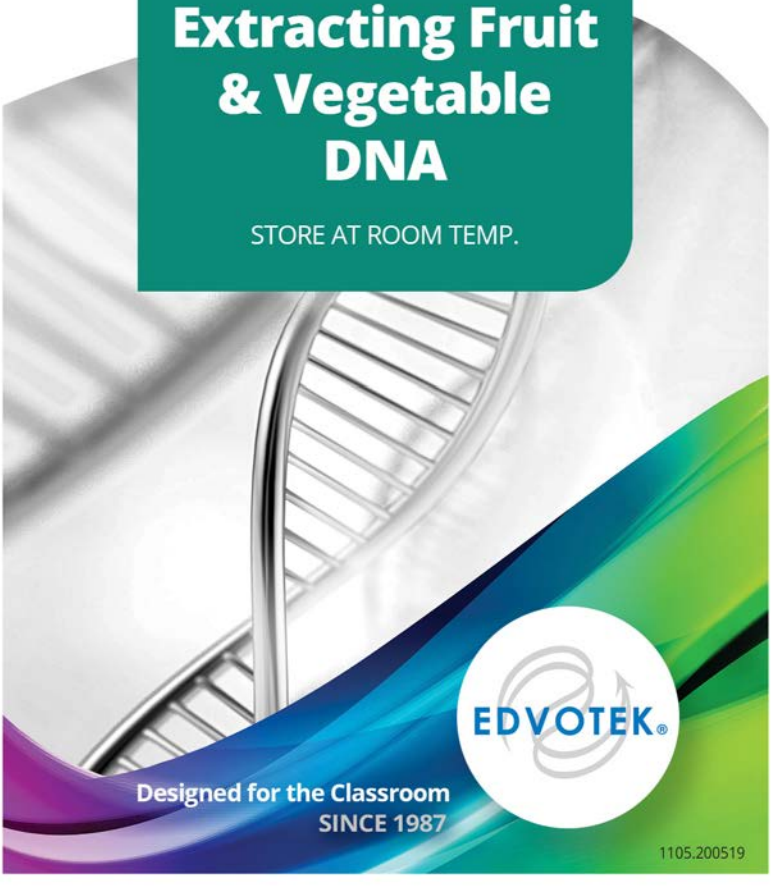
EDVOTEK® MyLab™ #1105

Extracting Fruit & Vegetable DNA

STORE AT ROOM TEMP.



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SINCE 1987

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OBJECTIVES

The objectives of this experiment are to learn:

- How to isolate DNA from fruits or vegetables
- What DNA looks like in solution
- How to spool DNA from solution
- What DNA looks like after it is spooled from solution
- The structure of DNA
- The function of DNA

COMPONENTS

This experiment contains reagents and disposables for 3 experiments.

- DNA Extraction Buffer
- Calibrated Transfer pipets
- Wooden sticks
- Large test tubes
- Small test tubes

REQUIREMENTS

- Vegetables such as onions, tomatoes, lettuce or scallions
- Fruits such as ripened strawberries (fresh or frozen), bananas, or grapes
- Clear 70% or 91% isopropyl alcohol (rubbing alcohol) - freezer cold
- Pencil with clean eraser or chopstick
- Laboratory notebook (optional)

GENERAL SAFETY PRECAUTIONS

Parental or adult supervision required.

1. Designate a clean and uncluttered area for performing experiments.
2. Read all instructions before you begin.
3. Do not eat or drink. Do not apply make-up or contact lenses. Adult(s) should not smoke while performing experiments.
4. Wash your hands before and after performing the experiment.
5. Gloves and goggles should be worn routinely as good laboratory practice.
6. Disinfect the counter top or bench with 70% isopropyl alcohol (rubbing alcohol, or place clean newspaper over the area to be used.

WARNING

Choking hazard. Products contain small parts. Not appropriate for children under 5 years old. No human or animal products are used in any experiments.

DEOXYRIBONUCLEIC ACID (DNA)

DNA plays an important role in two processes. DNA provides information to copy itself, so genetic information can be passed on from generation to generation of cells. In its second important role, DNA provides instructions for making proteins, which are vital to the maintenance and function of cells.

The structure of the DNA molecule was determined by James Watson and Francis Crick in 1953. They determined that DNA is a double helix consisting of two strands. The Watson and Crick DNA model is often described as a spiral ladder. The two strands of DNA that make up the backbone of the ladder are made of sugar phosphodiester groups. The sugar backbone acts as a support for the rungs of the ladder.

These rungs are composed of the chemical base pairs of Adenine and Thymine, Guanine and Cytosine. The first letters of these bases, A,T,C,G, are used by scientists to designate the order of the bases within the DNA strands. The bases are always arranged in pairs. When A occurs on one strand, T occurs on the opposite strand. Similarly, G and C are on opposite DNA strands. The bases are held together by weak hydrogen bonds which are shown as dashed lines in Figure 1.

In this experiment, DNA will be extracted from fruits and vegetables such as onion, strawberry, or tomato and spooled from solution. DNA will be observed by the naked eye on a spooling stick. An observer will NOT be able to see the molecular structure of DNA. These structures are much too small to be seen with the naked eye or by the use of a regular microscope. An observer will see billions of DNA fragments twisted together to form a sticky, white mass.

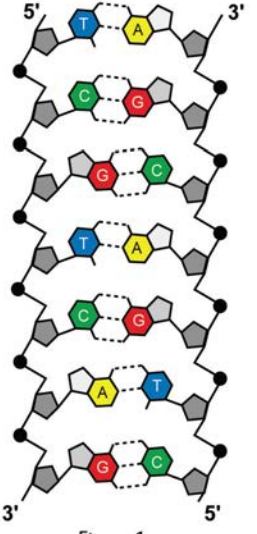
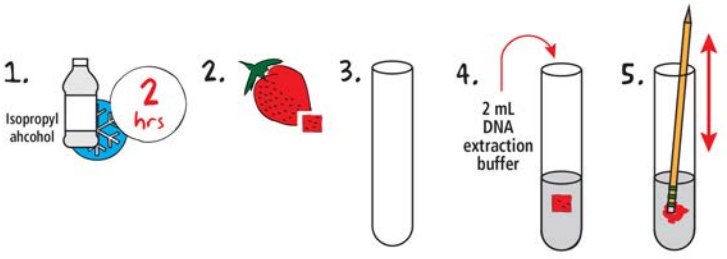


Figure 1



EXPERIMENTAL PROCEDURES FOR TWO EXPERIMENTS

In this activity, DNA is extracted from fruits and vegetables using an extraction buffer and spooled from solution by overlaying the liquid with ice-cold isopropyl alcohol.

1. PLACE isopropyl alcohol in the freezer for at least 2 hours before starting the experiment.

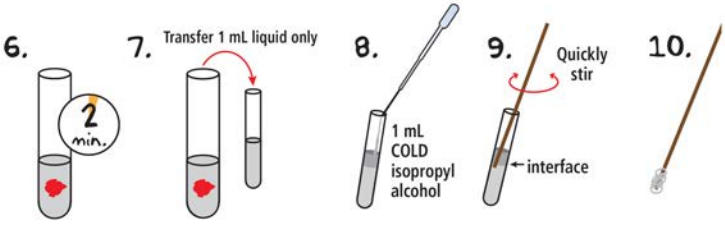
2. CUT a 5 x 5 x 5 mm cube (about the size of a pencil eraser) from the selected fruit or vegetable.

3. TRANSFER the fruit or vegetable piece to a large test tube.

4. Use a transfer pipet to ADD approx. 2 mL DNA Extraction Buffer to the tube.

5. MINCE the fruit or vegetable with the eraser end of a pencil or clean chopstick (mash well). This will release the cellular contents and the DNA.

CONTINUED



EXPERIMENTAL PROCEDURES, continued

6. Let the tube REST for about 2 minutes to let the pieces of fruit or vegetable settle to the bottom.

7. Carefully TRANSFER 1 mL of the liquid extract from the large test tube to one of the small, clean test tubes. Take care not to transfer any pieces of fruit or vegetable.

8. Carefully OVERLAY the DNA extract with 1 ml of freezer-cold isopropyl alcohol by letting it gently run down the side of the test tube.

9. Using a wooden stick, SPOOL the DNA by quickly stirring and rotating the stick in a circular motion at the interface of the extract and the alcohol. LIFT the stick out of the solution from time to time and OBSERVE the DNA attached to it.

10. After spooling for several minutes, REMOVE the stick from the test tube to OBSERVE the DNA. The DNA will appear as a viscous, gelatinous material adhering to the stick.

STUDY QUESTIONS

1. What are two functions of DNA in cells?

2. Describe the general chemical structure of DNA.

3. Where in human cells is DNA found?

4. Complete the second strand of this piece of DNA:
   GTCATTGCCATGCAGCAG

5. Why is DNA not visible to the naked eye?

TERMS AND CONDITIONS

- FOB: Washington, DC
- Safety Data Sheets are available on our web site and by request.

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Answers to Study Questions:

1. *DNA provides information to copy itself so genetic information can be passed on from generation to generation. DNA also provides information for making proteins.*

2. *DNA is a double helix consisting of two stands. The Watson and Crick model is often described as a spiral ladder. The two strands of DNA, that are the backbone of the ladder, are made of sugar phosphodiester groups. The sugar backbone acts as a support for the rungs of the ladder. These rungs are composed of the chemical base paris Adenine, Thymine, Guanine, and Cytosine.*

3. *DNA is found in the nuclei of human cells.*

4. *CAGTAACGGTACGTCGTC*

5. *DNA is not seen by the naked eye because the individual bases and the backbone are too small to be seen. However, billions of DNA fragments twisted together to form a gelatinous mass can be seen after alcohol precipitation is performed and the DNA are spooled.*