

# Good Cells Gone Bad

Developed by the Arizona Cancer Center at the University of Arizona

## **WHAT IS CANCER?**

Cancer is a word used to describe many diseases, all of which are characterized by the uncontrolled growth and spread of cells. These cells are abnormal and do not behave or function like normal cells. Normal cells grow and multiply in a controlled way to replace old or dead cells. Cancer cells grow and multiply uncontrollably. They continue growing and dividing regardless of whether or not new cells are needed.

This uncontrolled growth of cancer cells results in the formation of malignant tumors. These tumors can grow slowly or rapidly. The tumors can invade and spread to other tissues and organs in our bodies, destroying normal cells along the way. When cancer spreads it is called metastasis.

There are more than 100 kinds of cancer. Cancers are usually named for the body tissue from which the cancer cell was developed.

Cancer develops when a cell becomes abnormal. What causes the cell to become abnormal is often not understood. Many factors have been found to be cancer-causing. They include tobacco products, exposure to some chemicals, and excessive exposure to sunlight. You cannot catch cancer from another person.

In Arizona and in the U.S., breast cancer and prostate cancer are the most common cancers diagnosed each year, and lung cancer continues to be the leading cause of cancer death among both males and females. Arizona also has the highest incidence of skin cancer anywhere in the U.S. Although skin cancer is usually not life-threatening, there is one type of skin cancer, malignant melanoma, that can be very serious. If melanoma is not found early, when it can be easily cured, it can be deadly.

## GOOD CELLS GONE BAD

Cells are the basic unit of structure and function for all living things. As cells grow and divide, they arrange themselves in a particular way to form tissues. All tissues perform functions in our body. Healthy or normal cells can:

- Make proteins or “worker molecules” required by the body
- Communicate with other cells by sending signals and messages
- Make their own energy using oxygen
- Divide to make new cells
- Grow in a controlled fashion and know where they belong in the body
- Die after a specific number of divisions

Cancer occurs when cells no longer function normally. Cancer cells grow and divide in an uncontrolled way. The cells take on new characteristics that allow them to behave in an undesirable manner. In cancer cells:

- Proteins or “worker molecules” can be missing or present in unnecessary amounts
- Messages or signals used for communication are missing or changed
- Energy is made using sugar
- Growth is not regulated so the cancer cells grow out of control
- Changes occur that allow the cells to go places in the body where they do not belong
- An “immortal” nature allows the cancer cells to live longer than normal

## GOOD CELLS GONE BAD WORKSHEET

Keeping in mind the information you have been provided throughout the day and what has been covered in these handouts, examine the contents of the “normal cell.” What do you think the red ribbon represents?

What about the thumbtacks and paper clips, any idea what these might symbolize? What role do these items have in the cell?

Why would a cell need a postage stamp?

What about the match? Hint: energy.

What is the candle for? Think about the life expectancy of a candle? How does that relate to a cell?

Examine the contents of the “cancer cell.” Does the “cancer cell” contain the same components?

How is the “cancer cell” different?

Look at the ribbon. Is this symbol of the DNA molecule different from the DNA found in the “normal cell?” Are there any “mutations” or alterations?”

What about the thumbtacks and paper clips? How are they different? Are these symbols of the proteins or “worker molecules” made by a cell still functional? These changes symbolize that a relatively small change in the DNA can still have a major effect on how a cell functions.

Where is the postage stamp? What happens to a cell when it no longer communicates with the rest of “society?” Cancer cells do not receive or respond to normal signals sent by other cells (like signals to stop growing or to die).

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What else is missing from the “cancer cell?” What do you think the missing candle represents? Do cancer cells have a finite life expectancy, like that of a candle?

How do cancer cells get their energy? What symbolizes this energy source in the “cancer cell?” Cancer cells often switch to the less efficient process of glycolysis, or burning sugar to generate energy, rather than using oxygen through respiration as the “normal cell” does.

### Cell Contents

Place the following items inside plastic containers labeled “ Normal Cell” or “Cancer Cell.”

| <b>Normal Cell Contents</b> | <b>What it Represents</b>   |
|-----------------------------|---|
| Ribbon:                     | DNA or the “information molecule  |
| Thumbtacks/ paper clips:    | Proteins or “worker molcules”   |
| Stamp:                      | Communication network, how cells send information from one cell to another        |
| Candle:                     | Finite life-span of normal cells  |
| Match:                      | Cell's energy source, normal cells burn oxygen using a process called respiration |

| <b>Cancer Cell Contents</b>              | <b>What it Represents</b>  |
|--|--|
| Ribbon:                                  | DNA or the “information molecule has 2 black lines indicating mutations/changes  |
| Thumbtacks/paperclips (bent or altered): | These changes in the DNA create changes in the proteins  |
| No stamp:                                | Stamp is missing representing the fact that cancer cells do not receive or respond to normal signals sent by other cells (like signals to stop growing or die) |
| No candle:                               | Characterizes the “immortal” nature of cancer cells  |
| Sugar packet:                            | Cancer cells often switch to the less efficient process of glycolysis, or burning sugar to generate energy   |