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Mechanisms and modes of lead action on SOD inactivation in zebrafish livers

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Lead toxicity has been proved to be related with inducing oxidative stress of organisms, and causing inactivation of antioxidant enzymes, the mechanism of which remains unknown. This study investigated and compared superoxide dismutase (Cu/Zn SOD) activity inhibited in lead-treated zebrafish livers and explored the mechanism of SOD inactivation by lead at the molecular level using multiple spectroscopic techniques, isothermal titration calorimetric (ITC) measurement, molecular docking study and ICP-AES detection. Results showed lead exposure decreased SOD activities in zebrafish livers due to direct interactions between lead and SOD, resulting in conformational and functional changes of the enzyme. To be specific, studies at the molecular level indicated that lead bound into the active site channel of SOD, hindered the path of the catalytic substrate ($O_2^{\cdot-}$), damaged its skeleton conformation and secondary structure, and interacted with the enzymatically related residue (Arg 141) through electrostatic forces ($\Delta H < 0$, $\Delta S > 0$), and caused the release of Cu^{2+} and Zn^{2+} from the catalytic pocket of SOD. This work shows a correlation between results on organismal and molecular levels, and obtains a possible model hypothesizing mechanisms of lead toxicity using *in vitro* experiments instead of *in vivo* ones.

Biography

Rutao Liu has completed his PhD from Shandong University and Postdoctoral studies from Albert Einstein College of Medicine, Yeshiva University. He is the Director of China - America CRC for Environment & Health of Shandong Province. He has published more than 120 papers in reputed journals and has been serving as an Editor of Advances in Environmental Protection.

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