EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

CYANOCOST – ES 1105 Action

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Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management.

Short Term Scientific Mission (STSM)

"Characterization of the MC degradation process by MC-degrading bacteria from a Spanish reservoir."

Researcher

María Ángeles Lezcano Vega, PhD

IMDEA Water Institute, Alcalá de Henares, Madrid (Spain)

Group leader:

Dr. Rehab El-Shehawy (IMDEA Water)

Dr. Antonio Quesada (UAM)

e-mail: angeles.lezcano@imdea.org

Short bio

- **2012-present:** PhD on microcystins biodegradation by heterotrophic bacteria from reservoirs (IMDEA Water Institute).
- **2009-2011:** European Master of Inland Water Quality Assessment (UAM/Mälardalens högskola).
- **2005-2009:** Environmental Sciencies degree (UAM).

Host Organization

Dr. Jussi Meriluoto's group

Department of Biosciences,
Åbo Akademi University, Turku (Finland)

Åbo Akademi

Introduction

There are several constrictions related to the removal and/or inactivation of microcystins by physic and chemical processes (Westrick et al., 2010). However, it is known that heterotrophic bacteria from water blooms and sediments are able to degrade microcystins (Ishii et al., 2004), offering a real potential tool for toxin removal (Ho et al., 2007).

Objectives

1) Characterization of MC-LR and MC-RR degradation process in 13 isolated bacterial strains from a Spanish reservoir .
2) Identification of biodegradation products.

Methodology

1. Bioassay: incubation of bacteria with 1 mg/L of pure MC-LR and MC-RR (separately). Samples were taken at 0, 6, 12, 24, 48 and 120h. Two positive controls were included (Y2 and 2C20).

2. HPLC and LC-MS analysis: samples were prepared in 50% MeOH after binding to cartridges C18. HPLC analysis were performed in Agilent 1100 Series HPLC system at 238 nm, and identification of degradation products in Agilent 1200 Rapid Resolution LC coupled to a Bruker Daltonics HCT Ultra Ion Trap MS.

3. HPLC fractionation analysis: samples were prepared in 0.2 M of ammonium acetate in 15% of methanol. Analysis were performed HPLC-DAD system and were collected from the column each 0.5 min. for direct infusion in LC-MS equipment.

Results

Four from the thirteen isolated bacteria were able to degrade both MC-LR and MC-RR. Some of them lead to detection of biodegradation products, as shown in the figures below.

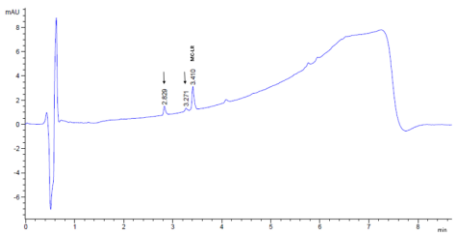

Fig. 1. HPLC Chromatogram of MC-LR and their biodegradation products after 48h. of incubation of bacteria 465.

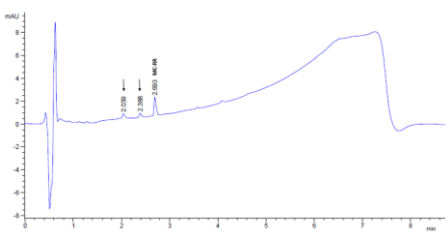

Fig. 2. HPLC Chromatogram of MC-RR and their biodegradation products after 48h. of incubation of bacteria 465.

	MC-LR BIODEGRADATION PRODUCTS			
STRAINS	Product A	Product B	Product C	Product D
Y2				
2C20				
457				
396.2				
432.1				
465				

Fig. 3. MC-LR biodegradation products identified in HPLC-UV after 120 hours of incubation (pink color).

	MC-RR BIODEGRADATION PRODUCTS		
STRAINS	Product A	Product B	Product C
Y2			
2C20			
457			
396.2			
432.1			
465			

Fig. 4. MC-RR biodegradation products identified in HPLC-UV after 120 hours of incubation (pink color).

Highlights

Four isolated bacterial strains are able to degrade both MC-LR and –RR, some of them showing different biodegradation products.

References

- Westrick, J. a, Szlag, D. C., Southwell, B. J., & Sinclair, J. (2010).
- Ishii, H., Nishijima, M., & Abe, T. (2004)
- Ho, L., Gaudieux, A.-L., Fanok, S., Newcombe, G., & Humpage, A. R. (2007).

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