Área: BIO

Aerobic co-oxidation of hemoglobin and aminoacetone

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Palavras Chave: *Aminoacetone, Hemoglobin, α-Aminoketones, Electron Transfer, Superoxide Radical*

Highlights

Aerobic hemoglobin and aminoacetone co-oxidation yield methylglyoxal and oxyradicals. Oxyhemoglobin (oxyHb) increases the aminoacetone oxidation rate. Superoxide and hydroxyl radicals plus H_2O_2 are reaction intermediates.. Oxyhemoglobin is oxidized to metHb and undergoes structural alterations.

Resumo/Abstract

Aminoacetone (1-aminopropan-2-one), a putative minor biological source of methylglyoxal, reacts like other α-aminoketones such as 6-aminolevulinic acid (first heme precursor) yielding electrophilic α-oxoaldehydes, ammonium ion and reactive oxygen species by metal- and hemeprotein catalyzed aerobic oxidation [1,2]. A wealth of reports implicates methylglyoxal in protein crosslinking and DNA addition, leading to age-related disorders, including diabetes [3,4]. Importantly, methylglyoxal-treated hemoglobin adds four water-exposed arginine residues, which may compromise its physiological role and potentially serve as biomarkers for diabetes [5]. In this work, we investigate the co-oxidation of aminoacetone and oxyhemoglobin in normally aerated phosphate buffer, leading to structural changes in hemoglobin, which might reportedly be attributed to the addition of aminoacetone-generated methylglyoxal to the protein. Hydroxyl radical-promoted chemical damage to hemoglobin may also occur in parallel, which is suggested by EPR-spin trapping studies with 5,5-dimethyl-1-pyrroline-*N*-oxide and ethanol. Concomitantly, oxyhemoglobin is oxidized to methemoglobin, as indicated by characteristic CD spectral changes in the absorption Soret and visible regions. Overall, these findings may contribute to elucidate the molecular mechanisms underlying human diseases associated with hemoglobin dysfunctions (e.g., diabetes) and with aminoacetone in metabolic alterations related to excess of glycine and threonine (e.g., threoninemia, *cri-du-chat* syndrome).

References

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