**Exploring the function, conformation and stability alterations of proteinase K (as a model enzyme) by zinc oxide nanoparticles**

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**Abstract**

**Proteinase K is one of the most active endopeptidase among the known proteases. This enzyme has important applications as protein degrading components in food processing industry, in medicine for the preparation of proteolytic creams and collagen implants, in nucleic acid preparations. Furthermore, ZnO nanoparticles have been used in different pharmaceutical and biological applications, but their effect on the stability, activity and structure of various enzymes should** be studied in more details. The effect of nanoparticles on the catalytic properties, conformation, stability and dynamics of native proteinase K was investigated by steady state thermal stability, fluorescence, circular dichroism, UV-Vis spectroscopy as well as kinetic techniques.

The enzyme activity of proteinase K showed that nanoparticles inhibited the activity of the enzyme and its thermal stability was increased by enhancing the concentration of nanoparticles. Structural studies showed that nanoparticles could change the structure of enzyme. The fluorescence spectroscopic experiments revealed that nanoparticles had the ability to quench the intrinsic fluorescence of enzyme through a static quenching procedure. The thermodynamic parameters also indicated that the binding process was spontaneous and that hydrogen bonds and van der Waals forces played a major role in the interaction of nanoparticles with enzyme. In conclusion, the inhibition of proteinase K activity with the increase of nanoparticles concentrations were caused by the change of the structure, as induced by the weak interactions (van der Waals and hydrogen bonds) between enzyme and ZnO nanoparticles.

**Keywords**

**Enzyme activity, stability, structure and nanoparticles**