Energy in Food

By Doaa George, based on the workshop investigation by Howard Stonelake

Introduction

Our bodies obtain the energy required to do our everyday activities from the food we eat. Food stores chemical energy, and this energy is transferred to our bodies when we eat. Energy is never created or destroyed, and it can easily change from one form to another. The energy in food is stored in chemicals, and is waiting to be released. For this reason, we call it chemical potential energy.

Different kinds of food contain different amounts of energy. This has a lot to do with what foods are healthy, and what foods make you gain weight! You will use the concept of energy transformation to burn different types of food and measure the amount of energy released as heat energy. Believe it or not, but burning food in air is the same chemical reaction that takes place inside our bodies. When we get energy from food we are literally burning it!

Safety

Safety precautions should be taken with the experiment.

1. Make sure you are not allergic to any type of food you are using.
2. Always wear safety goggles throughout the experiment.
3. Caution should be taken when using flames.
4. Watch out not to break glass and if any glass breaks inform your teacher.
5. Be sure your teacher checks your method and setup before you start measurements.

Figure 1: Different Foods

Questions:

Aim: To find out how much energy is released when a small piece of food burns.

Before you complete this investigation, make a hypothesis about what food you think will contain the most energy.

Hypothesis:

Plan:

This investigation has been planned for you.

Materials

- Small piece of food, e.g. Nutri-Grain or Tiny Teddy
- Bunsen burner
- Wire to make holder
- Small test tube
- Thermometer
- Measuring cylinder
- Stand and clamp
- Digital Scale (Optional)

Conduct:

Form a group of three and decide which type of food you will measure the energy content of.

Method

1. Use the measuring cylinder to measure exactly 10 ml of water into the small test tube.
2. Clamp the tube as shown in figure 1.
3. Use the thermometer to measure the initial temperature of the water.
4. Break off a small piece of food, and if a scale is available weigh it.
5. Use the wire to make a holder for the piece of food.
6. Light the Bunsen burner. Then put the food in the flame. As soon as it catches fire, hold it about 2 cm under the test tube.
7. When the food stops burning, stir the water gently with the thermometer, and measure the final temperature.
8. If you have time, repeat the experiment with other foods such as potato crisps, nuts, bread, rice, spaghetti

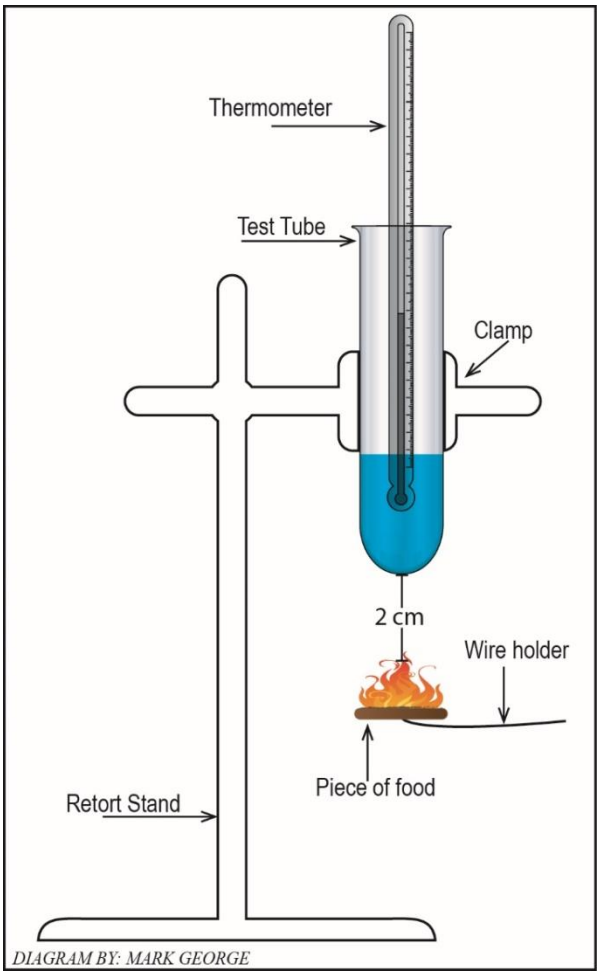

Figure 2: The setup for the experiment

Record your observations

What type of food releases the most heat? Record other observations, does it burn fast or slow? Does it smell?

Type of food	Initial temperature ^{0}C	Final temperature ^{0}C	Temperature difference ^{0}C	Other Observations

Take note of the volume/weight of the food, and the rate of temperature change.

Analysis:

Identify your dependent and independent variables.

Compare your results with the rest of the group's results to find which food caused the greatest amount of temperature change. Does this mean that this food also has the highest amount of stored energy?

What variables should be kept constant for all tests in order for the comparison of results between groups to be valid?

1. By how many degrees did the temperature of the water increase?

2. It takes 4.2 joules to raise the temperature of 1 ml of water by 1^0C. So, to calculate the heat energy gained by 10 ml of water, multiply the temperature rise by 42. Your answer will then be in joules.

Problem solving:

1. Do you think all the energy from the burning food went into heating up the water in the test tube? Explain.

2. Were there any problems with the investigation? If so, suggest how these problems could be fixed.

Conclusion:

Were you able to find which food contains the highest amount of stored energy?

Does your finding agree with your hypothesis?

Figure 1: https://www.flickr.com/photos/maiarenata/8402951325/in/photolist-dNxjF8-SACJr7-qcR7kb-QT8tnW-RW4AHN-dt73UW-BEtD8v-UAzcwM-dYzsV6-dND9FY-pibqfs-91ESGw-kUwyaH-RPTyHj-XgPtWQ-cefkoN-dnuzE3-bUHXEM-C7bGmS-tMiCcj-aBjdWq-i4cG1G-6pSbai-qcR4fd-e1Tvs9-dxMB4j-a1v6uJ-JEavUQ-o9NZJg-5LVrSV-fA1DS-8ZKKrV-b1izpc-5mFK-7XbptP-T9Y9K7-2b4k-6uHw2U-po4wAu-dAspHj-i8qMtV-cgnYod-ssSGNF-cDZCRY-EpTAYN-pP6Eh3-pzdneL-C8k1j3-b3Rn-aBjei7 Author: renata mala Licence: https://creativecommons.org/publicdomain/mark/1.0/