



Description Students learn about the hormone adrenaline/epinephrine and how it is impacting people in America through the intersection of medicine and business. The students are given an opportunity to consider the history and implications for business, science and families.		
Grade Levels 5-8	Student Outcomes Students will: <ul style="list-style-type: none"> List reasons for and against raising the price of Epi-pens. Explain how this price increase can affect families. Apply the information to a decision about the price of the Epi-pen and construct an applicable action item. 	Next Generation Science Standards <ul style="list-style-type: none"> Grade 5: 3-5-ETS1-2 Grades 6-8: MS-ETS1-1, 2
Duration 40 minutes		Common Core ELA Standards <ul style="list-style-type: none"> Grade 5: LS1.5; SA2.2a, b, c Grade 6: LS1.5, 6; SA2.2a, b Grade 7: LS1.3, 5; SA 2.4a, b Grade 8: LS1.2, 9; SA2.4a, b, c

Materials (one set per group of 4 students)

- Board
- Brainstorming Chart
- Writing utensils
- Technology to show the class a video or documents (computer, projector, laptops, etc.)

Vocabulary

Familiarity with these terms and concepts will enhance students' experience in the activity.

- **Adrenaline/Epinephrine:** A hormone secreted by the adrenal glands, especially in conditions of stress, increasing rates of blood circulation, breathing, and carbohydrate metabolism and preparing muscles for exertion. It also can be created in a lab from sources extracted from animals.
- **Hormone:** A regulatory substance produced in an organism and transported in tissue fluids such as blood or sap to stimulate specific cells or tissues into action.
- **Allergic reaction:** A histamine response by the immune system to a substance.
- **EpiPen®:** A brand name for an epinephrine auto-injector device used to manage potentially life-threatening anaphylactic reactions to allergens. Epinephrine is the first-line treatment for life-threatening allergic reactions.
- **Anaphylaxis:** An acute allergic reaction to an antigen (e.g., a bee sting) to which the body has become hypersensitive.
- **Ethics:** The branch of knowledge that deals with moral principles.



Teaching Points

- Today we are going to discuss this hormone (write it on the board): $C_9H_{13}NO_3$
- More information about this chemical go to:
<https://pubchem.ncbi.nlm.nih.gov/compound/DL-Adrenaline#section=Top>
- QUESTION: What elements do you see? Carbon, hydrogen, nitrogen, and oxygen.
- This is the chemical adrenaline, also called epinephrine. Do either of these words sound familiar to you? This is the chemical that can give people an extra boost of energy if you get scared or startled, or the drug that can help people if they are having a severe allergic reaction or are going into anaphylactic shock. This is also a chemical that has been discussed in the news a lot lately and we are going to learn a little bit about it and the controversy today and then I will ask you to write your opinion on the current issue.

Procedure

1. Share this short, four minute CBS segment on the rising cost of EpiPens® and the toll on families.
<https://youtu.be/OYmba6KhNDs>
 - a. Possible Discussion Questions:
 - What is the purpose of the EpiPen®?
 - What is the current problem that some people have with the EpiPen®?
 - How much is the cost of the epinephrine in the EpiPen®?
 - How do you think the Henegar family feel about the change in price?
 - Why might a family choose not to buy the EpiPen®?
 - What do you think led to the price change?
2. (Optional) Build more background:
 - a. History of the EpiPen® with discussion of anaphylaxis, discovery of adrenaline, and invention of the EpiPen®
 (short version) <http://www.healthline.com/health-news/strange-history-of-epipen#3>
 (longer version) <https://www.chemheritage.org/distillations/magazine/a-mighty-pen>
3. Have students break up into teams and make two charts: One chart for families and one chart for Mylan. On both charts they should write reasons for and against raising the price of the EpiPen®.

Example:

Families		Mylan	
Lower Cost of EpiPen®	Higher Cost of EpiPen®	Lower Cost of EpiPen®	Higher Cost of EpiPen®
<ul style="list-style-type: none"> • Buy Epi-pen • Less worry • Children are safe • Still afraid of child having a reaction, but at least they have the medicine 	<ul style="list-style-type: none"> • Maybe not buy it • Worry about money and child • Can't pay a different bill 	<ul style="list-style-type: none"> • Integrate counter-arguments 	<ul style="list-style-type: none"> • Maybe bonuses for employees • Hire more people • Profit for company • Less consumer loyalty

4. As a team, they need to take a side, either for or against the price change and a concrete action that should be taken with an explanation why.
5. Examples of how this could look:
 - a. Keep the price where it is and Mylan should testify before Congress explaining their reasons. This country is a free market economy and it is Mylan's right to raise their prices and the market's choice to buy or not.



- b. Lower the price by changing patent laws in the United States. It is unfair that a company can buy technology that was developed for free and charge outrageous prices to families that have to buy the product. This is life or death, there is not a real market choice.
6. Have students share their team's stance and action with the class.

Teaching Points:

- This is one example where business, chemistry, and health have crossed and it has an impact on many members of society. If you have an interest in chemistry, know that you can follow that passion across many industries. Also, it is important to think about these issues because these decisions affect people's lives and have ethical implications.

Taking it Further

- Learn more about how allergies, adrenaline, or EpiPens® work
- Possible resources:
 - a. Allergies https://youtu.be/tyuuEJLfO_E
 - b. Adrenaline <https://youtu.be/GilWRuk81tk>
 - c. EpiPens® <https://youtu.be/CHPjMFgXjiQ>
- Have students research other chemicals and innovations in our everyday lives and discover their history. Consider the following chemical innovations: Kevlar, Teflon, WD-40, Vaseline, Post-it notes.