

Thesis Title : Investigating The Structural and Functional Changes Due to Variations In Redox-Regulating Glutathione Peroxidases and Thioredoxin Reductases.

- [Background](#)

Background

Selenium is an essential micronutrient with important functions in human health and several pathophysiological conditions. The biological effects of selenium are largely mediated by selenium-containing proteins (selenoproteins). Selenoproteins represent diverse molecular pathways and biological functions [1]. There are 25 genes encoding selenoproteins in humans [1]. In selenoproteins, the 21st amino acid selenocysteine (Sec, U) is inserted in the nascent polypeptide chain during the process of translational recoding of the UGA stop codon [2]. In addition to the UGA-codon, a cis-acting element in the mRNA, called Sec-insertion sequence (SECIS), binds SBP2 to recruit other proteins, such as eukaryotic elongation factor selenocysteine-tRNA specific, to form the complex responsible for the recoding process [3]. Those peptides or proteins or enzymes containing selenocysteine are called selenopeptides or selenoproteins or selenoenzymes respectively. These selenoproteins play a critical role in antioxidant defense, hormone metabolism, immune responses and muscle development. [1] There are selenoproteins that have incorporated Sec under a precise process requiring the UGA codon, a specified tRNA (Sec tRNA [Ser]Sec), some regulatory proteins, and the SECIS element. Second, there are proteins that contain selenomethionine (SeMet), in addition to Sec. The third class consists of selenium-binding proteins (SBP), which bind Se by some unknown mechanisms [4]. All these selenoproteins are broadly divided into three families such as Glutathione peroxidases (GPXs), Thioredoxin reductases (TRs) and Iodothyronine deiodinases (DIOs). Being an important component of various antioxidant selenoprotein enzymes like glutathione peroxidase (GPX) and thioredoxin reductase (TRXR), plays an important role in combating oxidative stress caused due to excessive generation of ROS (reactive oxygen species). We will be focusing on two protein families Glutathione Peroxidases and Thioredoxin Reductases which have isoforms with selenocysteine and cysteine at the active sites. The presence of selenium improves the redox properties of the protein.

