

**Supplementary Information for**

**Zinc oxide nanoparticles alleviated the bioavailability of cadmium and lead and changed the uptake of iron in hydroponically grown lettuce (*Lactuca sativa L. var. Longifolia*)**

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There are 5 pages, and 2 Figures in this supporting document

### *Quality assurance and quality control (QA/QC) procedure*

To minimize the experimental errors before analytical analysis, experimental glassware were carefully cleaned by hot water and detergents first, and then rinsed by 5% nitric acid followed by ultra-pure water<sup>1</sup>. To increase the accuracy of the ICP-MS analysis, two internal standards containing 5 ppb rhodium and iridium were analyzed with every single quantification. The intensity fluctuation and possible errors of the instrument were corrected automatically based on the intensity of the internal standard variation. A calibration curve obtained from five concentrations of analytical ICP standards of Pb, Cd, Zn, and Fe aqueous solutions at ppb level in 3% nitric acid. To avoid possible interaction of highly concentrated calibration standards, ICP-MS readings were subjected to two minutes rinsing cycle through the blank solution containing 3% nitric acid<sup>2</sup>. All microbial population density analysis on a plate-basis count were performed under a sterile fume hood<sup>3</sup>. Gram staining was conducted at the initial and the final stage of the bacterial growth experiment to assure that strains were not cross-contaminated during the transition process<sup>4</sup>.

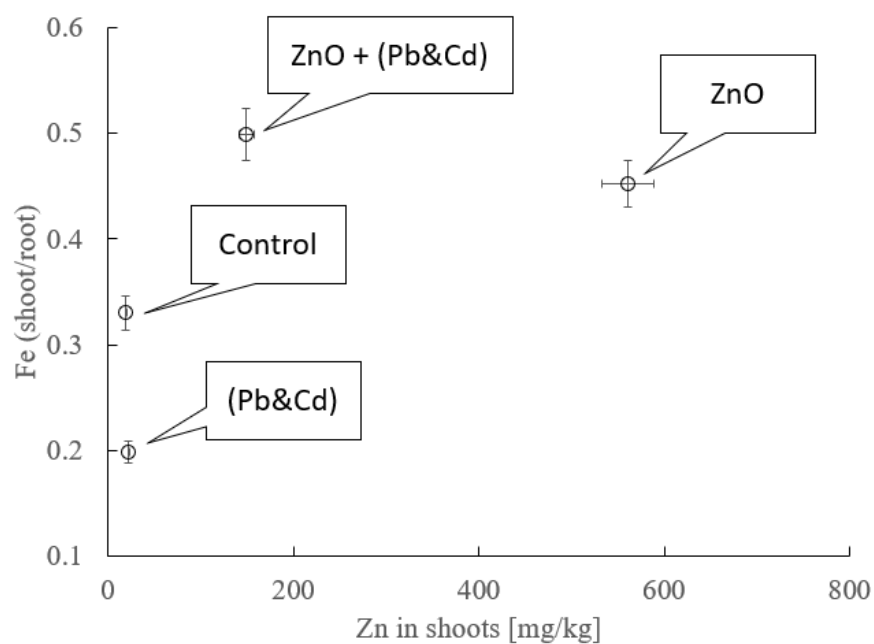


Fig.S.1 Relationship between the translocation ratio of Fe in response to the total Zn detected in shoots of lettuce exposed to four different treatments (ZnONPs, ZnONPs+Cd+Pb, Cd+Pb and Control with no chemical exposure). Error bars indicate the standard error of each data point (n = 3).

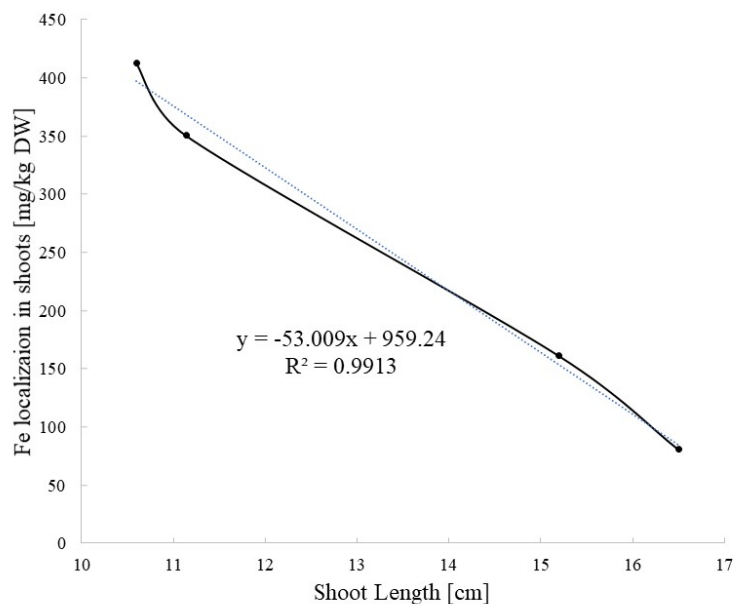


Fig.S.2 Relationship between concentrations of Fe in shoots and shoot elongation of lettuce subjected to four treatments; 100 mg/L of ZnO-ENPs alone or in combination with 1 mg/L Cd+ 100 mg/L Pb. Each point shows the mean value (n = 3). The dotted line characterizes the trend line of the concentration points.

## References

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