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Molecular and Biochemical Studies of NEW Oxidoreductase in Decolorization of Triphenylmethane Dyes

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Triphenylmethane dyes are aromatic xenobiotic compounds, and are used extensively in textile industries for dying nylon, wool, silk and cotton. Significantly some dyes have been shown to be mutagens, a mitotic poison and clastogen. The degradation of dyes has received considerable attention from the viewpoint of treating industrial wastewater containing dyes. Studies on the biodegradation of triphenylmethane dyes have focused primarily on the decolorization of dyes via reduction reactions

Several triphenylmethane dyes-degrading microorganisms have been reported and their characteristics have been reviewed recently. The mechanism for biodecolorization and biodegradation of crystal violet has been elucidated by fungi, but not by bacteria. Crystal violet was degraded by ligninolytic culture of *Phanerochaete chrysosporium*, and its initial oxidation proceeds via *N*-demethylation catalyzed by lignin peroxidase. Also, decolorization of crystal violet was found to be carried out by laccase from *Cyathus bulleri*, and by peroxidase from *Pleurotus ostreatus*. The structural genes encoding lignin peroxidase and laccase have been cloned and characterized. Although several triphenylmethane dyes-decolorizing bacteria have been isolated, no information has been obtained on the enzymes and genes involved in their decolorization of triphenylmethane dyes. Very recently, we isolated a new potent bacterium, *Citrobacter* sp. having a higher decolorization capability, even at a high concentration of triphenylmethane and azo dyes than any microorganisms reported so far.

To elucidate the molecular mechanism of biodegradation of triphenylmethane dyes by bacteria, we have firstly purified and characterized a new oxidoreductase responsible for decolorization of triphenylmethane dyes from *Citrobacter* sp. Also, we have isolated and expressed its gene in *E. coli*. We herein present the molecular and biochemical characteristics of a new triphenylmethane oxidoreductase.