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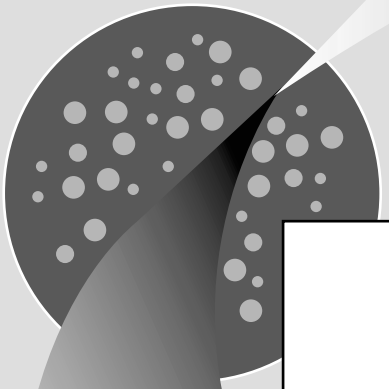

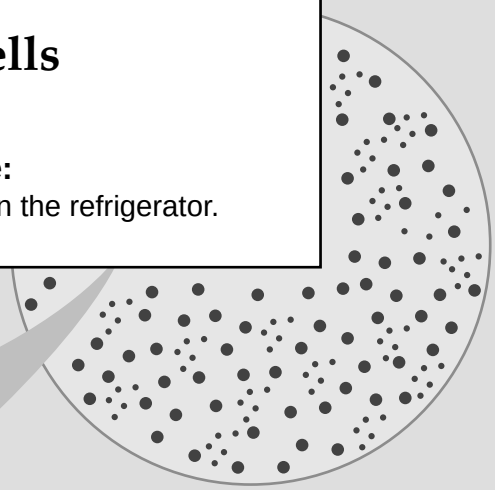

990

EDVO-Kit #

Morphology of Cancer Cells

Storage:

Store entire experiment in the refrigerator.

Experiment Objective:

The experimental objective is to observe morphological changes in cancer cells as compared to normal cells.

Major Section Headings

Experiment Components

Storage:
Entire experiment can be stored in the refrigerator.

None of the experiment components have been prepared from human sources.

This experiment contains reagents for 6 groups.

Two-spot slides with cancer and normal cells
Cell fixing agent
Immersion troughs
Eosin stain
Methylene blue stain
Mounting medium
Slide covers
Transfer pipets

Experiment Requirements

- Microscopes 400X magnification
- Forceps
- Distilled water
- Gloves

BACKGROUND INFORMATION

Morphology of Cancer Cells

Early studies on transformed malignant cells established that cancer-forming cells exhibit unique and distinguishing features in comparison to their normal cell counterparts. First, the cells are capable of sustained growth in culture that was virtually immortal. Second, the cells overgrew in culture forming a mass due to piling of cells. Third, solid tumor cells growing in culture were less adherent to each other and the tissue culture substratum. Fourth, the cells' morphologic appearance ranged from resembling the normal cell from which they arose to an embryonic form. Finally, most show an increase in number of nuclei, and distinct karyotype including translocation, deletions, and chromosomal inversion.

Much of the current work is focused on how genetic alterations promote the selections of cancer cells with aggressive behavior. Two classes of genetic alterations occur in cancer including the gain of oncogenes and the loss of tumor suppressors. Proto-oncogenes code for normal proteins in a cell that are involved in accelerating growth. Oncogenes arise in cancer cells when proto-oncogenes mutate or amplify leading to enhanced an activity promoting cell growth. An analogy of how oncogenes act would be that with the automobile whereby the gas pedal would be constantly pushed down to increase the speed of a car. Tumor suppressors, otherwise known as anti-oncogenes, are equally important in the development of cancer. The normal function of tumor suppressor proteins are to restrict cellular proliferation providing a protective function. When these genes undergo mutagenesis or inactivation, cellular proliferation continues without regulation, leading to cancer growth. Again the analogy of how tumor suppressors act would be that with the automobile's brake pedal that slows or regulates the rate of a cell's division. In cancer, the oncogene takes over cell division and the altered or inactive suppressor no longer has control over the process. In almost all cases the functional consequence of these genetic changes is that cancer cells exhibit increased growth, altered cell surface properties, loss of normal cellular morphology and/or resistance to anti-cancer drugs, and increases in number of nuclei and aberrant karyotype.

Although different cancer types, as well as cancer cells from a single tumor mass may show a different genetic makeup and properties, the distinguishing feature of cancer cells is their loss of growth control. Cancer cells show an abnormally high growth rate. This property of cancer cells is the basis of how anti-cancer drugs selectively kill rapidly growing cancer cells but do not harm slow growing normal cells with in a patient's body.

BACKGROUND INFORMATION

Background Information, continued

Cell growth involves an increase in cell mass and size which then triggers a cell to divide. Thus cell growth and cell division are linked. Cell division involves two recognizable coordinated events; the duplication of cell DNA and physical division of the cells into two daughter cells. Because cancer cells replicate so fast, they often show a multinucleated phenotype and contain numerous nuclei. In addition, cancer cells often show an abnormal variability in the size and shape of their nuclei. Pathologists often use the abnormal nuclei observed in cancer cells to diagnose cancer.

What contributes to the uncontrolled growth of cancer cells? Normal cells show a property called contact inhibition, whereby cell growth ceases under conditions of decreased nutrients, injury or cell crowding. Cancer cells, however, have lost contact inhibition and continue to grow when normally cells cease to grow. This increased growth leads to cancer cells colonizing and destroying normal tissue. It is thought that defects in the cell membrane of cancer cells interfere with the ability of these cells to "sense" the cellular environment.

In addition to alterations in cell growth and loss of contact inhibition, cancer cells show altered cell shape. Thus cancer cells look different from their normal counterparts. Normal cells grow as ordered patterns as the cell density increases. In contrast, cancer cells form chaotic masses. One consequence of their altered morphology of cancer cells is that these altered cell shapes contribute to increased cell movement seen in cancer cells. A direct consequence of this defect leads to malignant cancer cells migrating and spreading throughout the patient's body.

