

A Bumblebee Thioredoxin-Like Protein That Is Up-regulated by a Temperature Stimulus and Lipopolysaccharide Injection

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A thioredoxin-like protein (txl) gene was cloned from the bumblebee, *Bombus ignitus*. The *B. ignitus* txl (Bitxl) gene spans 1777 bp and consists of three introns and four exons coding for 285 amino acid residues with a conserved active site (CGPC). The deduced amino acid sequence of the Bitxl cDNA was 65% similar to the *Drosophila melanogaster* txl. Northern blot analysis revealed the presence of Bitxl transcripts in all tissues examined. When H₂O₂ was injected into the body cavity of *B. ignitus* workers, Bitxl mRNA expression was up-regulated in the fat body tissue. In addition, the expression levels of Bitxl mRNA in the fat body greatly increased when *B. ignitus* workers were exposed to low (4°C) or high (37°C) temperatures, or injected with lipopolysaccharide (LPS), which suggests that the Bitxl possibly protects against oxidative stress caused by extreme temperatures and bacterial infection.