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Model prebiotic iron-sulfur peptides

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Iron-sulfur clusters are indispensable to extant metabolism and are thought to reflect an ancient role in mediating the chemical reactions that led to life. However, there has been no clear proposal for how these inorganic clusters came to occupy such an important position in biology. Here we describe our efforts in delineating a plausible path from short, prebiotically plausible peptides to longer sequences with characteristics similar to modern day ferredoxins. Small molecule thiolates and short peptides can give rise to [2Fe-2S] and [4Fe-4S] clusters in aqueous solution when illuminated with UV light in the presence of iron ions. The resulting iron-sulfur peptides are redox active. Additionally, duplications of iron-sulfur coordinating tripeptides give sequences with cysteinyl ligand spacing similar to contemporary ferredoxins that are better able to stabilize iron-sulfur clusters.