Silkworm Thioredoxin Peroxidase Is Induced by External Temperature Stimulus and Viral Infection

Kwang-Sik Lee, Seong-Ryul Kim, Nam-Sook Park, Iksoo Kim[1], Pil-Dong Kang[1], Bong-Hee Sohn[1], Kwang-Ho Choi[1], Seok-Woo Kang[1], Yeon-Ho Je[2], Sang-Mong Lee[3], Hung-Dae Sohn and Byung-Rae Jin

College of Natural Resources and Life Science, Dong-A University,
Busan, 604-714, Republic of Korea

[1]Department of Agricultural Biology, National Institute of Agricultural Science and Technology,
RDA, Suwon 441-100, Republic of Korea

[2]School of Agricultural Biotechnology, Seoul National University,
Seoul, 151-742, Republic of Korea

[3]Department of Sericultural and Entomological Biology, Miryang National University,
Miryang, 627-130, Republic of Korea

A thioredoxin peroxidase (TPx) that reduces H2O2 was firstly characterized in the lepidopteran insect, silkworm *Bombyx mori*. The *B. mori* TPx (BmTPx) cDNA contains an open reading frame of 585 bp encoding 195 amino acid residues and possesses two cysteine residues that are characteristic of 2-Cys subgroup of peroxiredoxin family. The deduced amino acid sequence of the BmTPx cDNA showed 78% identity to *Drosophila melanogaster* (DmTPx-1), 73% to *Aedes aegypti* (AaTPx), and 54% - 48% to other insect 2-Cys TPx. Phylogenetic analysis confirmed a closer relationship of the deduced amino acid sequences of the BmTPx gene to the DmTPx-1 and AaTPx within the 2-Cys TPx cluster. The cDNA encoding BmTPx was expressed as a 25-kDa polypeptide in the baculovirus-infected insect Sf9 cells and the purified recombinant BmTPx was shown to reduce H2O2 in the presence of electrons donated by dithiothreitol. Northern blot analysis revealed the presence of BmTPx transcripts in all tissues examined, suggesting that BmTPx gene is expressed in most, if not all, body tissues. Western blot analysis showed the presence of the BmTPx in the fat body and midgut, but not in the hemolymph, suggesting the BmTPx is not secretable. When H2O2 was injected into body cavity of *B. mori* larva, BmTPx mRNA expression was dramatically increased in the fat body tissues. Interestingly, the expression levels of BmTPx enzyme in the fat body were particularly high when *B mori* larva was exposed at low (4℃) and high (37℃) temperatures or baculovirus infection, suggesting that the BmTPx seems to play a protective role against oxidative stress caused by temperature stimuli and viral infection.