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Brevibacillus thermoruber: A promising microbial cell factory for exopolysaccharide production (Article)

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Abstract

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Aims: This study aims to identify a high level exopolysaccharide (EPS) producer thermophile that in turn could be used as a model organism to study the biological mechanisms and whole genome organization of EPS-producing thermophilic bacteria. **Methods and Results:** Thermophilic isolates were screened, and then growth and EPS production of the best producer *Brevibacillus thermoruber* strain 423 were investigated under different carbon and nitrogen sources, temperature, pH and agitation rates. Rheological characterization revealed that the EPS behaved like a typical Newtonian fluid and viscosity of the EPS solution increased with increasing Ca²⁺ ion concentration. Chemical characterization by TLC, GC-MS, FT-IR and NMR suggested a heteropolymer structure with glucose as major monomer unit. High biocompatibility of pure EPS fractions suggested their potential use in biomedical applications. **Conclusions:** This study reports on the comprehensive description of microbial production conditions as well as chemical, rheological and biological characterization of the EPS produced by *B. thermoruber* strain 423. The bioreactor cultures were found to reach two times higher yields and three times higher productivities when compared with literature. **Significance and Impact of the Study:** *Brevibacillus thermoruber* strain 423 combined the advantages of its nonpathogenicity with the advantages of fast productivity and hence proved to be a very promising model organism and cell factory for microbial EPS production. © 2013 The Society for Applied Microbiology.

Author keywords

Bioproduction; *Brevibacillus thermoruber*; Exopolysaccharide; Microbial; Thermophiles

Indexed keywords

EMTREE drug terms: carbon; exopolysaccharide; glucose; nitrogen

GEOBASE Subject Index: genome; growth rate; microbial activity; pH; polysaccharide; temperature effect; thermophilic bacterium

EMTREE medical terms: agitation; anion exchange chromatography; article; bacterial cell; bacterial strain; bacterium isolate; *Brevibacillus*; *Brevibacillus thermoruber*; carbohydrate analysis; carbon source; controlled study; gas chromatography; genome analysis; infrared spectroscopy; nonhuman; nuclear magnetic resonance; nucleotide sequence; pH; temperature; thermophile; thermophilic bacterium; thin layer chromatography

Species Index: *Brevibacillus*; *Brevibacillus thermoruber*

Molecular Sequence Numbers: GENBANK, KF192950 (referenced)

Chemicals and CAS Registry Numbers: carbon, 7440-44-0; glucose, 50-99-7, 84778-64-3; nitrogen, 7727-37-9

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Panda, A.K., Bisht, S.S., DeMondal, S.
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Preparation, Characterization, Cytotoxicity and Antioxidant Activity of DOPA Melanin Modified by Amino Acids: Melanin-Like Oligomeric Aggregates

By: Costa, Thiago G. ^[2]; Feldhaus, Mateus J. ^[2]; Vilhena, Felipe S. ^[2]; Heller, Melina ^[3]; Micke, Gustavo A. ^[3]; Oliveira, Aldo S. ^[4]; Brighente, Inês M. C. ^[4]; Monteiro, Fabiola B. F. ^[1]; Creczynski-Pasa, Tânia B. ^[1]; Szpoganicz, Bruno ^[2]

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Abstract

Two new synthetic melanin-like oligomers inspired by the synthesis of pheomelanin (cys-DOPA) were prepared using L-DOPA as a precursor and the amino acids serine (ser-DOPA) and threonine (thr-DOPA) for modifications. The products obtained exhibited appreciable antioxidant activity. The compounds were characterized by liquid chromatography-mass spectrometry (LC-MS), elemental analysis and infrared spectroscopy. The pKa values of the groups present in each melanin suspension were determined in aqueous solution by potentiometric and spectrophotometric titration. Cytotoxicity assays showed an IC₅₀ > 500 mg L⁻¹ resulting in non-toxic compounds for living cells. Finally, cys-DOPA, ser-DOPA and thr-DOPA exhibited antioxidant activity determined by the DPPH scavenging assay, with EC₅₀ = 7.69, 1.02 and 27.60 mg L⁻¹, respectively.

Keywords

Author Keywords: synthetic melanins; amino acid modification; antioxidant activity

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