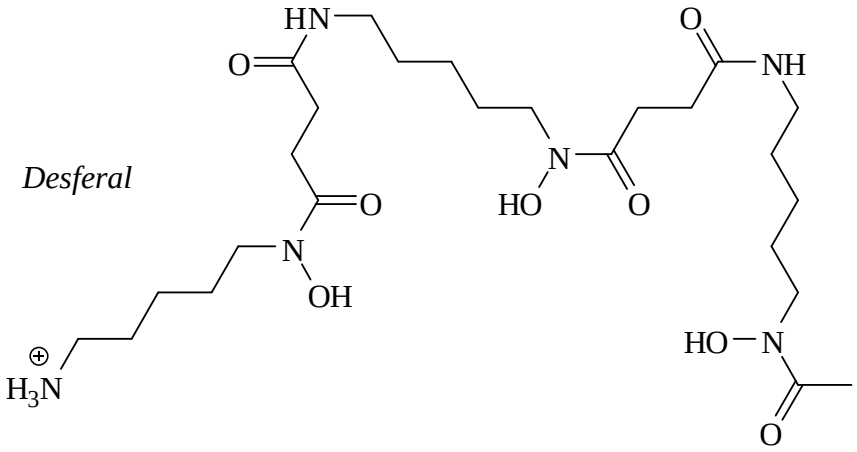
Marks 3

- Hemochromatosis or "iron overload" is a potentially fatal disorder in which excess iron is deposited in the bodily organs as insoluble hydrated iron(III) oxide. It can be treated by administration of desferioxamine B (*Desferal*), a natural substance isolated from fungi.

Desferal



Desferal is taken over 8-12 hour periods up to six times per week. A value of log K = 30.6 is associated with the following equilibrium:

$$Fe^{3+} + LH_3^+ \rightleftharpoons FeL^+ + 3H^+ \quad \text{where } LH_3^+ = \textit{Desferal}$$

Briefly describe the chemical basis for the use of *Desferal* in iron overload therapy.

The solubility of Fe_2O_3 is *very* small - the equibrium for the reaction below lies far to the left:

$$\mathbf{Fe_2O_3(s) + \text{excess } H_2O \rightleftharpoons 2Fe^{3+}(aq) + 6OH^-(aq)}$$

Complexation of Fe^{3+} ions with Desferal is very favourable – the equilibrium for the reaction below lies far to the right (as K for this reaction is $10^{30.6}$):

$$\mathbf{Fe^{3+} + LH_3^+ \rightleftharpoons FeL^+ + 3H^+ \quad \text{where } LH_3^+ = \textit{Desferal}}$$

The Desferal complexes all free $Fe^{3+}(aq)$ ions, so more Fe_2O_3 must dissolve to re-establish the first equilibrium (le Chatelier's principle). Eventually all the Fe_2O_3 will dissolve.