Up

One of the earlier descriptions of the shape of this curve was given by Hill (1910).

From the equilibrium equation: $Hb_n + n\ O_2 <=> (HbO_2)_n$

Came the mathematical description: Saturation = $K^* PO_2^n/(1 + KPO_2^n)$

With a value for n of around 2.5

(Thanks for the reference Neely)

It was determined that Haemoglobin consisted of 4 subunits. Adair (1925) postulated 4 equilibrium reactions with constants generating an equation of the form:

Saturation = $(a_1p+2a_2p2+3a_3p3+4a_4p4)/[4^*(a_1p+a_2p2+a_3p3+a_4p4)]$

where a_1-a_4 are the "Adair parameters" and p is the oxygen tension.

This approach is appealing because it seems to reflect the underlying mechanics of cooperative oxygen binding. Sadly it is an oversimplification of the process. However it remains a basis of many mathematical models. (Kelman 1966)

This program uses the equation of Severinghaus (1979) as it seems to have a nice balance of accuracy and simplicity.

Saturation = $[23{,}400^*(PO_2^3+150^*PO_2)^{-1}+1]^{-1}$

An inversion of this equation to determine Oxygen tension from saturation has also been described although the mathematics is not for the faint hearted. (It contains the cube root of a negative number!) (([illegible]

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