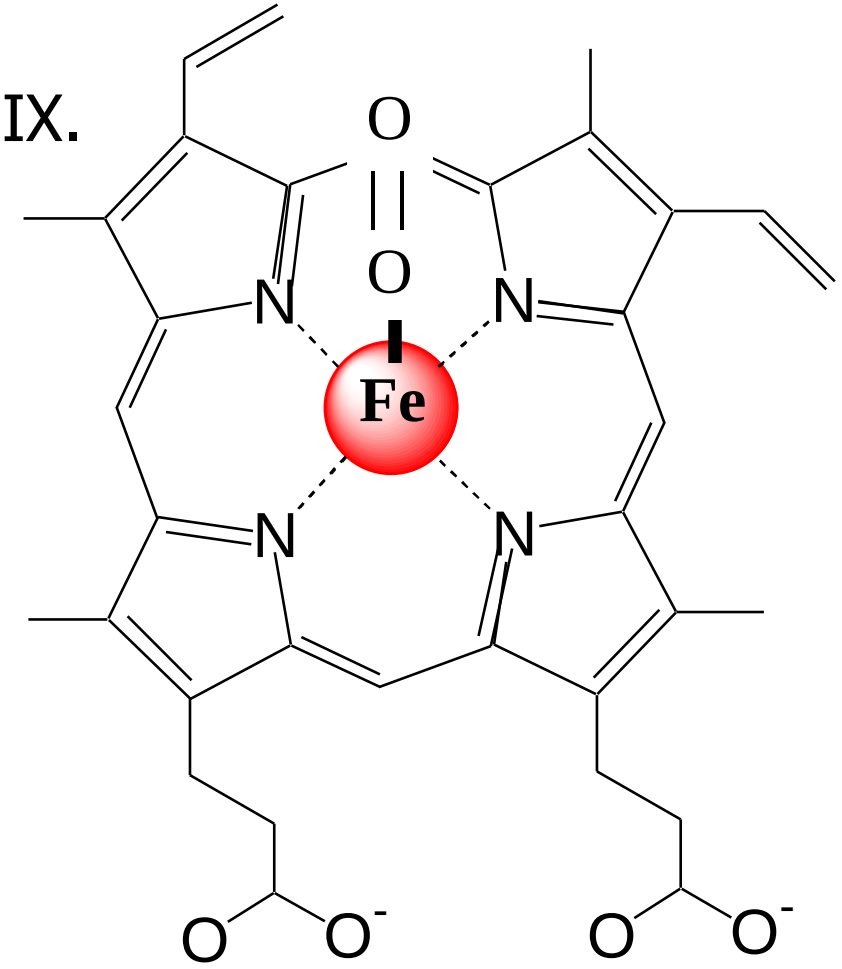
Heme binding by O_2, CO and H_2O_2

NC State University

The iron in heme is the binding site for oxygen

Heme is iron protoporphyrin IX.

Functional aspects in Mb

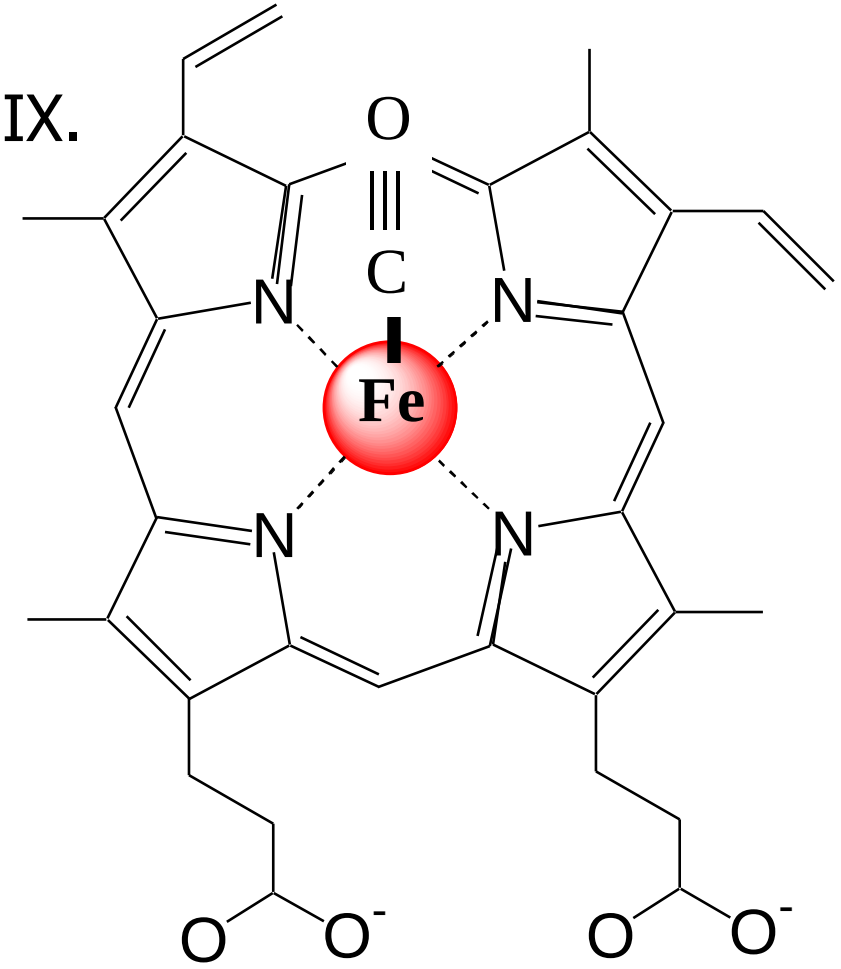


The iron in heme functions to limit CO binding

Heme is iron protoporphyrin IX.

Functional aspects in Mb

1. Discrimination against CO binding.



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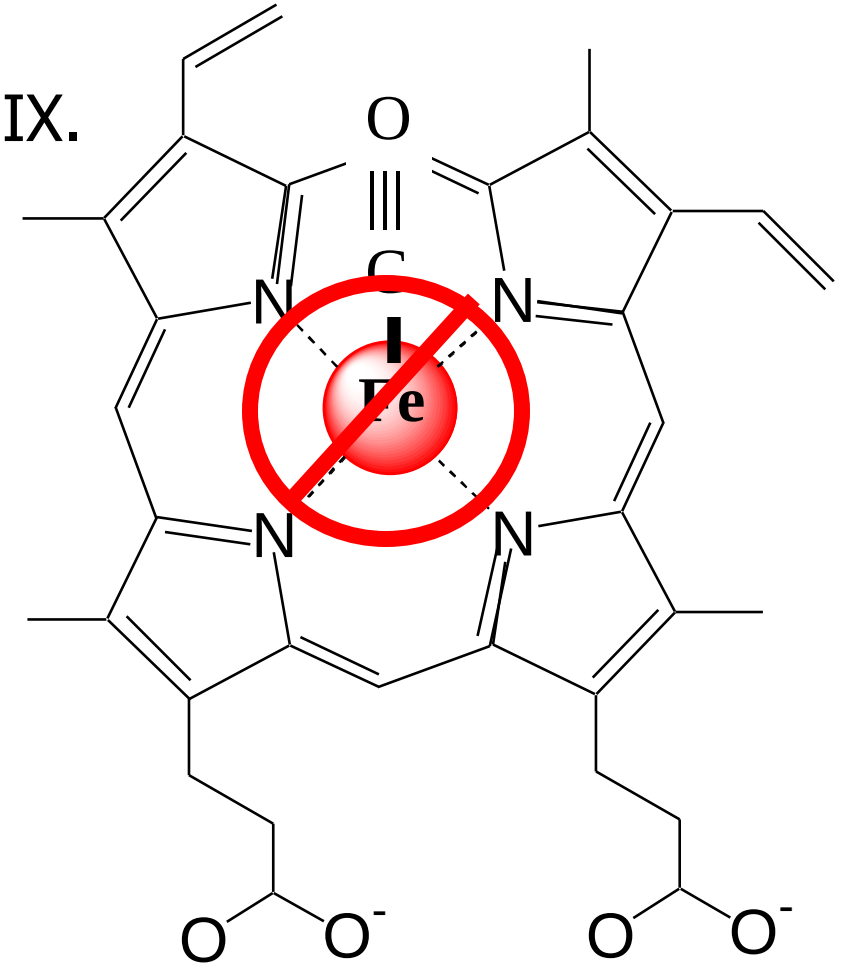

The iron in heme is can exist in two oxidation states (Fe^{3+} and Fe^{2+})

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Functional aspects in Mb

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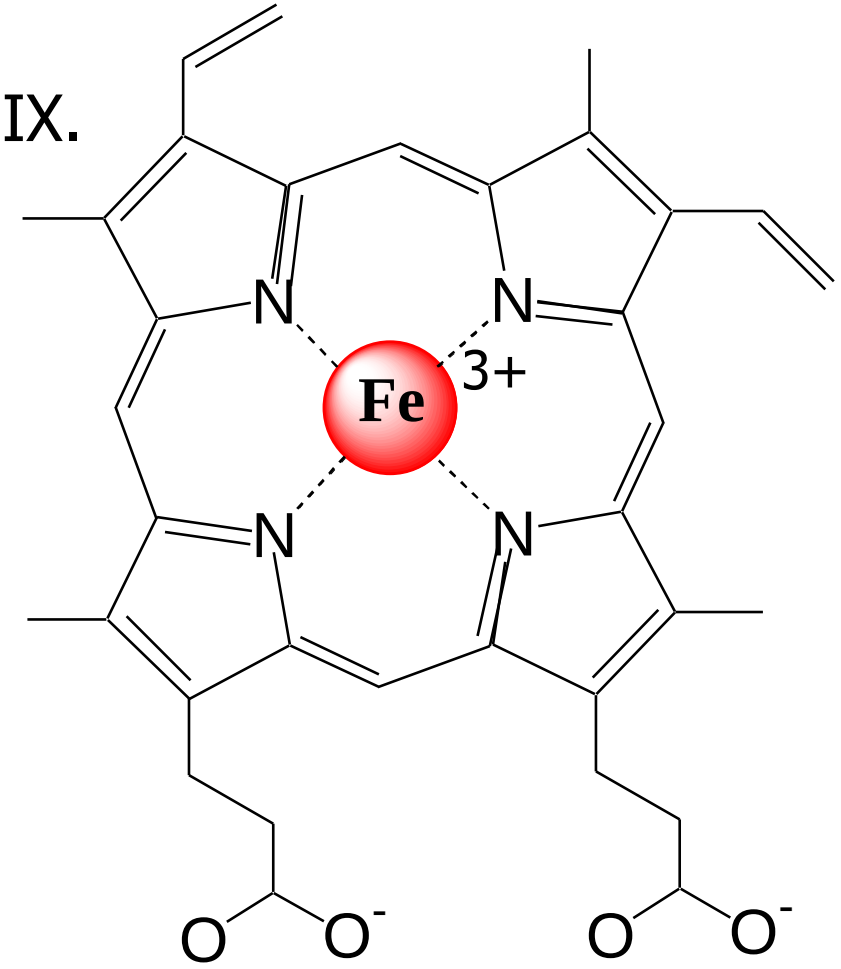
2. O_2 is the physiologically relevant ligand, but it can oxidize iron (autooxidation).



The iron in heme must remain in the Fe^{2+} state for O_2 binding

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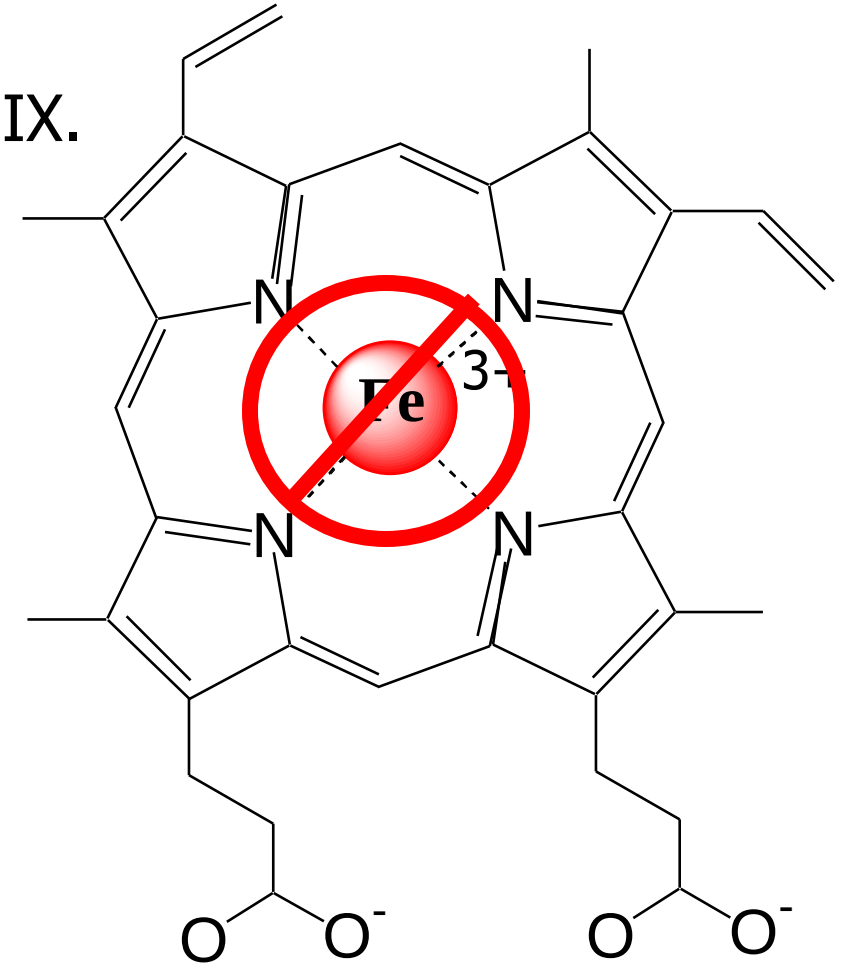
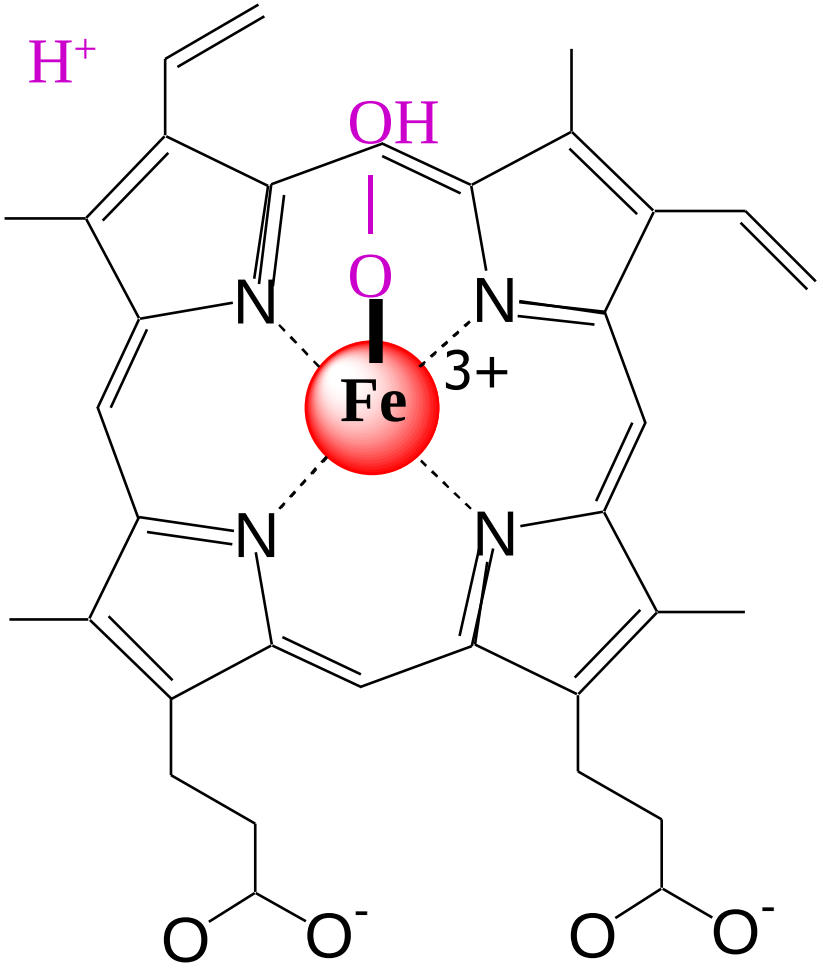


The iron in heme is also the binding site for hydrogen peroxide

H_2O_2 binds to ferric (Fe^{3+}) heme as peroxide anion (HOO^-).

This can lead to heterolytic O-O bond cleavage.



The iron in heme is site formation of ferryl heme

H_2O_2 binds to ferric (Fe^{3+}) heme as peroxide anion (HOO^-).

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The cleavage leads to formation of compound I, which is the reactive form of activated heme.