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## **Structural and Functional Analysis of Latex Clearing Protein (Lcp) Provides Insight into Enzymatic Cleavage of Rubber**

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### **Abstract:**

Latex clearing proteins (Lcps) are rubber oxygenases that catalyse the extracellular cleavage of poly(cis-1,4-isoprene) by Gram-positive rubber degrading bacteria. Lcp of *Streptomyces* sp. K30 (Lcp<sub>K30</sub>) is a b-type cytochrome and acts as an endo-type dioxygenase producing C<sub>20</sub> and higher oligo-isoprenoids that differ in the number of isoprene units but have the same terminal functions, CHO-CH<sub>2</sub>- and -CH<sub>2</sub>-COCH<sub>3</sub>. Our analysis of the Lcp<sub>K30</sub> structure revealed a 3/3 globin fold with additional domains at the N- and C-termini and similarities to globin-coupled sensor proteins. The haem group of Lcp<sub>K30</sub> is ligated to the polypeptide by a proximal histidine (His198) and by a lysine residue (Lys167) as the distal axial ligand. The comparison of Lcp<sub>K30</sub> structures in a closed and in an open state as well as spectroscopic and biochemical analysis of wild type and Lcp<sub>K30</sub> mutants provided insights into the action of the enzyme during catalysis.

Keywords: rubber oxygenase, latex clearing protein, polyisoprene, biodegradation, enzymatic cleavage