New Product Highlights

Thioredoxin Reductase (E.C. 1.8.1.9): An antioxidant enzyme in mammalian cells

Thioredoxin reductase (TrxR), an **NADPH**-dependent (Prod. No. **N 7505**) oxidoreductase, is one of the antioxidant enzymes present in mammalian cells. Together with **catalase** (Prod. No. **C 3155**), **glutathione peroxidase** (Prod. No. **G 6137**) and **superoxide dismutase** (Prod. No. **S 8160**), it helps remove reactive oxygen species (ROS) from the cell. TrxR tightly binds one molecule of **flavin adenine dinucleotide** (FAD, Prod. No. **F 6625**) per subunit, each of which also contains a redox-active disulfide bond. TrxR catalyzes the NADPH-dependent reduction of the active site disulfide in oxidized **thioredoxin** (Trx, Prod. No. **T 8690**) to the dithiol. Trx is a small protein that is ubiquitously expressed and, in its reduced form, is the major disulfide reductase in cells. Trx also serves as a hydrogen donor in the synthesis of deoxyribonucleotides by ribonucleotide reductase, a preliminary step in DNA synthesis and cell proliferation. Members of the Trx superfamily regulate the binding of transcription factors to DNA, modulate the biosynthesis and activity of secretory proteins and serve as hydrogen donors in several reducing enzyme systems. In addition, the regeneration of Trx by TrxR is a major intracellular antioxidant pathway [1-7].

Oxidative stress causes DNA damage and high levels have been associated with carcinogenesis. Because the Trx/TrxR pathway acts as an antioxidant, it may be regarded as a tumor-preventive system. However, once a malignancy has been established, cancer cells require a constant deoxyribonucleotide supply that in turn depends on a highly active Trx/TrxR pathway [5]. In addition, the inhibition of TrxR may be a factor in the treatment of chronic inflammatory diseases such as rheumatoid arthritis and Sjögren's syndrome.

Sigma-RBI is pleased to introduce **Thioredoxin reductase** (Prod. No. **T 9698**) purified from rat liver. Thioredoxin reductase isozymes from mammalian sources vary in molecular mass between 55-67 kDa, compared to the 35 kDa enzymes found in prokaryotes, plants or yeast [8,9]. The mammalian enzyme contains a selenocysteine residue, which is essential for its enzymatic activity [10,11]. Mammalian TrxR will reduce both mammalian and *E. coli* thioredoxins as well as non-disulfide substrates such as selenite, lipoic acids, lipid hydroperoxides and hydrogen peroxide [12].

References

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