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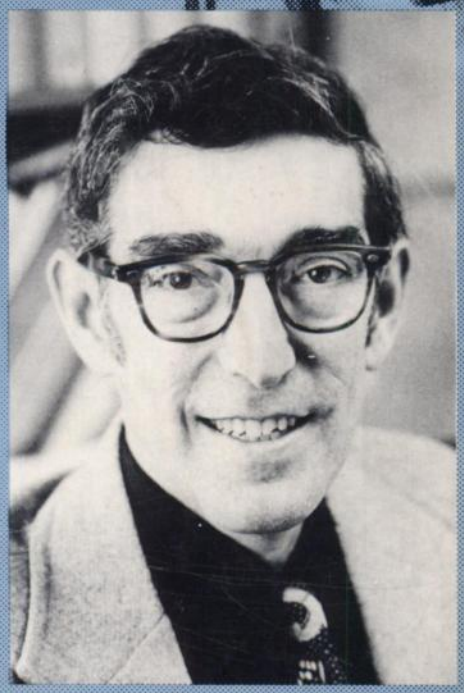
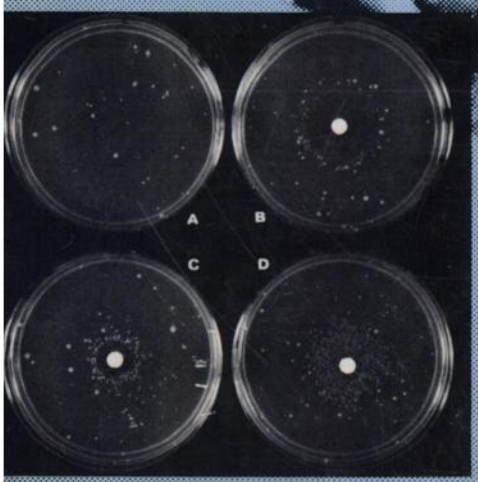
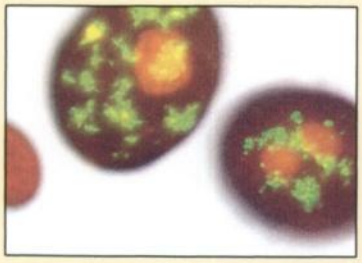




Becton Dickinson FACS Systems

ADVANCES IN CELL BIOLOGY

The Fluorescence Activated Cell Sorter (FACS) has become a powerful means of identifying and separating cells and cell constituents according to distinctive properties of FLUORESCENCE and SIZE. FACS makes possible multi-parameter measurement of individual cells, providing the distribution of these measurements in a sample. Evaluation against operator-selected criteria, at rates to 5,000 cells per second, forms the basis for physical separation of viable subpopulations. FACS measurements have been documented for sensitivity to as few as 3,000 fluorescent molecules per cell. Light-scatter measurements are sensitive to particles as small as 0.3 micron in diameter, and can be used to detect viability, without staining, in homogenous populations such as lymphocytes. FACS Systems are accepted as the standard of comparison for quality, performance and reliability, and are in daily use in top laboratories worldwide. Following is a brief view of recent FACS advances:

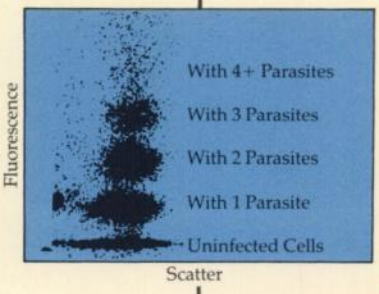


Cell Cycle after Simian Virus-40 Infection

FACS has been used to study the interplay between Simian Virus-40 (SV-40) and host cells after infection of growing cell cultures. Both mock- and SV-40 infected cultures have been harvested at 24 to 48 hours after infection, stained for DNA content, and analyzed with FACS for cell cycle distribution. Infected cultures exhibited a marked shift to above average G2 DNA content by 24 hours after infection, and remained in this state for at least 24 hours further, indicating that after infection, cycling cells completed one round of DNA synthesis, but remained undivided.

Live/Dead Cell Enumeration

The forward-angle light-scattering measurement of FACS can be used to discriminate viable and nonviable cells in homogeneous populations, such as lymphocytes. FACS analysis during a lymphocytotoxicity test of mouse spleen cells reacted with varying dilutions of rabbit anti-mouse T-cell antiserum plus complement has shown that as antiserum concentration increases, the percentage of cells in the dead subpopulation also increases.



Sorting of Erythrocytes Containing Malaria Parasites

Plasmodium berghei-infected mouse erythrocytes can be analyzed and sorted on the basis of parasite DNA content. Infected cells, treated with a vital DNA-binding dye, fluoresce with intensity corresponding to the number of parasites contained. Uninfected cells are nonfluorescent. Measurements of light scatter and fluorescense intensity from each cell are displayed as a correlated dot plot, as shown. Sorting of uninfected from infected cells enables subsequent studies.

For additional information, including an extensive bibliography, call or write Becton Dickinson FACS Systems.

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COVER LEGEND

The neoplastic change in cells and the transmission of the change to descendants to cells suggest that neoplastic transformation involves a permanent alteration in the genetic material of the cell. The nature of the alteration resembles a mutation. Somatic mutation indeed has been one of the prominent theories of cancer causation since the earliest days of research on cancer and on genetics.

The study of the role and relationship of mutation to neoplasia accelerated following demonstrations that many chemicals that are carcinogenic in animals also produce mutation in animal and microbial systems.

The first demonstration of induced mutation was achieved in the fruit fly, *Drosophila melanogaster*, the material developed for genetic studies by Thomas Hunt Morgan. Herman Joseph Muller (1890–1967), then at the University of Texas, produced mutations in *Drosophila* exposed to X-rays [*Science* (Wash. D.C.), *66:* 84–87, 1927]. For this first artificial transmutation of the gene, Muller won the Nobel Prize for medicine or physiology in 1946.

The first production of mutation by chemicals was reported in 1946 by Charlotte Auerbach (*b.* 1899) and her associates at the University of Edinburgh [*Science* (Wash. D.C.), *105:* 243–247, 1946]. They exposed *Drosophila* to sulfur and nitrogen mustards.

Research on chemical mutagenesis was expanded by the introduction of microbial systems for such testing, especially after the introduction of activation of chemicals that require metabolic conversion. This was developed by Bruce N. Ames (*b.* 1928), of the University of California at Berkeley, using a *Salmonella* histidine mutant for mutation detection and activation of the chemicals by liver microsomes (*Proc. Natl. Acad Sci.* U. S. A., *70:* 2281–2285, 1973). A review and summary of identifying chemicals causing mutations and cancer is by Ames [*Science* (Wash. D.C.), *204:* 587–593, 1979]. A more extensive and critical examination of the relation of mutagenic activity in the *Salmonella typhimurium* system and known or suspected carcinogens is by S. J. Rinkus and M. S. Legator (*Cancer Res.*, *39:* 3289–3318, 1979).

Pictured are (*left* to *right*) Drs. Muller, Auerbach, and Ames. We are indebted to Drs. Auerbach and Ames for their portraits and to the Indiana University for the portrait of Dr. Muller. The photograph of *D. melanogaster* mutants is by courtesy of the Brookhaven National Laboratory. The four plates of the Ames test are: *A*, spontaneous revertants; *B*, furylfuramide (AF-2), 1 μg; *C*, aflatoxin B_1, 1 μg; *D*, 2-aminofluorene, 10 μg. The photograph is by courtesy of Dr. Ames.

M. B. S.