11.4E: Iron-Binding Proteins

Iron binding proteins of the innate immune system include lactoferrin and transferrins.

Learning Objectives

• Describe Iron-Binding proteins

Key Points

• Lactoferrin (LF), also known as lactotransferrin (LTF), is a multifunctional protein of the transferrin family.
• Lactoferrin is a globular glycoprotein with a molecular mass of about 80 kDa that is widely represented in various secretory fluids such as milk, saliva, tears, and nasal secretions.
• Transferrins are iron-binding blood plasma glycoproteins that control the level of free iron in biological fluids.

Key Terms

• transferrin: A glycoprotein, a beta globulin, in blood serum that combines with and transports iron
• Lactoferrin: Lactoferrin (LF), also known as lactotransferrin (LTF), is a multifunctional protein of the transferrin family. Lactoferrin is a globular glycoprotein with a molecular mass of about 80 kDa. It is widely represented in various secretory fluids such as milk, saliva, tears, and nasal secretions.
• iron: Iron is a chemical element with the symbol Fe (from Latin: ferrum) and atomic number 26. It is a metal in the first transition series.

Iron-binding proteins are proteins generally used to play roles in metabolism. They are carrier proteins (those used to
move ions and molecules across membranes) and more generally metalloproteins (those which contain a metal ion cofactor). Iron-binding proteins are serum proteins, found in the blood, and as their name suggests, are used to bind and transport iron.

Figure: **Lactoferrin**: Richardson diagram of recombinant human lactoferrin. Based on PDB (Protein Data Bank) 1b0l

Lactoferrin (LF), also known as lactotransferrin (LTF), is a multifunctional protein of the transferrin family. Lactoferrin is a globular glycoprotein with a molecular mass of about 80 kDa. It is widely represented in various secretory fluids such as milk, saliva, tears, and nasal secretions. Lactoferrin is also present in secondary granules of PMN (Polymorphonuclear neutrophil) and is secreted by some acinar cells. Lactoferrin can be purified from milk or produced recombinantly. Human colostrum (“first milk”) has the highest concentration, followed by human milk, and then cow milk (150 mg/L).

Figure: **Transferrin**: PDB (Protein Data Bank) rendering based on 1a8e.

Lactoferrin is one of the components of the immune system of the body. It has antimicrobial activity (bacteriocide, fungicide) and is part of the innate defense, mainly at mucoses. In particular, lactoferrin provides antibacterial activity to human infants. Lactoferrin interacts with DNA and RNA, polysaccharides and heparin, and shows some of its biological functions in complexes with these ligands.

Transferrins are iron-binding blood plasma glycoproteins that control the level of free iron in biological fluids. Human
transferrin is encoded by the TF gene. Transferrin glycoproteins bind iron very tightly, but reversibly. Although iron bound to transferrin is less than 0.1% (4 mg) of the total body iron, it is the most important iron pool, with the highest rate of turnover (25 mg/24 h). Transferrin has a molecular weight of around 80 KDa and contains two specific high-affinity Fe(III) binding sites. The affinity of transferrin for Fe(III) is extremely high (1023 M\(^{-1}\) at pH 7.4), but decreases progressively with decreasing pH below neutrality. When not bound to iron, it is known as “apotransferrin” (see also apoprotein).