

Name:
Date:

WB1 – Structural Proteins: Collagen and Keratin

Download **4zry_Keratin**, and open the file in PyMOL. This is a representation of human keratin, which is a structural protein found in hair and nails. It helps give hair and nails their structure and strength.

1. What is the secondary structure which makes up keratin?
 α -helices
2. Keratin is described as a fibrous protein, as opposed to a globular one. What does this mean, and how does this relate to the function of keratin?
A **fibrous protein is arranged in long fibres**, stacked next to each other. A globular one exists in small 'globe-like' structures, such as enzymes. It is important that keratin is fibrous, because **fibrous proteins are stronger than globular ones**, and can arrange in 3D strands, which globular proteins cannot do.
3. Keratin is held together by hydrophobic interactions between the polypeptide strands. What are hydrophobic interactions?
Hydrophobic interactions occur when the polypeptide chains are **hydrophobic**, and **repel water**. When **two of these chains are brought together, they push the water out from between them, causing an overall interaction with each other**. This allows the strands of **keratin to stack alongside each other** and form large fibrous structures.

Download **3wn8_Collagen**, and open the file in PyMOL. This is a representation of human collagen, which is a structural protein found in bones, tendons, cartilage and other connective tissues.

1. How does the secondary structure of collagen differ from that of keratin?
Collagen **doesn't have any α -helices**.
2. View the collagen strands end-on. What type of shape do they form, and why is this important to their structural function?
Collagen form as **helices of three polypeptide strands**. A helix is a **strong structure**, which is considerably stronger than three individual polypeptide strands would be on their own. This is important because collagen forms **connective tissues**, which have to be **strong** and able to withstand impacts well.
3. Using the command **3wn8 > A > find > polar contacts > just intra main chain**, explain how collagen maintains its tertiary structure.
There is extensive **hydrogen bonding** between the three strands in the collagen.