



# Thioredoxin

Thioredoxin is a class of small redox proteins known to be present in all organisms and play a role in many important biological processes. The response of Thioredoxin to reactive oxygen species (ROS) is crucial to skin health and aging, but it is not commonly used in skin care because of the high cost of enzymes. At Skin Actives we produce near-pharmaceutical quality Thioredoxin, which is suited specifically for skin care applications. This means that we can offer excellent quality at reasonable prices.

## Applications

- Controls cellular redox potential
- Crucial to cell function and aging
- Controls activity of many enzymes
- Keeps an optimum reducing thiol intracellular state

## Function

Thioredoxins are a group of 12 kDa redox proteins that mediate numerous cytosolic processes in all cells by facilitating the reduction of other proteins by cysteine thiol-disulfide exchange. It is ubiquitous and found in many organisms from plants and bacteria to mammals. Human Thioredoxin can be exported out of the cell where it has additional functions including the ability to stimulate cell growth. Human Thioredoxin has anti-oxidative and anti-apoptotic properties<sup>1</sup>. Taking into account that the redox (reduction-oxidation) state of cells is crucial to cell function and aging, the possible benefits

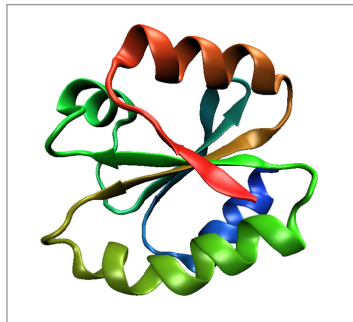


Figure 1: Human Thioredoxin

of Thioredoxin include its use in skin damage by UV<sup>1</sup>, skin aging prevention and reversal<sup>2</sup>, vitiligo<sup>3</sup>, hyperpigmentation<sup>4</sup>, and more.

Thioredoxin proteins have a characteristic tertiary structure termed the Thioredoxin fold. Thioredoxins are kept in the reduced state by the flavoenzyme Thioredoxin reductase, in a NADPH-dependent reaction. Thioredoxins act as electron donors to peroxidases and ribonucleotide reductase. The related Glutaredoxins (also supplied by Skin Actives) share many of the functions of Thioredoxins, but are reduced by Glutathione rather than a specific reductase.

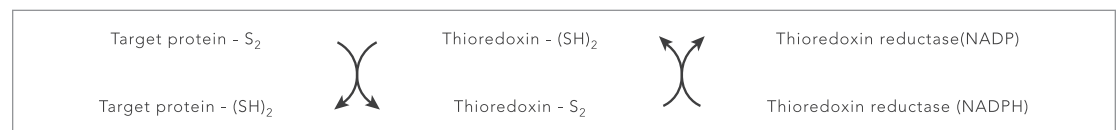


Figure 2: The Thioredoxin system. Thioredoxin (SH<sub>2</sub>) reduces disulfide bonds (S<sub>2</sub>) in target proteins. Oxidized Thioredoxin (S<sub>2</sub>) is reduced by Thioredoxin reductase, which receives reducing equivalents from NADPH.

## Technical Information

<p>INCI: Molecular Weight: Purity: Formulation: Production: Optimal Concentration: Storage: Reconstitution:</p>	<p>rh-Polypeptide-2 (Skin Conditioning Agent, Miscellaneous). 13,400, containing 125 amino acids. Purity is greater than 95% as determined by analysis using SDS-PAGE. Suspension in ammonium sulfate (80% saturation). Produced in <i>E. coli</i> and purified using proprietary chromatographic techniques. The optimal concentration should be determined for each specific application. This suspension is stable at 2-8°C. Do not freeze. Add buffered (pH 7.5) saline solution (about 1:5 to 1:10) to the suspension to redissolve Thioredoxin.</p>
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### References

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- 2 Young, Jennifer J., Patel, Asmita; Rai, Priyamvada (2010) Suppression of thioredoxin-1 induces premature senescence in normal human fibroblasts. Biochem Biophys Res Comm 392: 363-368.
- 3 Vafaei, T, Rokos, Hartmut, S, Mohamed M. A. E. L., Schallreuter, KU (2010) In vivo and in vitro evidence for epidermal H(2)O(2)-mediated oxidative stress in piebaldism Exp. Derm., 19:883-887
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