Why Multiples of 21? Why does Selenoprotein P Contain Multiple Selenocysteine Residues?

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Article Information

Identifiers and Pagination:

Year: 2020
Volume: 1
Issue: 1
First Page: 42
Last Page: 53
Publisher ID: CNT-1-42
DOI: 10.2174/2665978601666200213120929
Article History:
Received Date: 31/10/2019
Revision Received Date: 10/12/2019
Acceptance Date: 22/01/2020
Electronic publication date: 2020

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Background: In animals, the 21st amino acid selenocysteine is incorporated into a restricted subset of proteins by recoding of a UGA stop codon. This recoding requires a distinctive selenocysteine insertion sequence in selenoprotein encoding mRNAs, trans-acting factors and in most cases, adequate dietary intake of selenium. With one exception, selenoproteins contain a single selenocysteine, which is incorporated with low translational efficiency. The exception is selenoprotein P, which in some species is predicted to contain as many as 132 selenocysteines and which is considered to play roles in selenium transport and storage.

Objective: This study aimed to develop comparative physiological and evolutionary perspectives on the function(s) of selenoprotein P.

Methods: The review of the literature on the roles of selenoprotein P in diverse animals.

Results: Selenoprotein P contains multiple selenocysteines, making it energetically costly to produce. Furthermore, it is often associated with detrimental effects to the animals that produce it. Possible benefits that

outweigh these costs include the general storage and transport of selenium; the transport of both toxic and useful metal ions; and specific functions in reproduction and in the nervous system.

Conclusion: A probable reconciliation of the negative effects of producing Selenoprotein P is its benefit in terms of promoting reproductive success.

Keywords: Selenium, selenoprotein P, comparative physiology, evolution, lifespan, reproduction.