A Matter of Taste
Investigating Our Genome

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DNA Basic Information

What is DNA?
- Deoxyribonucleic acid
- Genetic material composed of 4 nucleotide bases

Where can we find DNA?
- In the nucleus

What are the structural components of DNA?
- Chromosome
- Chromatin
- Chromatid
- Centromere

Chromosome
Strands of DNA, encoded with genes and contain genetic information of the individual

Chromatin
- Mass of genetic material
- Composed of DNA
- Condenses during cell division

Chromatid
One half of two identical copies of a replicated chromosome, which are joined together during cell division by centromere

DNA Candy Model


Fig.1: Materials

Materials:
- Soft candy in 4 colours (gummy bears, gum drops, or mini marshmallows)
- Rope like candy (Twizzlers)
- Toothpicks
- Paper & pen (or marker)
- Paper towel


Fig.2: The final DNA candy model

Experiment Nr.1: Extracting DNA From Fruits

Research question:
Can DNA be extracted from a kiwi?

Hypothesis:
Our prediction is that it will be possible to extract the DNA from the kiwi as well as to see it through the microscope.

Materials:
- Half of a kiwi or banana
- 4 tsp. 91% isopropyl alcohol – chilled
- ⅛ tsp. of salt
- 2 tsp. washing – up liquid
- 100ml of water
- Teaspoon
- Freezer ziplock bag
- 1 plastic cup
- 1 coffee filter
- Small glass

Observation:
- Pouring mixture into the beaker, seeds were separating from liquid
- DNA separated from the rest of liquid while adding alcohol

Conclusion:
- The experiment confirms that kiwis contain DNA, which can be easily extracted.
- DNA becomes visible when many strands group together.
- The protective membranes must be broken to release the DNA.
- Alcohol makes DNA visible because it is not soluble in it.
- Such experiments aid genetic research on traits and heredity.


Fig.3: Materials Experiment Nr. 1


Fig.4: Separated DNA


Fig.5: Kiwi DNA structures under the microscope

Experiment Nr. 2: Investigating Our Genome

- Taste is influenced by genetics, not just personal preference.
- 99% of DNA is identical; the 1% difference makes us unique.
- SNPs (Single Nucleotide Polymorphisms) affect traits like taste.
- The TAS2R38 gene determines sensitivity to PTC, a bitter compound in broccoli, kale, and Brussels sprouts

Research question:
Is the personal taste perception linked to the genome?

Hypothesis:
According to the test person's perception of not liking broccoli that much and that it tastes bitter to them, we predict that the test person's genotype is heterozygote (Tt; mild taster)

Materials (Reagents) :
- Extraction Buffer I: 50 µL
- Extraction Buffer II: 50 µL
- Hot-Start Mastermix: 12.5 µL
- PTC Primer: 12.5 µL
- BtsCI Restriction Enzyme: 0.5 µL
- CutSmart Buffer: 2.5 µL
- Gel-Loading Dye (6X): 2 µL
- 100 bp DNA Ladder: 10 µL per gel
- SYBR Green I (10,000x): 2 µL per gel
- Agarose: 0.4 g per gel
- TBE Buffer: 20 g

Equipment:
- Thermocycler
- Gel electrophoresis
- Transilluminator
- Microwave
- Centrifuge

Micropipettes and Pipette Tip Boxes:
- 2-20 µL micropipettes
- Pipette tip boxes (2-200 µL)
- 20-200 µL micropipettes

Other:
- Permanent markers
- Plastic racks
- Styrofoam box with ice
- Cups (for disposing of pipette tips)
- Safety goggles

Consumables:
- PCR tubes (1 mL and 0.2 ml)
- Syringes (1 mL)
- Pipette tips (2-200 µL)
- Plastic shot glasses (40 cl)
- Gloves
- Saline solution
- Distilled water

Conclusion:
- The hypothesis was confirmed as true.
- The test person is a heterozygote (mild taster).
- DNA extraction and PCR help analyze genetics.
- DNA fragmentation and electrophoresis confirm differences.
- Taste perception varies based on genotype.
- Inherited genetic material influences taste sensitivity.


Fig.6: Materials used in the experiment

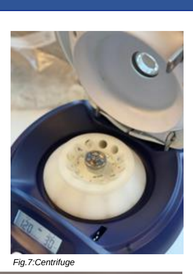
Fig.7:Centrifuge

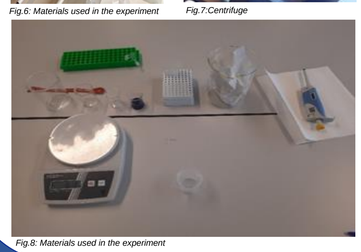
Fig.8: Materials used in the experiment

Fig.9:Thermocycler

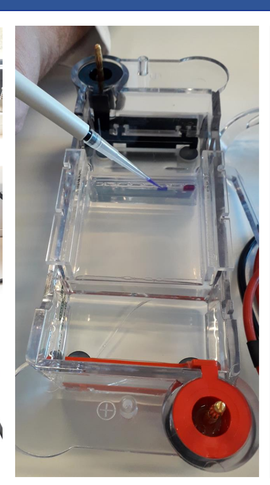
Fig.10: Gel electrophoresis chamber

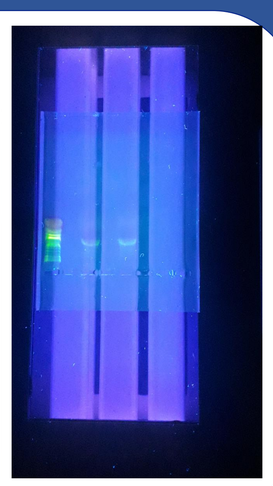
Fig.11: Electrophoresis gel on a transilluminator

Results

Experiment			Experiment		
	Outcome			Outcome	
Sample	HYP.	RES.	Sample	HYP.	RES.
Group 1	TT	Tt	Group 3	tt	?
Group 2	Tt	Tt	Group 4	TT	TT

TT = homozygote dominant (strong taster)

Tt = heterozygote (mild taster)

tt = homozygote recessive (non – taster)

A Matter of Taste Applications

The research on SNPs in the TAS2R38 gene and taste perception has several real-world applications:

Personalized Nutrition & Diet Planning

Genetic taste predisposition affects diet choices. Strong tasters may avoid better bitter vegetables, missing key nutrients. Nutritionists can suggest alternative preparations to improve palatability.

Food Industry & Product Development

Companies can tailor food products to genetic taste preferences, such as creating milder versions of bitter plant-based foods or adjusting processed food formulations.

Health & Preventive Medicine

People who avoid bitter foods may be at higher risk of nutrient deficiencies. Genetic screening could help promote balanced diets by identifying alternative nutrient sources.

Pharmacogenetics & Drug Development

The TAS2R38 receptor also affects drug taste perception, influencing medication adherence. Pharmaceutical companies could develop taste masked formulations for better patient compliance.

Most Important Conclusions

- **DNA becomes visible when many strands group together.**
- **Protective membranes must be broken to release DNA.**
- **DNA extraction and PCR help analyze genetics.**
- **DNA fragmentation and electrophoresis confirm differences between DNA samples**
- **Taste perception varies based on genotype.**
- **Inherited genetic material influences taste sensitivity.**