Cytochrome-c3 hydrogenase

1. Nomenclature

EC number
1.12.2.1

Systematic name
hydrogen:ferricytochrome-c3 oxidoreductase

Recommended name
cytochrome-c3 hydrogenase

Synonyms
H₂:ferricytochrome c₃ oxidoreductase
cytochrome c₃ hydrogenase
cytochrome c₃ reductase
cytochrome hydrogenase
hydrogenase
hydrogenase, cytochrome

CAS registry number
9079-91-8

2. Source Organism

<1> Desulfovibrio gigas [1, 6, 7]
<2> Desulfovibrio vulgaris (Hildenborough [1,13]; Miyazaki [4,16]) [1, 4, 5, 8, 13, 16]
<3> Desulfovibrio desulfuricans (Norway 4 [1,9]; Norway [2]; Essex [10]) [1, 2, 3, 9, 10, 15]
<4> Thiocapsa roseopersicina (Bbs [11]) [11]
<5> Escherichia coli [12]
<6> Desulfomicrobium norvegicum [13]
<7> Desulfovibrio fructosovorans [14]

3. Reaction and Specificity

Catalyzed reaction

2 H₂ + ferricytochrome c₃ = 4 H⁺ + ferrocytochrome c₃
Reaction type
- oxidation
- redox reaction
- reduction

Natural substrates and products
- S Additional information <3, 4, 6, 7> (<3, 6, 7>, cytochrome c₃ is the natural electron acceptor [2, 13, 14]; <3> nonaheme cytochrome c is a competent physiological electron acceptor for the [Ni,Fe] hydrogenase [10]; <4>, a natural electron donor is a low-potential c’3 cytochrome [11]) [2, 10, 11, 13, 14]
- P ?

Substrates and products
- S H⁺ + ferrocytochrome c₃ <2> (Reversibility: ? <2> [5]) [5]
- P H₂ + ferrocytochrome c₃
- S H⁺ + neutral red <3> (Reversibility: ? <3> [2]) [2]
- P H₂ + oxidized neutral red
- S H⁺ + phenosafranine <3> (Reversibility: ? <3> [2]) [2]
- P H₂ + oxidized phenosafranine
- S H⁺ + reduced methyl viologen <2, 3> (<3>, weak activity in H₂-uptake assay [2]) (Reversibility: r <3> [2]; ? <2> [3, 4]) [2, 3, 4]
- P H₂ + methyl viologen
- S H₂ + benzyl viologen <3> (Reversibility: r <3> [2]) [2]
- P H⁺ + reduced benzyl viologen <3> [2]
- S H₂ + ferredoxin <1> (<1>, requires the presence of cytochrome c₃ for the reduction of ferredoxin [1]) (Reversibility: ? <1> [1]) [1]
- P H⁺ + reduced ferredoxin
- S H₂ + ferrocytochrome c <3> (<3>, nonaheme cytochrome c [10]) (Reversibility: ? <3> [10]) [10]
- P H⁺ + ferrocytochrome c
- S H₂ + ferrocytochrome c₃ <1, 2, 3, 4, 5, 6, 7> (<3>, tetraheme cytochrome c₃ [10]) (Reversibility: r <3> [2, 3]; ? <1, 2, 3> [1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]) [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]
- P H⁺ + ferrocytochrome c₃
- S H₂ + methyl viologen <1> (Reversibility: ? <1> [7]) [7]
- P H⁺ + reduced methyl viologen
- S H₂ + methylene blue <3> (<3>, no activity in H₂-evolution assay [2]) (Reversibility: ir <3> [2]; ? <3> [10]) [2, 10]
- P H⁺ + reduced methylene blue
- S H₂ + rubredoxin <1> (<1>, requires the presence of cytochrome c₃ for the reduction of rubredoxin [1]) (Reversibility: ? <1> [1]) [1]
- P H⁺ + reduced rubredoxin
- S Additional information <3, 7> (<3>, no reduction of ferredoxin, methylene blue or hexacyanoferrate(II) by H₂ [3]; <3>, enzyme can catalyze H⁻²H exchange in absence of added electron carriers [3]; <3>, enzyme catalyzes production of H₂ from Na₂S₂O₄ in presence of cytochrome c₃ [3]; <7>, enzyme also exhibits high Tc(VII)-reducing activity [14]) [3, 14]
- P ?