Comparative Pharmacokinetics and Withdrawal Time of Florfenicol in Nile Tilapia (*Oreochromis niloticus*), Asian Seabass (*Lates calcarifer*) and Black Sea Bream (*Acanthopagrus schlegelii*)

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Introduction

Nile tilapia (*Oreochromis niloticus*), Asian seabass (*Lates calcarifer*), and black sea bream (*Acanthopagrus schlegelii*), formerly assigned to Perciformes, are now placed in the distinct orders Cichliformes, Carangiformes, and Acanthuriformes, respectively. To assess whether this taxonomic reassignment corresponds to functional differences in drug disposition, we compared their pharmacokinetics (PK), optimal dosing regimens, and withdrawal times (WDT) following oral florfenicol (FF) administrations at 10 mg/kg at 25°C.

Aim: To compare the PK parameters, optimal dosing regimens, and estimate the WDT of FF among the three fish species following the recommended dosage.

Materials and Methods

- Pharmacokinetic research:
  - ✓ 7 Nile tilapia, 5 Asian seabass, 7 Black sea bream reared at 25°C
  - ✓ Single oral gavage of FF at 10 mg/kg
  - ✓ Collect blood at 0–72 h post-administration
  - ✓ HPLC analysis; calculate PK (2-compartments)
- Tissue residues and WDT:
  - ✓ 35-40 fish/species at 25˚C
  - ✓ Oral gavage of FF 10 mg/kg/day for 5 days
  - ✓ Collect muscle/skin samples
  - ✓ HPLC analysis
  - ✓ Calculate WDT (95% CI/95% variation)

Results

Table 1. The PK parameters (mean ± SD) of 10 mg/kg FF. Different superscripts indicate significance (P<0.05)

PK parameters	Nile tilapia	Asian seabass	Black sea bream
T_{max} (h)	1.83±0.37^a	0.56±0.32^b	1.41±0.67^a
C_{max} (μg/mL)	19.41±4.54^a	21.72±12.61^a	21.31±3.90^a
$t_{1/2\beta}$ (h)	15.39±1.76^a	11.01±3.15^b	6.75±1.56^b
AUC (h·μg/mL)	286.3±50.8^a	106.6±25.8^b	188.7±48.7^b
$t_{1/2\alpha}$ (h)	1.22±0.81^a	0.54±0.42^b	0.79±0.54^b
Vz/F (L/kg)	0.80±0.13^b	1.69±0.83^a	0.52±0.05^b
CL/F (L/kg/h)	0.04±0.01^a	0.10±0.02^b	0.06±0.02^b
MRT (h)	19.77±0.99^a	13.11±5.16^b	9.84±1.85^b

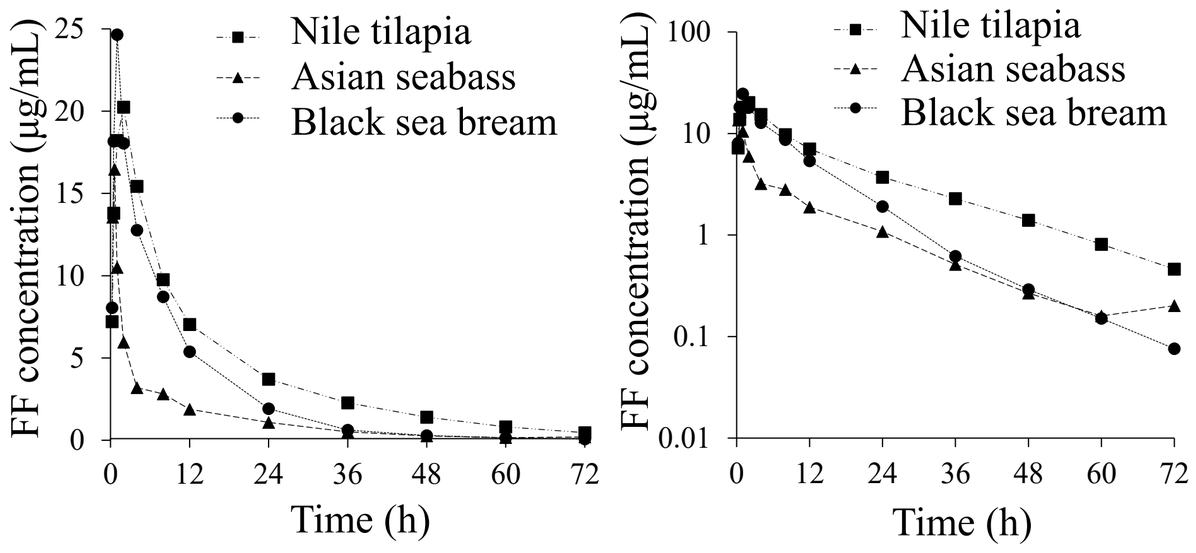


Fig 1. Linear (left) and semi-logarithmic plots (right) of serum concentration-time profile

Table 2. Optimal dosing (mg/kg) of FF at various MIC values

MIC	Nile tilapia	Asian seabass	Black sea bream
1 ppm	1.49±0.33	5.45±1.39	5.27±2.41
2 ppm	2.98±0.67	10.89±2.78	10.54±4.82
3 ppm	4.46±1.00	16.34±4.17	15.80±7.23
4 ppm	5.95±1.33	21.78±5.56	21.07±9.64

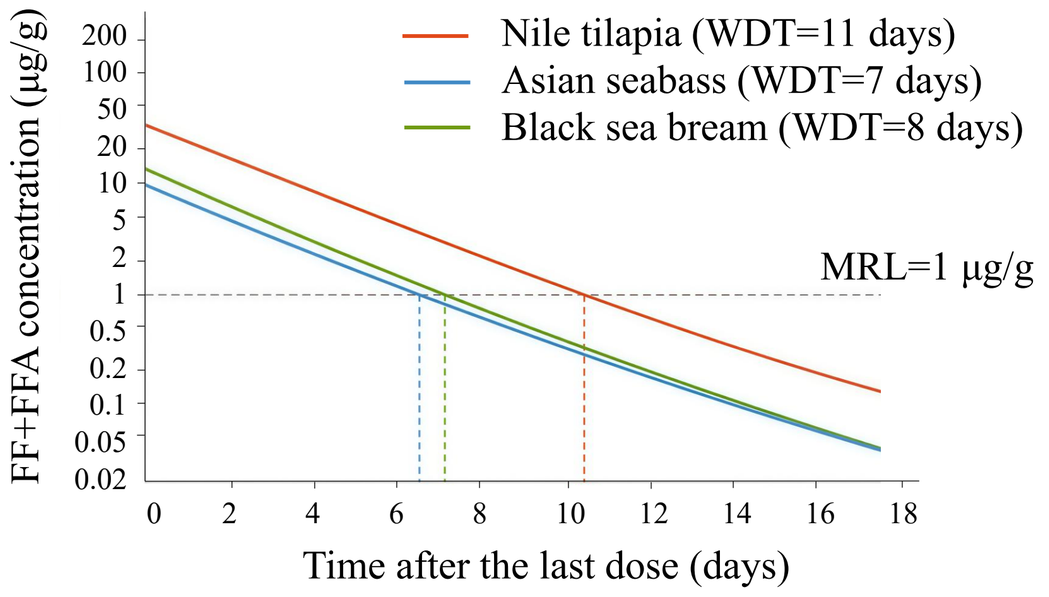


Fig 2. Residue depletion of FF+FFA in the muscle/skin after 10 mg/kg/day FF for 5 days (95% CI/95% variation)

Conclusion

1. Overall PK profiles were similar among species, while black sea bream showed intermediate PK characteristics between Nile tilapia and Asian seabass for most PK parameters.
2. Nile tilapia showed the longest $t_{1/2\beta}$ and highest AUC, whereas Asian seabass exhibited the highest CL/F, followed by black sea bream, and lowest in Nile tilapia.
3. For field application, Nile tilapia required a lower dose but a longer withdrawal period.
4. Order-level taxonomic separation showed only partial concordance with functional drug disposition.

References

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