood, the event can be used to help analyze exactly what role is played by the human compared to the mouse chromosomes in these hybrid cells.

It has been for some time, for example, that tissue cells exposed to SV-40 virus often became transformed into a cancer-like form, while at the same time the virus disappeared somewhere in the cell. The genetic material of the virus still manifests itself in these cells in various ways, such as production of a substance at the cell surface, the T-antigen, which can be recognized with the help of specific anti-sera. The T-antigen may be recognized with the help of specific anti-sera. The T-antigen may also be quite significant for the cancer-like behavior of the cells.

A GROUP of biologists (Mary C. Weiss, Boris Ephrussi and L. J. Scaletta) reported in the Proceedings of the National Academy of Sciences on their studies of human-mouse cell hybrids in which the human cell input had been exposed to SV-40 virus. They report that the hybrid cell lines occasionally lose the T-antigen, but only when they have also lost all of the human Chromosomes originally present. This result implies that the SV-40 virus genes had become attached to the chromosomes, probably many times over.

The result is in agreement with the report in another issue of the same proceedings, from a group led by R. Dulbecco of the Salk Institute in San Diego, that SV-SV-40 DNA and that this from 20 to 50 copies of the SV-40 DNA,and that this DNA is physically associated with the chromosomes of the cell insofar as these can be purified by physical methods.

Apart form the basic science interest of these studies, we should be reminded of the inadvertent mega-experiment of the last decade, when many millions of doses of SV-40 virus were administered to children around the world as a contaminant of polio vaccine. Presumably, the virus was promptly eliminated from most of the inoculated children by the normal immune mechanisms, but we are too ignorant still to be sure we have been asking the right questions.

ANOTHER exciting application was reported by Dr. Howard Green's group at New York University Medical School in the Dec. 21 issue of Nature magazine. The mouse cells used for making the hybrids were obtained from a mutant line carrying a genetic defect in the enzyme thymidine kinase. The hybrids regained the genetic information for this enzyme from the added human chromosomes. The subsequent loss of the enzyme could be correlated specifically with the loss of one of the so-called E-group

Thus not only could a gene now be located on a specific chromosome, but for the first time this could be done even without the use of a known mutation in man affecting that enzyme. Instead, the experiment contrasts specific gene functions in human cells with those of the mouse, about which we have a wider range of experimental information.

SOMATIC cell genetics, in principle, ought to be even more important in studies on plants, where it would speed the development of entirely new kinds of crops. The already known ability of single plant cells to grow out into intact plants would make these procedures even more valuable. Perhaps because the issue was so clouded by fantastic and unbelievable claims forwarded by Lysenko during the period of government control of biology in the Soviet Union, however, tentative leads suggesting fusion of plant cells dating back more than 30 years have been virtually ignored.

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