Rates of Cell Growth

Cells can grow at astonishing rates. For example, the bacterium *Escherichia coli* (ehsh-uh-RIHK-ee-uh KOH-ligh), or *E. coli*, is a single-celled organism that can easily double its volume in about 30 minutes. It can then divide to form two new cells. If conditions are ideal, each of these cells can grow to form two new cells in the next 30 minutes.

Ideal conditions for this kind of growth can never be maintained for very long, however. A quick look at the consequences of rapid growth will explain why. In just one day, a single cell would grow into a 14-kilogram mass of bacteria. In three days, the mass of the cells would equal the mass of the Earth! Real conditions, or the circumstances that cells normally face, are very different.

CLASS SET

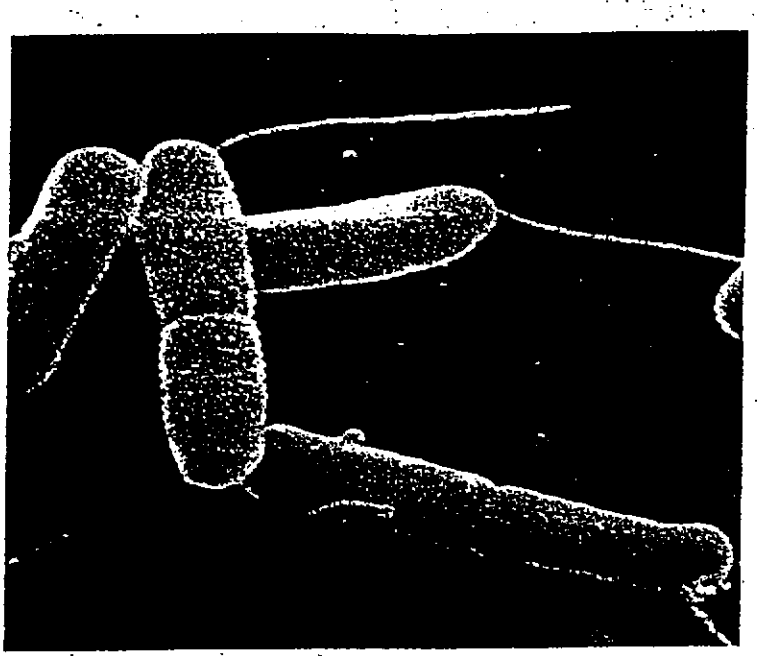

Figure 8–3 Single-celled prokaryotic organisms reproduce by cell division. In this scanning electron micrograph of bacteria (E. coli), you can see two bacteria undergoing cell division.

Figure 8–4 The scientist in this photograph is growing pine tree cells on culture plates. As the cells divide they will form a continuous layer, one cell thick, across the surface of each culture plate. But when the cells come in contact with adjacent

Controls on Cell Growth

One of the most striking aspects of cell behavior in a multicellular organism is how carefully cell growth and cell division are controlled. Cells in certain places in the body, such as the heart and the nervous system, rarely divide—if they divide at all. In contrast, the cells of the skin and digestive tract grow and divide rapidly throughout life, providing new cells to replace those that are worn out or broken down due to daily wear and tear.

We can observe the effects of controlled cell growth in the laboratory by placing some cells in a petri dish containing nutrient broth. The nutrient broth provides food for the cells. Most cells will grow until they form a thin layer covering the bottom of the dish. Then the cells will stop growing. Why do they stop growing? When cells come into contact with other cells, they respond by not growing. At present, scientists are trying to understand how this process works.

Controls on cell growth and cell division can be turned on and off. When an injury—such as a cut in the skin or a break in a bone—occurs, cells at the edges of the injury are stimulated to divide rapidly. This action produces new cells, starting the process of healing. When the healing process nears completion, the rate of cell division slows down, controls on growth seem to be reimposed, and everything returns to normal.

Uncontrolled Cell Growth

The consequences of uncontrolled cell growth in a multicellular organism are severe. Cancer, a disorder in which some cells have lost the ability to control their own rate of growth, is one such example. When cancer cells are placed in a culture of living tissue, they do not stop growing even though they come into contact with other cells. Cancer cells will continue to grow and divide until the supply of nutrients is exhausted.

Cancer is a serious disorder that claims many lives and affects all of us, directly or indirectly. To cell biologists, cancer provides valuable information concerning the importance of controls on cellular growth.

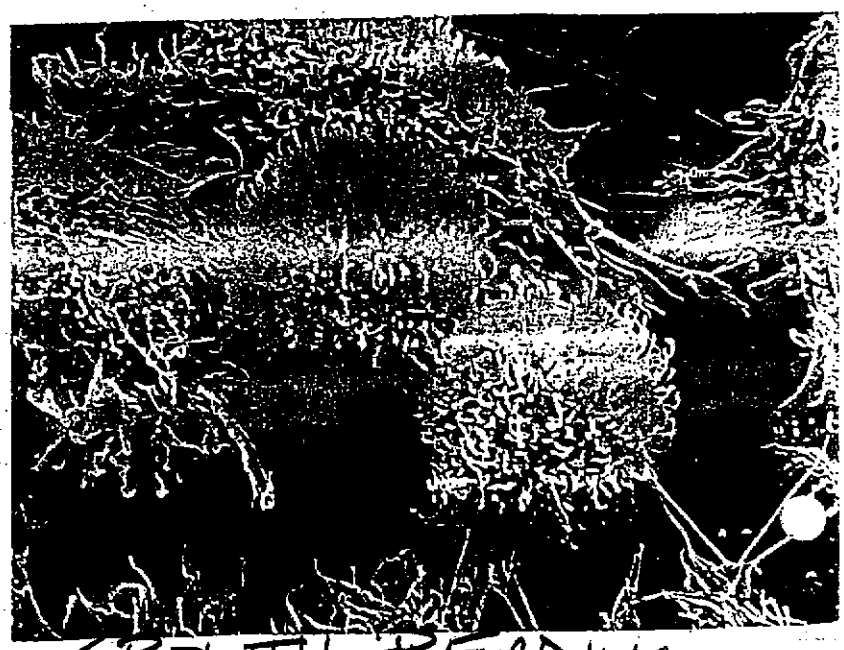

Figure 8–5 Unlike normal cells, cancer cells do not stop growing and dividing even if they come in contact with other cells. Actually, cancer cells, such as those shown in this scanning electron micrograph, have lost their ability to control their own rate of growth.

CELL GROWTH READING

1. What Controls cell growth?

2. Why would cell growth be turned off and on?

3. What is cancer?

4. How long will cancer cells continue to divide?

- please write all questions and answers on your own sheet of paper to be handed in. :)