Apoptosis and Disease

Contributors

Amanda Reynolds
Graduate Student
Georgia Southern University, GA

Anne Newell
Partner Teacher
Portal Middle/High School, GA

Intended Audience

<table>
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<th>K-4</th>
<th>5-8</th>
<th>9-12</th>
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Activity Characteristics

<table>
<thead>
<tr>
<th>Classroom Setting</th>
<th>Requires special equipment</th>
<th>Uses hands-on manipulatives</th>
<th>Requires mathematical skills</th>
<th>Can be performed individually</th>
<th>Requires group work</th>
<th>Requires more than one (45 min class) period</th>
<th>Appropriate for special needs student</th>
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Introduction

Description

Students will answer questions about their lifestyle choices and learn how negative choices can impact their future health.

Abstract

This lesson starts with a brief introductory powerpoint over the cell cycle and apoptosis. Afterwards, students will be asked a series of questions about their individual lifestyle choices (i.e. tanning frequency). As we work through the activity, we will discuss how each lifestyle choice can negatively impacts future health. For each negative lifestyle choice students partake in, they will “lose cells” or color in bubbles on a square of bubble wrap. After answering all the questions, students will count their number of colored bubbles to determine their risk factor for future health and wellness.

Core Themes Addressed

<table>
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<tr>
<td>Molecular basis of heredity</td>
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<td>Biological evolution</td>
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<td>Interdependence of organisms</td>
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<td>Matter, energy, and organization in living systems</td>
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<td>Behavior of organisms</td>
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Keywords

Cell cycle, cardiovascular disease, and cancer

Learning Objectives

At completion of this activity, learner will:

1. Describe apoptosis.
2. List 3 negative lifestyle choices.
3. Explain how negative lifestyle choices causes disease.

Standard C: Life Science

- The Cell
Teacher Handout
Apoptosis and Diseases

Student Prior Knowledge

Students should have the following knowledge prior to completing this activity:

1. Cells and cell cycle.
2. Mitosis.

Teacher Background Information

Apoptosis is a form of programmed cell death. To counteract the effects of apoptosis ten billion cells are made daily, which is vital for cell health. In the cell cycle, all cells arise through mitosis/meiosis and die through apoptosis. Due to toxins in the environment and unhealthy lifestyles choices this cycle can malfunction, resulting in many common types of diseases. For example, when apoptosis happens faster than cells can be replaced it can cause AIDS, cardiovascular disease, and neurodegenerative disease. However the opposite can happen when apoptosis doesn’t occur fast enough and can cause cancer and autoimmune disorders. Interestingly, most scientists now consider aging to be a disease. Aging occurs when your body cannot repair itself efficiently, because of slowed apoptosis, coupled with damaged accumulated over a lifetime.

Class Time

This activity will require a minimum of one 45 minute class period.

1. Introduction Powerpoint-15 minutes
2. Explain Lab/Put Students in Groups-5 minutes
3. Lab Activity-20 minutes
4. Wrap-Up/Review-5 minutes

Teacher Preparation Time

This lesson will require approximately 30 minutes of preparation time.

1. It will take 30 minutes to cut 5 by 5 inch squares of bubble wrap for each student in your class.
Materials and Equipment (Per Student)

1. (1) sharpie or marker (washable)
2. (1) 5 by 5 inch square of bubble wrap

Methods

1. Questions and answer to this activity can also be found in the introductory powerpoint. Question and answers will be included below.
2. **Question 1:** Do you apply sunscreen to your body every time you go outside (even when it is cloudy)? (A) All the time (B) 50% of the time (C) None of the time
   **Answer 1:** (A) Color in 1 bubble. (B) Color in 3 bubbles (C) Color in 6 bubbles
3. **Question 2:** How often do you go to a tanning bed to get an artificial tan? (A) Never (B) Once a Month (C) Once a week (D) More than once a week
   **Answer 2:** (A) Color in 1 bubble. (B) Color in 2 bubbles (C) Color in 4 bubbles (D) Color in 6 bubbles
4. **Question 3:** Does anyone in your household (including you) smoke tobacco substances? (A) Yes, on average more than 1 pack a day (B) Yes, on average 1 pack a day (C) Yes, on average half a pack a day (D) Never
   **Answer 3:** (A) Color in 6 bubbles. (B) Color in 4 bubbles (C) Color in 2 bubbles (D) Color in 1 bubble
5. **Question 4:** Do you exercise vigorously for more than 30 minutes, 5 times a week? (A) No (B) Yes, but not 5 times a week (C) Yes, but not for more than 30 minutes (D) Yes
   **Answer 4:** (A) Color in 6 bubbles. (B) Color in 3 bubbles (C) Color in 3 bubbles (D) Color in 1 bubble
6. **Question 5:** On average, how much red meat do you eat daily? (A) I rarely eat red meat (B) I eat less than 3 oz. of red meat a day (C) I eat about 3 oz. of red meat a day (D) I eat more than 3 oz. of red
   **Answer 5:** (A) Color in 1 bubble. (B) Color in 2 bubbles (C) Color in 4 bubbles (D) Color in 6 bubbles
7. **Question 6:** On average, how many servings of vegetables do you eat daily? (A) I rarely eat vegetables (B) I eat 3 servings (C) I eat 1 serving (D) I rarely eat vegetables
   **Answer 6:** (A) Color in 1 bubble. (B) Color in 2 bubbles (C) Color in 4 bubbles (D) Color in 6 bubbles
8. **Question 7:** On average, how many servings of fruit do you eat daily? (A) I rarely eat fruit (B) I eat 2 servings (C) I eat 4 servings (D) I eat more than 4 servings
   **Answer 7:** (A) Color in 6 bubbles. (B) Color in 4 bubbles (C) Color in 2 bubbles (D) Color in 1 bubble
16. **Question 8:** On average, how many 12 oz. cans of soda, sport’s drinks, energy drinks, or sweet tea do you drink a day? (A) I rarely drink sweet beverages (B) I drink 1 can a day (C) I drink 3 cans a day (D) I drink more than 3 cans a day

17. **Answer 8:** (A) Color in 1 bubble. (B) Color in 2 bubbles (C) Color in 4 bubbles (D) Color in 6 bubbles

18. **Question 9:** How often do you eat at fast food restaurants? (A) I rarely eat at fast food restaurants (B) I eat fast food once a week (C) I eat fast food 4 times a week (D) I eat fast food more than 4 times a week

19. **Answer 9:** (A) Color in 1 bubble. (B) Color in 2 bubbles (C) Color in 4 bubbles (D) Color in 6 bubbles

20. **Question 10:** Do you drink enough fluids to stay hydrated (clear urine)? (A) No, I am never fully hydrated. (B) Sometimes, I am hydrated 50% of the time (C) Yes, I am always fully hydrated

21. **Answer 10:** (A) Color in 6 bubbles. (B) Color in 3 bubbles (C) Color in 1 bubble

22. **Question 11:** How much sleep do you get on a nightly basis? (A) I sleep less than 6 hours a night (B) I sleep about 7 hours a night (C) I sleep about 8 hours a night (D) I sleep about 9 hours a night

23. **Answer 11:** (A) Color in 6 bubbles. (B) Color in 4 bubbles (C) Color in 2 bubbles (D) Color in 1 bubble

24. Have students tally up the number of bubbles (cells) they colored in during the course of the activity. Use that number to find out the risk factor range.

25. Risk factor ranges are listed at the end of the introductory powerpoint,

**Tips/Suggestions**

1. There is a lot of material to cover in this activity. This activity can be easily split into 2-45 minute class periods or 1-90 minute class period.

2. Some questions can be eliminated to ensure the activity can fit in one 45 minute class period with a 5 minute wrap-up section at the end. The questions to be eliminated can be at the teacher’s discretion.

**Answers to Student Handouts**

1. Which answer accurately describes apoptosis?

   A. Apoptosis is when more cells are made to keep organs healthy.

   B. Apoptosis is when cells die.

   C. Apoptosis keeps organs healthy but it can “malfunction” and cause disease.

   D. Both A & B accurately describe apoptosis.
E. Both B & C accurately describe apoptosis.

2. List THREE negative lifestyle choices that can affect your health.
   
   1) Not exercising
   
   2) Eating an unhealthy diet
   
   3) Smoking

3. You will use the following figure to explain how negative lifestyle choices can cause disease. Fill in each box with one of the following words/phrases: cellular stress, cardiovascular disease, apoptosis, and eating fatty foods.
Student Handout
Apoptosis and Diseases

Introduction

Apoptosis is a form of programmed cell death. To counteract the effects of apoptosis ten billion cells are made daily, which is vital for cell health. In the cell cycle, all cells arise through mitosis/meiosis and die through apoptosis. Due to toxins in the environment and unhealthy lifestyles choices this cycle can malfunction, resulting in many common types of diseases. For example, when apoptosis happens faster than cells can be replaced it can cause AIDS, cardiovascular disease, and neurodegenerative disease. However the opposite can happen when apoptosis doesn’t occur fast enough and can cause cancer and autoimmune disorders. Interestingly, most scientists now consider aging to be a disease. Aging occurs when your body cannot repair itself efficiently, because of slowed apoptosis, coupled with damaged accumulated over a lifetime.

Student Background Knowledge

Students should have the following knowledge prior to completing this activity:

1. Parts of the cell.
2. Mitosis and the cell cycle.

Vocabulary


Cardiovascular Disease: A lack of oxygen to the heart which results in increased apoptosis.

Cancer: Mutations within the cell causing decreased apoptosis.

Materials Checklist

<table>
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Procedure

Answer the following two questions at the end of the activity.

**I lost a total of _______ cells out of a total of 66.

**Which risk factor category did you fall into?
Student Worksheet
Apoptosis and Diseases

Which answer accurately describes apoptosis?

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2)  
3)  

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