

Bacterial degradation of the veterinary antibiotic florfenicol



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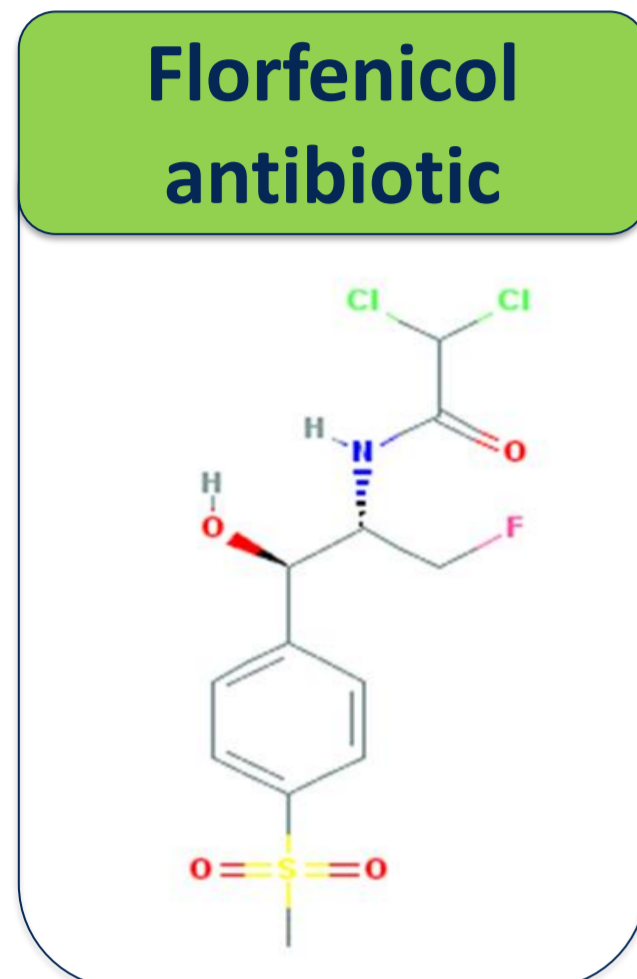
PORTO

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Introduction

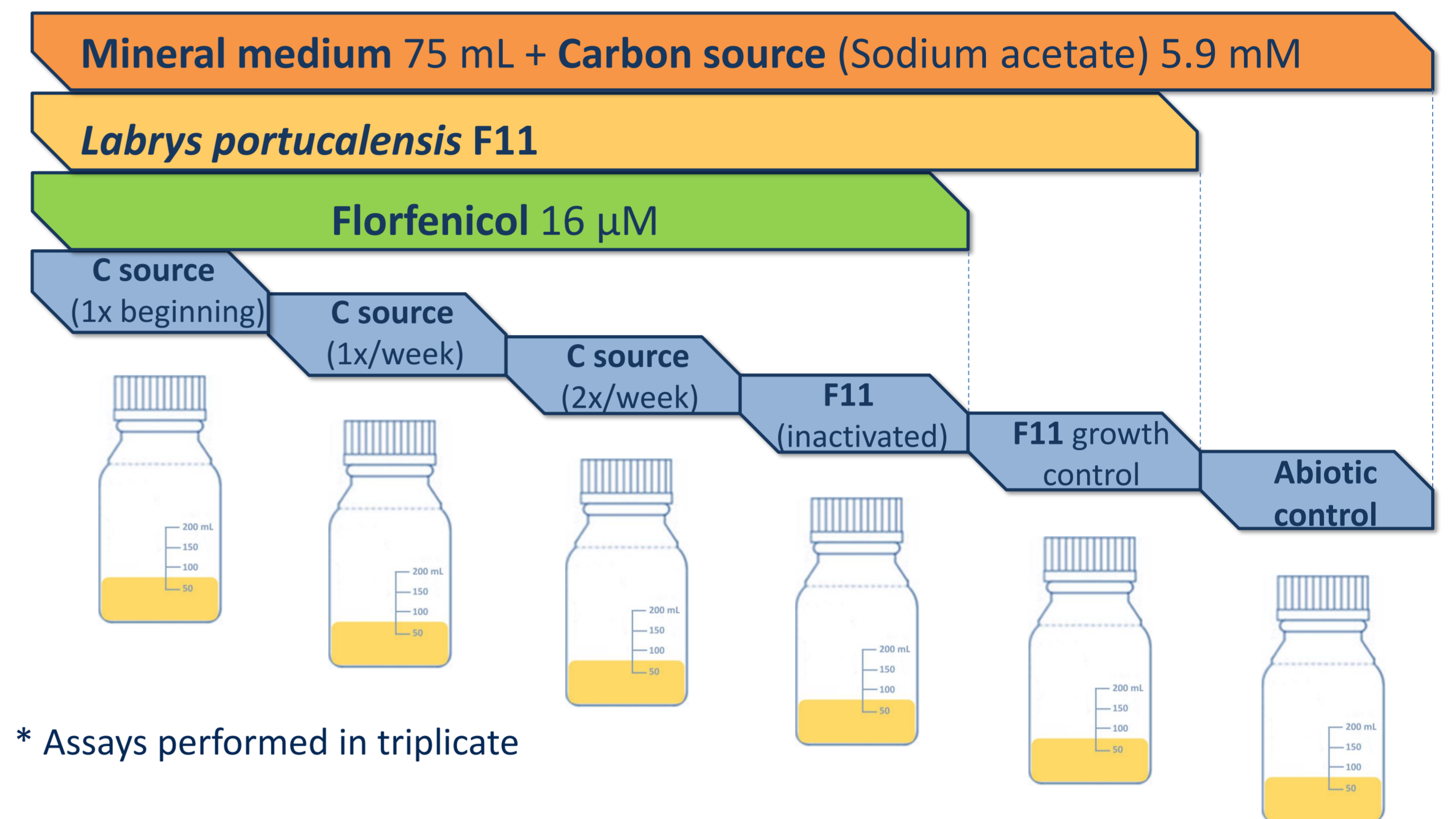


Florfenicol (FF) is a synthetic antibiotic, widely used in veterinary medicine. It is one of the few approved antibiotics for use in aquaculture during both production and processing operations, mainly to prevent and treat bacterial diseases. Therefore, this antibiotic is inevitably presented in the effluents from fish farms and eventually directly discharged in surface waters.

Removal of FF has been mainly reported using physical-chemical processes but reports on its removal by biological processes is scarce. Bioremediation has been considered the strategy of choice to reduce the risk of hazardous chemicals in the environment. Therefore, microorganisms able to tolerate and degrade FF could represent added value towards more efficient biological removal processes.

The main aim of this study was to investigate FF degradation by the bacterial strain *Labrys portucalensis* F11, capable to degrade other pharmaceuticals.

Methods



* Assays performed in triplicate

Incubation

- 28 days
- 25 °C
- 120 rpm constant shaking
- Protected from light

Analytical methods

- FF removal: HPLC-DAD
- Fluoride release: Potenciometry
- Cell density: Spectrophotometry

Results & Conclusions

Biodegradation of FF in cometabolism

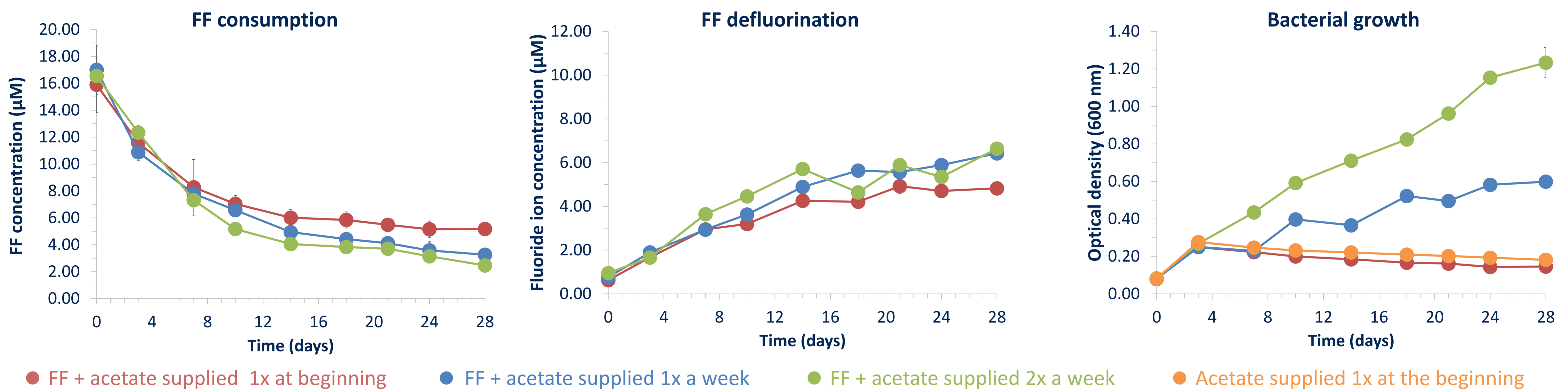


Figure 1 – FF degradation by *L. portucalensis* F11 under different acetate feeding regimes

Table 1 – FF removal by *L. portucalensis* F11 and F⁻ release at day 28 of incubation

	FF removal (%)	F ⁻ release (%)
FF + F11 + C source (1x beginning)	67,1 ± 2,9	35,0 ± 3,0
FF + F11 + C source (1x/week)	80,7 ± 2,8	47,2 ± 2,0
FF + F11 + C source (2x/week)	85,2 ± 1,5	47,4 ± 1,8
Abiotic control	3,4 ± 5,9	0,0 ± 0,8

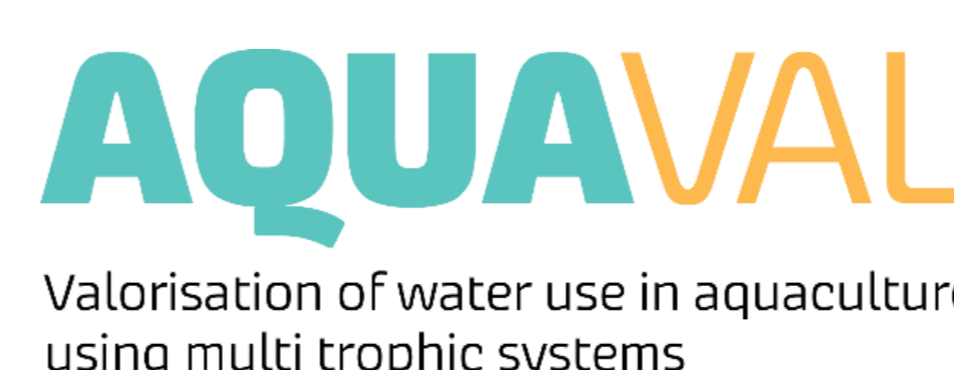
FF removal and F⁻ release expressed as percentage of the initial FF provided (16 μM). Results represent the mean of triplicates ± SD.

- Acetate periodic addition improved cell growth and FF consumption, although periodicity (1x or 2x per week) showed no effect on the latter.
- A positive effect of the carbon source periodic feeding on FF defluorination was observed, indicating that the additional carbon source could have contributed to circumvent the enzymatic rate-limiting step of FF metabolism.
- Despite FF antibiotic properties, there was no evidence of toxic effects on F11 cells, whose growth was not affected at the FF supplied concentration.

- *Labrys portucalensis* F11 is a good candidate to recycle this xenobiotic compound back into natural biogeochemical cycles.
- Periodic feeding with an additional carbon improved the removal of FF and has a positive effect on its defluorination.
- Microorganisms able to deal with FF can contribute for the enhancement of bioremediation processes towards more efficient removal processes.

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