



Candy DNA Model Lesson

Grades 3-12

Lesson adapted by Beth Calder and Susan Brawley

(There are many similar lessons available on the web, but Cooperating Teachers and Teaching Fellows adapted this lesson plan in our program; with special recognition and thanks to Dave Ploch, Old Town High School.)

Reference:

Audesirk, T., Audesirk, G., and Byers, B.E. 2001. Biology: Life on Earth. 6th Edition, Prentice Hall College Div., Upper Saddle River, NJ.

Background information on DNA and different variations of DNA model activities can be found at the following web sites:

<http://www.hhmi.org>

<http://www.dnai.org>

<http://biology.about.com/c/ht/00/07/>

How_DNA_Model_Candy0962932481.htm

<http://nobel.scas.bcit.ca/resource/dna/>

dna_sweets.htm

Objectives:

To introduce DNA to students.

To review DNA structure and complementary base-pairing with a hands-on activity.

Materials:

Twizzlers

Small Colored Gumdrops (or small colored marshmallows)

Toothpicks

Note: When working with food activities, be aware that some students may have food allergies.

Background Information:

DNA (deoxyribonucleic acid) is found in the chromosomes of all living things. The chromosomes (located in the cell's nucleus) contain genetic information in long sequences of DNA (DNA chains can be millions of nucleic acids long). DNA provides a set of instructions on how to build the proteins in every living organism, what proteins are needed to create the organism, and in which sequence amino acids are needed in order to build all of the different proteins required for the organism's growth.

Structure:

All DNA (in humans, snakes, frogs, birds, turtles, insects, etc.) is composed of three parts: a five-carbon sugar called deoxyribose, a phosphate group, and a nitrogen-containing base (there are 4 potential bases in DNA: adenine, guanine, cytosine, and thymine) (please see Cold Spring Harbor Laboratory website for general DNA information: <http://www.dnai.org>). The three part components of DNA make up nucleotides. Nucleotide chains are formed as the phosphate group of one nucleotide attaches to the sugar of the following nucleotide. The structure of DNA is a double helix similar to the shape of a "ladder" that has been twisted. The phosphate/sugar attachments are on the outside "uprights" of the ladder, while the attached bases, between the two nucleotide strands, can be considered the "rungs" of the ladder. Two strands of sugar and phosphate backbone are twisted and connected to alternating bases.

Complementary Base Pairing:

The alternating bases (the “rungs” of the ladder) pair together between the two DNA strands in complementary pairs. Adenine always pairs with thymine, while cytosine always pairs with guanine. Therefore, in the double helix structure, one DNA strand is matched to complementary bases of the other strand.

Activity:

Review the above information and website (<http://www.dnai.org>) with students, and then have students build their own DNA helix models from candy. Have students select 4 different colors of gumdrops (or marshmallows), two Twizzlers, and a handful of toothpicks. Explain to students that the Twizzlers represent the sugar/phosphate backbone of their DNA and that the gumdrops (or marshmallows) represent the nitrogen-containing bases. Students can generate a legend to designate which color gumdrop corresponds to which base. The students can first create one DNA strand by attaching the gumdrops (alternating bases) with a toothpick to one Twizzler. Have students push the gumdrop down through the toothpick close to the Twizzler to allow for enough room to attach the second DNA strand. (In the end, students should have two bases in the middle of one toothpick and the two ends of the toothpick attached to each Twizzler to allow for a tighter double helix.) Once the first DNA strand has been completed, have the students attach the second DNA strand by complementary base pairing.

For example, the first “rung” of the DNA “ladder” is guanine, the student will want to place a “cytosine” gumdrop next to it and then begin attaching the second Twizzler to add the second upright of the double helix “ladder”.

The students should continue the complementary base pairing until the DNA “ladder” is complete. After the students complete their DNA “ladder”, they can slowly twist it into a double helix model. Have each student explain to the teacher/educator his or her nitrogen containing-base legend and define complementary base pairing to reinforce knowledge and understanding. The teacher/educator can check to determine if each student’s sequence is correct and agrees with his/her base legend. After each student has a DNA model checked by the teacher/educator, the students can enjoy eating their creations!