

CODE CRACKERS

Activity overview

Age: 7 – 12 years old

Time: 30 min

Topics: DNA, proteins, genetic characteristics, adaptations, natural world

Learning objectives:

- DNA is the instructions that make up all living things.
 - DNA can be found in almost any part of the body.
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BACKGROUND

A bit like a recipe book, all the biological instructions for making an organism are contained in a long molecule called DNA (deoxyribonucleic acid). All living things, from humans and mice, to plants and bacteria, have a unique set of instructions written in the four chemical letters of DNA: A, C, G, and T.

Within the DNA code are the instructions for all the proteins that our body needs to function. Proteins are the main biological building blocks and machinery in our cells. Different proteins have different jobs in the body, like digesting food and making energy.

In this activity we will use a code cracker wheel to decode sequences of DNA into protein sequences. Then, using protein profile cards we will find out what these proteins do by matching our sequences to the protein sequences on the cards. The activity can be carried out individually or in teams of four.

Find out more

What is DNA:

www.yourgenome.org/facts/what-is-dna

What does DNA do:

www.yourgenome.org/facts/what-does-dna-do

ACTIVITY PREPARATION

Materials

For each group of four participants you will need:

- Codes for cracking worksheets (one per person)
- Code cracking wheel sheet (one per person)
- Protein profile cards
- Answer sheet

Set up

1. Print all the protein profile cards, code cracking wheel sheets, codes for cracking worksheets and answer sheets needed for the group.
2. Give each group a set of the profile cards and codes for cracking worksheets, as well as code cracking wheel sheets (and answer sheets when they have nearly finished).
3. Make sure everyone has a pencil or pen so they can get cracking the codes!

ACTIVITY GUIDANCE

Warm up

1. Begin the activity by discussing with the group that DNA contains the instructions for making all living things. Within the DNA code are instructions for making proteins. Proteins are the building blocks and machinery inside of all the cells that make up a living thing. Proteins do a lot of different "jobs" within our bodies they can also give animals different adaptations.
2. Ask the group: Can they think of any "jobs" that proteins might do in making our bodies work or helping us survive? Examples: digesting our food, making our hair, giving our hair colour, making energy, making our muscles move, tasting things, smelling things, etc.
3. Explain to the group that in small teams they are going to crack DNA codes to find out what different proteins do.

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Run the activity

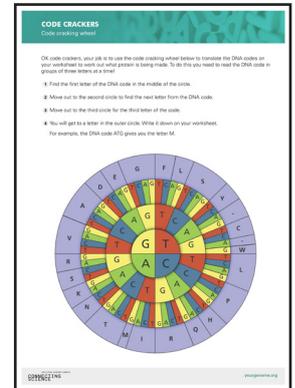
1. Demonstrate how to use the **code cracking wheel**.

- To use the wheel, work from the inside circle out to the outer circle. For example, if the first triplet of the sequence is 'CAT', the amino acid it codes for is 'H'.
- Before starting the activity it is recommended that you demonstrate the example below.

Translate the following:

DNA sequence - atg gag gag ccg cag tca gat cct agc gtc gag ccg

Amino acid sequence - MEEPQSDPSVEP



The code cracking wheel

2. Explain to the group that they need to work through the list of DNA codes in their **codes for cracking** worksheets and decode each one.
3. Once they know the protein codes they should find the page with the matching code on their **protein profile cards** then write down the name of the protein and what it does on their worksheets.
4. Once everyone has finished, reveal the answers or give them an **answer sheet** to check they have got the answers right.

DNA code 4	cct	ggg	gag	aac	cta	tgc	tat	aga	aag	atg	tgg	tgc
Cracked code	P	G	E	N	L	C	Y	R	K	M	W	C
What is it?												
What does it do?												



Cracked code

P G E N L C Y R K M W C

What is it?

Snake poison protein

What does it do?

Enables snakes to kill their food when they bite them

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Reflect on it

Ask the group what was their favourite protein. What did it do and how did it help the animal survive? Why was it their favourite?

Encourage them to think about what all the other adaptations or features creatures have and how these may be controlled by a DNA instruction.

If they had all the DNA codes for just one creature, how big do they think the worksheet would have to be? How long would it take them to work out what all of that DNA did?

Take it further

Want to explore differences in DNA between different creatures? Why not have a go at making a bracelet that shows the DNA code of your favourite creature?

DNA Sequence Bracelets: www.yourgenome.org/activities/sequence-bracelets

Want to see how all the information is stored in DNA? Why not make your own helix and see which part contains the letter codes seen here?

Yummy Gummy DNA: www.yourgenome.org/activities/yummy-gummy-dna