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Characterization of Human Selenocysteine Synthase Involved in Selenoprotein Biosynthesis

Katsumasa Abe¹⁾, Hisaaki Mihara¹⁾, Ryuta Tobe¹⁾ and Nobuyoshi Esaki¹⁾

1) Institute for Chemical Research, Kyoto University

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Abstract:

Bacterial selenocysteine synthase is a pyridoxal 5'-phosphate-dependent enzyme that catalyzes the conversion of seryl-tRNA^{Sec} to selenocysteyl-tRNA^{Sec} for selenoprotein biosynthesis. Human selenocysteine synthase (SecS), originally annotated as SLA/LP, was previously reported to operate in selenocysteyl-tRNA^{Sec} synthesis, but the mechanism of conversion from Ser-tRNA^{Sec} by the eukaryotic enzyme remained unresolved. Herein, the human cDNA encoding SecS has been cloned and overexpressed in *Escherichia coli*. SecS was co-purified with *E. coli* tRNAs, which was revealed to contain tRNA^{Sec} by PCR analysis. The purified enzyme exhibited a UV-visible absorption maximum at 420 nm characteristic of pyridoxal 5'-phosphate-dependent enzymes. *In vitro* selenocysteyl-tRNA^{Sec} synthesis assay suggests that the formation of phosphoseryl-tRNA^{Sec} is essential for human seryl-tRNA^{Sec}, but not archaeal seryl-tRNA^{Sec} to be converted to selenocysteyl-tRNA^{Sec} by human SecS.

Key words: selenoprotein, selenocysteine synthase, selenium, human, biosynthesis

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