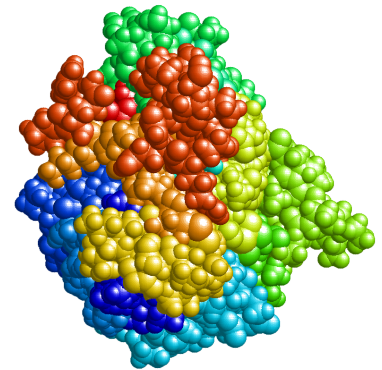


## Function Finders Protein Profiles

Protein name: Alpha-bungarotoxin

Organism: Many banded krait (snake)

Amino acid sequence: PGENLCYRKMWC



RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/1abt/3d](https://pdbe.org/1abt/3d)

Snake venoms contain a multitude of biologically active toxins that work together to overpower and kill prey, one of which is alpha-bungarotoxin.

### Protein facts:

- Alpha-bungarotoxin is a deadly venom produced by a snake called the 'Many-banded Krait' from South-East Asia.
- The snake venom kills the prey by paralysing their muscles.
- Other venomous snakes, including cobras and sea snakes, have similar proteins that work in the same way.
- 30 milligrams of venom, less than a tenth of a teaspoon, is enough to kill a 100 kg human in 24 hours.
- Anti-venom is a treatment for snake bites; it attaches to the protein and stops it from working which can save the lives of snake bite victims.

### How does this protein relate to me?

Alpha-bungarotoxin, from the Many-banded krait, blocks signals between nerve and muscle cells and is used by scientists to study these signals. Along with other snake venoms, alpha-bungarotoxin has been studied as potential treatments for a range of conditions including arthritis, thrombosis and even some types of cancer. Research is still ongoing in this field.



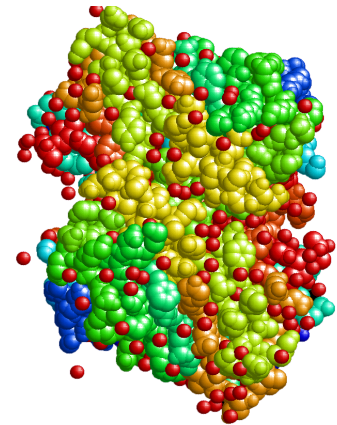
## Function Finders

### Protein Profiles

Protein name: Green Fluorescent Protein (GFP)

Organism: Jellyfish (*Aequorea victoria*)

Amino acid sequence: MSKGEELFTGVV



RCSB Protein Data Bank

View this protein in 3D visit:

[PDB.org/1gfl/3d](https://PDB.org/1gfl/3d)

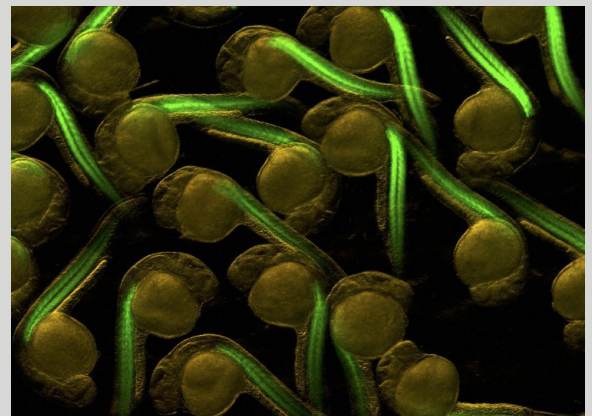
GFP is used by certain organisms to communicate with one another. Genetic manipulation makes use of it to follow proteins in the cell.

#### Protein facts:

- Green fluorescent protein fluoresces green when exposed to blue light. The jellyfish that produces GFP is usually colourless, but flashes green in response to external factors.
- GFP is used by biologists in research. It can be introduced into an organism to watch its development. When coupled with other genes GFP can be used as a marker for successful genetic manipulation – the modified cells glow green to indicate that the gene has been successfully inserted.
- The *GFP* gene has been deliberately mutated to fluoresce at other wavelengths producing more than eight colours, including cyan and yellow.
- The artist Eduardo Kac made a ‘transgenic artwork’ in 2000, a rabbit that was genetically manipulated with the jellyfish GFP gene so that it glowed green under blue light.

#### How does this protein relate to me?

*GFP* can be used to understand human development and proteins. By attaching *GFP* to specific proteins in a cell, researchers can track their production and their path in our bodies. For this reason *GFP* is known as a ‘reporter’ gene as it tracks (or reports) the location of a second protein.



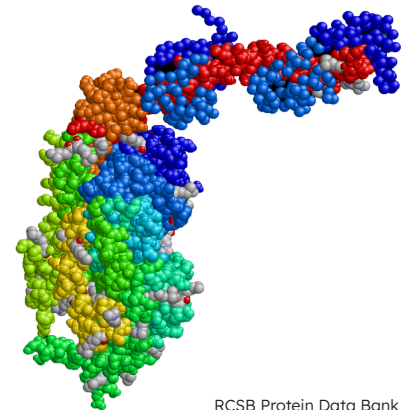
## Function Finders

### Protein Profiles

Protein name: **Myosin 1**

Organism: **Human**

Amino acid sequence: **MSSDSEMAIFGE**



RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/2mys/ed](https://pdbe.org/2mys/ed)

Myosin is a major protein found in muscle fibres. Without it you would not be able to move.

#### Protein facts:

- Myosin is attached to the end of the muscle fibre and makes it contract by binding to and pulling on a scaffold of another protein called actin. By 'walking' along this scaffold, the ends of the muscle fibres are brought closer together, thereby shortening the length of the muscle.
- It takes about two trillion myosin molecules working together to provide enough strength to hold an apple.
- Myosin is also used to transport other molecules around the cell. Myosin coats bags of different molecules and pulls them along an interconnecting network of 'paths' in the cell.
- Different forms of myosin are found in organisms from yeast, to sunflowers, to hamsters.
- Chimpanzee myosin differs to human myosin by only two genetic letters, or base pairs.

#### How does this protein relate to me?

Myosin uses chemical energy in the form of a molecule named ATP. If you are running flat out, the supply of ATP is exhausted rapidly and muscle switches the energy supply to glycogen. This results in the production of lactic acid causing a burning sensation in the muscles.



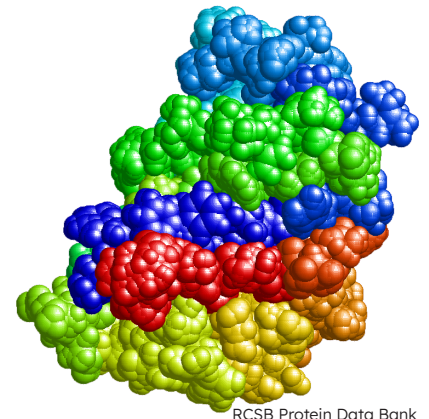
## Function Finders

### Protein Profiles

Protein name: **Mucin-1**

Organism: **Human**

Amino acid  
sequence: **PGGEKETSATQR**



RCSB Protein Data Bank

View this protein in 3D visit:

[PDB.org/2acm/3d](https://PDB.org/2acm/3d)

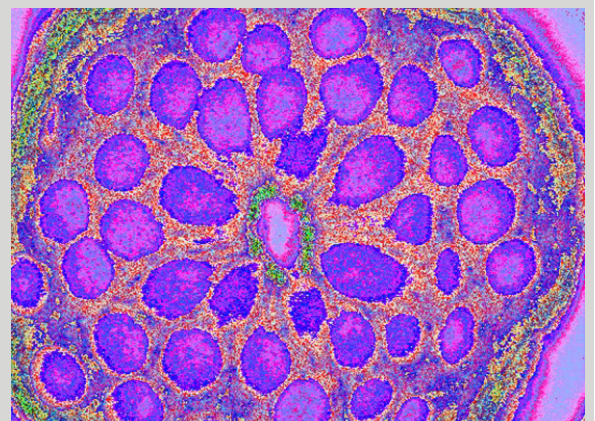
Mucins are large proteins that form a protective film on the surface of certain cells in our bodies including the intestines and nasal passages.

#### Protein facts:

- A film of mucins can protect cells from micro-organisms and particles that may damage the cell.
- To date 19 human mucin genes have been identified.
- There are two classes of human mucin proteins – membrane-bound and secreted. Mucin-1 is classed as a membrane-bound mucin.
- Mucin-1 molecules are secreted from the cell and bind to each other using regions at each end of the protein. This creates an uninterrupted protective layer on the surface of the cell.
- The central region of each mucin-1 protein is covered in sugar molecules which protects it from digestion by enzymes.

#### How does this protein relate to me?

Mucins are involved with certain cancers. High levels of mucin-1 cause a reduction in the amount of a protein (named P53) involved in slowing cell division. As a result, cells divide more rapidly which can lead to certain types of cancer, e.g. breast and ovarian carcinoma.



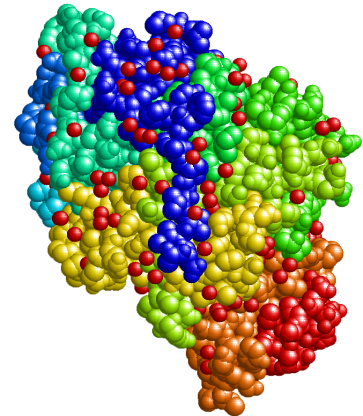
## Function Finders

### Protein Profiles

Protein name: Luciferase

Organism: Firefly

Amino acid sequence: ENMENDENIVYG



RCSB Protein Data Bank

View this protein in 3D visit:

[PDB.org/2d1q/3d](https://PDB.org/2d1q/3d)

Luciferase is an enzyme used by fireflies to create their characteristic light.

#### Protein facts:

- Luciferase is one of a number of proteins that are used by organisms to generate light in a process called bioluminescence.
- Luciferase uses chemical energy to speed up the reaction between luciferin and oxygen to generate light.
- The adult firefly beetle uses bioluminescence to attract a mate. Other organisms also use bioluminescence including deep sea fish such as the Anglerfish which uses it to attract prey rather than a mate.
- The word luciferase is based on the word lucifer meaning light-bearer.
- By changing just one amino acid in the protein sequence of luciferase, the light emitted changes from yellow to red.

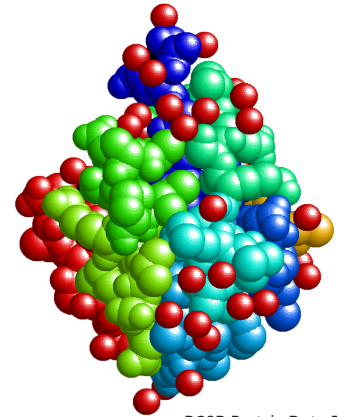
#### How does this protein relate to me?

Luciferase can be used to follow the production of other proteins in a cell or the body of an organism. This has been used to follow the development of cancerous cells and visualize how anti-cancer drugs slow down cancerous cell division.



Protein name: Antifreeze Protein Type III

Organism: Atlantic Wolffish

Amino acid  
sequence: MKSAILTGLLFV

RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/1gzi/3d](https://pdbe.org/1gzi/3d)

Antifreeze proteins prevent organisms, like the Atlantic wolffish, from freezing in the icy seawater they live in.

**Protein facts:**

- Antifreeze proteins are also known as ice-structuring proteins because they bind to ice crystals and prevent them from growing.
- Antifreeze proteins are produced by the liver and are released into the blood. These proteins are also produced in the scales, fins and gills of fish and act as the first line of defence against freezing.
- The 3D structures of the many different proteins that act as antifreeze agents show very little similarity to each other.
- The evolution of these proteins is thought to have happened more than once: 10-30 million years ago in Antarctica and again 1-2 million years ago due to glaciation in the northern hemisphere.
- Other organisms that also use antifreeze proteins include bacteria, fungi, plants and insects.

**How does this protein relate to me?**

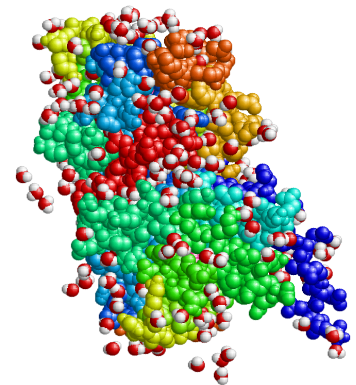
Inspired by the way antifreeze proteins help prevent fish like the Atlantic wolffish (shown right) from freezing, some manufacturers are investigating the use of antifreeze proteins in ice cream and frozen yoghurt. The presence of the proteins prevents significant ice crystallisation and therefore creates a smoother ice cream or frozen yoghurt.



Protein name: Odorant Receptor Protein OR1

Organism: Mosquito

Amino acid sequence: GWALRIMFLHLY



RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/1obp/3d](http://PDBe.org/1obp/3d)

Odorant receptor proteins allow organisms to detect specific chemicals in their environment.

### Protein facts:

- Odorant receptor protein OR1 recognises a component of human sweat.
- This protein is present in the antennae of mosquitoes that carry malaria (*Anopheles gambiae* and *Anopheles stephensi*).
- Only female mosquitoes feed on human blood and transmit malaria (males don't!) and therefore only female mosquitoes have this protein.
- Production of this protein in the mosquito decreases after it has a blood meal.
- Knowledge of this protein and the compound it recognises could be used to battle malaria.

### How does this protein relate to me?

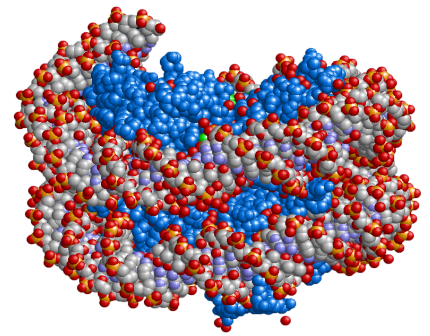
The mosquito OR1 protein binds to components of human sweat. Using this protein, a mosquito can identify a blood meal.

Mosquitoes such as *Anopheles gambiae*, are vectors of the parasite *Plasmodium spp* that causes malaria. When travelling to countries where the disease is endemic (naturally present) it is important to take anti-malarial drugs and to sleep under a mosquito net.



Protein name: Histone H2B

Organism: Pea

Amino acid  
sequence: PREIQTAVRLLL

Histones are used to wind DNA up so that it can be condensed and fit into the nucleus of each cell.

RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/2cv5/3d](https://pdbe.org/2cv5/3d)**Protein facts:**

- Histones play an important role in all cells by providing a robust structure around which two metre lengths of DNA can wrap to create gigantic coils which form the basis of chromosomes. This coiling mechanism significantly reduces the space required in the nucleus to store unwrapped DNA.
- DNA is wrapped around four clumps of histone proteins named H2A, H2B, H3 and H4. The histones act like a cotton reel around which the DNA thread is wrapped.
- Histones don't only work to give a structure to DNA, they also have a role to play in gene expression: the activity of genes. Histone modifications can lead to the formation of heterochromatin; a tightly packed form of DNA which has limited transcription properties which results in gene silencing, or 'switching off'.

**How does this protein relate to me?**

Histones are one of the most-conserved proteins in our bodies and are essential to life. If researchers remove histone H2B from yeast cells, the yeast dies. Our cells modify histones by adding or removing chemical groups: these changes can be associated with diseases such as leukaemia, Hodgkin's lymphoma and Huntingdon's disease.





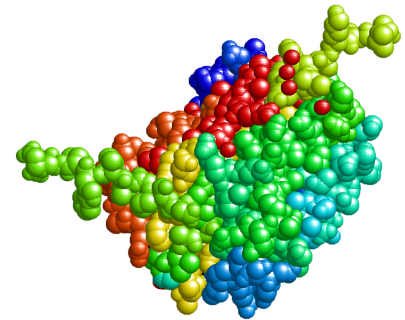
## Function Finders

### Protein Profiles

Protein name: **Caspase 1**

Organism: **Human**

Amino acid sequence: **EKRKLFIRSMGE**



RCSB Protein Data Bank

View this protein in 3D visit:

[PDBe.org/1ice/3d](https://pdbe.org/1ice/3d)

Caspases are enzymes that destroy or activate important proteins in the cell. The result is the deliberate destruction of targeted cells; a process called apoptosis.

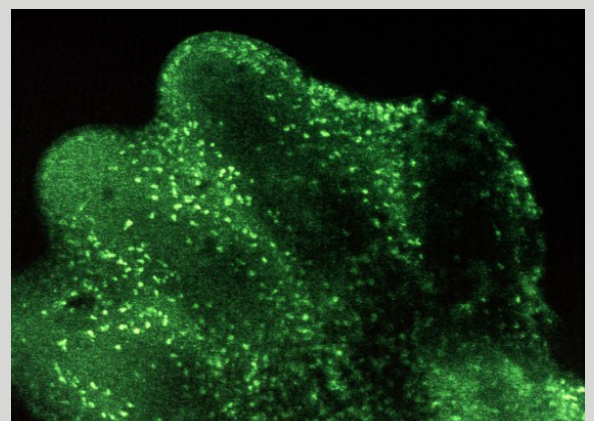
#### Protein facts:

- Caspases cleave proteins at certain points to either destroy them or make them active.
- Some of our cells have to 'die' for us to develop properly. For example, half of our nerve cells die as the nervous system develops – this leaves the correct neural wiring behind.
- Cell death protects against cells that may pose a threat to the rest of the organism, e.g. cells damaged by radiation or infected by viruses.
- Other organisms also use killer caspases to cause specific cells to die, e.g. when a tadpole loses its tail, the tail cells die due to a controlled, targeted process.
- Where cell death is blocked, cells can undergo uncontrolled division and result in certain cancers, e.g. types of leukaemia and melanoma (skin cancer).

#### How does this protein relate to me?

Caspases are important for your development, e.g. the formation of your fingers and toes. As the foetus grows, caspases mediate the death of cells to form the spaces between your digits (shown in the picture).

Some cancer treatments also induce apoptosis in specific cancer cells to prevent their growth.



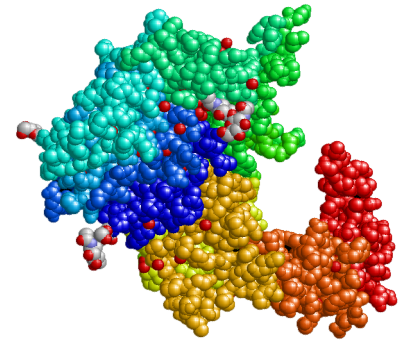
## Function Finders

### Protein Profiles

Protein name: HER2

Organism: Human

Amino acid sequence: MELAALCRWGLL



RCSB Protein Data Bank

View this protein in 3D visit:

[PDB.org/1n8y/3d](https://PDB.org/1n8y/3d)

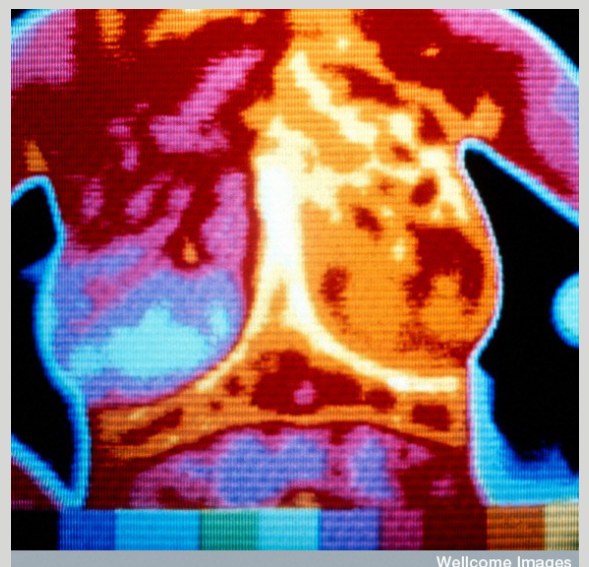
HER2 acts as a 'molecular switch', instructing cells when to divide and when not to divide.

#### Protein facts:

- HER2 stands for Human Epidermal growth factor Receptor 2. It helps cells to develop and divide. It is also known as ERBB2.
- The protein has relatives in worms and flies that do exactly the same thing.
- Approximately 15-20% of breast cancer patients have an amplification of the HER2 gene or over expression of its protein product.
- Herceptin is a drug used to treat some types of breast cancer, it attaches to HER2 and stops it from working. Blocking HER2 with herceptin stops cancer cells from dividing and might also stop tumours from growing a good blood supply.

#### How does this protein relate to me?

This protein is one of the 20-25,000 proteins in the human genome. In some cancers HER2 is produced much more than usual, helping cells to grow and divide faster and develop into cancerous tumours. Research has shown that women with HER2-positive breast cancer have a more aggressive disease, greater likelihood of recurrence and decreased survival compared to women with HER2-negative breast cancer. Tests for HER2 can help determine which course of treatment is best to treat the cancer.



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