

Chemotherapy & Blood



a lesson plan from
CancerEd

Grades K-2

Subject: Science

Crossovers: Mathematics and ELA

Topic: Cancer Treatment Options

Links to Other Lessons: Leukemia and Cells & Cell Division

Description: Students are introduced to key components of blood (red blood cells, white blood cells, and platelets) and the function of each. Students then examine and compare candy models of blood from a cancer patient before chemotherapy and after chemotherapy and consider the effects of the observed differences.

Time Required: 15-20 minutes

Background Information (for Teacher): *Cancer Treatment Options* backgrounder for teachers

Prerequisite Knowledge (for Students): Students should have an understanding of the following concept: Cancer cells divide in an uncontrolled manner – they divide when they should not, and they divide more quickly than healthy cells.

Learning Objectives:

- Students will identify key components of the blood and explain the function of each.
- Students will understand how the blood of a cancer patient differs before and after chemotherapy.
- Students will recognize and understand several side effects of chemotherapy.

Standards Addressed: See end of document

Supplementary Materials:

- *What is in Blood?* handout
- *Before and After Chemotherapy: What is Different?* handout

Classroom Materials:

- 10 zip-seal sandwich bags
- 5 bags (9 oz.) of red candies (Brach's Cinnamon Imperials)
- 1 bag of M&M minis
- 35 white jelly beans (ex. coconut Jelly Bellies)*
- 10 green jelly beans

*If white jelly beans are difficult to find, you can use white Tic Tacs instead

Preparation & Setup:

Prepare bags of candies (one set of bags for each student group):

Bag #1 (representing blood before chemotherapy):

- 350* (approximately) red candies – red blood cells
- 15 blue M&M minis – platelets
- 5 white jelly beans – white blood cells
- 2 green jelly beans – cancer cells

*Approximately 2/3 of a bag (9 oz.) of Brach's Cinnamon Imperials.

Bag #2 (representing blood after chemotherapy):

- 175** red candies – red blood cells
- 5 blue M&M minis –platelets
- 2 white jelly beans – white blood cells

- 0 green jelly beans – NO cancer cells
- ** *Approximately 1/3 of a bag of Brach's Cinnamon Imperials.*

NOTE: These are not the actual ratios of cell types and platelets in the blood. The ratio of red blood cells to white blood cells in a healthy individual is near 1000:1 (which would be difficult to model).

Staple labels to each of the bags for further clarification. (Labels “Lab Sample: Before Chemo” and “Lab Sample: After Chemo” can be found on our website)

Each team of students should receive:

- A set of “blood” samples (one bag #1 and one bag #2)
- Copies (one for each student or team) of the *What is in Blood?* handout
- Copies (one for each student or team) of the *Before and After Chemotherapy: What is Different?* handout

Alternate Setups: Instead of preparing the bags yourself, allow the students to prepare their own “blood samples” in small groups.

Lesson Opener: Distribute bag #1 to the students. Explain that the bag represents blood taken from a cancer patient. Ask the students to describe what they see in the bags.

- *Each bag has different types of candy in it. (there are several different things in our blood)*

Development

Activity Description:

Explain that there are many different things in our blood, and each performs a different and important job.

As you explain the jobs performed by each component of the blood, have the students draw a picture or write a few words in the space provided (on the *What is in Blood?* handout) that will help them remember what each part of the blood does.

- **Red Blood Cells (RBCs);** represented by red candies – carry oxygen to all of the parts of your body; this provides all of the parts of your body with energy
- **White Blood Cells (WBCs);** represented by white jelly beans – fight bacteria and viruses that infect your body and make you sick
- **Platelets;** represented by blue M&M minis – help to stop bleeding (form clots) when you get a cut; act like “zippers”

Now, introduce the **cancer cells**. Point out that these cells are not found in healthy blood. You may want to explain why cancer cells may be in the blood (in some cases, cancer cells break away from tumors and enter blood vessels; this allows the cancer cells to travel to other parts of the body)

- **Cancer Cells:** represented by green jelly beans – divide and grow out of control and prevent other cells from doing their job. Chemotherapy is used to destroy these cells.

Next, explain to students that in order to get rid of the cancer cells, the patient will need to have treatment. One type of treatment is *chemotherapy* (often called “chemo” for short). Chemotherapy is medicine that kills cells that grow quickly*, such as cancer cells. Unfortunately, chemotherapy also kills healthy cells that grow quickly, too (ex. hair cells, cells of the digestive system, and *blood cells*).

**NOTE: There are many types of chemotherapy, and each uses a different mechanism to destroy cancer cells. While many chemotherapeutic agents “target” rapidly-dividing cells, it should be noted that not all agents work this way.*

Distribute bag #2 to the students and tell them that this represents blood taken from a patient that has had chemotherapy. Ask them to identify the ways that the contents of the bags differ (using correct blood component terms, rather than candy names). *The Before and After Chemotherapy: What is Different?* handout can be used to

record observed differences. Alternatively, the teacher can record student responses on a board or large pad of paper.

Students should observe the following:

The blood of a patient *after* chemotherapy has:

- No cancer cells
- Less RBCs
- Less WBCs
- Less platelets

Explain that the chemotherapy killed all of the cancer cells, but along with bad cells, some healthy cells were destroyed too (which is why you see less red blood cells, white blood cells, and platelets).

Next, encourage students to consider the problems that someone who just had chemotherapy might face by reviewing the job performed by each part of the blood and differences between blood before and after chemotherapy. Students can draw/write their responses on the bottom of the *Before and After Chemotherapy: What is Different?* handout.

Discuss student responses as a class.

Answers:

- Less RBCs – oxygen is not delivered to all of the parts of the body, therefore the body is not provided with enough energy; the patient may be tired/weak
 - Less platelets – the blood will not clot well; the patient may bleed too much when they are injured, patient may have more nosebleeds
 - Less WBCs – there are not enough WBCs to defend against bacteria and viruses; patients may get sick more often and have more difficulty recovering from infections
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Closure: To reflect, think about someone who has just had chemotherapy. What might be difficult or dangerous for him/her? How might he/she feel? Discuss this as a class. What are some ways that the class can help someone (and help provide a healthy environment for someone) who has just had chemotherapy?

Assessment: Assess student responses to discussion questions to evaluate learning gains. Students should identify the parts of blood and the job each part plays. Students should also recognize key differences between blood before a patient has chemotherapy and after he/she has chemotherapy and recognize the effect of these differences on the health of an individual.

Further Exploration: If you would like to show a short video about blood components:

<http://www.hematology.org/Patients/Basics/>

Additional Resources:

Cancer Research UK: How Chemotherapy Works <http://www.cancerresearchuk.org/about-cancer/cancers-in-general/treatment/chemotherapy/about/howchemotherapy-works>

A document from Cancer Research UK that explains the mechanism of chemotherapy.

DNews: What Does Chemotherapy Actually Do To Your Body? <https://www.youtube.com/watch?v=MNFGTRWavTI>

A video from DNews that explains what chemotherapy does to a cancer patient's body.

Re-Mission2: Computer Games <http://www.re-mission2.org/games/>

Play these fun games from Re-Mission2.org to “fight” cancer using chemotherapy and radiation

Questions or Comments?

Please contact us at: info@CancerEd.org

Standards Addressed:

Next Generation Science Standards K-2	
Practices	<p><i>Practice 2: Developing and Using Models</i></p> <ul style="list-style-type: none"> • Distinguish between a model and the actual object, process, and/or events the model represents. • Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). <p><i>Practice 3: Planning and Carrying Out Investigations</i></p> <ul style="list-style-type: none"> • Make predictions based on prior experiences.
Core Ideas	<p><i>LS3.B: Variation of Traits</i></p> <ul style="list-style-type: none"> • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. [an individual's blood before chemotherapy is different from a patient's blood after chemotherapy]
Cross Cutting Concepts	<p><i>Scale, Proportion, and Quantity</i></p> <ul style="list-style-type: none"> • Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). <p><i>Structure and Function</i></p> <ul style="list-style-type: none"> • The shape and stability of structures of natural and designed objects are related to their function(s). [different cells have different structures and functions; cancer cells differ from healthy cells]
Common Core State Standards	
ELA/Literacy	<p><i>SL K.1 (SL 1.1, SL 2.1)</i> Participate in collaborative conversations with diverse partners about kindergarten (<i>grade 1, grade 2</i>) topics and texts with peers and adults in small and larger groups.</p>
Mathematics	<p><i>MP.2 Reason abstractly and quantitatively</i></p> <ul style="list-style-type: none"> • K.CC.B Count to tell the number of objects. • K.CC.C Compare numbers • K.MD.A Describe and compare measurable attributes • K.CC.B Classify objects and count the number of objects in categories