EFFECT OF FLORFENICOL ON CYP 1A GENE EXPRESSION AND ENZYMATIC ACTIVITY IN NILE TILAPIA

Chi-Chung Chou*, Pei-Fang Hsieh, Yi-Chen Wu, Yi-Pin Lu, Ju-Yi Hsieh, Hual-Jhong Ke, Srirengaraj Vijayaram

Department of Veterinary Medicine, College of Veterinary Medicine, National Chung Hsing University, Taichung, 40227 Taiwan

Introduction

Nile tilapia (*Oreochromis niloticus*) is one of the most important aquaculture species in the world and florfenicol (FF) is one widely used broad-spectrum antibiotics in aquaculture. While it is well known that cytochrome P450 metabolizes a myriad of drugs in the terrestrial animals, whether or not this is true for FF metabolism in fish remains unknown. To investigate the metabolism of FF in Nile Tilapia, cytochrome P450 1A was examined for its gene regulation in multiple organs and the hepatic CYP 1A enzyme activity at two regulated FF dosages and temperatures.

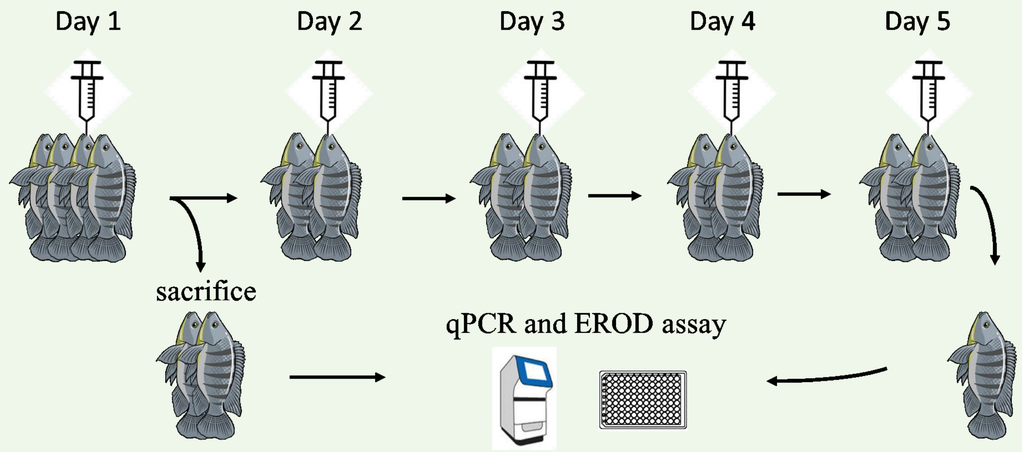
Materials and methods

Oral administration of florfenicol for 5 days

Gene: qPCR

EROD assay with α-naphthoflavone (α-NF)

Dosage/Temp	25˚C	30˚C
5 mg FF/kg	Group 1	Group 3
15 mg FF/kg	Group 2	Group 4



Results

Genetic regulation

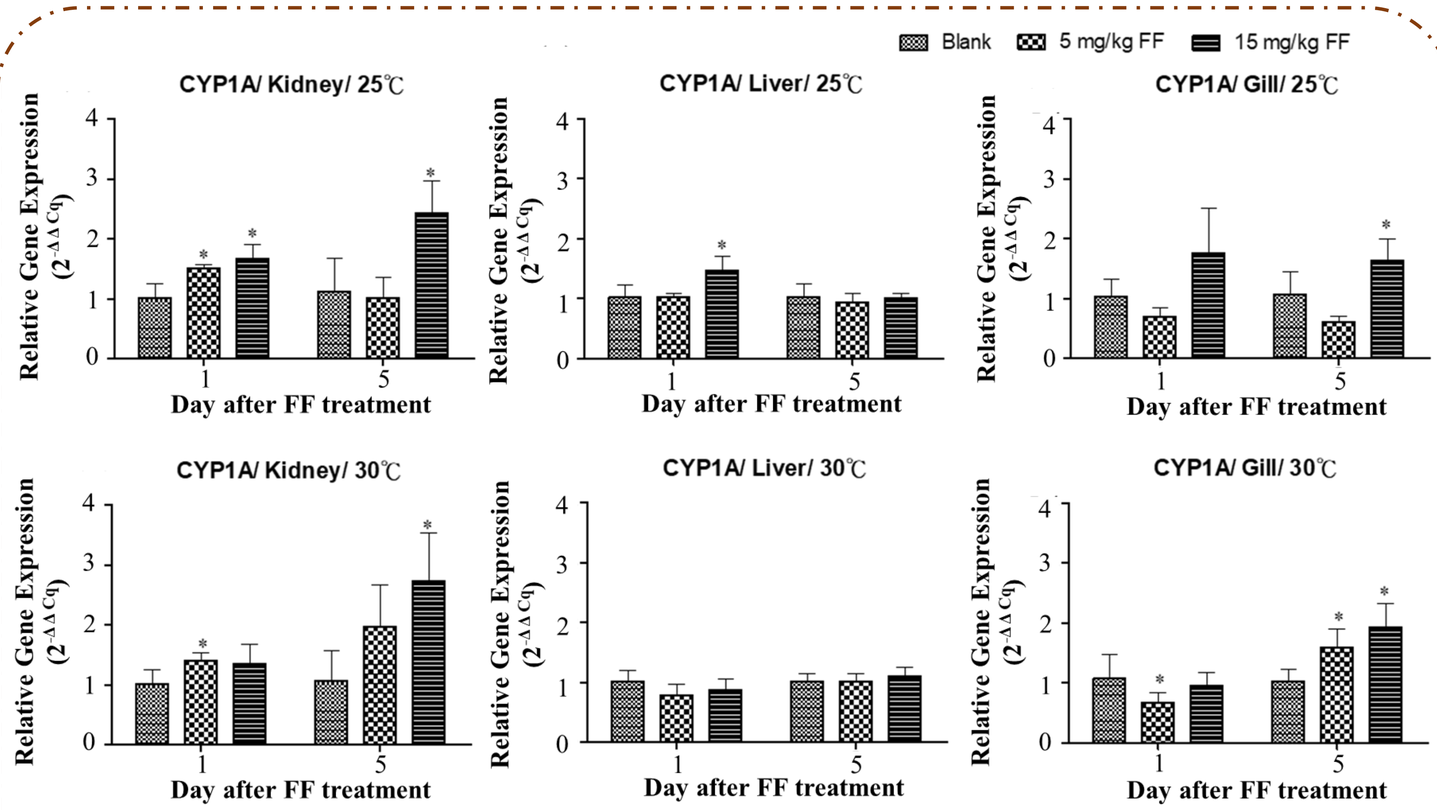


FIG 1. CYP 1A gene expressions after administration of 5 or 15 mg/kg FF to Nile Tilapia rearing at 25 and 30˚C.

1. At both temp., the expression of CYP 1A gene in **the liver is not affected**.
2. At both temp., significant increase of CYP 1A expression was observed from day 1 in the kidney and day 5 in the gill especially in the high-dose group.
3. At 25˚C, the expression of CYP 1A gene in the gills of the low-dose group showed a downward trend on day 5.

Enzyme activity

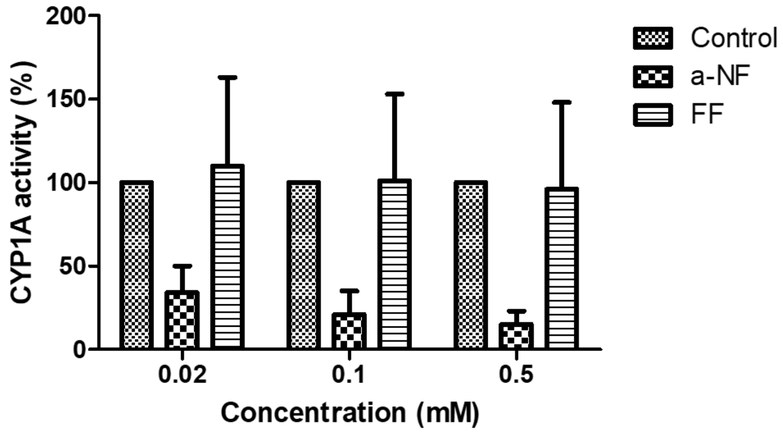


FIG 2. *In vitro* comparative inhibition of CYP 1A activity between FF and α-naphthoflavone (α-NF).

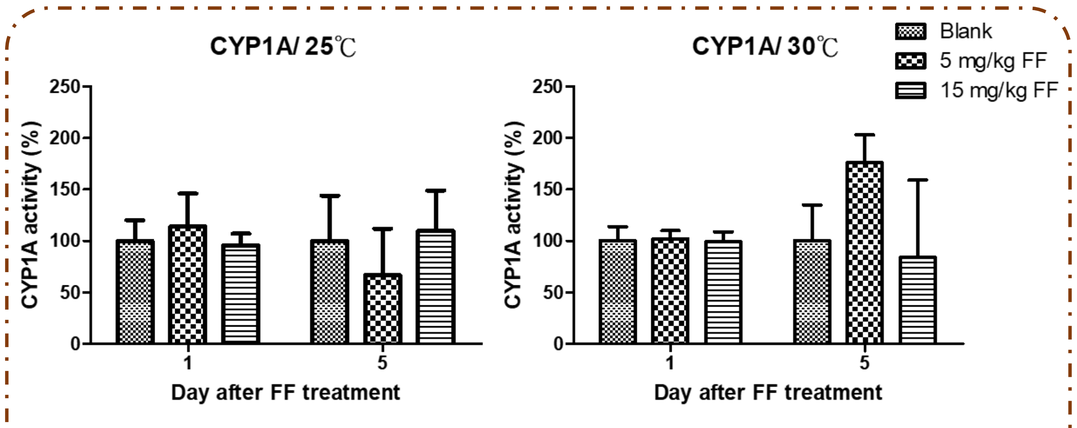


FIG 3. The inhibitory effect of FF on CYP 1A activity after administration of 5 or 15 mg/kg FF to Nile Tilapia rearing at 25 and 30˚C *(in vivo)*.

Conclusion

1. **FF at recommended dosages did not change CYP 1A response at both genetic and enzymatic levels. It is suggested that CYP 1A might not be the major CYP 450 enzyme responsible for FF metabolism in Nile Tilapia.**
2. The CYP 1A gene expression in the liver was not affected by FF at both temperatures, but was significantly up-regulated in the kidneys and gills, especially at higher dosage (15 mg/kg).
3. Statically significant increase of CYP 1A gene expression could be observed starting day 1 in the kidney, but not gill.
4. No significant temperature effect on CYP 1A expression at the genetic level. (Fig. 1)
5. FF has no apparent effect on hepatic CYP 1A enzymatic activity either *in vitro* (0.02-0.5 mM) or *in vivo* (5 or 15 mg/kg oral; at 25 and 30˚C). (Fig. 2 & 3)

Contact: Chi-Chung Chou: ccchou@nchu.edu.tw