

Field diagnostics of nephrocalcinosis in farmed Atlantic salmon by using radiography

HYPOTHESIS:

We wanted to demonstrate the potential of using radiography as a diagnostic tool for live diagnostics of nephrocalcinosis in farmed Atlantic salmon.

DURATION: 2021-2023

FISH SIZE TESTED: 9 – 980 g

SALINITY TESTED: Brackish water and fresh water

HIGHLIGHTS:

- Radiography is a useful tool for diagnosing nephrocalcinosis in farmed Atlantic salmon.
- The accuracy of the diagnostics depends on fish size, severity of nephrocalcinosis, x-ray equipment and the reader's experience.
- In large smolts, the accuracy is comparable to that of histopathological evaluation.
- It is possible to diagnose live fish in large numbers, and to follow their performance and survival in sea.
- Ultrasound was tested as a supporting tool for rapid, live diagnostics. It is possible to use, but the sensitivity is lower than by radiography, and it requires good equipment and trained personnel to be useful.
- Fish from 9 g to 980 g from 14 different fish groups were examined by radiography, in total 634 fish. 165 of these were sampled for histology, and most were scored macroscopically in addition.
- The results show a high level of precision of radiography in fish groups with high severity of nephrocalcinosis, whereas the

precision was lower in groups with less severe nephrocalcinosis. In individuals with low degree of nephrocalcinosis (score 1), both macroscopic scoring and radiography scoring was inaccurate, and the diagnosis was made by histology.

RECOMMENDATION:

- Radiographic diagnostics of nephrocalcinosis should be implemented in fish health services, to provide a tool for live fish diagnostics. This requires training of personnel and good equipment but would give a much more informative diagnostic than the one that could be done by autopsy and histopathology.
- In macroscopical scoring there is a need for coordinating the diagnosis of nephrocalcinosis, as there are several different scoring systems used. This makes the problem more difficult to identify and compare between different sites and companies.
- Further development of the method is required.



Radiography scoring system used:

Score 0: No observable changes in the kidney

Score 1: A small calcification in one location or increased radio density in the kidney capsule ventral lining.

Score 2: Calcifications in several locations.

Score 3: Larger amounts of calcifications observed, intact kidney shape in lateral view.

Score 4: Larger amounts of calcifications observed, distorted kidney shape in lateral view.

Macroscopical scoring system:

Score 0: No observable changes in kidney capsule morphology.

Score 1: Increased visibility of ureters or small calcium deposits in ureters.

Score 2: Observable small calcifications in tissue beside or in branches of the ureters.

Score 3: Large amounts of calcifications

The factsheet is ready for commercial implementation

observed, intact kidney shape.

Score 4: Large amounts of calcifications observed, swelling of kidney tissue and distorted kidney shape.

Histopathological scoring system:

Histopathology was scored after a scoring system with scores weighted by location and severity, and the range observed in our material was from 0 (healthy kidney) to 40 (severe nephrocalcinosis).

Score	Makro	Røntgen	Histologi
0			
1			
2			
3			
4			