



HAL
open science

Anti-inflammatory activity of exopolysaccharides (EPS) from New Caledonian marine bacteria

Malia Lasalo, Eleftherios Chalkiadakis, Simon Gensous, Linda
Guentas-Dombrowsky, Maximilien Mathian, Philippe Georgel, Mariko Matsui

► To cite this version:

Malia Lasalo, Eleftherios Chalkiadakis, Simon Gensous, Linda Guentas-Dombrowsky, Maximilien Mathian, et al.. Anti-inflammatory activity of exopolysaccharides (EPS) from New Caledonian marine bacteria. *Natural Products: Inspiring Innovation in Chemistry, Biology and the Discovery of New Medicines*, Jul 2023, Andover, United States. . pasteur-04665150

HAL Id: pasteur-04665150

<https://riip.hal.science/pasteur-04665150v1>

Submitted on 12 Aug 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Copyright

Anti-inflammatory activity of exopolysaccharides (EPS) from New Caledonian marine bacteria

LASALO Malia (mlasalo@pasteur.nc)¹, CHALKIADAKIS Eleftherios², GENSOUS Simon², GUENTAS Linda³, MATHIAN Maximilien³, GEORGEL Philippe⁴, MATSUI Mariko¹

¹BIOactivities of NATural products and derivatives (BIONA), Institut Pasteur of New Caledonia, ²BIOTECAL, New Caledonia, ³Institut des Sciences Exactes et Appliquées (ISEA), University of New Caledonia, ⁴Laboratoire d'ImmunoRhumatologie Moléculaire, Institut National de la Santé et de la Recherche Médicale (INSERM) UMR_S1109, Université de Strasbourg, France



Background

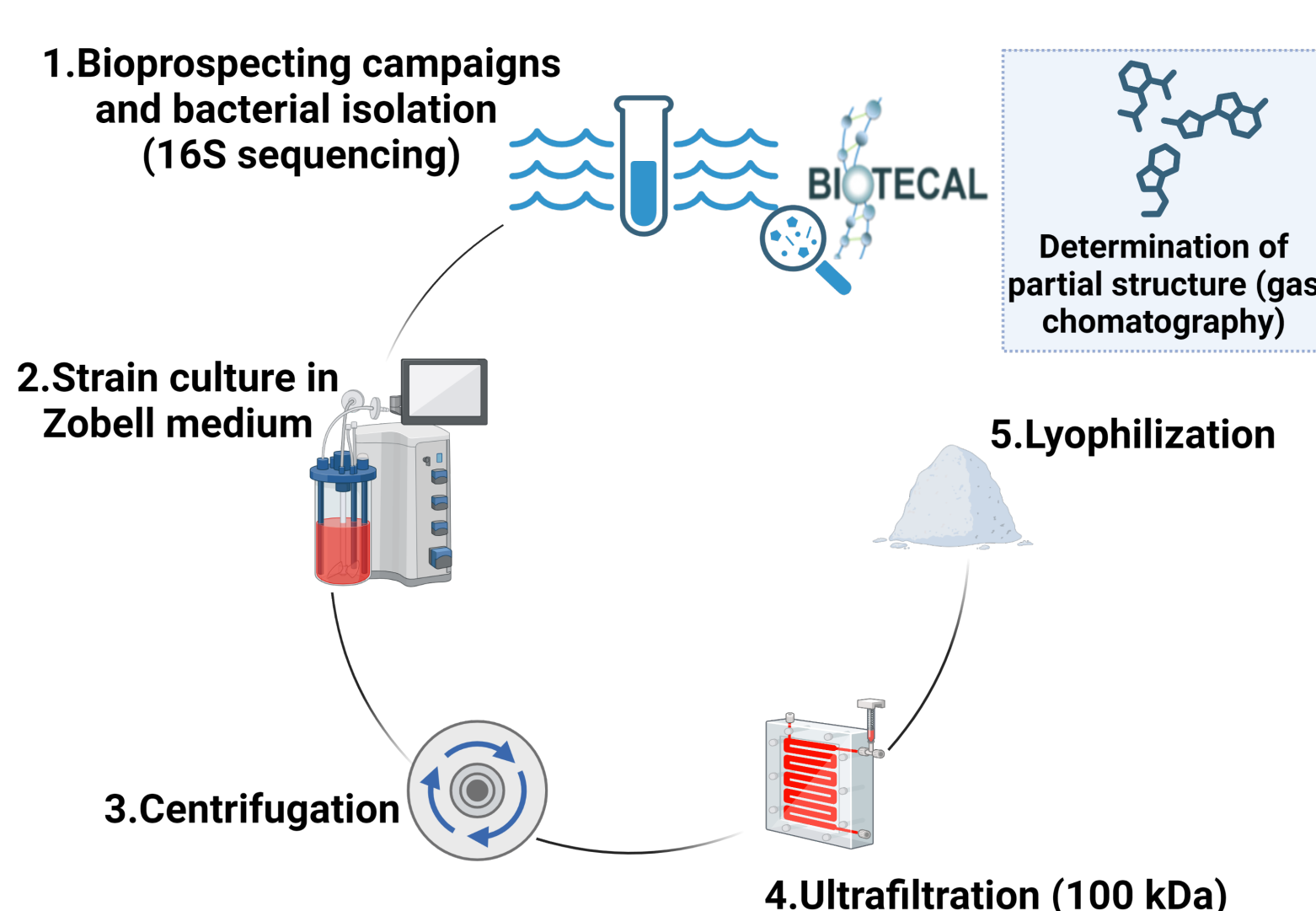
- Chronic inflammatory diseases affect 5-7% of Western population¹
- Treatments based on corticoids and NSAIDs lead to severe side effects, whereas monoclonal therapy caused the development of opportunistic diseases
- Research is still ongoing to find other molecules: chelators² (deferoxamine...)
- Marine natural products (MNPs) are a potential source of bioactive molecules
- Bioprospecting campaigns in New Caledonia led to the characterisation of bacterial strains expressing bioactive molecules (EPS)³

OBJECTIVE: Evaluate the anti-inflammatory activity of EPS from New Caledonian marine bacteria

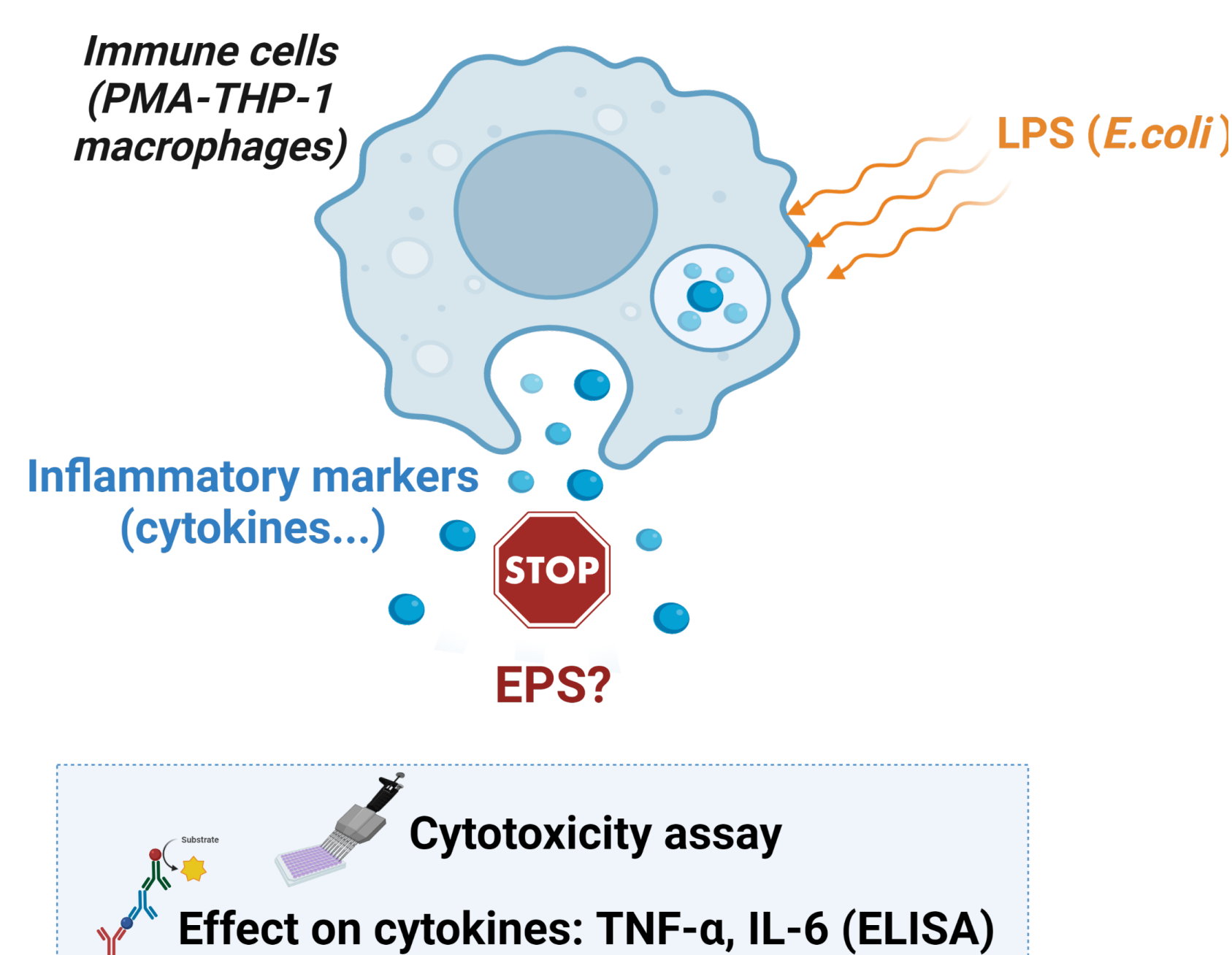


Methodology

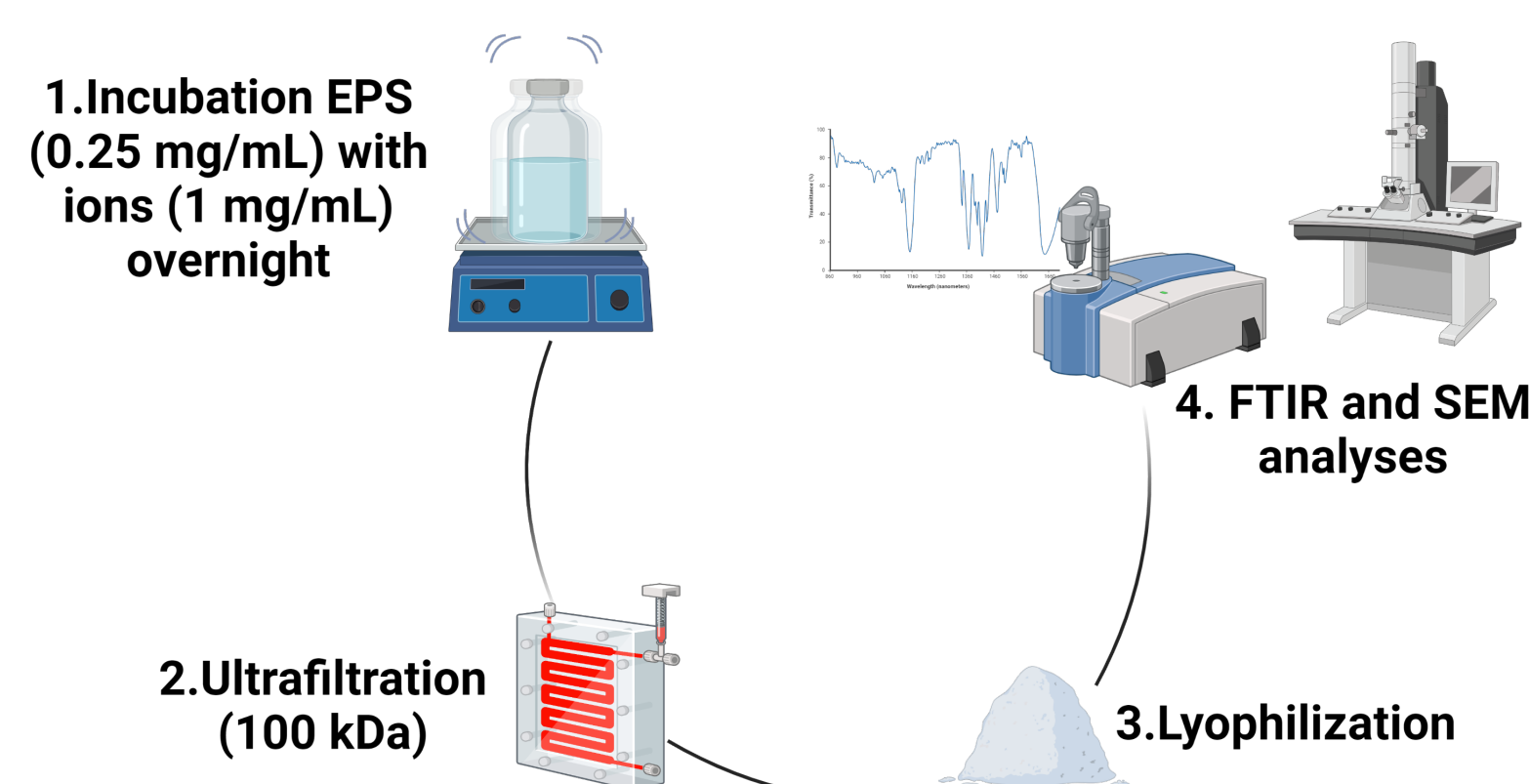
EPS Production



In vitro anti-inflammatory assays



Tests for metal chelation



Results and discussion

1. Anti-inflammatory activity of EPS from marine bacteria

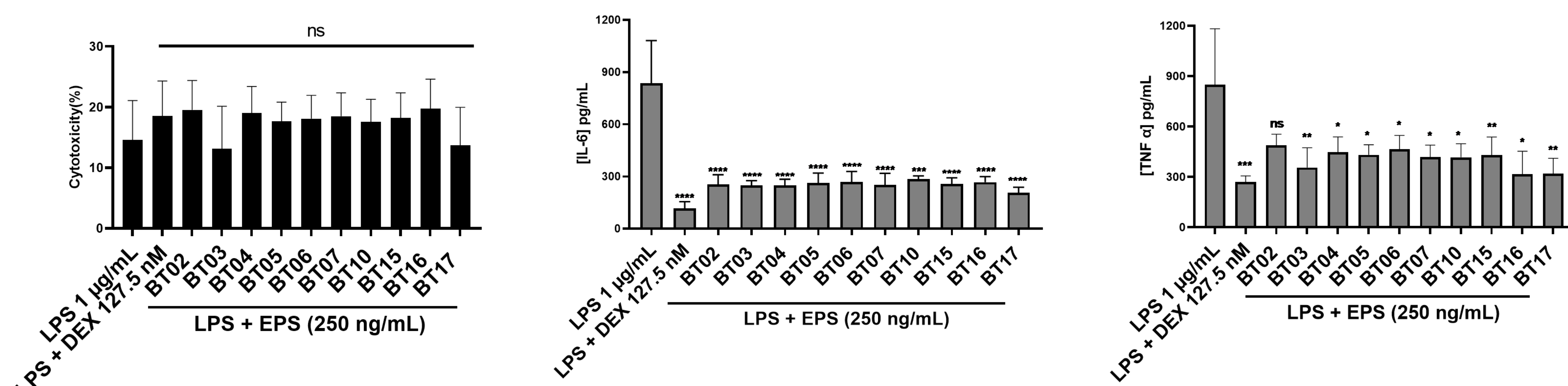


Figure 1. Inhibitory effect of 10 EPS on cytokine production (Mann Whitney Test, n=9 wells, *p<0.05,**p<0.01,***p<0.005,****p<0.0001,ns: non significant, DEX: dexamethasone)

- No significant cytotoxicity was observed compared to the LPS condition
- EPS have an anti-inflammatory activity on the production of IL-6 and TNF-α
- BT03, BT15 and BT17 have the most significant inhibitory activity on the production of TNF-α
- Further experiments were carried out for BT17

2. Bacterial identification, chemical composition and anti-inflammatory activity of BT17

- 16S sequencing datas showed that BT17 is produced by a *Vibrio* bacteria
- N-acetyl glucosamine is predominant with a concentration up to 16%
- Interestingly, *Vibrio alginolyticus* is known to produce an anti-inflammatory EPS that also contain N-acetyl glucosamine⁴

	Mass percent
Glucose	
Galactose	
Glucuronic acid	
N-acetyl glucosamine	16%

Table 1. Chemical composition of BT17 (gas chromatography)

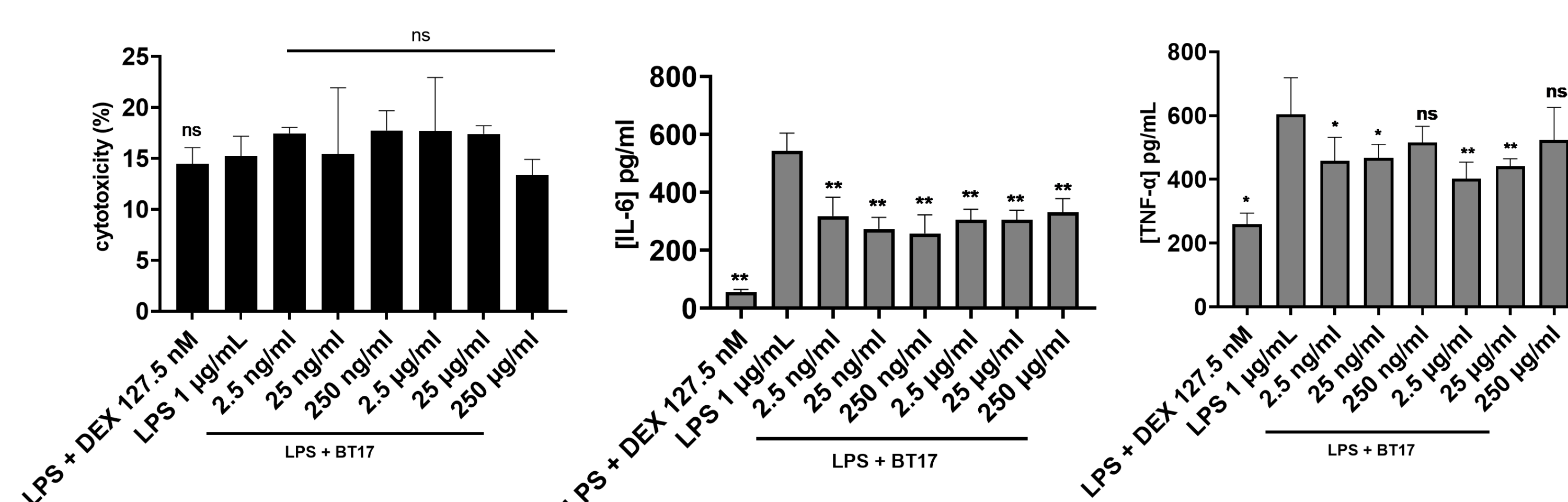


Figure 2. Inhibitory effect of BT17 on cytokine production (Mann Whitney Test, n=6 wells, *p<0.05, **p<0.01, ***p<0.005, ****p<0.0001,ns: non significant, DEX: dexamethasone)

- No significant cytotoxicity was observed compared to the LPS condition
- BT17 have an anti-inflammatory effect by reducing the production of cytokines but no dose effect was observed
- Chelating metal ions is a strategy in the metalloimmunology process: interestingly, EPS are known to be potential chelators⁵

3. BT17 is a potential chelator of metal ions

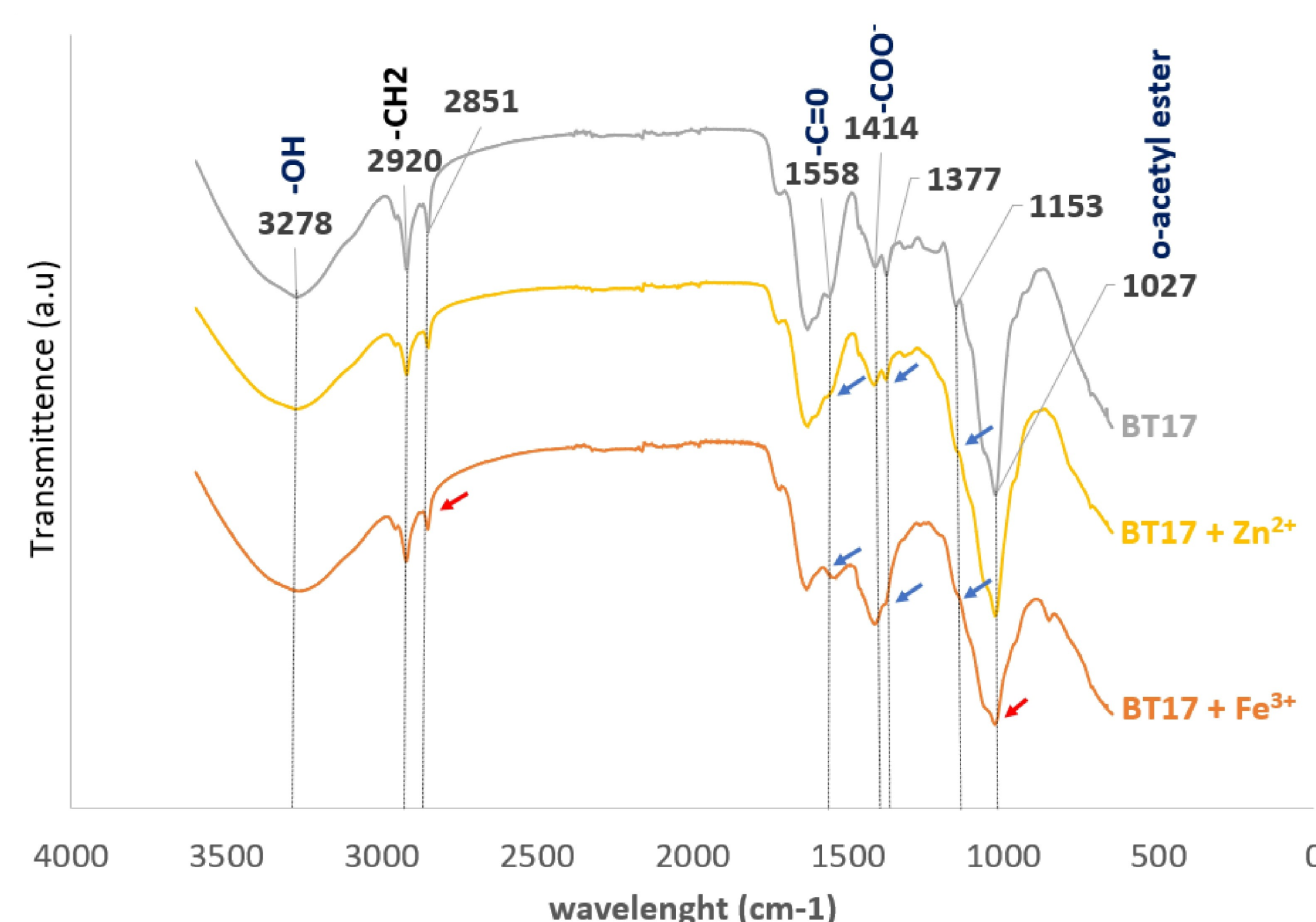


Figure 3. Fourier transform Infrared spectroscopy spectra of BT17

- Groups (in blue) have been reported to interact with metal ions (cations)⁵
- Shifting of peaks (red arrows) as well as changes in the intensity of the peak (blue arrows) areas suggest increase or decrease in the functional groups contents directly engaging with the metal

- Metal ions have minor changes on the conformation of the polymer
- The presence of metal in the EPS matrix was also confirmed by the EDX
- Homogeneous distribution of metal ions suggests that they are chelated by the EPS

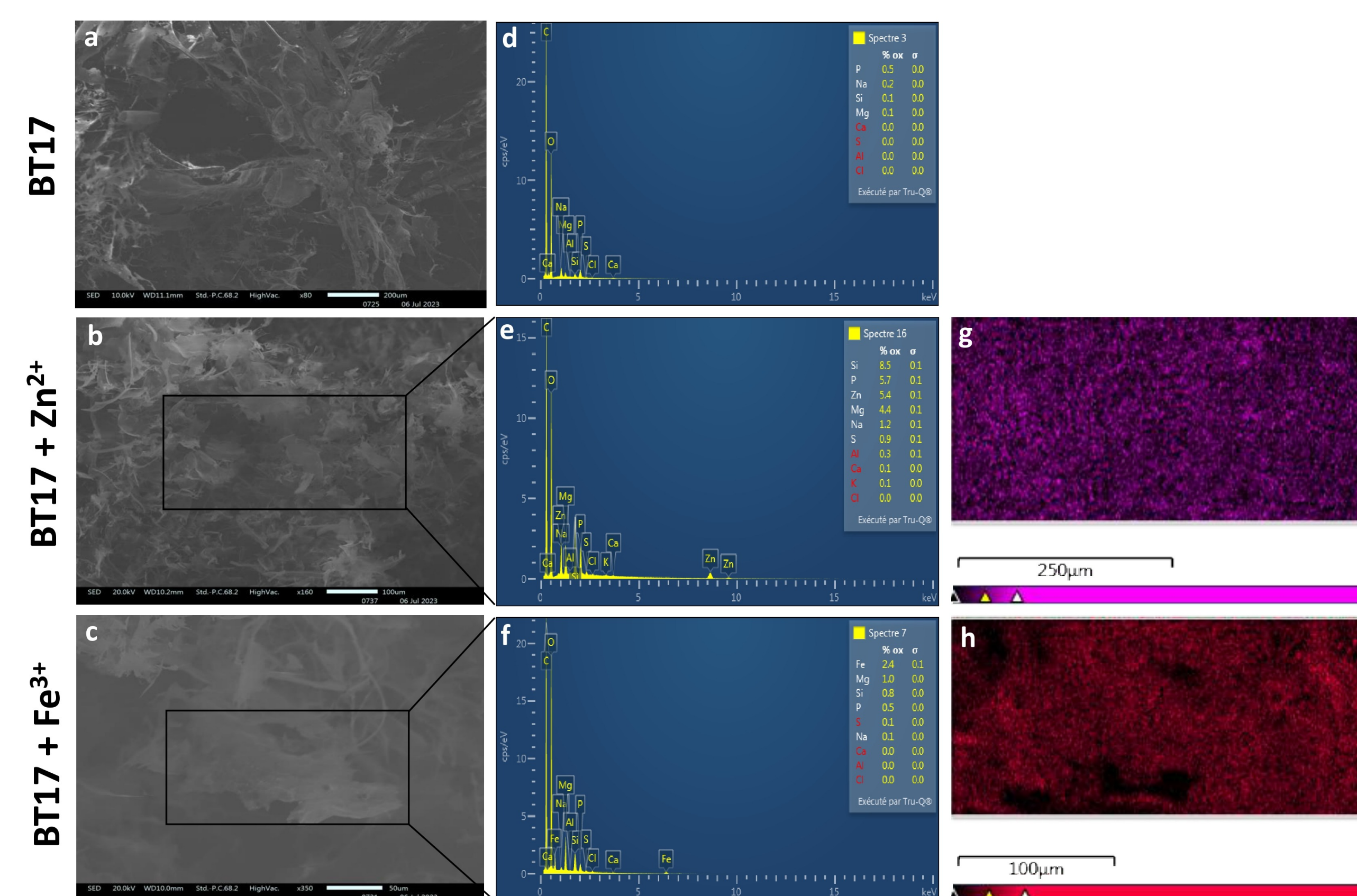


Figure 4. Scanning electron microscopy photography (a-c), EDX spectra (d-f) and cartography (g-h) of BT17 with metal ions

Conclusion and perspectives

- 10 bacterial EPS have an anti-inflammatory activity on the production of IL-6 and TNF-α in the PMA-THP-1 model
- Among them, BT17 is a potential chelator of metal ions
- Further experiments will be carried out to complete the results (ICP-OES...)
- Considering the importance of metal ions in immunity, BT17 could play a role in the research of novel therapeutics

Acknowledgements: ML is financed by the french national research agency (ANR) project CHARM and the participation in the congress is financed by the Doctoriales award 2022 (University of New Caledonia)

References:
¹Nicolas Lasalo et al., 2023, Frontiers in Pharmacology
²Di Paola et al., 2022, International journal of molecular sciences
³Dufourcq et al., 2013, Letters in Applied Microbiology
⁴Drouillard et al., 2015, Marine drugs
⁵Parmar et al., 2020, Microbiological research