

# Molecular Characterization of the Cu,Zn Superoxide Dismutase (SOD1) and Thioredoxin-Like Protein Genes from the Bumble Bee, *Bombus ignitus*

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The Cu,Zn superoxide dismutase (SOD1) and thioredoxin-like protein (txl) genes were cloned from the bumble bee, *Bombus ignitus*. The *B. ignitus* SOD1 gene spans 1317 bp and consisted of three introns and four exons coding for 151 amino acid residues with a predicted molecular mass of 15554 Da and pI of 6.24. The *B. ignitus* SOD1 possesses the typical metal binding ligands of six histidines and one aspartic acid common to SOD1s. The deduced amino acid sequence of the *B. ignitus* SOD1 cDNA showed 82% identity to *Apis mellifera ligustica* SOD1 and 72% to *Apis mellifera* SOD1. Northern blot analysis revealed the presence of *B. ignitus* SOD1 transcripts in all tissues examined. When methylviologen was injected into body cavity of *B. ignitus* adult, *B. ignitus* SOD1 mRNA expression was up-regulated in the fat body tissues. The *B. ignitus* txl gene spans 1783 bp and consisted of three introns and four exons coding for 285 amino acid residues with a predicted molecular mass of 31298 Da and pI of 4.83. The *B. ignitus* txl possesses the conserved active site sequence, CGPC, typical in members of the thioredoxin superfamily. The deduced amino acid sequence of the *B. ignitus* txl showed 65% identity to *Drosophila melanogaster* txl. Northern blot analysis revealed the presence of *B. ignitus* txl transcripts in all tissues examined. When H<sub>2</sub>O<sub>2</sub> was injected into body cavity of *B. ignitus* adult, *B. ignitus* txl mRNA expression was up-regulated in the fat body tissues. Furthermore, when *B. ignitus* adult was inoculated with LPS, *B. ignitus* SOD1 and txl mRNA synthesis was differentially and time-dependently up-regulated in the fat body tissues, suggesting that the *B. ignitus* SOD1 and txl seem to play a protective role against oxidative stress caused by bacterial challenge.