

# New Antioxidant Genes from an Anhydrobiotic Insect: Unique Structural Features in Functional Motifs of Thioredoxins

Nesmelov A., Devatiyarov R., Voronina T., Kondratyeva S., Cherkasov A., Cornette R., Kikawada T., Shagimardanova E.

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

---

## Abstract

© 2016, Springer Science+Business Media New York. *Polypedilum vanderplanki* is the most complex known organism able to survive body desiccation via entering a state of suspended metabolism called anhydrobiosis. This unique ability is based on the specific molecular machinery involving a synthesis of non-reducing sugar trehalose and a variety of protective proteins. Genes encoding these protective proteins are extensively duplicated in the *P. vanderplanki* genome and become hugely upregulated in response to desiccation. Some of these highly expressed genes encode substitutions of amino acids crucial for the function of corresponding proteins. An intriguing group of protective proteins in *P. vanderplanki* are thioredoxins (TRX). These antioxidant proteins are important for *P. vanderplanki* anhydrobiosis since desiccation is tightly related to the elevated production of free radicals and oxidative damage. The TRX set is unprecedentedly expanded in the *P. vanderplanki* genome up to 25 TRX genes. Genomes of congeneric midge *Polypedilum nubifer*, *Apis mellifera*, *Drosophila melanogaster*, and *Anopheles gambiae* encode only 3–7 TRX genes. Moreover, all three *P. vanderplanki* thioredoxin genes most expressed at 24 h of *P. vanderplanki* larva desiccation encode for proteins missing the typical CxxC motif.

<http://dx.doi.org/10.1007/s12668-016-0278-x>

---

## Keywords

Amino acid substitution, Anhydrobiosis, CxxC motif, *P. vanderplanki*, Thioredoxins