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Studies on antibacterial activity of ZnO nanoparticles by ROS induced lipid peroxidation

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Recent studies indicated the role of ROS toward antibacterial activity. In our study we report ROS mediated membrane lipid oxidation of *Escherichia coli* treated with ZnO nanoparticles (NPs) as supported by detection and spectrophotometric measurement of malondialdehyde (MDA) by TBARS (thiobarbituric acid-reactive species) assay. The antibacterial effects of ZnO NPs were studied by measuring the growth curve of *E. coli*, which showed concentration dependent bacteriostatic and bactericidal effects of ZnO NPs. The antibacterial effects were characterized by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Further, antibacterial effect of ZnO NPs was found to decrease by introducing histidine to the culture medium treated with ZnO NPs. The ROS scavenging action of histidine was confirmed by treating histidine to the batch of *Escherichia coli* + ZnO NPs at the end of the lag phase of the growth curve (Set-I) and during inoculation (Set-II). A moderate bacteriostatic effect (lag in the *E. coli* growth) was observed in Set-II batch while Set-I showed no bacteriostatic effect. From these evidences we confirmed that the antibacterial effect of bare as well as TG capped ZnO NPs were due to membrane lipid peroxidation caused by the ROS generated during ZnO NPs interaction in culture medium.

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