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# Water pollution sensor using microalgae and xurography-based microfluidic chips

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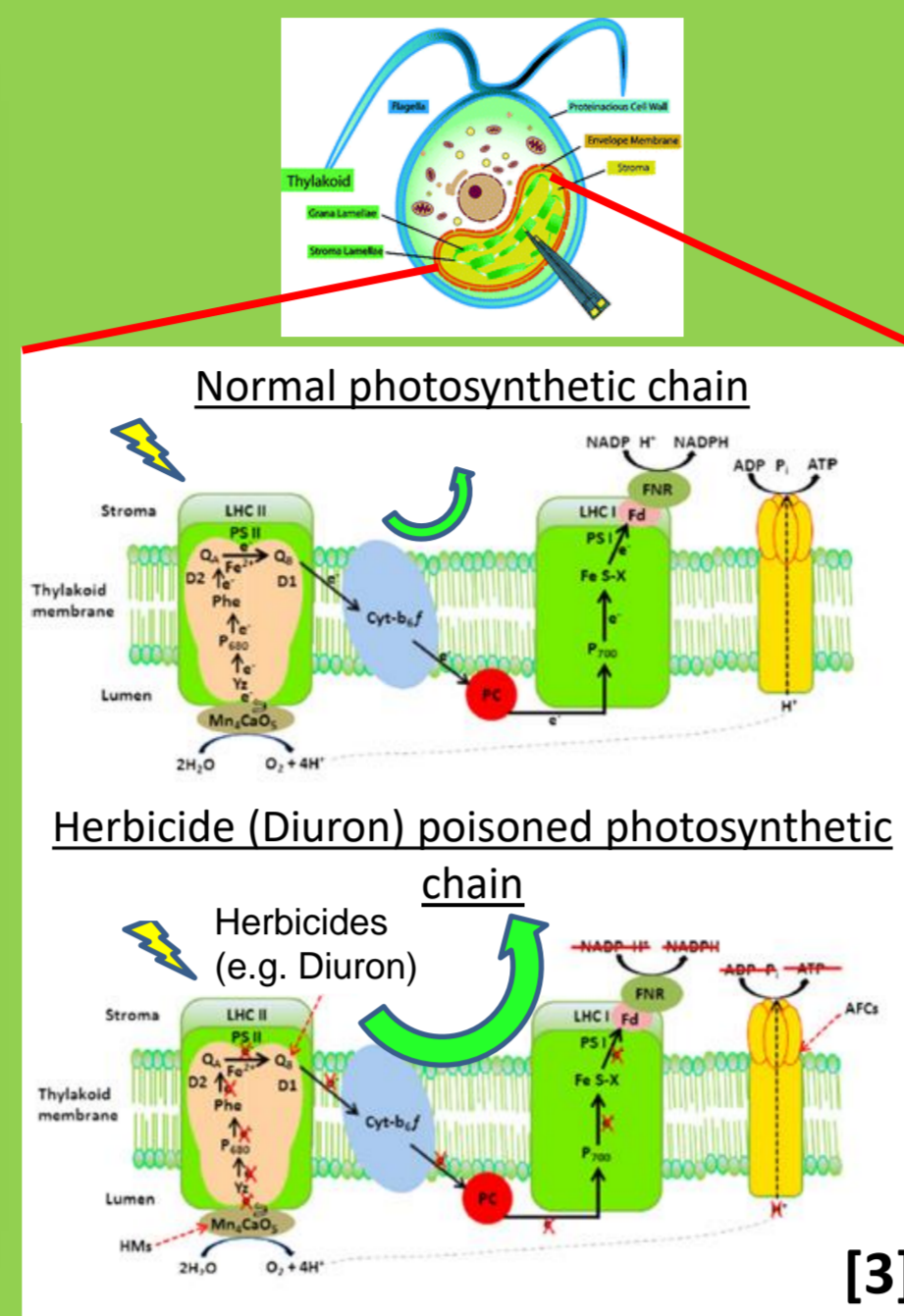


## Introduction

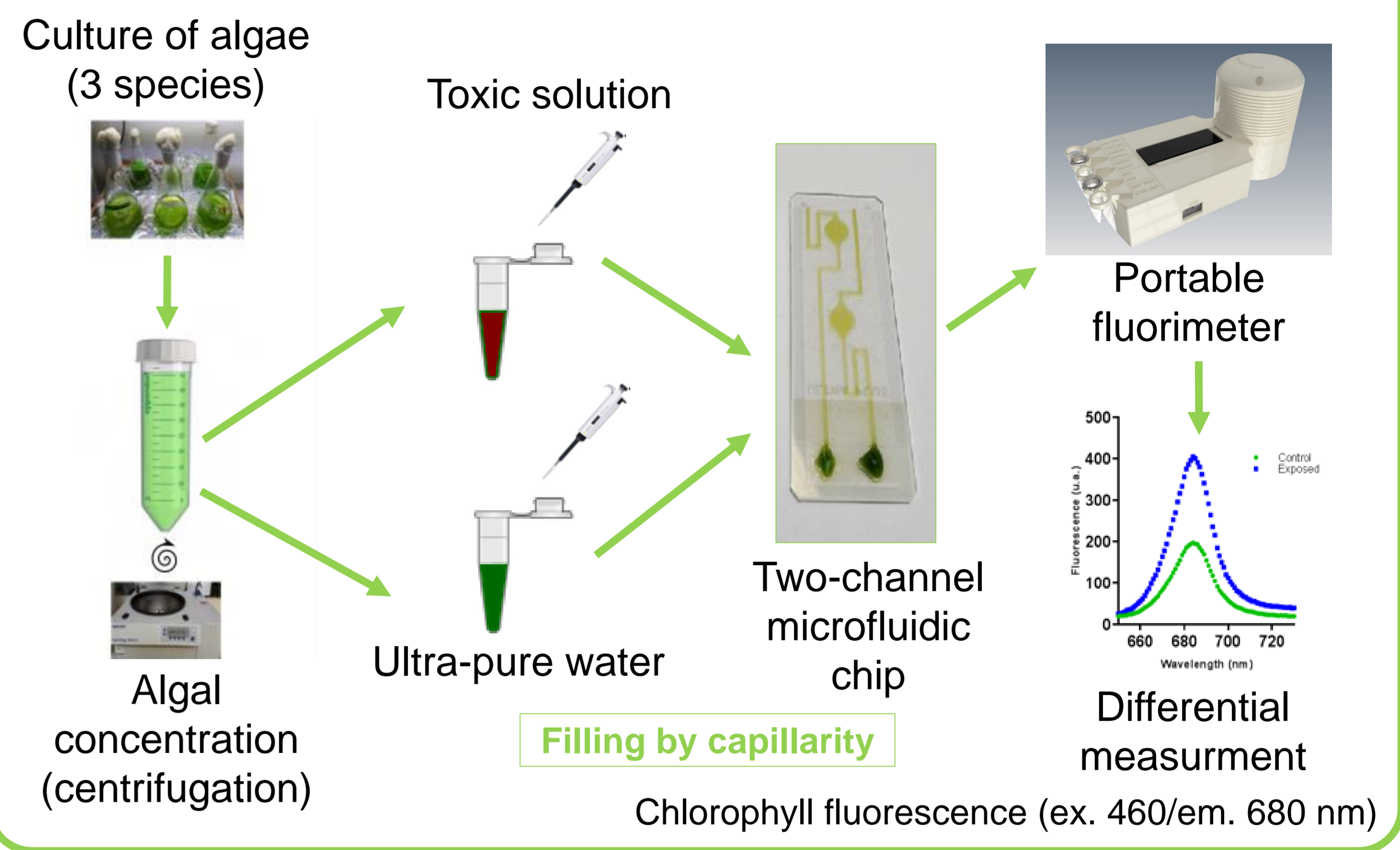
- Urban wastewaters (e.g. stormwaters): a source of many ecotoxic micropollutants for aquatic ecosystems [1].
- Algal biosensors are very promising tools for the measurement of potential toxic discharges, using photosynthetic activity disturbance (chlorophyll fluorescence) [2].
- Current barriers to their effective use: algal immobilization (e.g. with hydrogels, that lead to a low sensitivity and problems of reduced cell viability), variability of response and transportation on field (pumps).
- Microfluidics and xurography are very useful to overcome these technical problems (good volume control, no immobilization, miniaturization, low cost).

## Objective

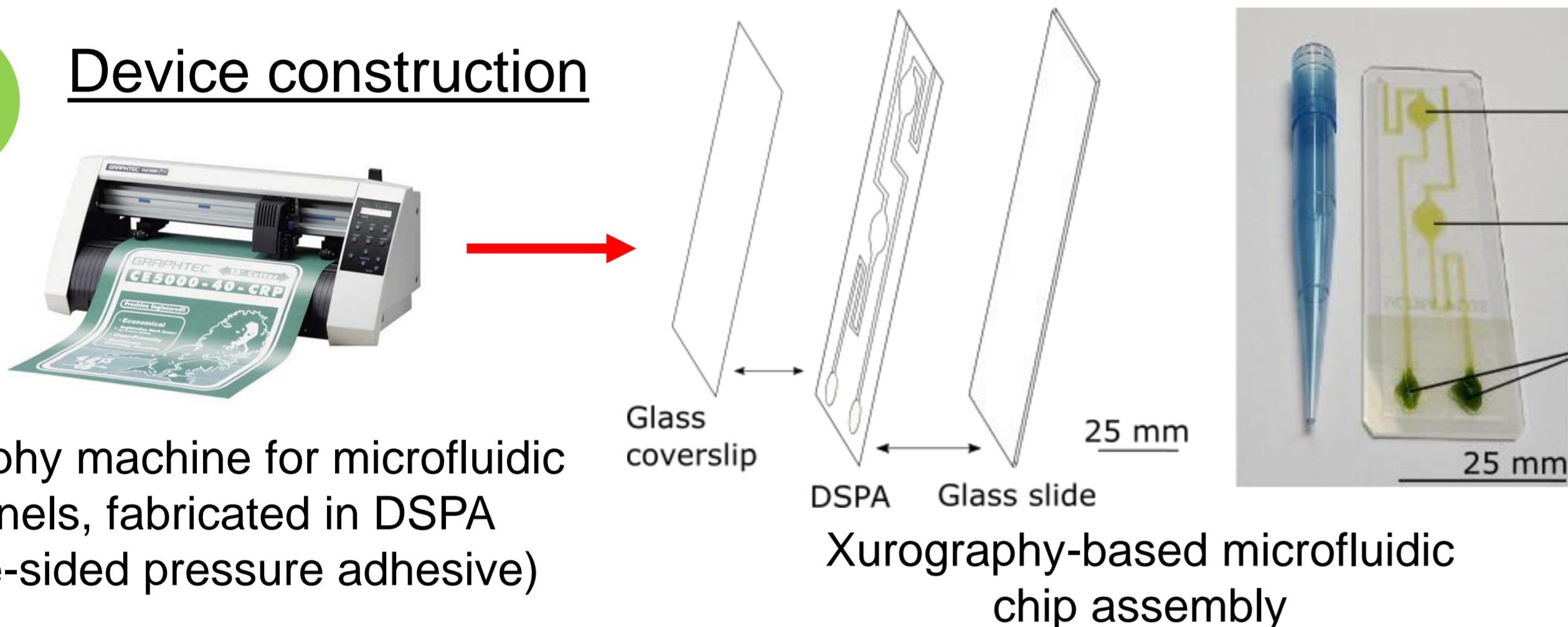
To develop (with a model pesticide, Diuron) an multi-algal biosensor employing ready-to-use xurography-based microfluidic chips and a dedicated fluorescence analysis system; and to apply this tool for the detection of toxic urban wastewater samples.



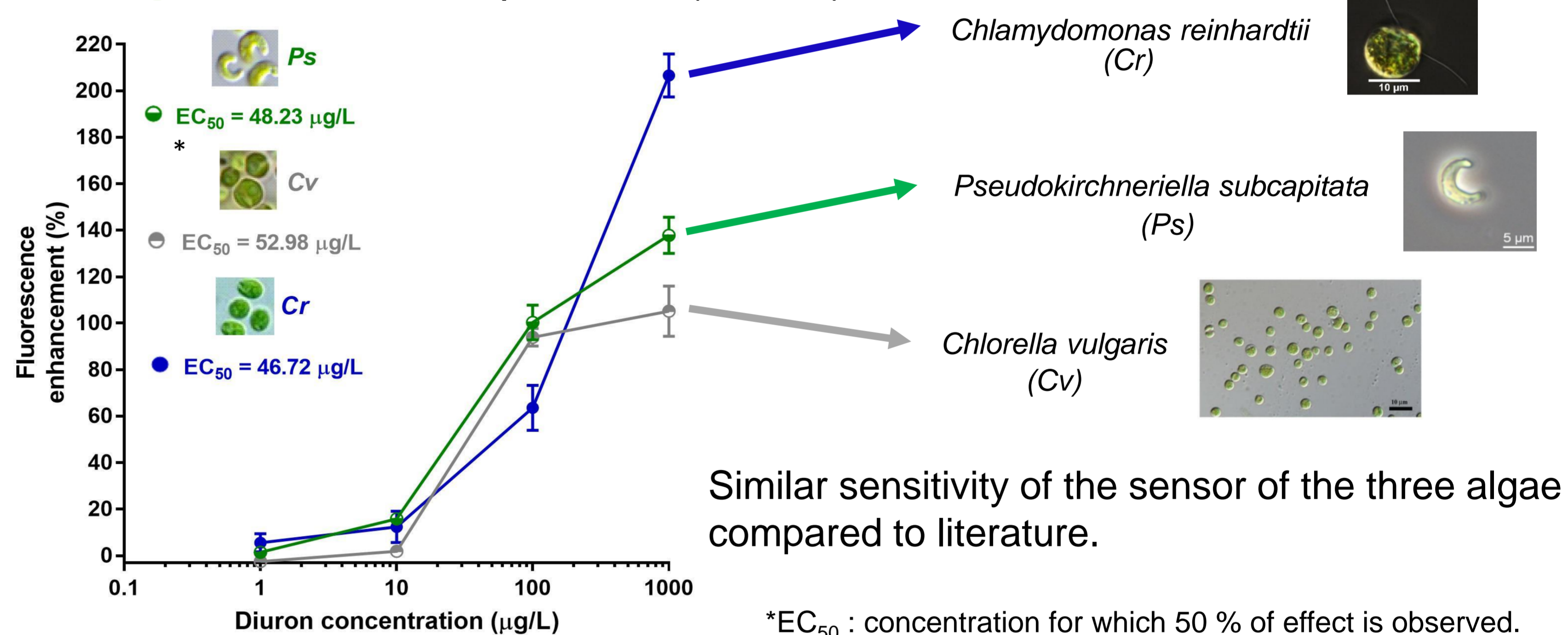
## General principle of the sensor



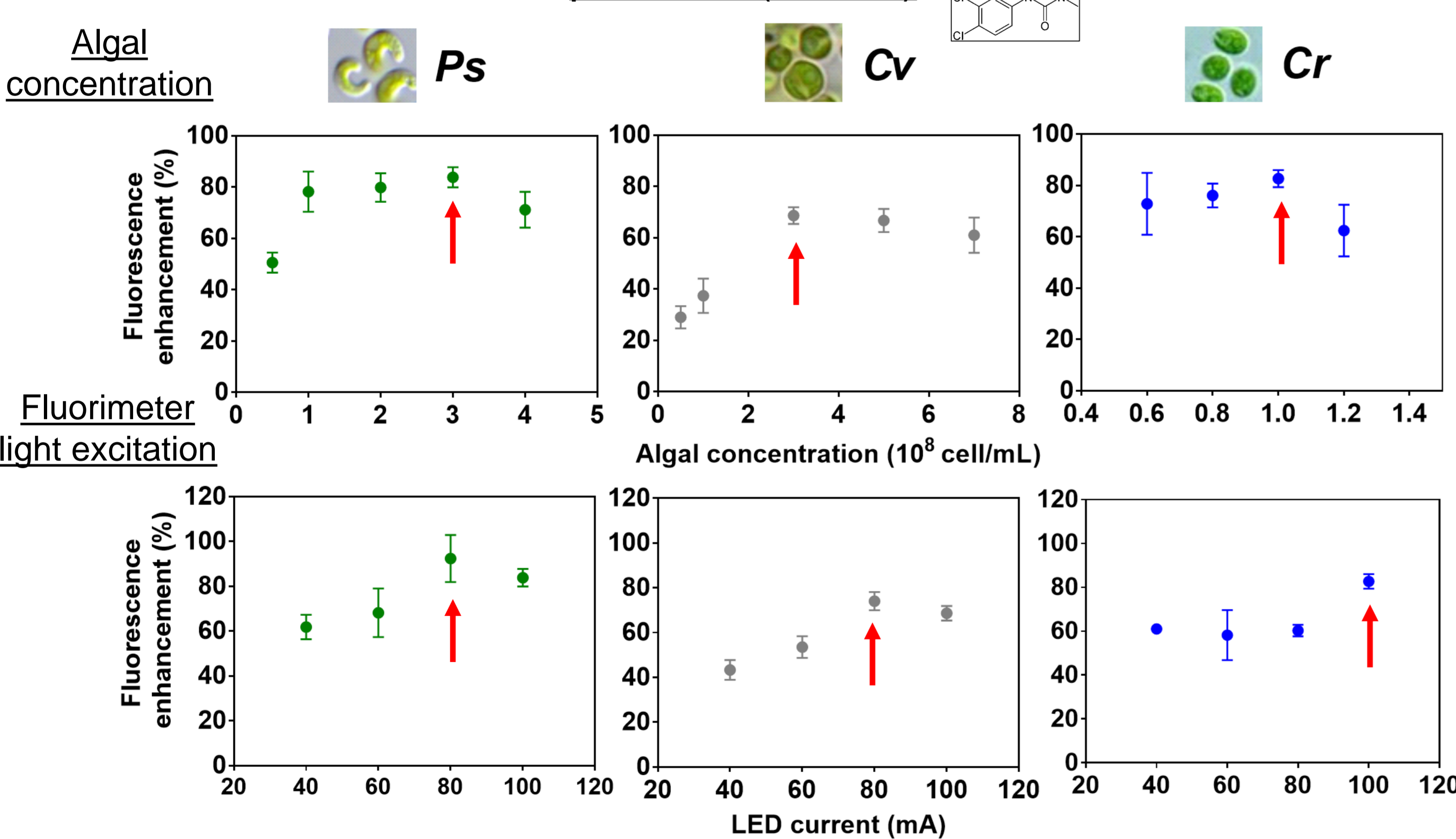
## 1 Device construction



## 3 Sensor sensitivity evaluation using a model pesticide (Diuron)



## 2 Sensor sensitivity parameter optimization using a model pesticide (Diuron)

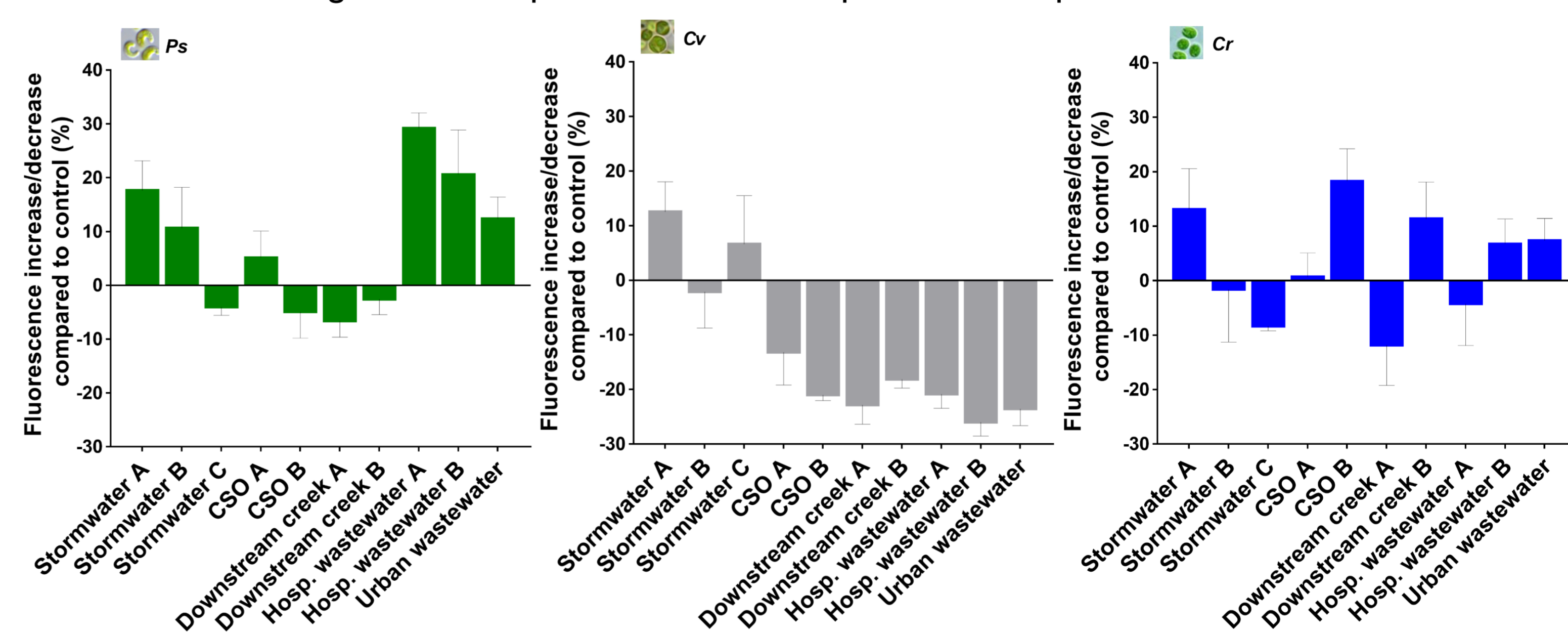


## 4 Application of the biosensor to urban discharges toxicity evaluation

Application to 10 urban discharges toxicity evaluation : 3 stormwaters, 2 combined sewer overflows (CSO), 2 contaminated suburban creeks, 2 hospital and 1 urban wastewater treatment plant influents.

Main observations :

- A different response of the three algae to the 10 samples tested.
  - Potential for using multiple algae strains
- A more significant response to the most polluted samples.



## Conclusion

- We developed here a ready-to-use water toxic pollution biosensor :
  - Low cost
  - Fast and easy to construct
  - Reliable
  - Portable
  - Easy-to-use
  - Sensitive
  - Fast to respond
- The potential of microfluidic and xurography for algal sensor construction was demonstrated.
- The use of multiple algae strains is essential to develop an effective tool.

## Further Work

- To develop a multi-channel (for replicates) sensor using more complex chips.
- To avoid preliminary algal concentration using lab-on-a-disc technology.
- To calibrate the sensor with many different kinds of waters/discharges.

## References

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