



## Proteins 1:

# The importance of proteins

### Components

	NAME	DESCRIPTION	AUDIENCE
	<i>The importance of proteins</i> teachers guide	This teachers guide indicates how to use the video, <i>Life's building blocks</i> , to engage student interest in proteins.	teachers
	<i>Life's building blocks</i> video	This video illustrates diverse functions of proteins in everyday life. It features research at The University of Western Australia into roles of protein in honeybee reproduction.	teachers and students

### Purpose

To **Engage** student interest in the role of proteins in everyday life, their significance in organism function and introduce their importance in research science.

### Outcomes

Students:

- appreciate diverse functions of proteins within the body;
- understand that proteins are used in many ways in modern life, including medicine, industry and agriculture; and
- appreciate the significant role proteins play in living organisms and how investigation into their function may assist in solving biological problems.

### Activity summary

ACTIVITY	POSSIBLE STRATEGY
Teacher introduces students to the subject of proteins and asks a series of questions (suggestions outlined below) to ascertain prior knowledge and understanding of the function of proteins.	whole class
Teacher plays the video, <i>Life's building blocks</i> , that illustrates diverse roles proteins play in everyday life. Research into the function of proteins in honeybee reproduction is presented by UWA researcher Dr Boris Baer.	whole class or individually as resources permit
Teacher-led discussion on students' understanding of proteins and their importance in biological function in light of information delivered in the video (suggested discussion points follow).	whole class

### Teachers notes

The video introduces students to the multiple and diverse role of proteins, and their importance to biological life. Students may not be aware of the extent proteins influence biological function.

The featured UWA research on reproduction of honeybees introduces students to techniques of protein analysis and worldwide decline of honeybees. The research facility at UWA (Crawley campus) houses around 20 beehives. Many bees housed in this facility are marked for research purposes; the queen bee shown in the film is marked with pink to enable ease of identification.

More information about honeybees and UWA research is available at [www.ciber.science.uwa.edu.au](http://www.ciber.science.uwa.edu.au)

Questions on the following page may be useful for promoting class discussion, both before and after viewing the video.

PRE-VIDEO QUESTIONS	TYPICAL RESPONSES
<p>What are proteins?</p> <p><i>Open-ended discussion to encourage student thinking on the molecular structure and/or function of proteins.</i></p>	<p>Students may mention proteins are found in meat (or are meat); some dietary supplements; and some cosmetic treatments (such as collagen implants). Students may also recall they are found in the body and function as important structural molecules (eg muscle) and functional molecules (eg enzymes).</p>
<p>What are some examples of proteins?</p> <p><i>Identification of specific proteins, those within the body/organism, industry, or as part of nutrition/sports science.</i></p>	<p>Answers will reflect students' knowledge. Teacher may wish to identify a wider range of protein types such as transport, communication and structural/organisation proteins.</p>
<p>What do proteins do?</p> <p><i>Exploration of functions of proteins within organisms, industry or other aspects of life. Students may be aware of proteins in sports science and nutrition.</i></p>	<p>Answers will reflect students' knowledge.</p> <p>Proteins are bodybuilding molecules and are important in our diet as a source of nutrients. Proteins are also structural, scaffolding and supporting the organisation of the body. Proteins are active in many processes within the body, such as transport, signalling and storage.</p> <p>Many proteins, such as enzymes, are used in industry.</p> <p>Teachers may wish to explore a wider range of protein functions, such as those in industry (eg food manufacture).</p>
POST-VIDEO QUESTIONS	TYPICAL RESPONSES
<p>What are the main functions of proteins in a human body?</p>	<p>Proteins are diverse molecules that play a fundamental role in biological functioning.</p> <p>Proteins within a human body include transport proteins, like haemoglobin. Proteins are: molecular messengers, such as hormones and neurotransmitters; structural, such as skin, ligaments, tendons, and muscle; catalysts for reactions; and responsible for most activities within cells.</p> <p>Students may expand on different types of proteins mentioned in the video to include similar or related molecules.</p>
<p>What proteins are useful in medicine, agriculture and industry?</p>	<p>Medicine: insulin, oestrogen (contraceptive pill)</p> <p>Agriculture: wool, animal husbandry</p> <p>Industry: enzymes, clarification, flavour enhancers</p> <p>Students may expand on examples provided in the video.</p>
<p>What does UWA research into honeybees show?</p>	<p>UWA research reveals the importance of proteins in honeybee reproduction.</p>
<p>What techniques do UWA researchers use to study proteins in honeybees?</p>	<p>Gel electrophoresis is used to separate proteins. Mass spectrometry is used to identify and determine the function of proteins.</p>
<p>The queen bee mates with up to ninety males, and stores this sperm for the rest of her life (up to seven years). How does sperm survive so long? How is sperm 'at war'?</p>	<p>Sperm is suspended in fluid (seminal fluid). Proteins within this fluid keep sperm alive.</p> <p>Other proteins within seminal fluid are capable of destroying sperm from rival males within the female's reproductive tract.</p>
<p>Why is it important that scientists try to ensure survival of bees?</p>	<p>Bees are a critical species for pollination of plants, including our food crops, but they are in decline worldwide. Establishing the role of proteins in honeybee reproduction is important in helping to halt declining bee numbers, due to disease and other ecological factors.</p>
<p>Why do you think proteins are referred to as 'building blocks of life'?</p>	<p>Proteins are essential for life and responsible for almost every activity in our bodies. They regulate cell function, catalyse reactions and play a role in fundamental life processes. Proteins influence almost every activity within our bodies.</p>

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## Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from [www.adobe.com](http://www.adobe.com).

QuickTime version 7 or later is required to view the video. This is a free download from [www.apple.com/quicktime](http://www.apple.com/quicktime). A high quality MP4 version is available on CD-ROM or download from the SPICE website.

 The video contains closed captions.

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## Associated SPICE resources

*Proteins 1: The importance of proteins* may be used in conjunction with related SPICE resources to teach the topic of proteins.

DESCRIPTION	LEARNING PURPOSE
<i>Proteins (overview)</i> This learning pathway shows how a number of SPICE resources can be combined to teach the topic of proteins.	
<i>Proteins 1: The importance of proteins</i> A video highlights the essential role played by proteins in living organisms.	<b>Engage</b>
<i>Proteins 2: Looking at proteins</i> Students complete a practical activity to isolate and visualise proteins in tissue samples, using gel electrophoresis.	<b>Explore</b>
<i>Proteins 3: Protein molecules</i> Students work through an interactive learning object that explains the molecular structure of proteins.	<b>Explain</b>
<i>Proteins 4: Making proteins</i> Students work through an interactive learning object that explains how proteins are made by living organisms. A fact sheet summarises the main stages of transcription and translation.	<b>Explain</b>
<i>Proteins 5: Defective proteins</i> What happens when the process of protein formation goes wrong? A case study about Kuro disease explains some implications.	<b>Elaborate</b>