Erythromycin Time-kill Activity on Activated Sludge Bacteria

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Introduction

Antibiotic are excreted and reach wastewater treatment plants (WWTP).

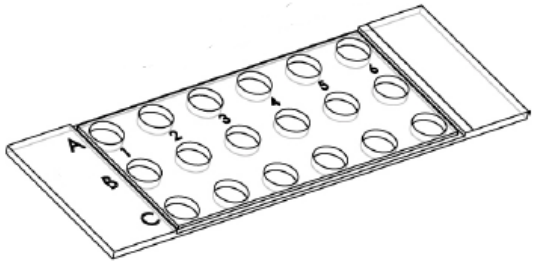
At WWTP level:

- Incomplete removal of antibiotics
- Toxicity on activated sludge?
- Resistance development?

Materials and methods: Time-Lapse Microscopy

- Activated sludge sampled in Nancy wastewater treatment plant

- µ-reactors on µ-slides with 18 wells



- Erythromycin concentration : [0.1 -100 mg/L]

(negative control, positive control mercuric sulfate)

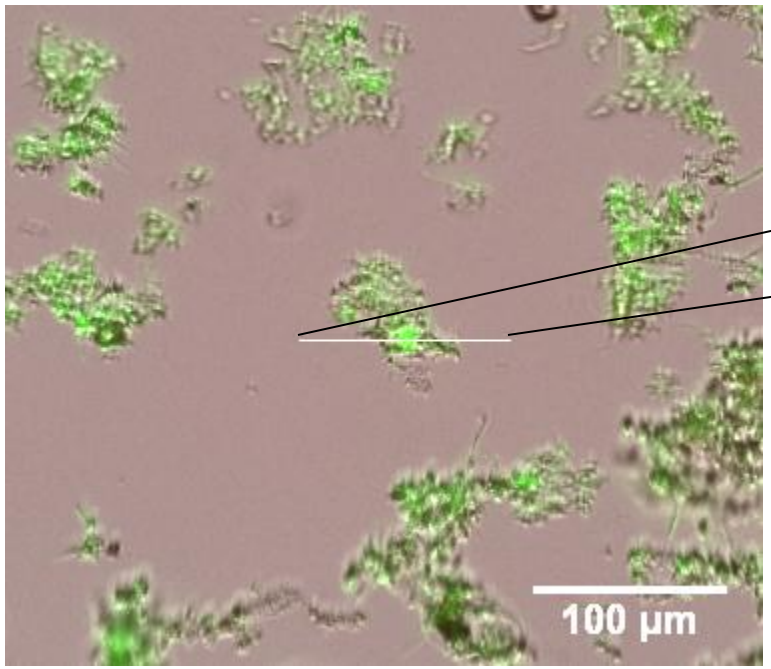
- 1 h of exposure time

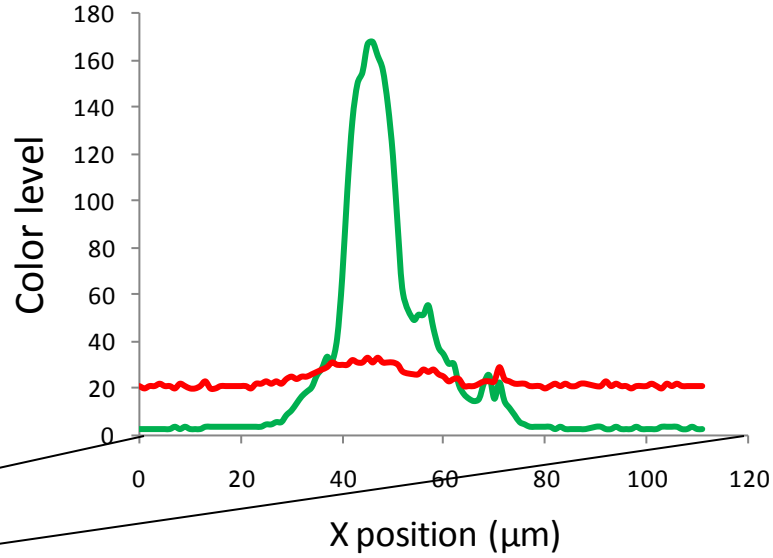
Materials and methods: Time-Lapse Microscopy

- Epifluorescence microscopy with Live/Dead ®BacLight™ viability kit

- Image analysis based on:
  - brightfield image → total biomass
  - Syto®9 fluorescence → live bacteria
  - Propidium iodure fluorescence → damaged bacteria

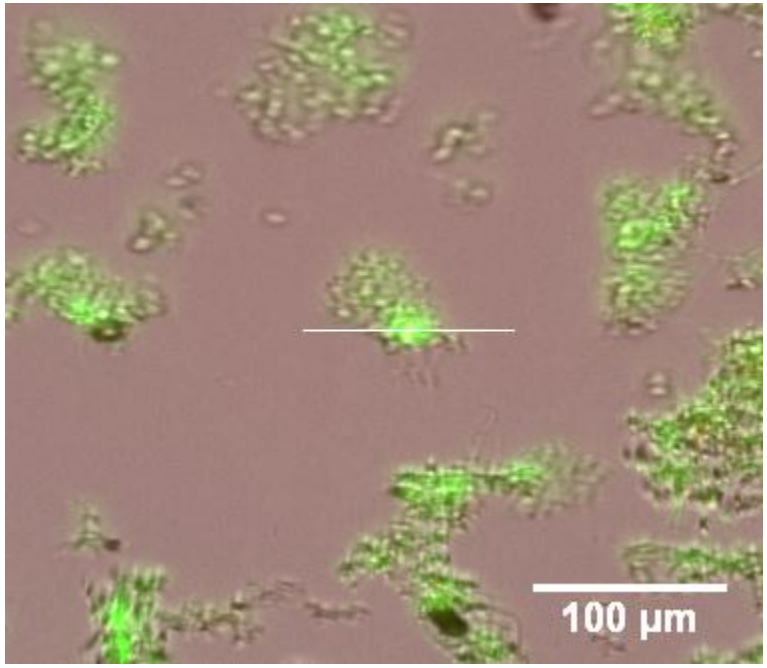
Erythromycin (5 mg/L) time-kill activity on activated sludge

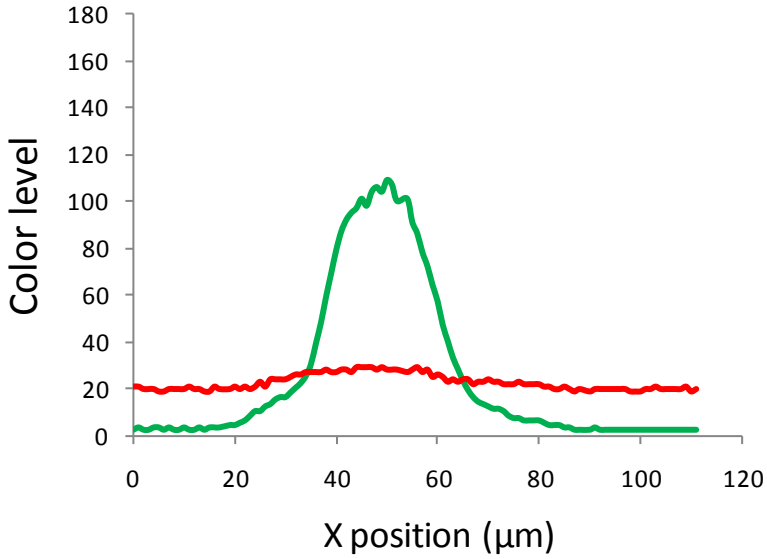




Time= 0 min
100% live bacteria

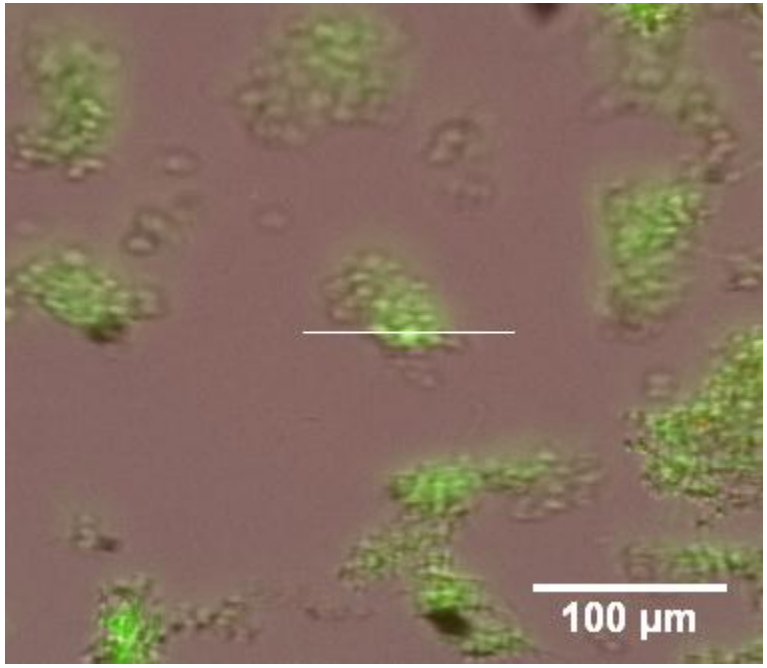
Erythromycin (5 mg/L) time-kill activity on activated sludge

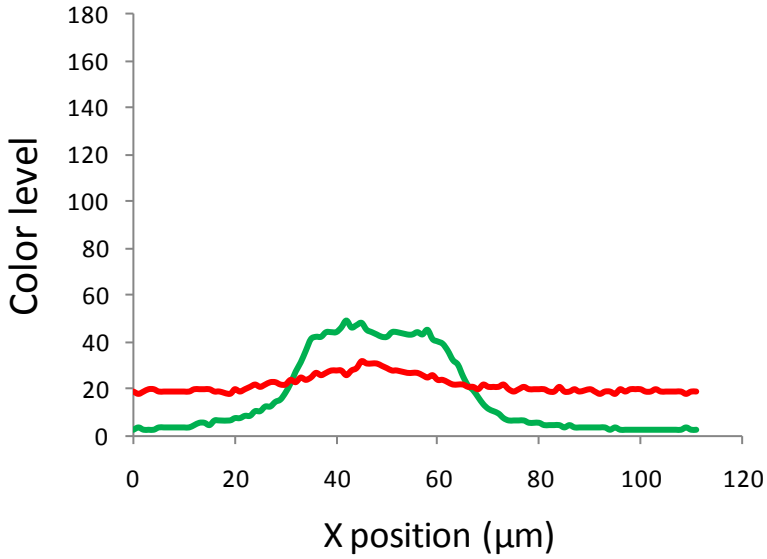




Time= 5 min
100% live bacteria

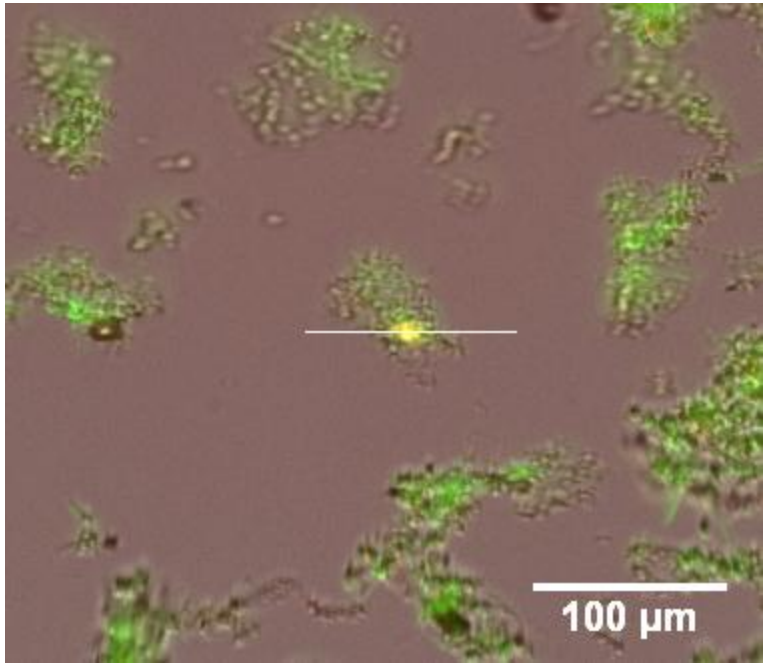
Erythromycin (5 mg/L) time-kill activity on activated sludge

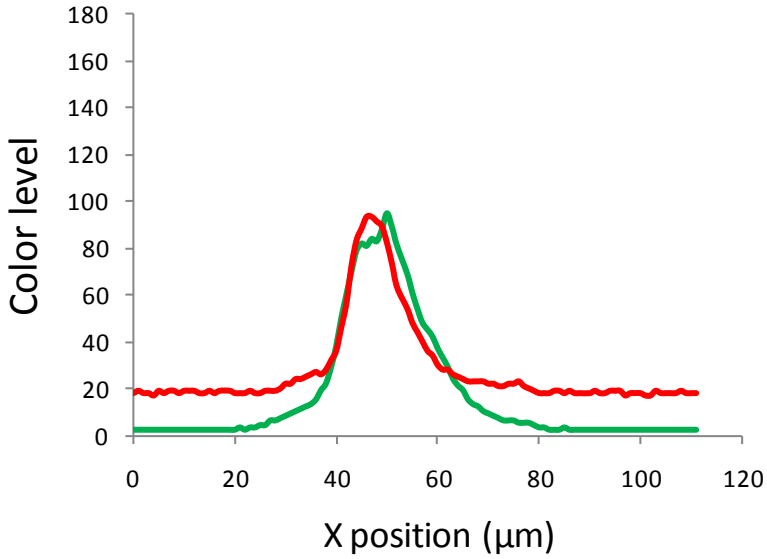




Time= 10 min
100% live bacteria

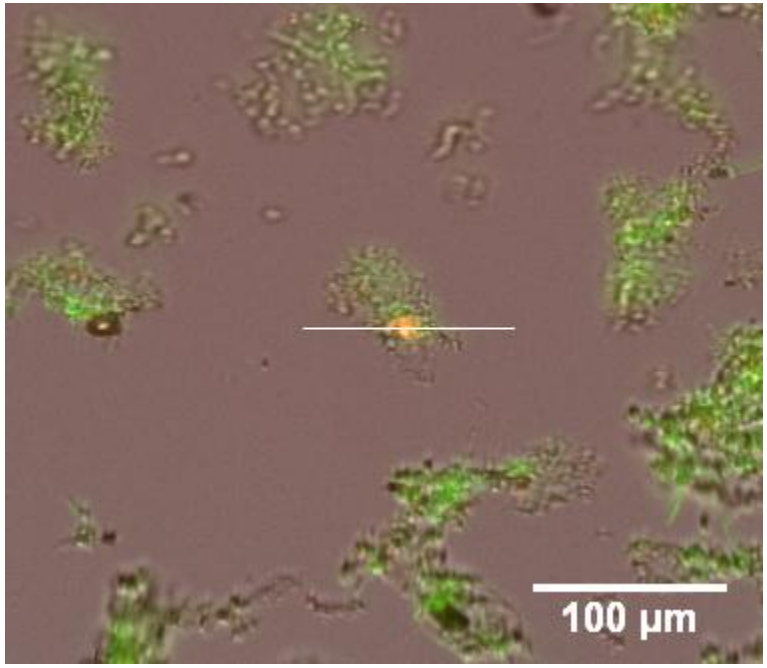
Erythromycin (5 mg/L) time-kill activity on activated sludge

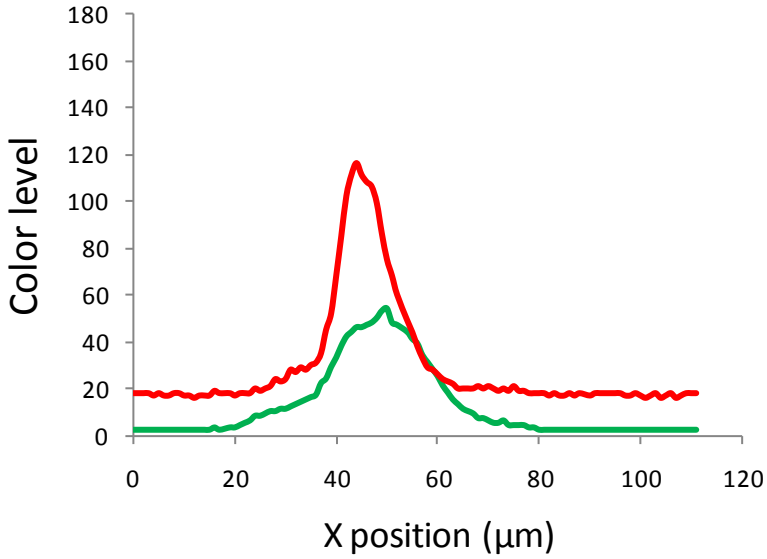




Time= 15 min
100% live bacteria

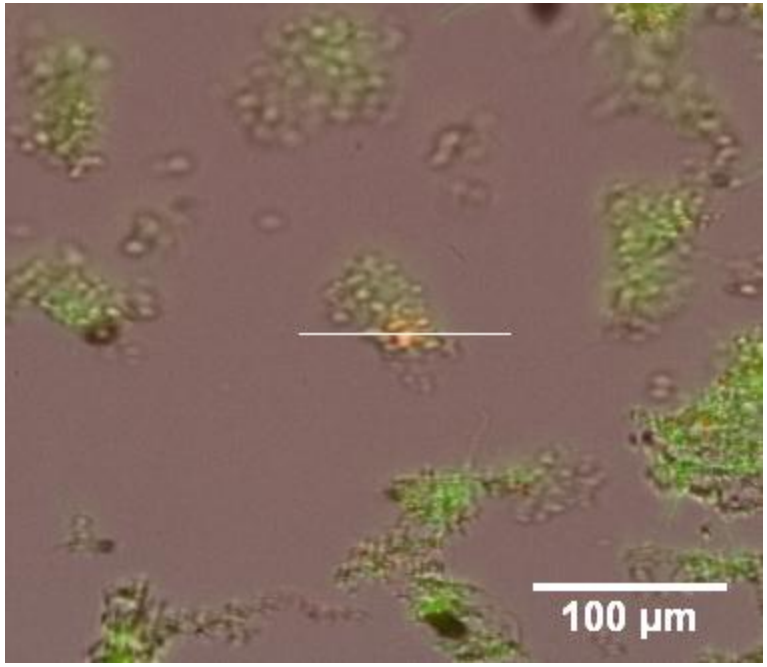
Erythromycin (5 mg/L) time-kill activity on activated sludge

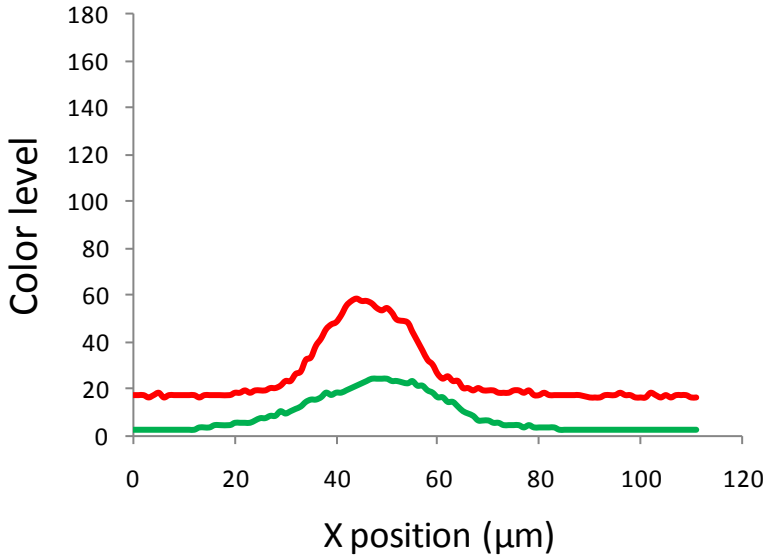




Time= 20 min
100% live bacteria

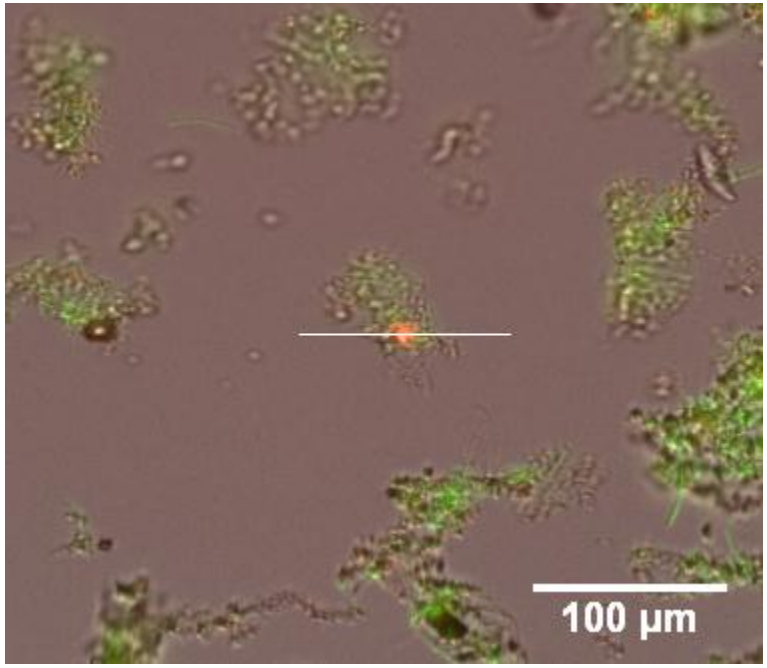
Erythromycin (5 mg/L) time-kill activity on activated sludge

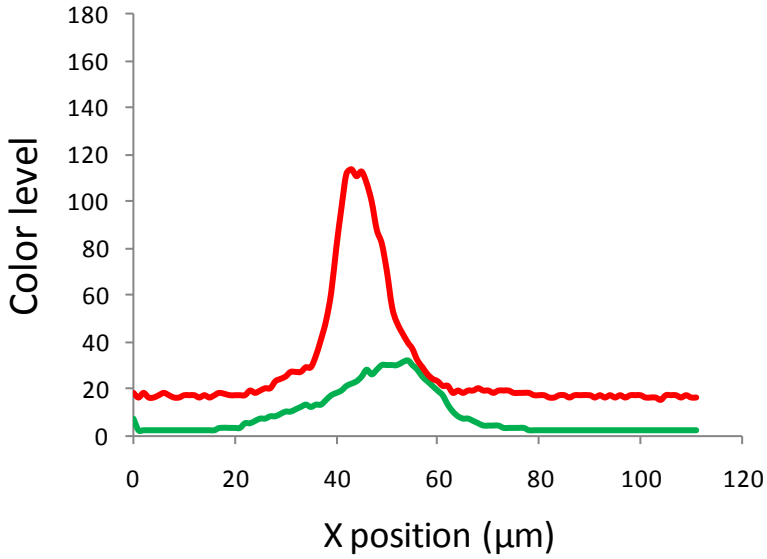




Time= 25 min
100% live bacteria

Erythromycin (5 mg/L) time-kill activity on activated sludge

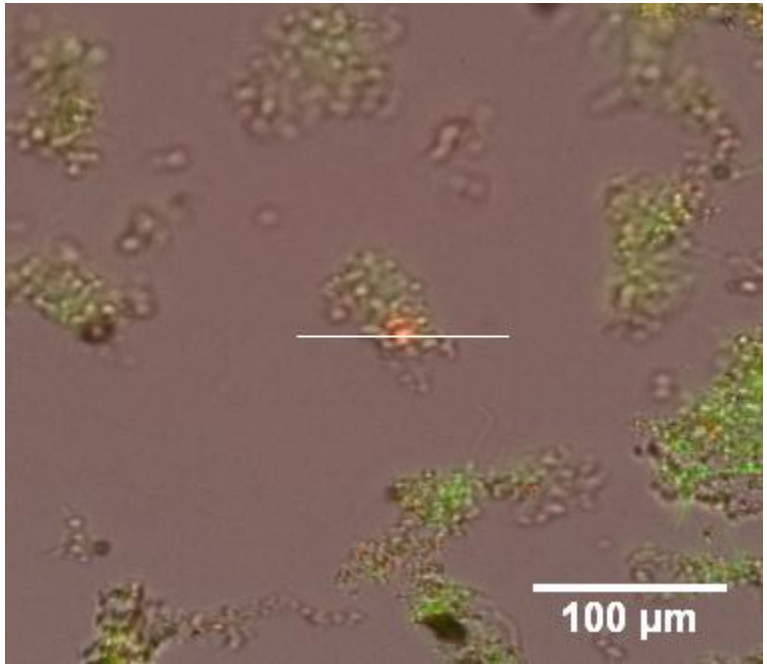


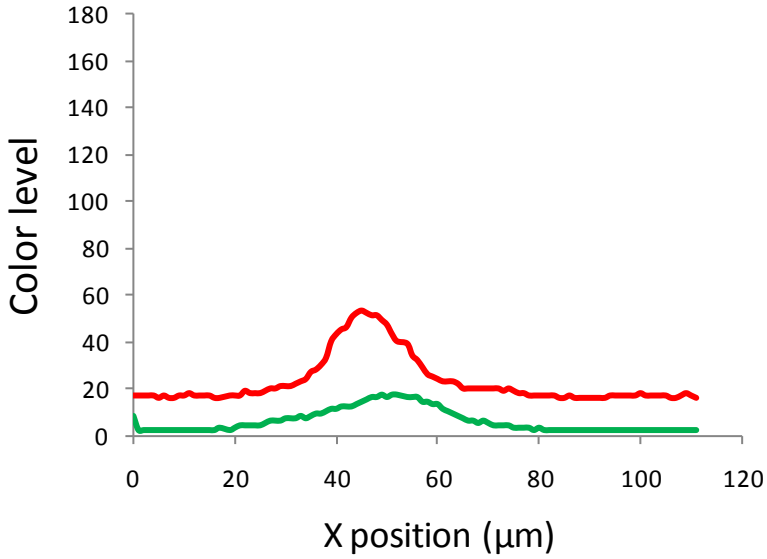


Time= 30 min

100% live bacteria

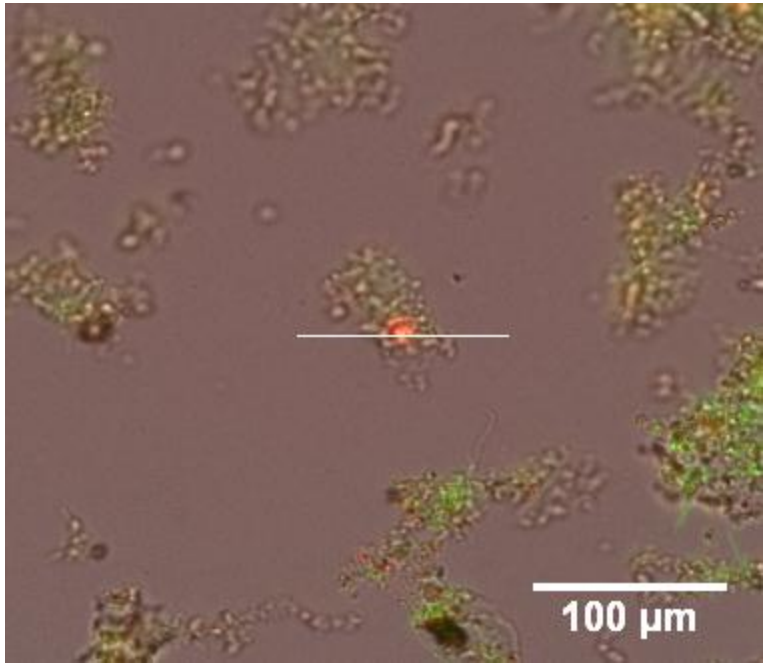
Erythromycin (5 mg/L) time-kill activity on activated sludge

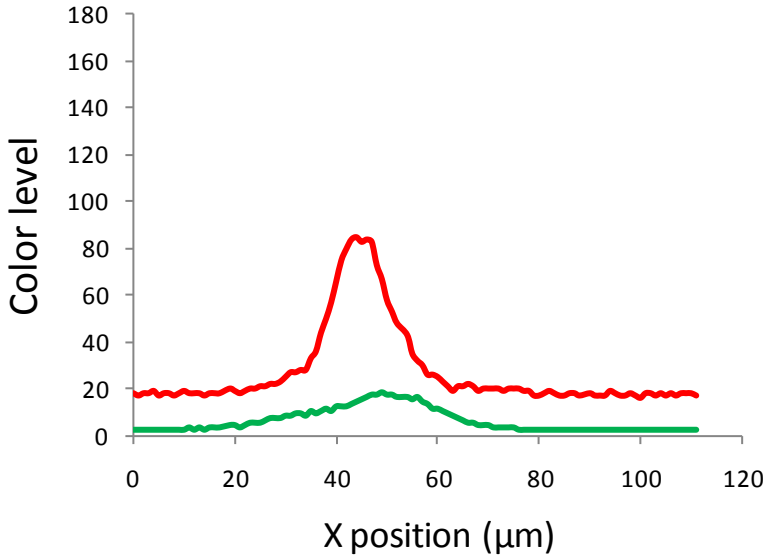




Time= 35 min
100% live bacteria

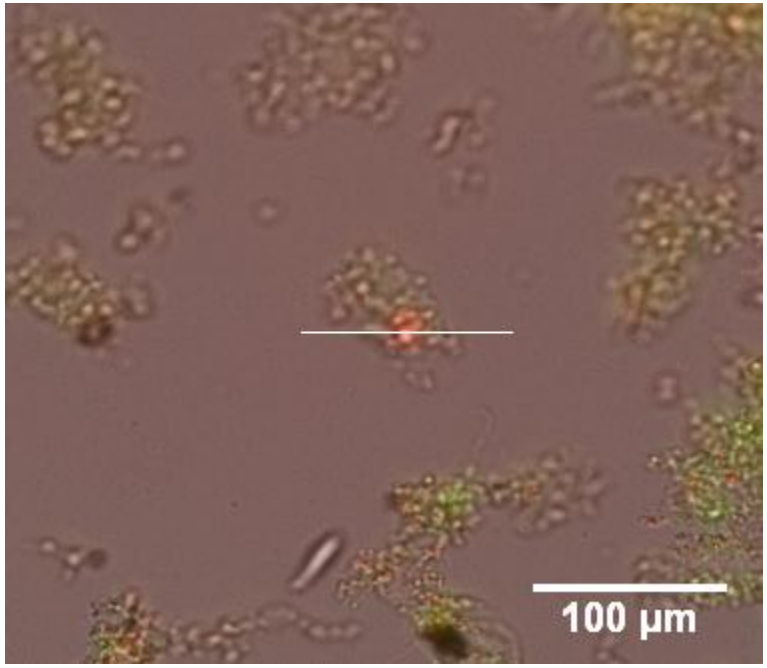
Erythromycin (5 mg/L) time-kill activity on activated sludge

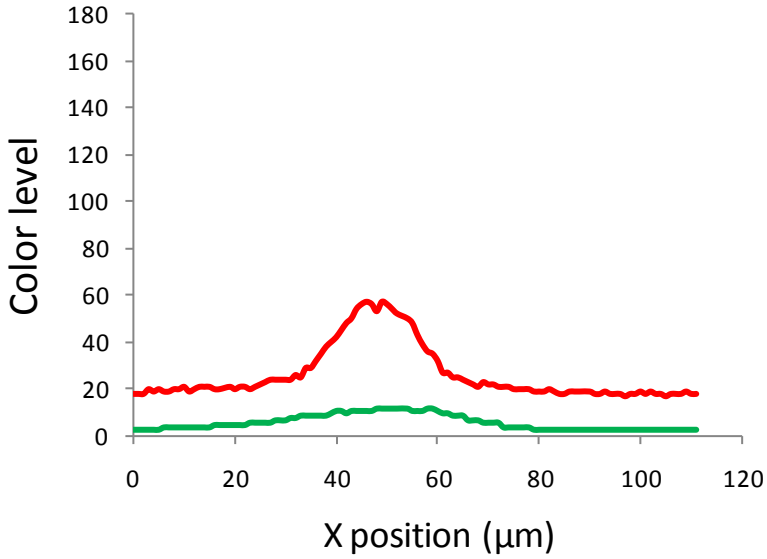




Time= 40 min
100% live bacteria

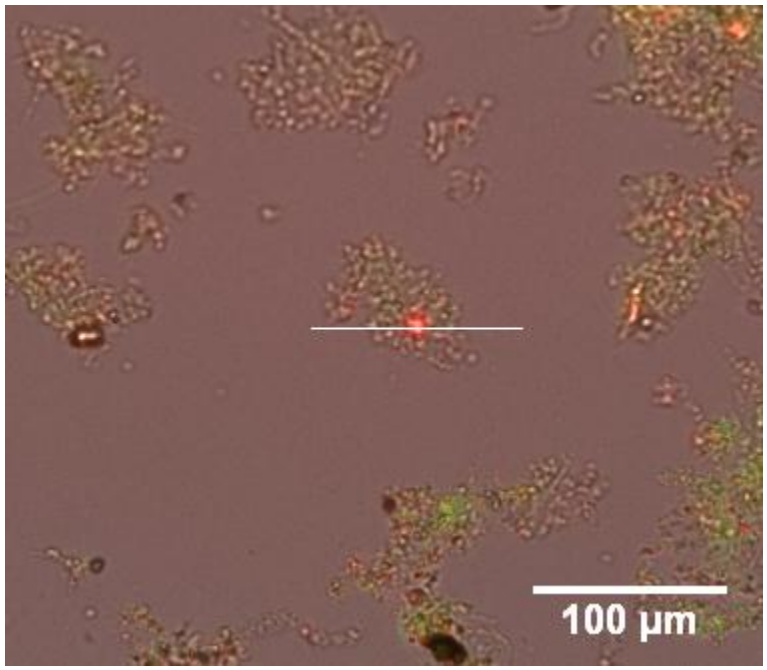
Erythromycin (5 mg/L) time-kill activity on activated sludge

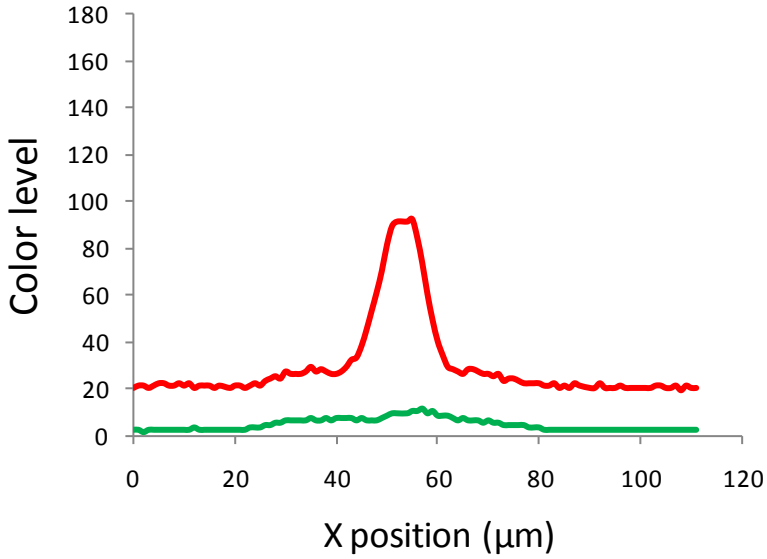




Time= 45 min
100% live bacteria

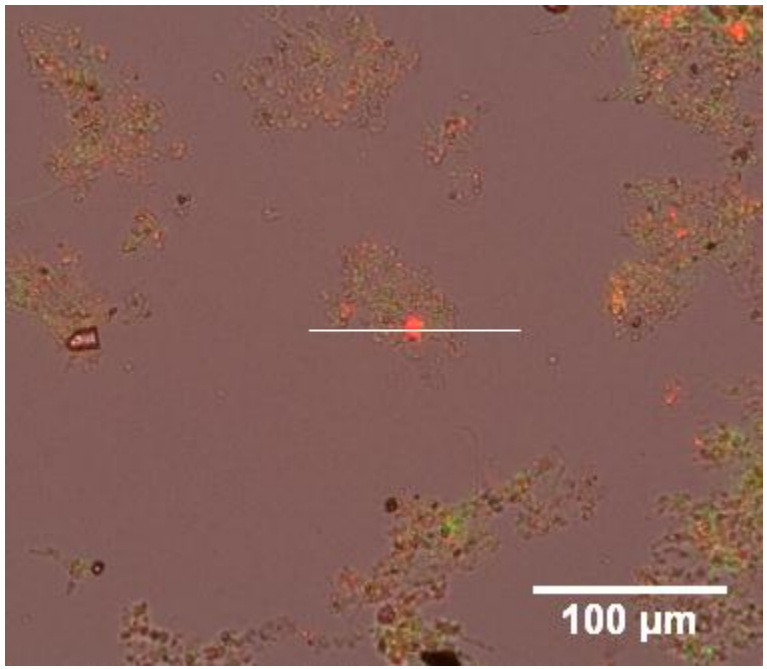
Erythromycin (5 mg/L) time-kill activity on activated sludge

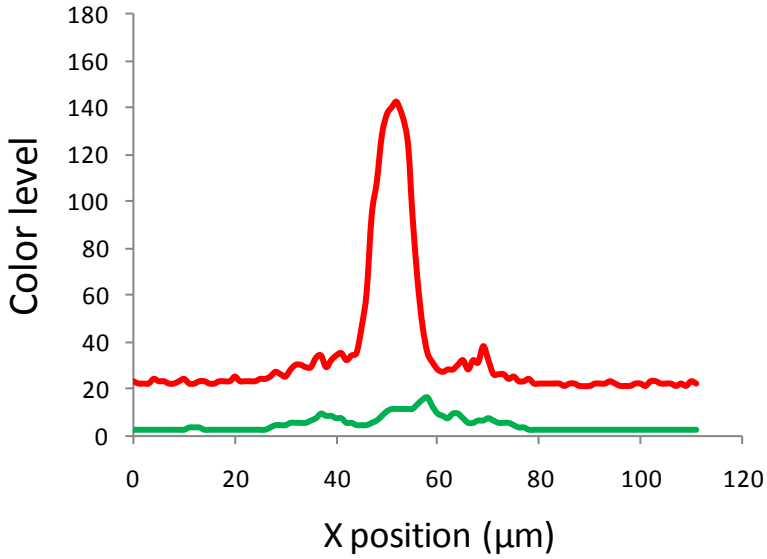




Time= 50 min
100% live bacteria

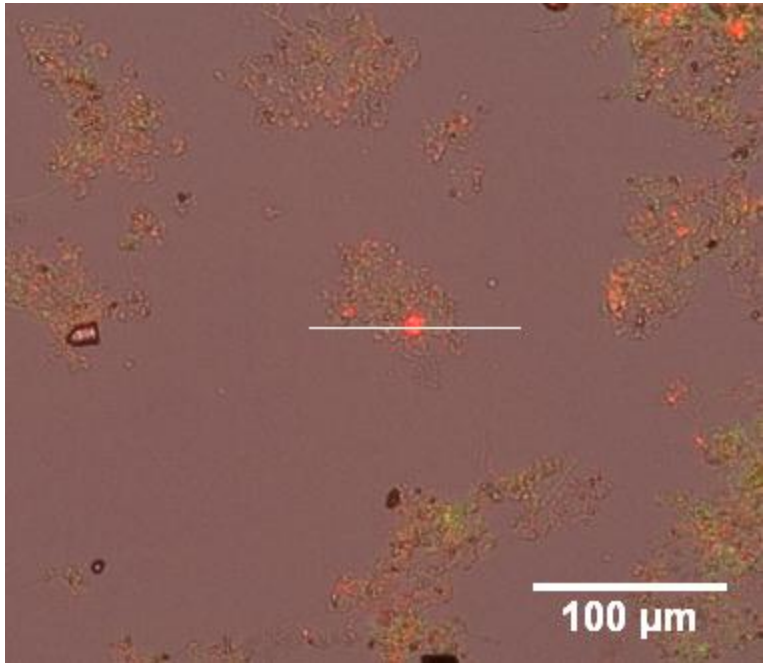
Erythromycin (5 mg/L) time-kill activity on activated sludge

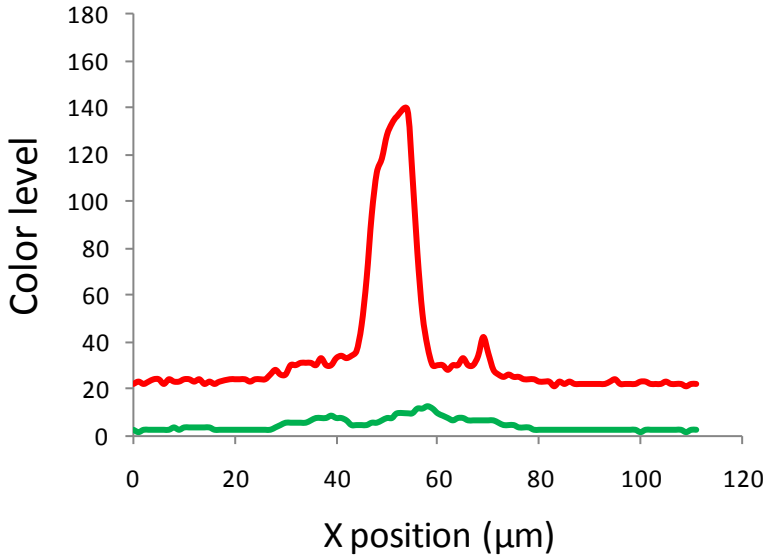




Time= 55 min
100% live bacteria

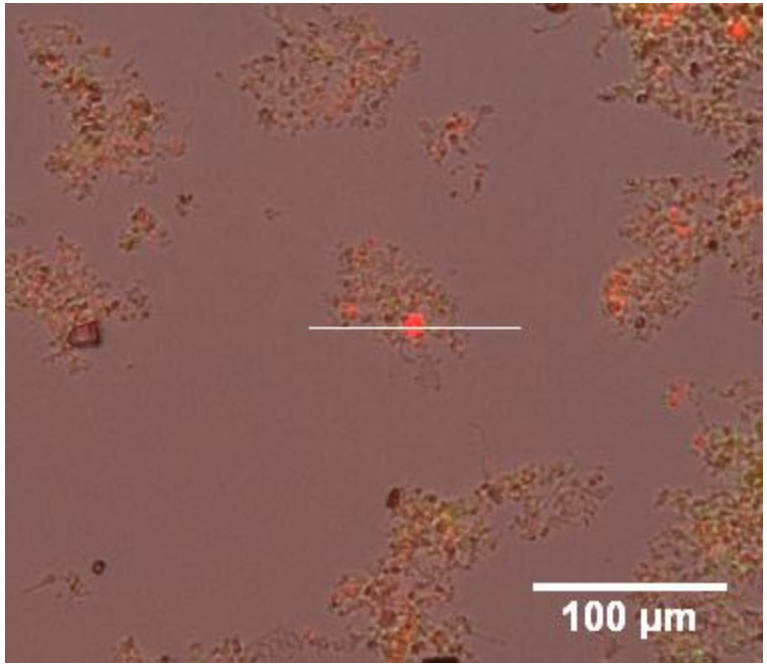
Erythromycin (5 mg/L) time-kill activity on activated sludge

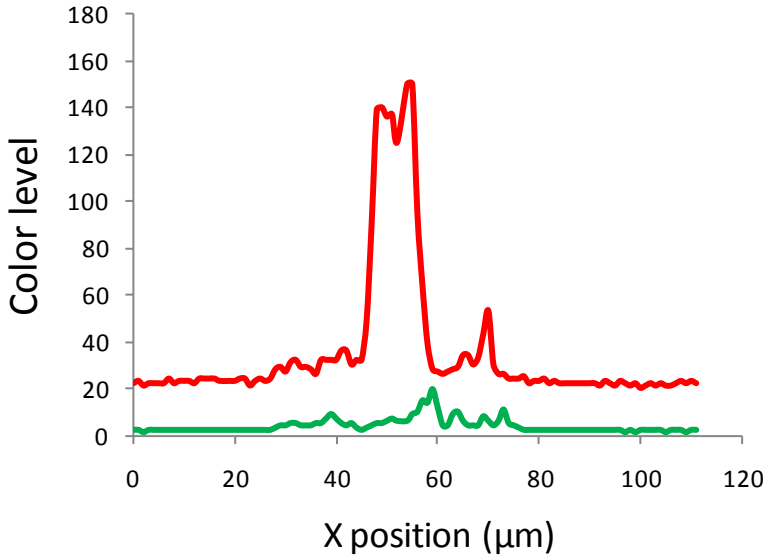




Time= 60 min
100% live bacteria

Erythromycin (5 mg/L) time-kill activity on activated sludge

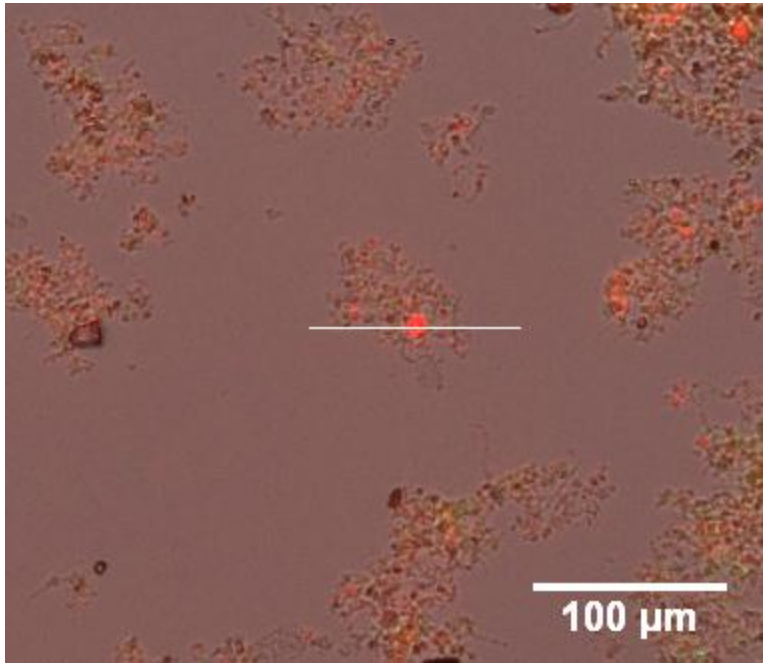


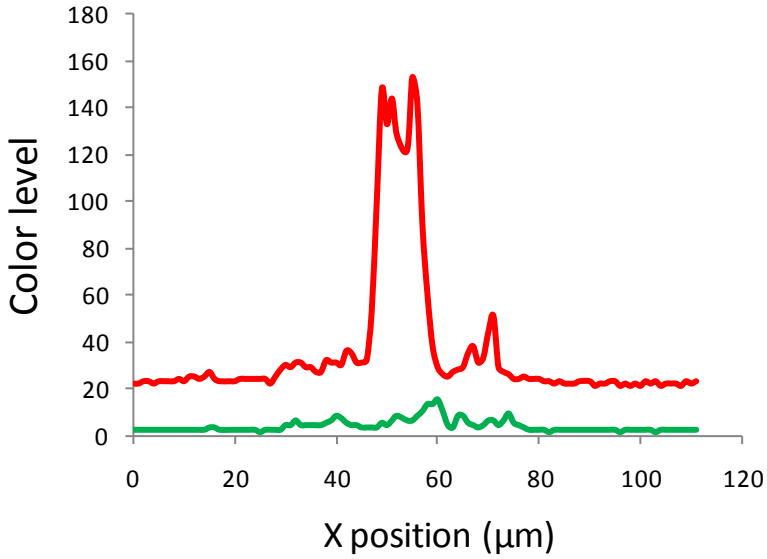


Time= 65 min

100% live bacteria

Erythromycin (5 mg/L) time-kill activity on activated sludge





Time= 70 min
100% live bacteria

Conclusions and prospects

- Activated sludge bacteria were sensitives to erythromycin (concentrations > 0.1 mg/L)

- Fast method that gives qualitative and quantitative results on cell death kinetic

→Modeling

→Other molecules

Thank you for your attention.