**What is Polypeptide Chain?**

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Polypeptides are a form of peptide rather than a separate entity. These are developed in the body when amino acids are linked covalently using peptide bonds, typically creating a tripeptide though there are a variety of forms that this chemical can take on. On the end of every terminal is an N-terminal or amino terminal that contains a free amino group. The other end of this carboxyl group contains the C-terminal and carboxyl terminals.

There are no specific rules that divide polypeptides from peptides. These are generally classified by their size, with biologists using the term peptide to refer to smaller chains of amino acids that contain a dozen or less separate amino acids in the chain and polypeptides contain those that are larger.

Both polypeptides and peptides are generally found in every organism on Earth in a wide variety of organizations based on the type of structures commonly found in the given life form. This includes even the most basic organisms such as bacteria or fungi, though the peptides and polypeptides in these organisms do tend to react very differently than those in plants or animals.

### Basic Peptide Bonds

Peptides are created when a variety of amino acids in an animal’s body form bonds, creating a single structure that can interact with bodily tissues as required.

- As a general rule, peptides refer to a bonded group of chemicals that contain 50 or fewer amino acids. Groups that are larger than this are considered to be proteins. In some cases proteins may break down into peptides as they interact with tissues in the body. Peptides may also bind together to create larger proteins based on the type of reactions that they take part in within bodily tissues.
• Bonds within a peptide are referred to as amide bonds. These bonds contain a nitrogen, carbon and oxygen atom, in addition to other elements depending on the type of peptide that has been created.

• Peptide bonds can be organized in one of two ways: a double bond can be drawn between an oxygen and carbon atom with single bonds between the nitrogen and carbon atoms or a double bond can be created between carbon and nitrogen atoms with a negative charge on the oxygen. The difference in these structures is referred to as resonance structures.

• Peptide bonds are actually hybrids of two resonance structures which are closure to a double bond with oxygen and carbon atoms. This means that this is a more significant contribution to the overall structure of the peptide while the other structure plays more of a supporting role. The bond between carbon and nitrogen does not allow these atoms to rotate in respect to the other.

Peptides naturally contain constraints on how their 3D shape can be formed. Interactions between the amino acids and a variety of chemical groups can help determine what part of the peptide faces into the water and which will face inward.

The shape of a peptide or a protein is critical in determining the ultimate function of this peptide, so research is greatly focused on understanding how these proteins and peptides fold once they are created by the cell, and how their shape alters once they start taking part in biological reactions. Understanding these formations will also allow researchers to bond chemicals accurately to create high quality synthesized versions of these peptides for research.

Commonly Related Polypeptides

Many polypeptides that have been identified as vital to mammals are associated with the pancreas.

• Neuropeptide Y, a neuropeptide containing 36 amino acids is used by mammals as a neurotransmitter to the brain and nervous system. There are a variety of variations of this peptide in different animal groups, though it is often seen acting from the hypothalamus. This polypeptide is produced by the neurons of the sympathetic nervous system to grow fat tissue and act as a vasoconstrictor. In some animals this peptide may be used as means of controlling food intake, storing fat for energy, reducing the perception of pain, controlling blood pressure, controlling seizures and managing the circadian rhythm.

• Peptide YY or peptide tyrosine tyrosine is encoded on the PPY gene as a 36 amino acid polypeptide. It is released by the ileum cells within the colon during feeding as a means of reducing appetite when the body becomes full, though the full function of this peptide is not yet known. PYY is exerted through the NPY receptors to inhibit gastric motility and absorption of electrolytes and water in the colon. It is believed that this peptide may also suppress the secretion of neuroendocrine cells in the colon and ileum after a meal by slowing gastric emptying.

• Pancreatic polypeptide is secreted by the endocrine pancreas PP cells. These are predominantly located in the head of an animal's pancreas. This polypeptide also contains 36 amino acids and is used as a self-regulation mechanism for controlling the secretions of the exocrine and endocrine while also helping to control hepatic
glycogen levels from gastrointestinal secretions. This secretion mechanism is found to increase after an animal exercises, fasts or takes in protein, though it decreases when an animal’s body secretes somatostatin or intravenous glucose.

These peptides may take on a variety of other forms depending on the animal where the peptide is formed. This has led to some difficulties in creating a concrete identification process for polypeptides in this family. As a general rule a polypeptide will take on a linear chain format with a singular format, though some peptides are placed into this category if they are particularly long but are not long enough to be classified as a protein in spite of failing to meet these specifications.

**Uses in Molecular Biology**

Recently peptides and polypeptide structures have been seen additional attention in biology due to their potential in the creation of antibodies that can purify specific proteins.

- These peptides can be synthesized using antigenic peptides within the desired protein, which researchers use as a means of mimicking antigenic peptides from a desired section of a protein. This has been used to create antibodies in mouse and rabbit test subjects.

- Peptides are also being used to better understand protein structures and their function because probes can see the structure of these chemicals more easily.

Peptides are also being researched for their inhibitory properties which may have potential in restricting the growth of cancers and similar diseases. In animal test subjects peptides have shown promise in detecting and targeting items such as LHRH and regulating the receptors.

This process could be used to treat certain types of cancer, though the process for synthesizing these peptides or applying them in a pharmaceutical application is still being investigated for its potential methodology. Protein tags that can be used to identify the protein structures involved in this process are still being investigated to better understand how this process works in the body naturally.

The sequences of amino acids in polypeptides are controlled by codons which are located in the mRNA molecules that were used by an animal’s body to translate the polypeptide when it was originally created. This sequence of codons within the mRNA sequence is also dictated by the codons in the DNA that was originally used to transcribe the mRNA that controls the peptides. This helps to keep a great deal of control over a class of chemical that is otherwise highly prone to alterations.

**Resource Box:**

http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/Polypeptides.html

http://en.wikipedia.org/wiki/Peptide#Pancreatic_polypeptide-related_peptides