# Biosynthesis of selenium nanoparticles by bacterial exopolysaccharide produced by Vibrio alginolyticus ATCC 17749

**Microbial biotechnology**

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**BACKGROUND AND OBJECTIVES**: Bacterial exopolymers (EPS), predominantly acidic heteropolysaccharides with functional groups, have emerged as versatile templates for the rapid biosynthesis of metallic nanoparticles (NPs). The EPS-mediated reduction of metal ions is recognized for its simplicity, safety, and eco-friendliness. Moreover, the capping of NPs with EPS facilitates subsequent modifications, thereby enhancing their material properties for a variety of applications.

**MATERIALS AND METHODS**: This study focuses on the EPS produced by the marine bacterium Vibrio alginolyticus strain 17749as a stabilizing agent for selenium NPs (Se NPs). The bacterial strain was cultivated in marine broth, and EPS was extracted using a cold ethanol precipitation method. Se NPs were synthesized using a green approach by combining 10 mM sodium selenite ($Na_2SeO_3$) with an equal volume of EPS solution under stirring. Freshly prepared ascorbic acid (40 mM) was added dropwise to the mixture, which was then incubated at 40 °C in the dark for 4 h.

**RESULTS AND DISCUSSION**: A color transition from colorless to light orange indicated successful SeNP formation. The resulting EPS-SeNPs were isolated via centrifugation at 12,000 rpm for 15 min, followed by freeze-drying and storage. UV spectroscopy confirmed the synthesis of Se NPs, exhibiting a characteristic absorption peak at 263 nm. Zeta potential measurements demonstrated enhanced stability of EPS-Se NPs compared to bare Se NPs, with values increasing from -28.06 mV to -32.00 mV. This enhanced negative zeta potential confirmED EPS's crucial role in the formation, stabilization, and dispersion of Se NPs. Fourier transform infrared spectroscopy (FTIR) analysis identified characteristic peaks for both EPS and Se NPs, including hydroxyl (-OH) groups at 3388.73 cm-1 and 3413.02 cm-1, and carbonyl (C=O) groups at 1656.00 cm-1 and 1711.05 cm-1. These findings indicate the successful integration of EPS functional groups into the NPs structure.

**Keywords**: bionanotechnology, bacterial exopolysaccharides, seleniuom nano particles