Science of the Total Environment 562 (2016) 588–595

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

A *Bacillus* sp. isolated from sediments of the Sarno River mouth, Gulf of Naples (Italy) produces a biofilm biosorbing Pb(II)

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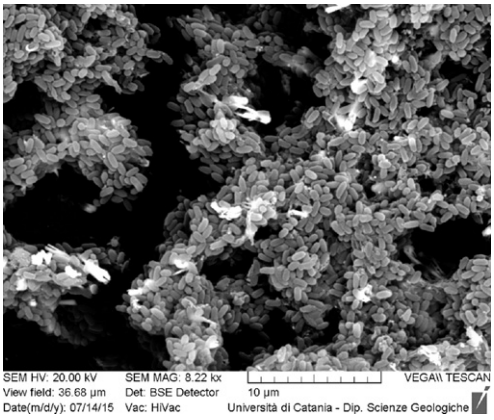
HIGHLIGHTS

- The strain is able to sequester Pb by biosorption in a biofilm.
- A Pb-resistant Bacillus sp. isolated from marine polluted sediments.
- The strain is proposed as a tool for bioremediation of Pb-polluted marine sediments.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 21 January 2016
Received in revised form 13 April 2016
Accepted 13 April 2016
Available online xxxx

Editor: D. Barcelo

Keywords:
Lead
Biosorption
16S rRNA gene
Sarno River
ICP-AES
SEM-EDS

ABSTRACT

A Pb-resistant bacterial strain (named hereinafter Pb15) has been isolated from highly polluted marine sediments at the Sarno River mouth, Italy, using an enrichment culture to which Pb(II) 0.48 mmol l^{-1} were added. 16S rRNA gene sequencing (Sanger) allowed assignment of the isolate to the genus *Bacillus*, with *Bacillus pumilus* as the closest species. The isolate is resistant to Pb(II) with a minimum inhibitory concentration (MIC) of 4.8 mmol l^{-1} and is also resistant to Cd(II) and Mn(II) with MIC of 2.22 mmol l^{-1} and 18.20 mmol l^{-1}, respectively. Inductively coupled plasma atomic emission spectrometry (ICP-AES) showed that Pb inoculated in the growth medium is absorbed by the bacterial cells at removal efficiencies of 31.02% and 28.21% in the presence of 0.48 mmol l^{-1} or 1.20 mmol l^{-1} Pb(II), respectively. Strain Pb15 forms a brown and compact biofilm when grown in presence of Pb(II). Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray Spectroscopy (SEM-EDS) confirm that the biofilm contains Pb, suggesting an active biosorption of this metal by the bacterial cells, sequestering 14% of inoculated Pb as evidenced by microscopic analyses. Altogether, these observations support evidence that strain Pb15 has potentials for being used in bioremediation of its native polluted sediments, with engineering solutions to be found in order to eliminate the adsorbed Pb before replacement of sediments in situ.

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http://dx.doi.org/10.1016/j.scitotenv.2016.04.097
0048-9697/