

DNA extraction

Focus questions	How might we see the raw material of life, DNA?
Vocabulary	Protocol, extraction, communication, collaboration, skepticism

Protocols are established procedures adopted by a lab or group of labs for producing quality results that can be replicated by others. These detailed step-by-step instructions insure that scientists are taking all the actions necessary to get good results. Protocols are constantly evolving based on new technology and/or scientific discoveries. Different labs researching the same thing may use different protocols based on the equipment and resources available.

As a member of a team within your lab, you will be expected to closely collaborate with the other members of your team. Working with others is essential to improving the quality of the science done by the group. Your lab has been divided into working teams.

1. Use your team's knowledge about cells and DNA to collaborate on a protocol design.
 - a. Develop your own protocol for isolating DNA from whole corn. Include details about:
 - your use of equipment
 - times
 - amounts
 - temperatures
 - b. Try out your protocol and collect data on your success.
2. Present your team's findings during the lab meeting. Lab meetings are focused on three main concepts:
 - **Communication:** sharing your information with others.
 - **Collaboration:** working together with others towards a goal.
 - **Skepticism:** evaluating information critically and looking for evidence and reasoning behind claims.

By using communication, collaboration, and skepticism, the lab will use the knowledge gained from all the teams' results to develop and test a final protocol.

Procedure

Develop and test your protocol

1. In your lab notebook, record any information about cells and DNA that might be important to know when **extracting** DNA.
2. Record the question: "How can we use collaboration to figure out how to get DNA out of cells?"
3. Collaborate with your team to determine what resources you will need and how/in what order you will use them.
4. Once all members of your team have agreed on a method, record your planned protocol.
5. Your teacher will sign off on your initial protocol, confirming that all members of your team agree.
6. Fill out the Communication/Collaboration check-in before you begin testing.

7. Obtain all the materials you need. Work through your initial protocol for the rest of the class time. Write notes on any changes, observations, or clarifications in your lab notebook.
8. Once finished, record your results. Do you believe that you extracted DNA? If so, what does it look like? If not, why do you think you did not get it?
9. Label your test tube with your group name and date. Store in the refrigerator. Keep your results to compare with the other groups' results during the next meeting.
10. For homework, consider changes you would make to your protocol and why you would make those changes.

Lab meeting

1. Prepare an informal presentation of your findings during the lab meeting. Communicate a summary of your protocol and how well your method of extraction worked out. In your group, discuss the following questions and record your answers in your lab notebook:
 - What was your protocol?
 - What can you conclude about the effectiveness of your method? (claim)
 - How do your results support your conclusion and why? (evidence and reasoning)
 - What worked with your protocol? What did not?
2. All members of your lab team must take part in the presentation of your protocol and findings.
3. After each presentation, be prepared to ask clarifying questions of the presenting team.
4. As each team presents their findings, consider whether the team used a "scientific" approach to developing their protocol.
 - Was their design informed by their understanding of the cell?
 - Is their protocol detailed enough for anyone to be able to repeat it and obtain the same results? This characteristic is called "being replicable".
5. Consider how other groups' protocols differ from yours. What can you learn from the other groups that you did not know or did not consider?
6. Using the Lab Meeting Data Sheet, make notes on how each team's protocol differed. During the discussion, write down any interesting questions, responses, or comments that you feel would be important to note.
7. After all groups have presented, the class will collaborate in developing a new protocol using the knowledge gained from each team's initial testing. Record the new protocol in your lab notebook.

New protocol testing

1. Return to your team and run the new class-developed protocol.
2. In your lab notebook, write down any observations.
3. Store the lab results in the refrigerator with your team name and date.
4. Compare the results from the class-developed protocol with your initial results.
5. Complete the post-assessment.
6. Discuss your final results as a class.

Assessments

Rubrics for self-assessment

Your current ability to communicate using evidence

1. My current ability to communicate using evidence when talking in my lab group. (Indicate by putting an x on the line.)



2. My current ability to communicate using evidence when talking in large class “lab meeting”. (Indicate by putting an x on the line.)



What is one way in which you improved in your ability to participate in a class discussion? Be specific. Give an example from the lab group work or meeting if possible.

3. I would rate our collaboration as: Non-existent OK Very good
The reason for my rating is:

One improvement I would suggest in order to improve our communication and collaboration is:

Group assessment

Observation	Yes	No
Everyone had a chance to participate equally in our discussion.		
Everyone listened well to contributions.		
Someone in our group took over.		
I “kept up” and understood what our group was doing and why.		
We divided up the work fairly.		