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Porphyridium cruentum's exopolysaccharides as versatile building blocks for new bioactive materials

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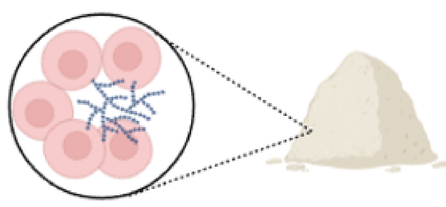
Allmicroalgae natural products

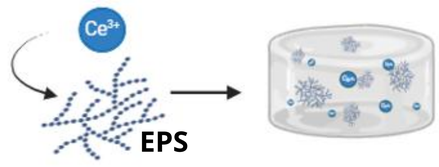
Introduction/Resume

Marine algae and their metabolites have been widely recognized for their bioactive properties with applications in various industries, such as pharmaceutical, cosmetical, and nutraceutical. The red unicellular microalgae *Porphyridium cruentum* is a natural source for a variety of bioactive compounds, such as exopolysaccharides (EPS) and is already cultivated in large scale by several biotechnological companies due to its biological activity, mostly for cosmetic applications (1,2).

Objective



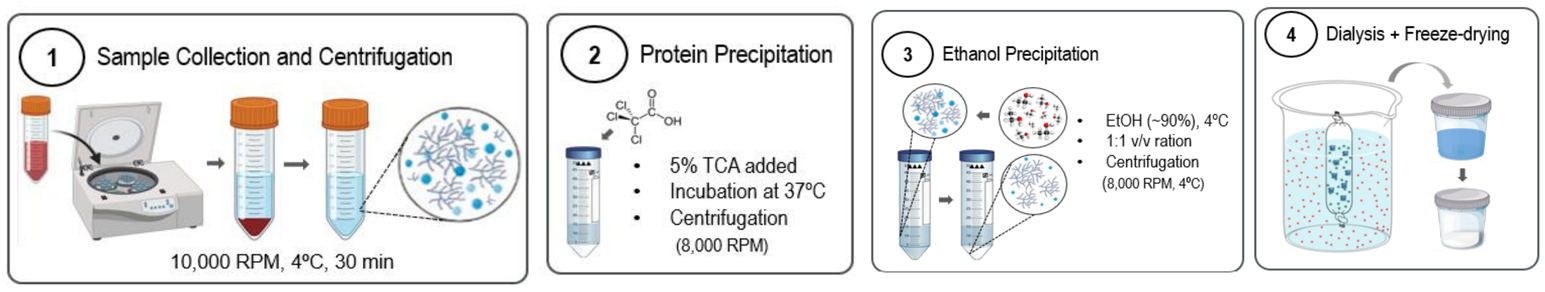
EPS COLLECTION + PURIFICATION



BIOMATERIAL FOR NEW BIOMEDICAL PLATFORM FOR TISSUE REGENERATION

Methods

OVERVIEW OF EPS PRODUCTION



EPS CHARACTERIZATION

Biochemical Composition
- Carbohydrate, protein, lipid, sulphate %

Sugar Composition
- High Pressure Ion Chromatography (HPIC)

Functional Properties
- Solubility/Water Holding Capacity
- Antioxidant and antimicrobial capacity
- Cytocompatibility

Results

EPS CHARACTERIZATION

EPS is composed of 45.3 wt% carbohydrates and have a **high sulfur (6.7%)** content. They have a high molecular weight, and a **low polydispersity index** (1.2), indicating a **highly homogeneous** material.

EPS showed attractive properties for the development of **hydrogel systems**, with a **solubility** and **water holding capacity** of **53.6%** and **581.0%**, respectively.

Table 1. Carbohydrates, proteins, lipids, sulphate in EPS as percentage of dry weight.

	Composition (wt%)
Total Carbohydrates	45.3
of which,	
Galactose	38.86 ± 2.31
Glucose	15.56 ± 0.09
Xylose	34.06 ± 2.35
Glucuronic Acid	11.52 ± 0.85
Proteins	11.3 ± 0.9
Lipids	4.8 ± 0.24
Sulphate	6.0 ± 1.2

BIOLOGICAL ACTIVITY

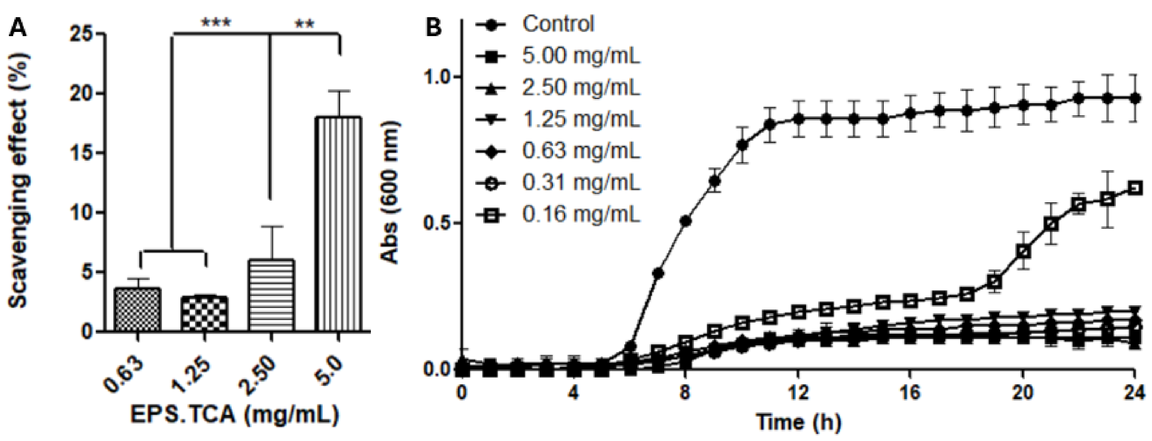


Figure 1. A: Scavenging effect of EPS solutions via ABTS assay. B: Effect of different EPS solutions against *s. aureus*.

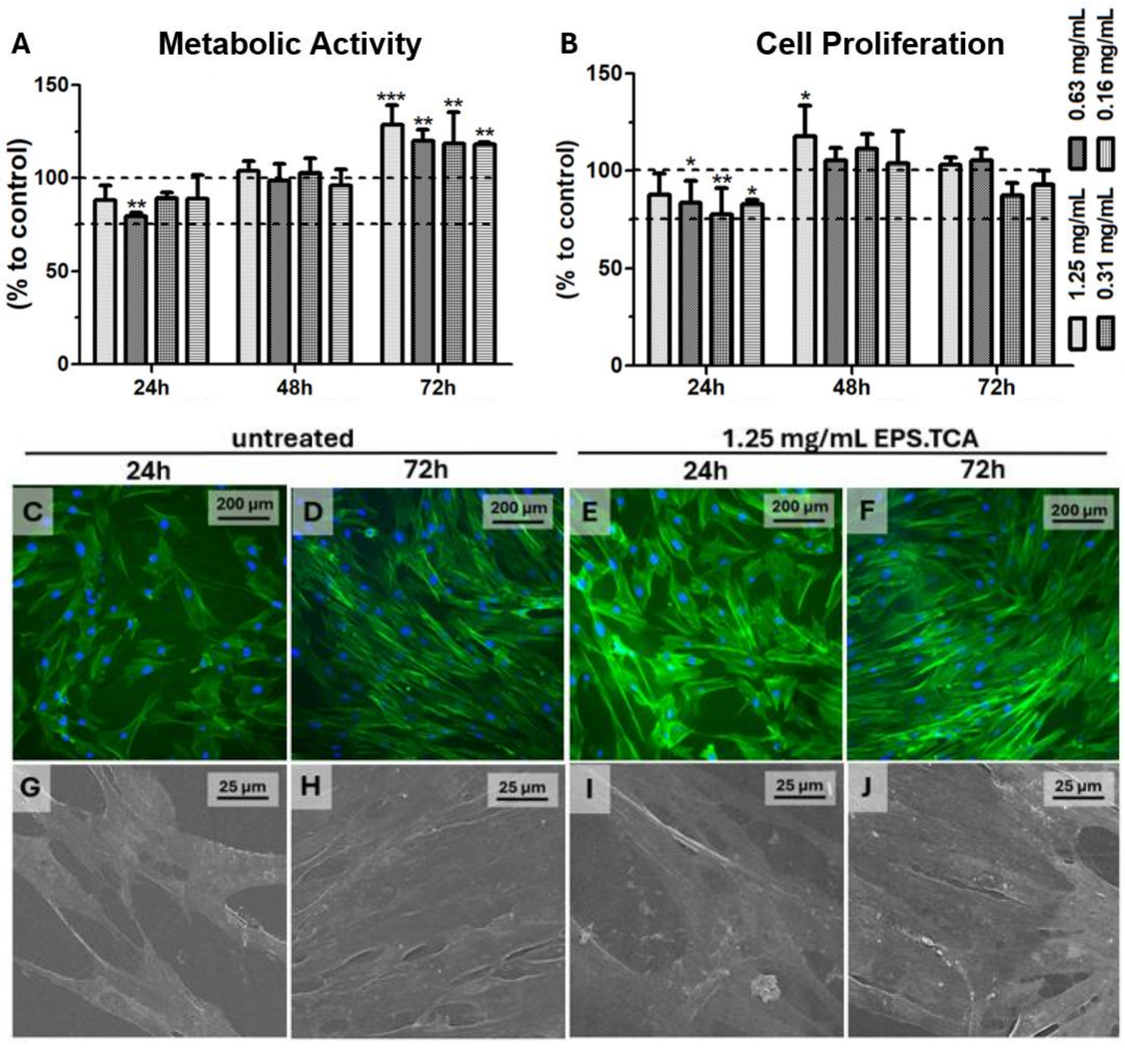


Figure 2. Metabolic activity as measured by resazurin assay (A) and cell proliferation as measured by BrDU assay (B) of HDFs in contact with EPS treated media in comparison to control. DAPI and phalloidin staining of HDFs of untreated media (C,D), and EPS-treated media at (E,F) at 24 and 72 hours. SEM micrographs of HDFs of untreated media (G,H), and EPS-treated media (I,J) at 24 and 72 hours.

Conclusions

EPS from *P. cruentum* **exhibited antioxidant and antimicrobial activity**, and showed **cytocompatibility** within the range of tested concentrations and appeared to stimulate cell growth.
Future research should focus on exploring the range of possible applications for these molecules, in particular with their potential as part of **hydrogel systems** for wound healing and tissue regeneration.

Acknowledgements

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References

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[2] Raposo M. et al., 2014, 10.1016/j.lfs.2014.02.013