



#NOSMCampMedEMNO

Crime Scene Investigation (CSI):
DNA Extraction & Karyotype Analysis

Activity: DNA extraction



DNA evidence is used at crime scenes to determine and identify possible suspects linked to the crime. In criminal justice, it is used to enhance the accuracy of the system, helping prove certain individuals were at the place of the crime. There are multiple sources of DNA used to determine the profile of the victim/suspect, some biological material include blood, saliva, urine, hair, cells, etc.

Crime scene investigators also collect different items that might have been touched or worn by people involved in the crime. The extraction of our DNA using our saliva is proven to be a less instructive method, it is quick and cost efficient. After spitting into a collector, the saliva mixes with a stabilizing liquid, it is now ready to be sent to laboratories for testing. A few steps are taken within a lab to extract the DNA within the saliva and it is important to fully understand what is going on within the activity before we get started.

Breakdown of the experiment

1. **Removal of proteins** – we must first use sodium chloride (salt) to help remove the proteins that are bound to the DNA. In our first step of the experiment we dissolve the salt in water, helping keep the proteins dissolved.
2. **Breaking the cells open** – many methods can be used to accomplish this step. In this activity we will be using soap, since they are great at breaking and dissolving fats, once mixed with the cells it breaks and dissolves the cell membrane, this helps the DNA come out of the cell. In this case, the soap won't have any effect on the DNA since it's not made up of lipids.
3. **Separating the DNA from the cells** – we can use multiple methods to cause DNA to precipitate. In this activity, we use rubbing alcohol to get our DNA to come out of the cells and clump together. This way, the strands of DNA are made visible.

Part 1 – Gathering supplies

- **Water** – 1 cup
- **Salt** – 1 tablespoon
- **Dish soap** – 4-5 drops
- **Ice cold rubbing alcohol** (put in the freezer one hour prior to the experiment)

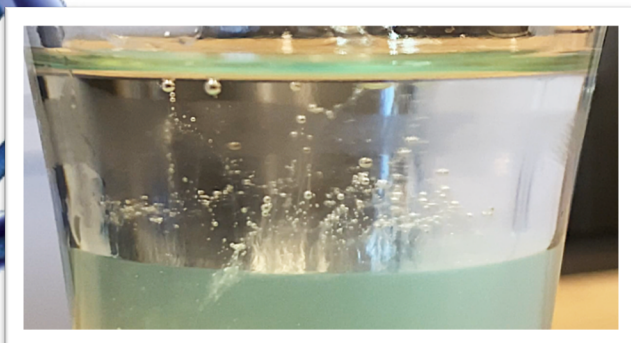
Part 2 – Extraction

1. Add the cup of water and the tablespoon of salt to a glass. Mix well to ensure the salt dissolves properly.
2. Take some of the saltwater and swish it around in your mouth for 1 minute. Then, spit the mixture out into another glass (container or cup).
3. Add a few drops (4-5) of dish soap to the mixture and mix it well. It is important to wait 2 full minutes in order to get a cloudy consistency.
4. Remove the mixture from the container and pour the mixture into a smaller container.
5. Slowly pour ice cold rubbing alcohol along the side of the small container. This is important so that the rubbing alcohol does not directly mix with the solution, but rather forms a separate layer.
6. The white strands you see floating in the top layer is your DNA! You can even remove it and place it on your finger. Take a picture and post it with #NOSMCampMed!

SHOW US YOUR RESULTS!

Send us a picture of your DNA after extracting it, as well as any other pictures you may have taken during the process. You can even make a short video demonstrating the experiment yourself!

You can email your photos / videos to campmed@nosm.ca, or post them to Instagram using **#CampMed**, **#NOSMCampMed**, and **#NOSMCampMedEMNO**.



References:

https://www.gs.washington.edu/outreach/dhilon_dnaprocedure.pdf
<https://wellcomecollection.org/works/xgxyszvb>
<https://blog.helix.com/3-steps-to-extracting-dna-from-saliva/>

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Murder Case Hint #2: Karyotype Analysis

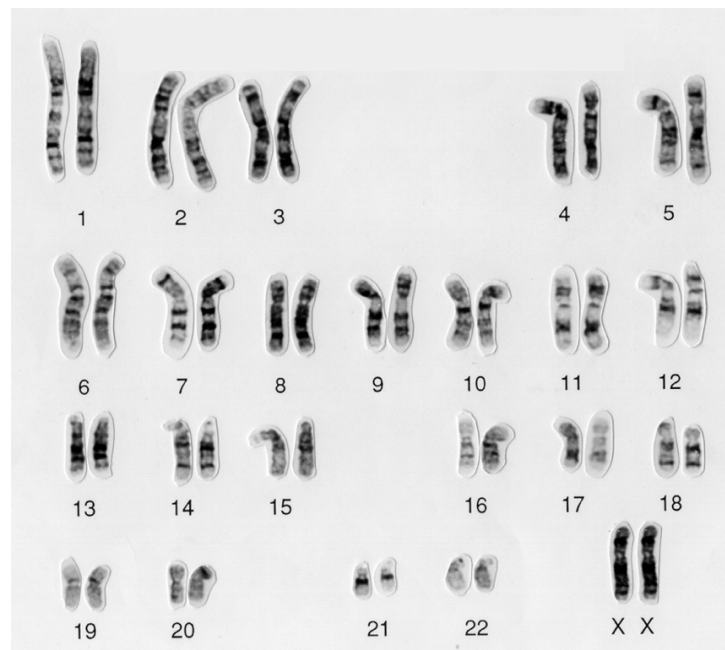
Let's talk **karyotype**!

To keep things simple, karyotypes are pictures of a person's chromosomes. Chromosomes are defined as organized structures of DNA and proteins that are found in the nucleus of the cell. To capture this, medical laboratory technicians must follow certain steps in order to isolate them. Once this is done, karyotypes can be examined under a microscope in order to determine many things. One of these things is the ability to biologically differentiate females from males.

During the investigation, the karyotype was identified through the blood sample thought to be from the killer.

Using the Internet, or any other resource you may have access to, find out the difference between the karyotype of females and males.

Now, can you determine the **gender** of the possible killer?



Based on my knowledge of karyotype analysis, I believe the remaining suspects are _____.

Submit your answer by voting in the Doodle Poll: <https://doodle.com/poll/dnimdxd3nrer7tdp>