

Bankhead-Coley Cancer Research Program

Srivastava, Arun

*Division of Cellular and Molecular Therapy,
Department of Pediatrics*

University of Florida

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Project Title: Fluorescence-Activated Cell Sorter

Project Summary: Fluorescence-Activated Cell Sorting (FACS) is an essential technology for basic and clinical research where individual live cells must be studied in large numbers, particularly when the source material is a mixture of cells, such as patient tissue samples, research animal tissues, or mixed cell cultures. In addition to powerful analytical capabilities, "cell sorters" are specialized flow cytometers, machines that can analyze characteristics of individual cells within a tissue one cell at a time, that have the additional ability of separating desired cell types with similar characteristics (thus enriching them) at very high speed. The applications of these instruments toward cancer research have been well-documented and include detecting and enriching cells that have been experimentally transduced with genes; detecting and enriching specific types of cells that are identified through antibody binding; or identifying cells and enriching cells with specific states of growth, cell death, or activation, in response to drug treatment, for instance. Furthermore, all of these uses can be performed simultaneously in one experiment by using some of the numerous fluorescent reagents that are currently available. Cell sorting has been used for the past 20 years to understand the underlying mechanisms of normal cellular growth as well as when these mechanisms go awry, such as in cancer. By enriching various populations of cells, researchers have demonstrated that normal and cancer cells are biologically very different. For example, in the past ten years, researchers using cell sorting have demonstrated that in blood cancer, stem-like cells are present within cancerous cells. Unlike cancer cells that grow and divide uncontrollably, the stem-like cells do not. Thus, standard chemotherapeutic drugs that target rapidly dividing, metabolically active cells are less effective in eradicating these cells. Furthermore, researchers are interested in defining populations of stem cells in a wide variety of cancers. In addition to allowing the ability to enrich various populations of cells, the cell sorter can be used to study the activity of single cells in a test tube or an animal model. The sorter is capable of isolating single cells, allowing for the ability to treat them with various drugs, or to remove them and inject them into animals. Such experiments allow researchers to test the efficacy of newer drugs and to clearly define what specific cell types are capable of forming tumors, for instance. A number of investigators at the University of Florida Shands Cancer Center (UFSCC) are interested in the relationships between normal cell development and the development of cancer. These investigators will use the cell sorter to separate various populations of normal and cancerous stem and progenitor cells in order to understand how they work. Such study is expected to support ongoing cancer research as well as yield wide and long-lasting benefits for the biomedical community.