**teachers guide**

**Proteins 5:**

**Defective proteins**

# Components

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|  | NAME | DESCRIPTION | AUDIENCE |
|  | *Defective proteins*teachers guide | What happens when the process of protein formation goes wrong? A case study about Kuro disease explains some implications. | teachers |
|  | *Cannibalism causes fatal disease?*fact sheet | Unravelling the story of kuro disease in Papua New Guinea’s Highlands led to two Nobel prizes and a deeper understanding of the importance of protein folding. | students |
|  | *Protein folding*fact sheet | This fact sheet describes transcription and folding errors that may occur during protein synthesis. Links between protein problems, prions and disease are explained. | students |
|  | *Problems with proteins*worksheet | This student worksheet uses fact sheets, *Cannibalism causes fatal disease?* and *Protein folding,* to test student understanding of the processes involving proteins. | students |

Purpose

To **Elaborate** on students’ understanding of protein structure and function, by analysis of a story that focuses on a rare fatal disease that emerged in a cultural group in New Guinea. After reading the story and a fact sheet, students appreciate how misfolding of proteins can result in disease and that new discoveries in science often require time to be validated and accepted.

# Activity summary

Outcomes

Students:

* apply their knowledge of protein structure and function to new information; and
* draw conclusions about the nature of misfolded proteins and their potential impact on animal and human health.

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| ACTIVITY | POSSIBLE STRATEGY |
| Students read story, *Cannibalism causes fatal disease?* about an outbreak of kuru disease, and fact sheet, *Protein folding*, on how consequences of errors during protein production can result in diseases in humans and animals. | individual case study |
| Distribute the worksheet, *Defective proteins*. Students work individually. Further information can be obtained from textbooks or references provided. | individual, possible assignment work |

# More information

The following useful references for students are included in the fact sheet, Defective proteins:

* CJD Support Network (nd). http://www.cjdsupport. net/
* Marchant, J. (2012). *Prion diseases hide out in the spleen*. Retrieved 9 May 2012 from [http://www.](http://www/) nature.com/news/prion-diseases-hide-out-in-the- spleen-1.9904
* Prusiner, S.B. (1998). *Prions. Proc. Nat. Acad. Sciences U.S.A., 95*(23), 13363–83. Retrieved 14 May 2012 from <http://www.pnas.org/content/95/23/13363.full>
* Reynaud, E. (2010). Protein misfolding and degenerative diseases. *Nature Education 3*(9):28, retrieved 9 May 2012 from http://www.nature. com/scitable/topicpage/protein-misfolding-and- degenerative-diseases-14434929

# Technical requirements

The teachers guide and worksheet require Adobe Reader (version 5 or later), which is a free download from [www.adobe.com.](http://www.adobe.com/) The worksheet is also available in Microsoft Word format..

# Acknowledgements

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# Associated SPICE resources

*Proteins 5: Defective proteins* may be used in conjunction with related SPICE resources to teach the topic of proteins.

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