EFFECTS OF TiO_2-BASED PHOTOELCTROCATALYTIC (TiO_2PEC) WATER PURIFICATION SYSTEM ON SKELETAL MORPHOLOGY AND GROWTH IN RAINBOW TROUT (*Onchorhyncus mykiss)* REARED IN A RECIRCULATING WATER SYSTEM

Contact: **giorgio.mirra@unimi.it**
PhD student in Veterinary and Animal Science
University of Milan

Giorgio Mirra*, Alessia Di Giancamillo, Lucia Aidos, Annamaria Costa, Gianluca Chiarello, Nadia Sherif, Tarek Temraz, Giuseppe Radaelli, Daniela Bertotto, Katia Parati, Luca Maistrello, Edda Mainardi, Eleonora Buoio, Mauro Di Giancamillo.

THE DEMAND

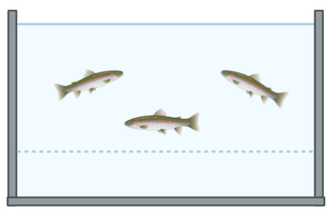
Investigating water purification systems is essential for enhancing the sustainability of recirculating aquaculture systems (RAS).

THE AIM

FISH-PhotoCAT is a PRIMA project that is studying a new water depuration system, which combines the normal UV disinfection with photo-electrocatalysis with titanium dioxide nanotubes coated mesh (TiO_2PEC). In this work we describe the effects that this innovative tool take on skeletal assessment in rainbow trout (150g-200g;*1 month of trial*).

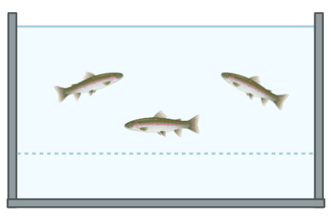
MATHERIAL AND METHODS

CONTROL GROUP:
- 3 TANKS
- 500 L
- RAINBOW TROUT 15 KG/M^3

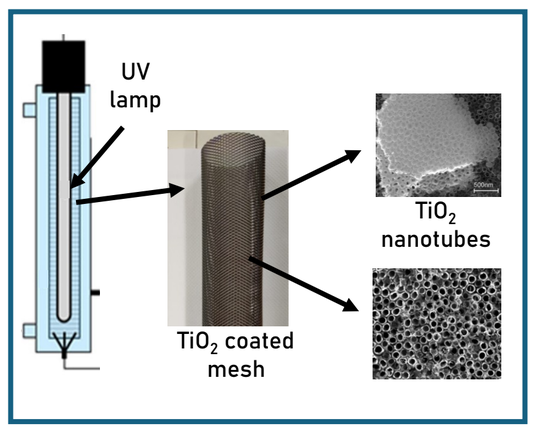


UV disinfection

TiO_2PEC GROUP:
- 3 TANKS
- 500 L
- RAINBOW TROUT 15 KG/M^3



UV + TiO_2PEC disinfection
+

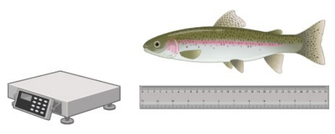


WATER ANALYSIS

NH_3
NO_2
NO_3

ZOOTECHINCAL PARAMETERS

Body weight
Total lenght
Caudal fin score



SKELETAL MORPHOLOGY

Diagnostic Imaging:
1. **X-ray**
2. **Computed Tomography**

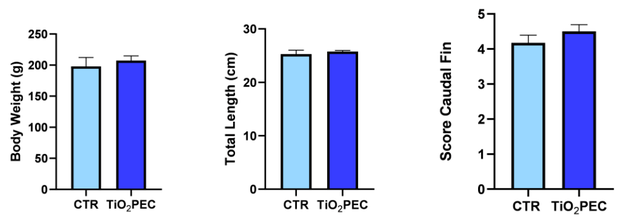
Histochemical staining:
1. **Whole-mount Alcian blue- Alizarin Red for skletal development**
2. **Picro Sirius Red for collagen fibers (bone matrix)**

RESULTS

WATER PARAMETERS

	CTR	TiO_2PEC	
NH3	0.15 mg/L	0.16 mg/L	
NO2	1.210 mg/L	0.74 mg/L	P=0.06
NO3	122.211 mg/L	108.510 mg/L	P<0.001

ZOOTECHINICAL PARAMETERS

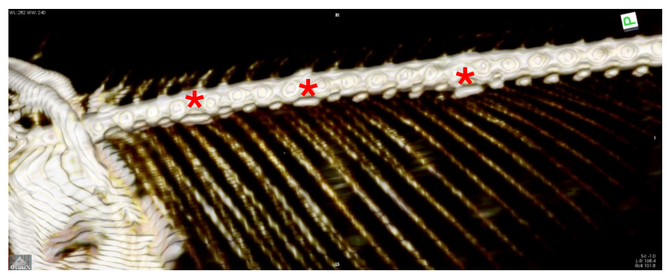


SKELETAL MORPHOLOGY: *Diagnostic imaging*

X-Ray

CT

CT



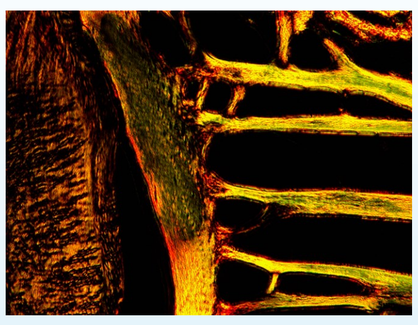
* →Vertebral fusion

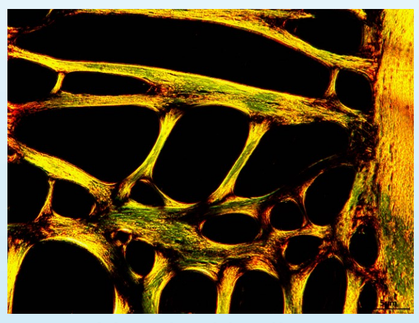
SKELETAL MORPHOLOGY: *Histochemical stainings*

WHOLE MOUNT: Alcian Blue-Alizarin Red

Caudal fin: bone tissue (alizarin positive staining in red)

PICRO Sirius Red





Vertebral bodies: collagen type 1 fibers

DISCUSSION AND CONCLUSION

Water parameters revealed that nitrates were lower in the TiO_2PEC group (122.211 mg/L *vs*. 108.510 mg/L; $p < 0.001$). In skeletal analysis, no differences were observed between the groups. No anomalies due to TiO_2PEC, affecting the vertebral column and the cephalic region were observed. Since skeletal anomalies such as vertebral fusion can be frequent in RAS systems, CT is an effective method for detection of skeletal anomalies, such as vertebral fusion, as you can see in the image. However, these abnormalities were scarce in both groups, so they are probably not linked to system. Similarly, no alterations of fin rays were found. Histochemistry revealed that the vertebral bodies were mainly organized with collagen type 1 fibers, as well as the caudal fins were normally structured in both groups (red color for alizarin red staining). These findings suggest that TiO2PEC did not introduce discernible variations in the assessed parameters between the two groups, but it is possible to appreciate an improvement in the quality of the water in the TiO2PEC group.

Fish-PhotoCAT
PRIMA Project

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