

Emerging problems with zoonotic bacteria in intensive warm water fish

culture: facts and risks

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Introduction

- Warm water aquaculture in intensive indoor recirculation farms develops fast
- In Europe & the USA
- More fish species, more farms
- More zoonotic bacteria found in diseased fish
- Water temperatures 24-28°C

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Introduction (2)

The Netherlands, last decennia, in intensive warm water indoor culture:

- *Vibrio vulnificus*
- *Edwardsiella tarda*
- *Streptococcus agalactiae*
- *Mycobacterium marinum*
- In eels, African catfish, tilapia and barramundi

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Introduction (3)

- Connected to problems with injuries of fish farmers and fish processors : swollen hand, chronic infections, or even worse
- In man especially problems with *Vibrio vulnificus* and *Mycobacterium marinum*
- Monitoring 2008: Also zoonotic bacteria found in healthy looking fish
- This is of great concern
- Therefore this (workshop and) lecture

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Facts: Bacteria in focus

- *Vibrio vulnificus*
- *Streptococcus iniae*
- *Streptococcus agalactiae*
- *Edwardsiella tarda*
- *Mycobacterium marinum*
- *Mycobacterium fortuitum*

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Facts: Zoonotic fish pathogenic bacteria found in **diseased** edible Dutch fish:

- *Streptococcus agalactiae* (tilapia)
- *Edwardsiella tarda* (eel, cichlids, turbot, a.o.)
- *Vibrio vulnificus* (eel, barramundi (and in man))
- *Mycobacterium marinum* (eel, African catfish, tilapia, sturgeon, sea bass (and man))

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Pictures of Nile tilapia in the USA with *Streptococcus iniae*/ *S. agalactiae* disease signs



(pictures: thanks to Joyce Evans)

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Clinical signs of *Streptococcus iniae* and *S. agalactiae*

- Exophthalmus, damaged eyes
- Surfacing, anorrexia
- Swimming turn-wise
- "C-shaped" body
- Feces hanging out of anus


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Typical *Edwardsiella tarda* lesion in eel



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Edwardsiella tarda-infections in Dutch indoor fish culture



cichlid turbot

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Case study 1: persistent *Vibrio vulnificus* biotype 2 in a Dutch eel farm (1st & 2nd outbreak in January 2008)



severe, chronic lesions, high mortality

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Case study 1: 3rd outbreak: March 2008



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Case study 1: April-May 2008: severe zoonosis: necrotic fasciitis in hand of a Dutch eel farmer

Fasciitis necroticans, which
resulted fast in full sepsis



Intensive Care, immediate surgery (4x)(boar claw incision)
and antibiotics treatment (amoxicilline, ceftazidim,
ciprofloxacin,doxycycline)



Man survived

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Case study 1: Eel farmer: reconstruction surgery of hand & arm

If 4x surgery to get rid of necrotic centers had not been done,
plus antibiotics treatment, patient would not have survived

Pictures and text in Dutch, see Reference:

*Dijkstra, A, Van Ingen, J, Lubbert, P.H.W., Haenen, O.L.M.,
Möller, A.V.M., 2009. Fasciitis necroticans ten gevolge van
een Vibrio vulnificus infectie in een palingkwekerij. Ned.
Tijdschr. Geneesk. 153: B157.*

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Case study 1: This *Vibrio vulnificus* was antibiotic resistant to:

- Oxytetracycline
- Flumequine, Oxolinic acid
- Trimethoprim + sulphonamid
- Neomycin
- Enrofloxacin
- Nitrofurantoin

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Vibrio vulnificus diagnoses since 1991 at CVI

29 x found:

- 25x in eel (all ages)
- 1x in barramundi
- 2x in ornamental fish
- 1x in man

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TBC: ZN-positive barramundi, with many spines



Fish TBC (*M.marinum*) is also found at
fish slaughtering sites of f.i.

African catfish

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Facts: Zoonotic bacteria in healthy fish (monitoring in NL, supported by the Ministry of Agriculture, Nature Conservation and Food Safety)



tilapia



African catfish

8 portions African catfish (each 5 fish)

7 portions tilapia

5 portions eel

Taking samples: isolation, TBC-check (ZN stain, and possibly identification by PCR)



Facts: zoonotic bacteria in healthy fish in NL

- *Streptococcus agalactiae* in big Afr.catfish (1x of 8)
- *Edwardsiella tarda* from small Afr.catfish (1x of 8)
- *Mycobacterium fortuitum* complex in tilapia (3x of 7)

Risks for man with low immune status (literature):

- ***Vibrio vulnificus***: meningo-encephalitis, gastroenteritis, septicemia, metastatic cellulitis in arms or legs, wound infections, eye inflammations, necrotic fasciitis and myositis
- ***Streptococcus agalactiae***: meningitis, endocarditis, spondylodiscitis and osteomyelitis
- ***Edwardsiella tarda***: severe wound infections, diarrhea and liver abscesses
- ***Mycobacterium marinum*** swimmer granuloma, subepidermal granuloma in hands/arms

Discussion: Facts around zoonosis in NL

- Spiny fish cause hand injuries in fish farmers/processors: tilapia, African catfish, barramundi, sea bass
- Fish slaughters: also cut in their hands with a knife
- No gloves are worn, hygiene is low
- Fish TBC: Chronically swollen hands, arthritis, granuloma in arm
- Hospitals isolate human bacteria at 37°C: TBC may be missed! It needs 30°C
- Anamnesis lacks information of contact with fish

Discussion/future:

- Need for good information: Zoonosis flyer for fish culturists and fish processors, but also vets, doctors, hospitals: on signs, prevention, hygiene, and therapy,...
- Make *Vibrio vulnificus* notifiable? Some doctors would say: yes, compared to human *Streptococcus* infections.
- Investigation of the problem at EU and world scale?
- Therapy and disinfection studies?
- Antibiotic resistance studies?

Thanks!

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and Food Safety, and our
colleagues from CVI

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