Cheek cell dna extraction lab answers

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DNA Extraction Virtual Lab

Go to the Learn.Genetics DNA Extraction Virtual Lab Website (http://learn.genetics.utah.edu/content/labs/extraction/). Click through the lab and answer the following questions.

1. What are 3 reasons you might need to extract human DNA?

2. If we want to isolate DNA, why do we need cells?

3. List the 4 steps you follow to purify DNA from a cheek swab.

4. Describe how you would collect cheek cells.

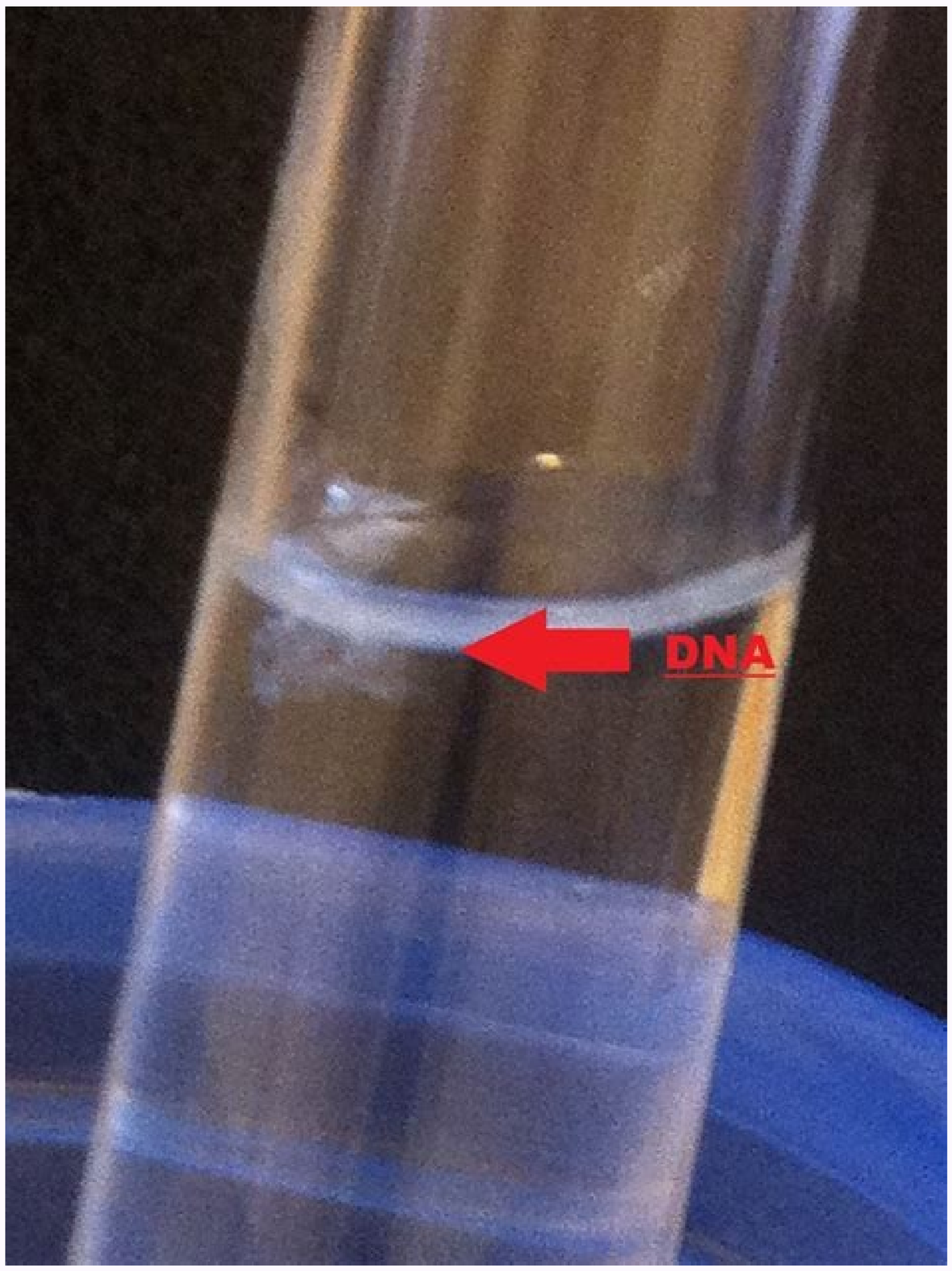
5. What does "lysis" mean?

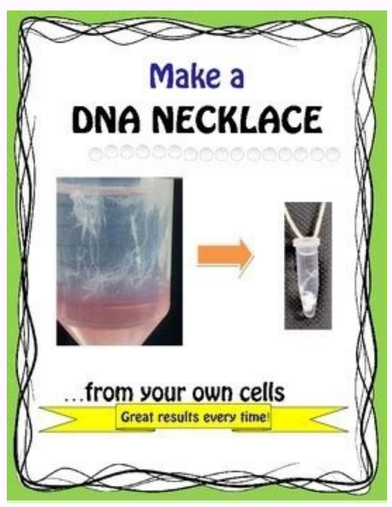
6. The lysis solution contains both detergent and proteinase K. What is the purpose of each of those?

7. What is the function of the concentrated salt solution?

8. Why is it necessary to microfuge the samples after adding the concentrated salt solution?

9. To precipitate means to "come out of solution". How and WHY does the DNA precipitate in this procedure?





EXTRACTION OF DNA FROM CHEEK CELLS

Each student will extract a sample of his/her own DNA from cheek cells isolated from inside of the mouth. Treatment with the enzyme proteinase K degrades protein and boiling helps to break open the cells. Centrifugation of the samples causes insoluble cell debris to go to the bottom of the tube while the DNA stays in solution. DNases that might degrade the isolated DNA are inactivated by the addition of the Chelex. Chelex bind ions (Mg^{2+}) required by the DNases for their function. Without these ions, the DNA is protected for the next step!

1. At your seat, use a sterile, disposable loop to scrape the inside of your cheek. This needs to be done vigorously! Scrape 20 times for each side. Dispose of the swab in the designated receptacle.

2. Twirl the loop in 200 µl of 5% Chelex buffer provided in 1.7 ml eppendorf tube. Label this tube with your number on the top and the side.

3. Add 10 µl of 2 mg/ml proteinase K solution to your tube and mix by flicking.

4. Incubate the tube for 20 minutes at 56°C in a heat block at the front bench.

5. Vortex the tube for 10 seconds.

6. Centrifuge at maximum speed for 20 seconds in a microcentrifuge.

7. At the front bench, boil the tube for 8 minutes in a heat block set at 110°C at the front bench.

8. Vortex the tube for 10 seconds.

9. Centrifuge at maximum speed for 3 minutes in a microcentrifuge.

Note: You will see a small white pellet of Chelex beads and cellular debris at the bottom of your tube. Your isolated DNA is in the solution on top of the pellet.

Your DNA contains important instructions found in every cell about how your body is built and functions. Try this simple experiment to extract DNA from your cheek to see what you're made of! Disclaimer Adult assistance is advised when handling isopropyl alcohol. Never consume isopropyl alcohol. While every reasonable effort is made to provide experiments that are safe, adult supervision is recommended at all times when experiments are performed. Safety gear, such as gloves and glasses, may be required. ingredients 2 teaspoons blue sports drink Small clear plastic cups and lids 2 drops dishwashing liquid 2 teaspoons isopropyl alcohol (at least 70%) 1 stir stick Instructions Chill the rubbing alcohol in the freezer for several hours. Pour 2 teaspoons of blue sports drink into a clear plastic cup. Pour the drink into your mouth and swish the solution vigorously for one minute. Use your teeth to scrape the insides of your cheeks (some gargling is ok too). Spit the drink back into the cup. Add 2 drops of dishwashing soap to the cup. Stir the soap into the solution completely (try not to create too many bubbles). Gently pour the 2 teaspoons of chilled isopropyl down the sides of the cup. Place a lid on the container and shake it gently. See the white stringy clumps forming where the alcohol and solution meet? That's DNA! Done the experiment? Download your Honourary Scientist Certificate! how it works The soap breaks down the cheek cells, releasing the DNA into the salty sports drink. The salt helps the cells clump together. DNA does not dissolve in alcohol, so it forms a solid where the sports drink and the alcohol meet. The white clumps are thousands of your DNA molecules! When you swish the sports drink, you'll also pick up bacteria in your mouth. So what you see may be a mixture of your DNA and bacteria! Scientists and researchers at SRC extract DNA from crops, such as wheat, to test it for disease and quality. DNA testing helps Canada's agriculture sector ensure people and animals receive safe, high-quality food and feed products. Super Science Add On The more vigorous you swish the sports drink in your mouth, the more cheek cells (DNA!) you will have in your cup. What do you have in common with a strawberry? Try extracting DNA from your favourite fruits and veggies. Combine ½ cup of water, 2 teaspoons dish soap and ½ teaspoon of salt. Mush 1/3 cup of plant material and add the salt solution to it. Mix. Pour the liquid through a coffee filter and go back to Step 7! 1. Extraction of DNA from Human Cheek Cells
2. Extracting DNA from Your Cells
Today you will extract DNA from your cheek cells. This process is similar to what is done when any DNA-containing tissue is found at a crime scene.
Cells from the lining of your mouth come loose easily, so you will be able to collect cells containing your DNA by swishing a liquid around in your mouth. The cells from the lining of your mouth also come off whenever you chew food.
3. Extracting DNA from Your Cells
To extract DNA from your cells, you will need to separate the DNA from the other types of biological molecules in your cells. What are the other main types of large biological molecules in cells?
4. Extracting DNA from Your Cells
You will be using the same basic steps that biologists use when they extract DNA (e.g. to clone DNA or to make a DNA fingerprint). You will follow these 3 easy steps to extract the DNA:
Detergent
eNzymes (meat tenderizer)
Alcohol
5. Getting Your Sample of Cells
Obtain a cup with sports drink. You will need to get thousands of your cheek cells in the sports drink in order to extract enough DNA to see.
Swish the sports drink around in your mouth vigorously for at least one minute.
Chew on your cheeks while swishing so you get as many cells as possible.
Spit the drink back into the cup
Repeat a few times
6. Step 1: Detergent
Add a small amount of detergent to a test tube (about 0.25 mL).
Now carefully pour the drink containing your cheek cells
into the test tube with
detergent until the tube is
half full.
7. Why am I adding detergent?
To get the DNA out of your cheek cells you need to break open both the cell membranes and the nuclear membranes. Cell membranes and nuclear membranes consist primarily of lipids. Dishwashing detergent, like all soaps, breaks up lipids. This is why you use detergents to remove fats (which are lipids) from dirty dishes! Adding the detergent to you cheek cell solution will break open the cell membranes and nuclear membranes and release your DNA into the solution.
8. Step 2: Enzymes
Add a pinch of enzyme (meat tenderizer) to your test tube.
Put the cover on the test tube; gently invert the tube five times to mix.
Let the mixture sit for at least 10 minutes.
Break HERE!
9. Why am I adding enzymes?
The nucleus of each of your cells contains multiple long strands of DNA with all the instructions to make your entire body. If you stretched out the DNA found in one of your cells, it would be 2-3 meters long. To fit all of this DNA inside a tiny cell nucleus, the DNA is wrapped tightly around proteins. The enzyme in meat tenderizer is a protease, which is an enzyme that cuts proteins into small pieces. As this enzyme cuts up the proteins, the DNA will unwind and separate from the proteins.
10. Step 3: Alcohol
Using a pipette, slowly add cold alcohol
into the test tube;
let the alcohol run down the side of the test
tube so it forms a layer on top of the soapy
liquid.
Add alcohol until you have about 2 cm of alcohol in the tube.
Alcohol is less dense than water, so it floats on top. Do not mix or bump the test tube for 10 minutes.
11. Why am I adding alcohol?
The cold alcohol reduces the solubility of DNA. When cold alcohol is poured on top of the solution, the DNA precipitates out into the alcohol layer, while the lipids and proteins stay in the solution. DNA molecules will clump together where the soapy water below meets the cold alcohol above, and you will be able to see these clumps of DNA as white strands.
12. Steps for DNA Extraction
Cracking the Code of Life Classroom Activities Objective To extract human DNA from cheek cells. copy of "See Your DNA" student handouts (PDF or HTML) 2 teaspoons (10 ml) 0.9 percent salt water (2 teaspoons table salt in one quart/liter of water) disposable paper or plastic cup large test tube (or any clear tube that can be sealed with a rubber or cork stopper) 1 teaspoon (5 ml) 25 percent mild detergent or dishwashing soap, e.g., Woolite or Palmolive (1 volume detergent or soap + 3 volumes water) 2 teaspoons (10 ml) 95 percent ethanol, chilled on ice small clear tube with seal slide of cheek cells stained with methylene blue If possible, before doing this activity, make and show a slide of some cheek cells and stain it with methylene blue so that students can see the shape of the nucleus of the cheek cell. Provide each student with a copy of the "See Your DNA" student handout and a set of materials. Before students begin, make sure they understand and will follow guidelines for maintaining sterile conditions. Have students prepare their saltwater and detergent solutions. When they are done, have each student swill two teaspoons of the saltwater solution in their mouths for 30 seconds. Make sure that students swish the solution around for the full 30 seconds. This will remove dead cells lining the mouth and provide students with a source of their own DNA. Have students spit their solution into a disposable plastic cup and then pour it into a large test tube containing 1 teaspoon (5ml) of the detergent solution. Students should cap the test tube and gently rock it on its side for 2-3 minutes. It is important that students are not too vigorous while mixing. DNA is an extremely long molecule. Physical abuse can break it into smaller fragments, a process known as shearing. After gently rocking the solution, have students uncap the tube and then slightly tilt it and carefully pour 1 teaspoon (5ml) of the chilled ethanol down the inside of the tube so that it forms a layer on the top. Again, it is very important that the students take care in adding the ethanol so that the alcohol floats above the soapy solution already in the tube. Tell students to allow the tube to stand for one minute. Then, have them use a thin acrylic or glass rod to slowly move some of the ethanol into the soap layer. The alcohol/soap interface is where most of the DNA will precipitate out of the soap solution. Have students twirl the rod to spool the DNA strands around it. If too much shearing has occurred, the DNA fragments may be too short to wind up, and they may form clumps instead. Students can try to scrape these out. After students have wrapped as much DNA on the rod as they can, have them remove the rod and scrape or shake the DNA into a small tube with the remaining ethanol. Tell students that the DNA in their test tubes came from the nucleus of their cells, specifically, the 46 chromosomes in the nucleus. Now that students have their DNA, what will they do with it? Will they grant consent for its use or keep it private from everyone? How will they guarantee this? Work with students to draft a policy statement concerning their own DNA. Use of Ethanol Closely supervise students' use of ethanol and instruct students that they cannot take the ethanol home. DNA is only about 50 trillionths of an inch long. The reason it can be seen in this activity is because students are releasing DNA from a number of cells. This happens when the detergent or dishwashing liquid breaks, or lyses, the membranes around the cell and around the nucleus. Once released, the DNA from the broken open cells intertwines with DNA released from other cells. Eventually, enough DNA intertwines to become visible to the eye as whitish strands. Tell students that one strand of DNA is so thin (.0000002mm) they would never be able to see it without using a microscope. Detergents break open cells by destroying the fatty membrane that encloses them. This releases the cell contents, including DNA, into the solution. Detergents also help strip away proteins that may be associated with the DNA. DNA is not soluble at high ethanol concentrations, so it precipitates out as long strands. Salts, such as sodium chloride, also greatly aid in precipitating DNA. The ethanol also causes gases dissolved in the water to be released, which may be observed as small bubbles. This procedure may not work well if the researcher has eaten corn flakes for breakfast. Presumably this is because the corn flakes have scoured too many buccal cells from the inside of the mouth. Repeating may give low yields if most of the loose buccal cells have already been harvested. Books Baker, Catherine. Your Genes, Your Choices: Exploring the Issues Raised by Genetic Research. Washington, D.C.: AAAS, 1999. Describes the Human Genome Project, the science behind it, and the ethical, legal, and social issues raised by the project. Marshall, Elizabeth L. The Human Genome Project : Cracking the Code Within Us. Minneapolis, MN: Econo-Clad Books, 1999. Explores the process and technology used in sequencing a portion of the human genome. A chance to see the process of science through the eyes of the scientist. The author connects the discoveries in the human genome with the ethical implications they pose for society. Reilly, Philip R. Abraham Lincoln's DNA and Other Adventures in Genetics. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, August 2000. Offers wide-ranging tales of crime, history, illness, and ethics to illustrate principles and issues of human genetics. Sayre, Anne. Rosalind Franklin and DNA. New York, NY: W. W. Norton & Company, Inc., July 2000. Offers a true life account of Franklin's work in elucidating the structure of DNA and explores the difficulties often faced by women in science. Franklin's research was central to the Nobel Prize-winning discovery of DNA, and Watson and Crick's discovery relied heavily on her pivotal X-ray crystallography data. Watson, James D. The Double Helix: A Personal Account of the Discovery of the Structure of DNA. New York, NY: Simon & Schuster, 1998. Chronicles the original story behind the race to discover the structure of DNA as seen through the eyes of James Watson. Articles Crick, Francis, and James Watson. "A Structure of Deoxyribonucleic Acid." Nature. Volume 171. 1953, Pages 737-738. The seminal paper on the discovery of the structure of DNA. "Outlook 2000: Inventing the Future." U.S. News & World Report, January 3, 2000. Special double issue includes different articles about the Human Genome Project, which explain how the secrets of DNA may help cure illnesses and arrest aging, as well as outline the benefits and perils of genetic testing. Web Sites NOVA Online—Cracking the Code of Life Provides program-related articles, interviews, interactive activities, resources, and more. Genes and Disease Shows what diseases have been mapped on which chromosomes. The Map Viewer presents a graphical view of the available human genome sequence data as well as cytogenetics, genetic, physical, and radiation hybrid maps. The Human Genome Project Provides background information on the Human Genome Project from the National Human Genome Research Institute. Several links provide more detailed resources describing the history and goals of the Human Genome Project. Genetics Resources Offers list of links with descriptions to more specific subject areas in the topic of genetics and medicine. The "See Your DNA" and "Mystery Message" activities and the "Case Studies" activities align with the following National Science Education Standards: Science Activities: Grades 5-8 Science Standard C:Life Science Reproduction and Heredity Molecular Basis of Heredity Case Studies: Grades 5-8 Science Standard F:Science in Personal and Social Perspectives Science and Technology in Society Case Studies: Grades 9-12 Science Standard F:Science in Personal and Social Perspectives Science and Technology in Society

Experience indicates that approximately 2.3% of all DNA canine testing will yield results that are inaccurate or cannot be interpreted. The reasons for this are that dogs have extremely high levels of oral bacteria which may result in degeneration of the sample before our DNA extraction process commences. Science ASSIST has an expert national advisory team with extensive, collective experience across all school laboratory management and safety. It is this team that will help with your enquiry. Lab report; Math problem; Speech presentation; Power point presentation; Articles and article critique; Annotated bibliography; Statistics projects; Online tests and quizzes; Online class help; What subjects do you write on? We offer essay help for more than 80 subject areas. You can get help on any level of study from high school, certificate ... Dear Twitpic Community - thank you for all the wonderful photos you have taken over the years. We have now placed Twitpic in an archived state. A 1.5-cm malignant lesion was excised from the patient's chin, and the excised diameter was 2.9 sq cm. An adjacent tissue transfer procedure from the right cheek (4 sq cm) to the chin defect was also performed. Report codes 11642 and 14040 Copy and paste this code into your website.

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