Threads From Cells

Extract and compare DNA from three cell sources

GEN.1A.4 "Conduct a standard DNA extraction protocol using salt, detergent, and ethanol from various cell types (e.g., plant, animal, fungus). Compare and contrast the consistency and quantity of DNA extracted from various cell types."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each step of the extraction in order and number the steps. Circle the words that describe how much material appeared and what it felt like in each practice-trial tube.

Three Samples, One Procedure

1. At each station, label three clear cups banana (plant), mushroom (fungus), and raw fish muscle (animal). Put 5 g of the matching chopped sample into each cup. For each cup, mix 20 mL water, 1 mL liquid dish detergent, and 1 g table salt. Add this solution, then mash the sample for two minutes. Filter each mixture through a separate coffee filter into a clean cup. Pour 10 mL of each filtrate into a labeled clear tube. Slowly pour 10 mL cold ethanol down each tube's wall. Keep the liquids layered, wait two minutes, and lift visible threads with a clean stick.

2. Detergent breaks apart cell and nuclear membranes, releasing DNA. Dissolved salt helps DNA molecules gather rather than stay dispersed. DNA is poorly soluble in cold ethanol, so whitish material may appear where the ethanol meets the filtered liquid. Plant and fungal cell walls can make mashing important, and different tissues may release different amounts of DNA. Wear goggles, keep ethanol away from flames, and use gloves when handling raw fish. Never taste materials, and wash your hands afterward. For a fair comparison, use the same sample mass, solution volumes, mashing time, and waiting time for each source.

3. In one practice trial, a tube labeled banana showed a wide, cloudy white band; a stick pulled out several long, slippery strands. The mushroom tube showed a thin band of short, soft wisps that broke apart when lifted. In the fish tube, a few pale specks clung to the stick, along with one short thread. These are observations of material at the ethanol boundary, not precise measurements of pure DNA. The samples may also contain other cell substances. A different fruit, mushroom, or fish sample could produce a different result, even if the same procedure is followed.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do detergent, salt, and ethanol each help make DNA visible in this procedure?

2. Which source produced the most visible material in the practice trial? Give one observation that supports your choice.

3. Compare the amount and consistency of the material in the mushroom and fish tubes.

4. A group adds ethanol before filtering its mashed sample. What should the group do instead, and where should it look for visible material?

3 YOUR TURN

Your own words

With your teacher's supplies, perform the procedure on banana, mushroom, and fish, then record a visible-material score from 0 (none) to 3 (much) and describe what you observe for each source. Write one sentence comparing both the amount and consistency of material from two sources in your results.

CELL SOURCE	VISIBLE MATERIAL (0-3)	CONSISTENCY AND EVIDENCE

Threads From Cells

PART 1 · READ AND MARK

Underline each step of the extraction in order and number the steps. Circle the words that describe how much material appeared and what it felt like in each practice-trial tube. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do detergent, salt, and ethanol each help make DNA visible in this procedure?	**Detergent breaks cell and nuclear membranes. Salt helps DNA molecules gather. Cold ethanol causes DNA to come out of solution as visible material.**
2	Which source produced the most visible material in the practice trial? Give one observation that supports your choice.	**Banana. Its tube had a wide, cloudy white band, and several long strands could be lifted out.**
3	Compare the amount and consistency of the material in the mushroom and fish tubes.	**Mushroom had a thin band of short, soft wisps that broke apart. Fish had only a few pale specks and one short thread.**
4	A group adds ethanol before filtering its mashed sample. What should the group do instead, and where should it look for visible material?	**Filter the mashed sample first, then slowly add ethanol to the filtrate without mixing the layers. Look where the ethanol meets the filtrate.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Banana | 2 | Several cloudy threads that stretch
Mushroom | 1 | Two short, clumpy wisps
Fish muscle | 2 | Several fine, loose threads
Banana and fish had similar amounts of visible material, but the banana threads stretched farther than the fine fish threads.

Accept observations that differ from the practice trial if students recorded their own results and support the comparison with those results. Visible material is not a precise measure of pure DNA.