DNA Extraction Lab Basic Level Student Version

Credits: Austin CC BioTechEd project; Donald Bell, OCCC project.

DNA Extraction Lab

A complete copy of DNA is found in every cell in any organism. In order to release the DNA to analyze it, scientists must break open the cells and remove structural proteins and enzymes that interfere with the DNA structure. This simplified procedure releases a great deal of DNA so that you can see it. It allows observation of DNA's physical and chemical properties. It does not, however, purify the sample enough for the strict standards of a research or forensics lab.

To investigate DNA, you must know the following:

□□DNA is found in the cell of every living thing
□□Proteins and enzymes may obscure seeing the DNA, so it must be removed.
□□You must break thru a cell membrane or cell wall to release DNA.
□□Among eukaryotes DNA is contained in the membrane wrapped nucleus.
□□DNA in prokaryotes is floating free in the cytoplasm.

You will have these materials to use:

□□Raw wheat germ (premeasured)
□□Non-iodized table salt (premeasured)
□□Dishwashing detergent (premeasured)
□□6% papain solution (meat tenderizer) (premeasured)
□□10 ml ice-cold ethanol in a test tube (keep it on ice)
□□Warm tap water (not boiling)
□□Ice
□□2 small plastic cups
□□1 plastic cup to hold ice
□□1 small plastic cup for disposal of materials
□□1 dropper (for stirrer and to dispense solution)

When you have collected these materials, wait for instruction from your instructor.

Laboratory

1. In one of the small cups, mix about 50 ml of hot distilled water (or tap water) with the vial of dishwashing soap and salt. Stir easy to limit the bubbles. *(Soap and salt are used to disrupt the cell walls and membranes to release the DNA. Heat also helps "lyse" the cells and speeds up the reaction. The salt will also help later to precipitate the DNA so that it becomes visible and can be separated.*)
2. Place the raw wheat germ in the second small plastic cup. *(Wheat germ is the embryo of a kernel of wheat – purchased at the grocery, it is usually toasted which destroys the DNA, this wheat germ is raw.)*
3. Add enough of the soap and salt solution to the wheat germ to fill it about 1/3 full. *The wheat germ will absorb the water and swell so you may need to add more soap*

solution so
there is clear liquid on top for step 7. If you add too much solution, the DNA will be diluted
and you won't see as much in the last step.
4. Add the vial of meat tenderizer solution that contains the papain. *(Meat tenderizers work*
by breaking down proteins to make the meat softer. There are proteins associated with DNA
that will make it harder to spool and less likely to clump together and precipitate unless they
are removed. Papain can also help break down DNAase, an enzyme that breaks down
DNA.)
5. To give the soap and salt time to work, stir the solution **slowly** for 5 minutes using the blunt end of the pipette. Stirring helps the reactions but don't stir too fast or you will get bubbles from the soap that traps the DNA.
6. Allow the solution to settle for about 2 minutes (or centrifuge for 30 seconds).
7. Use the pipette to withdraw 1 dropper full (about 1 ml) of the clearer fluid near the top of the solution.
8. Slowly add the fluid to the test tube containing 10 ml of ice-cold ethanol. DNA is soluble in
water, but not in ethanol. The colder the ethanol, the less soluble the DNA is. The DNA may not appear immediately but will slowly appear over the course of about 3 minutes.
9. Use the pointed end of the pipette to try and spool the DNA. Stir the solution slowly with the rod trying to wrap the DNA around it enough that it won't slide off when you pull it out of
the solution.

Questions:

1. What is the purpose of each of the following components in this protocol?
Dishwashing liquid
salt
meat tenderizer (papain)
ethanol
2. We can't really see a DNA molecule under the microscope unless it is tightly coiled into a
chromosome. Why can you see the DNA after you put it into the ethanol?
3. If you were able to spool the DNA you could see that it is stringy and has the consistency of
thick syrup or mucus. Based on what you know about the molecule, why do you think it has this
consistency?
Your questions: Think about how you can use this technique to find out if you can extract DNA
from other formerly living materials: fruits, vegetables, meats, etc. You could search the Internet
to get a protocol to extract DNA from a banana for example, or just try it out. Your teacher may
have additional suggestions on how to use your lab skills.