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Effect of selenite and selenium nanoparticles on lactic bacteria. A multi-analytical study.

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Abstract

The effect of selenite and chitosan-modified SeNPs (CS-SeNPs) on *Lactobacillus bulgaricus* was evaluated through a multianalytical approach based on flow cytometry and transmission electron microscopy (TEM), and high performance liquid chromatography (HPLC) on line coupled to inductively coupled plasma mass spectrometry (ICP-MS) to investigate both lactic bacteria viability in presence of selenium compounds and transformation of selenium compounds once accumulated by the bacteria. For this purpose, *L. bulgaricus* were grown at 37 ºC for 24, 48 and 72 h in presence of 1 and 10 µg $Se \cdot mL^{-1}$ of selenium as CS-SeNPs and Na_2SeO_3 . No significant differences in bacteria cell viability between selenium-enriched and control bacteria were observed when adding 1 µg $Se \cdot mL^{-1}$ either as Se(IV) or CS-SeNPs. In contrast, bacteria viability decreases when increasing selenium concentration up to 10 µg $Se \cdot mL^{-1}$ being this effect more accused when selenium was supplemented as selenite. Under these conditions SeNPs killed approximately 20% of *Lactobacillus* after 24 hours of exposure while the percentage increase up to 60% of bacteria when10 µg $Se \cdot mL^{-1}$ as selenite was applied. Transmission electron microscopy (TEM) images show that CS-SeNPs readily enter in the bacteria cells preserving membrane integrity and therefore causing no cellular damage. Results from HPLC-ICPMS indicate that most of the CS-SeNPs in the culture media were transformed by the bacteria to organo