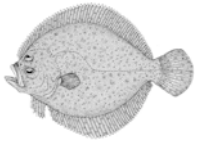
FISH HEALTH MANAGEMENT

PDFs available online in

ENGLISH / GREEK / SPANISH / FRENCH / GALICIAN / HUNGARIAN / NORWEGIAN / POLISH /TURKISH

HEALTH MANAGEMENT OF TURBOT:
English
(Scophthalmus maximus)



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Education and Culture DG
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AQUALEX Fish Health Toolset

The **AQUALEX Fish Health Toolset** was developed in order to combine teaching and learning in a specific subject area (fish health) with basic language learning in those languages most important in the European aquaculture industry. Its fish health materials should not however be regarded as a comprehensive fish disease manual for the selected species, for there are many such reliable and comprehensive publications.

The following topics and species were selected by industry users as well as VET providers:

- Fish Health/Disease Management for Trout, Sea Bass, Turbot and Carp
- Fish Farm Quality Assurance Manual
- Basic Techniques for Fish Haematology

A unique feature of the **AQUALEX Fish Health Toolset** consists in its supporting language units, designed to help users not only to find the information/content they need, but also to enable them to communicate in the workplace in their targeted language.
For those users who need fast access to reliable multi-lingual information on matters concerning fish health, the Toolset contains a **fish diseases glossary** in English, French, German, Spanish, Italian, Greek, Norwegian, Polish, Hungarian, Turkish and Galician.

For those users who need to learn or to improve their language skills, the Toolset provides online language lessons in the above-mentioned languages.

The **AQUALEX Fish Health Language Support** is available at three levels.

Level 1 (Common European Framework of Reference for Languages - CEFR) levels A1, A2)
The priority for many **first-time language learners** is to understand and convey simple but vital pieces of information (i.e., keywords) in a new language. The AQUALEX language lessons for Beginners (**English, French, Spanish, Greek, Norwegian, Polish, Hungarian, Turkish, Portuguese, Swedish** and **Galician**) are designed to enable complete beginners to use their native language knowledge of familiar items in the workplace/laboratory, in step-by-step visual presentations with audio input (www.aqualex.org and www.pescalex.org Level I) This method gives them a chance to fast-track their language learning at their chosen time and at their own speed.

Level 2 (CEFR levels B1, B2)
Having picked up the first essentials in a user-friendly way, **students or workers** aiming to improve their language skills can progress at their own speed through the Toolset Fish Health course materials in **English, French, Spanish, Greek, Norwegian, Polish, Hungarian, Turkish** and **Galician**, online (www.aqualex.org or www.pescalex.org Level II). They can acquire vocationally relevant information on the above aspects of fish health, either in the native or the targeted language.

Level 3 (CEFR levels C1, C2)
For the seasoned practitioner, Ph.D student or academic, the Toolset contains two **multi-lingual fish diseases and aquaculture glossaries** in **English, French, German, Spanish, Italian, Greek, Norwegian, Polish, Hungarian, Turkish and Galician**. These online resources present high-level information and detailed definitions in the accepted academic format.

The AQUALEX online materials (the AQUALEX Toolset) do not form part of externally recognised national or international academic or vocational curricula. However, registered users may incorporate the materials in specific courses if permission has been obtained.

TABLE OF CONTENTS

HEALTH MANAGEMENT OF TURBOT
(Scophthalmus maximus)

VIRAL DISEASES

Several viral diseases might cause disease and mortalities in turbot.

- Viral Haemorrhagic Septicaemia, VHS (as in salmonids)
- Viral Nervous Necrosis, VNN (as in Sea bass)
- Viral Erythrocytic Infection, VEI (as in Atlantic salmon)
- Infectious Pancreatic Necrosis IPN (as in salmonids)

Viral erythrocytic infection Paramyxovirus

Epidemiology

- Since 1992 in Spain

Viral erythrocytic infection (Paramyxovirus)
Source - Alicia E. Toranzo et all 1997 **ESTADO ACTUAL DE LA PATOLOGIA BACTERIANA Y VIRICA EN LA PISCICULTURA ESPAÑOLA**
http://www.revistaaquatic.com/aquatic/art.asp?t=h&c=18

Behaviour

Clinical picture
External Appearance

- haemorrhages in the head, mouth and fins
- dermatitis
- exophthalmia
- abdominal distension (Ascites)

Internal lesions

Diagnosis
Microscopy

- Presence of pale blue inclusions in affected erythrocytes.

Electron microscopy of these erythrocytes

- virus particles of 50–160 nm in size in the cytoplasm,
- budding of the cell membrane and extracellularly.

Histopathology

- occasional necrosis of kidney haematopoietic tissue
- increase in the size and number of melanomacrophage centres of the spleen and kidney
- oedematous areas with hepatocytes containing eosinophilc bodies in the liver
- Degeneration of muscle fibres accompanied by an intense inflammatory oedema
- Dermatitis as well as uveitis and corneal oedema were consistent lesions.

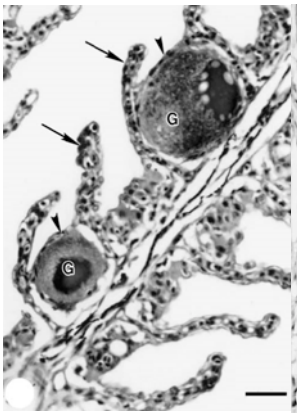
Herpesvirus by *Herpesvirus scophthalmi*

Epidemiology

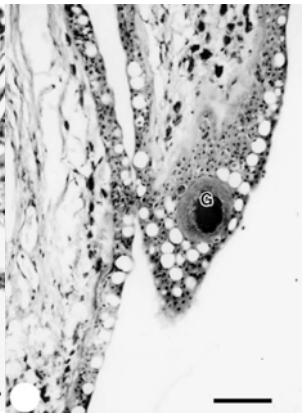
- Described more than 20 years ago
- Easy to isolate from fish without apparent symptoms
- Appear after a stress situation, e.g. transport or handling.

Behaviour

- Erratic swimming.



Scophthalmus maximus. Giant cells (G) in turbot gills located between secondary lamellae (arrows) and covered by 1 to 2 layers of squamous respiratory epithelium (arrowhead). Scale bar = 20 µm SOURCE - HELLBERG et all 2002



Scophthalmus maximus. Giant cell (G) in turbot skin. A giant cell is observed in the epidermis. Scale bar = 50 µm SOURCE - HELLBERG et all 2002

Clinical picture

External appearance:

- Development of giant cells in skin and gills

Internal signs:

- None

Diagnosis:

- Microscopic observation of big brown-yellowish rounded ‘giant’ cells with external capsule and a central nucleus, (characteristic “fried egg” appearance) in skin scrapings and fresh gill preparations
- Confirmation by histological analysis

Differential diagnosis:

- Epitheliocystis
- Lymphocystis

Treatment:

- None

Action:

- Proper husbandry and hygiene
- Infection is self-resolved

BACTERIAL DISEASES

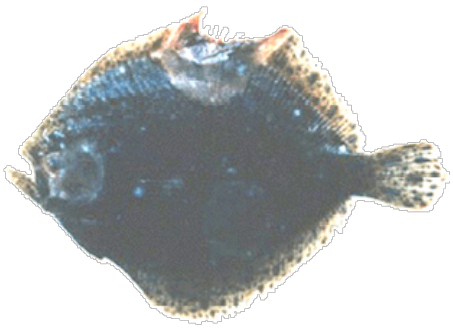
- Frequently diagnosed in cultured turbot.
- Antibiotic treatment is more effective in fry and juveniles than in adult fish, because diseased adult fish are not fed.
- Higher antibiotic dose for a longer period is required for adult fish.
- Vaccination is the most important key for the prevention of bacterial diseases.

  - **Flexibacteriosis (*Flexibacter maritimus*-renamed *Tenacibaculum maritimum*)**
  - **Vibriosis (*Vibrio anguillarum*)**
  - **Furunculosis (*Aeromonas salmonicida* spp)**
  - **Streptococcosis (*Streptococcus parauberis*)**
  - **Edwardsiellosis (*Edwardsiella tarda*)**
  - ***Serratia liquefasciens***

Flexibacteriosis (*Flexibacter maritimus* renamed *Tenacibaculum maritimum*)

Epidemiology

- Affects almost all the marine species
- Causes typical ulcerative cutaneous lesions
- High prevalent disease on turbot farms
- Characteristic in very intensive culture systems
- Associated with
  - high stocking densities
  - sudden fluctuations in temperature
  - stress



Source - Alicia E. Toranzo et all 1997 **ESTADO ACTUAL DE LA PATOLOGIA BACTERIANA Y VIRICA EN LA PISCICULTURA ESPAÑOLA**

Behaviour

- Loss of appetite
- Sluggish behaviour

Clinical picture

External appearance

- Fry and juveniles
  - grey patches in dorsal fin area
  - erosions and haemorrhages in mouth & lower jaw ("red mouth")
  - lesions, ulceration and tissue destruction around the mouth in severe cases, often yellow in colour due to the presence of the bacteria.
  - sometimes gill rot
- Adult fish
  - deep ulcerations on skin covered by a whitish necrotic debris.
  - High mortalities can occur without treatment.

Internal lesions:

- Presence of typical long and thin filamentous bacteria, specially forming aggregates in severe cases

Diagnosis based on:

- clinical picture
- typical external lesions
- microscopic examination of imprints of the external lesions and sometimes in severe cases, in internal organs (Presence of typical long and thin Gram negative filamentous bacteria, specially forming aggregates)

Confirmation:

- Isolation of the bacteria in specific culture medium and identification with biochemical, serological or molecular methods.

Differential diagnostics: Vibriosis and Furunculosis.

Treatment

- Combination of:
- external baths with disinfectants (formalin) with
- oral antibiotic treatment following an antibiogram.

Prevention

- Improve hygienic measures
- Application of H_2O_2 at a concentration of 240 ppm only as a general disinfection preventive method for treating water culture and surface of tanks before the introduction of fish
  - Reduce the density of affected units
  - Licensed vaccine in Spain

Vibriosis by *Vibrio anguillarum* mainly by the O1 and O2 serotypes

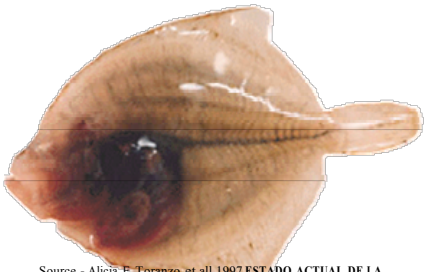
Epidemiology

- Normally appears in fry and juveniles, especially after stressful conditions.

Clinical picture

Behaviour

- Sudden mortalities
- Lethargy
- Loss of appetite



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http://www.revistaaquatic.com/aquatic/art.asp?t=h&c=18

External appearance:

- Dark Skin colouration
- Acute disease can cause high mortalities.
- Classic haemorrhagic septicaemia with cutaneous ulcerations.
- Frayed fins
- Erosions and haemorrhages on fins especially on dorsal and anal fins (different from Flexibacteriosis)
- Exophthalmia
- In more advanced phase lesions are found on the surface of the skin.
- Lesions can progress become very deep skin ulcers

Internal lesions:

- Severe congestion of all the internal organs can be observed.

Diagnosis is based on:

- Presence of typical lesions
- Observation of typical small bacilli sometimes with “coma” shape in imprints of these lesions and internal organs
- Isolation of the agent and identification by traditional microbiological methods (API system)

Treatment:

- Oral antibiotic treatment for 10 days can be quite effective in juveniles
- Relapses can be usual.
- It is always recommended to carry out antibiogram for confirmation of sensitivity

Vaccines:

- Licensed vaccines for turbot only in Spain
  (Combination immersion with *Flexibacter maritimus* vaccine)

Furunculosis by *Aeromonas salmonicida* spp

Epidemiology

- Chronic Bacterial Septicaemia affecting adult fish causing low but constant mortality.
- It is not a very frequent disease in turbot (specially if compared with salmonids)
- When it appears in one farm, it can become quite insidious and very difficult to control.

Clinical picture
Behaviour

External appearance:

- Small whitish nodulations on the surface of the skin (bacterial aggregates) become erosions and haemorrhagic ulcers.
- Boil-like skin lesions

Internal lesions:

- Congestion of internal organs
- Small whitish granulomas in spleen and kidney (bacterial aggregates).

Diagnosis

- Clinical picture and lesions
- Presence of bacteria in imprints of internal organs
- Bacterial isolation based on standard microbiological techniques. Colonies produce a brownish pigment which diffuses on the culture plates.

Differential diagnosis:

- Vibriosis
- Flexibacteriosis
- Microsporidiosis.

Treatment

- Antibiotic chemotherapy
- Duration 10 to 15 days
- Relapses often occur.

Vaccines:
Licensed vaccines for immersion and injection can achieve good protection.

Streptococcosis by *Streptococcus parauberi*

Epidemiology:

- Acute septicaemia by Gram positive cocci.
- Important disease that affects all sizes of turbot
- Temperature-dependent, (appearing at temperatures above 18° C)
- Stress from intensive culture can determine the onset of this disease
- Causes significant mortalities.

Clinical picture
Behaviour

External appearance:

- Severe external haemorrhages of fins, skin, and serosal surfaces
- Very pronounced bilateral exophthalmia
- Accumulation of purulent fluid on the periorbital zone (image) and base of fins
- Ulcers

Source - Alicia E. Toranzo et all 1997 **ESTADO ACTUAL DE LA PATOLOGIA BACTERIANA Y VIRICA EN LA PISCICULTURA ESPAÑOLA**

Internal lesions:

- Ascitic fluid
- Hemorrhages in kidney, spleen and digestive tract
- Exudative peritonitis, with pseudo-membranes of fibrin covering organs.

Diagnosis based on:

- Clinical picture and lesions
- Observation of Gram positive cocci typically forming chains in imprints of internal organs
- Isolation and identification of the bacteria.

Treatment:

- Complicated and expensive.
- It is possible to use Erythromycin but it is not very effective.
- Very difficult to avoid relapses, while temperatures are high.

Vaccines:

- One licensed vaccine in Spain that is very effective
- IP injection in juveniles will protect them during the whole production cycle.

Edwardsiellosis by *Edwardsiella tarda*

Epidemiology:

- Septicaemia disease by Gram negative short rods.
- Described some time ago for turbot
- Recently caused serious problems in France and Spain.
- Associated with stress and high temperatures
- Appears at the end of summer and autumn like Streptococcosis.

Clinical picture
Behaviour

External appearance:

- Inflammation and Haemorrhages on skin and fins
- Bilateral exophthalmia (sometimes with periorbital tumefaction with purulent fluid)
- Abdominal swelling (Ascites)
- Can be confused with Streptococcosis

Internal lesions:

- Ascites
- Inflammation and haemorrhages of the internal organs mainly in spleen and kidney.
- Severe apostematous inflammatory reaction,
- Large number of nodules and abscesses in kidney and spleen (with purulent fluid)
- Liver is less affected (only phagocytes loaded with bacteria that have no degenerative changes and some were dividing)
- Macrophages - main cell type implicated in the inflammatory response.

Differential Diagnosis
Streptococcosis

- Observation of Gram negative short rods in imprints of internal organs (inside the macrophages, mainly in spleen and kidney)

Treatment

- Quite complicated and expensive like Streptococcosis.
- It is possible to use Erythromycin but it is not very effective.
- Very difficult to avoid relapses, while temperatures are high.
- Difficult to control the disease until the adverse environmental conditions are restored.

Serratia liquefasciens

Epidemiology

- Described previously for turbot
- Has recently reappeared
- Caused by stress and high temperature (above 16-17ºC)
- Causes chronic mortalities.

Clinical picture
Behaviour

External appearance:

- Bacterial septicaemia
- External haemorrhages
- Abdominal dilation.

Internal lesions:

- Ascites
- Haemorrhages in all the internal organs
- Whitish nodules in spleen and kidney (abscess or necrosis by liquefaction)

Diagnosis:

- Isolation and identification of the bacteria with usual microbiological methods.

Treatment:

- Oral antibiotic treatment, although normally not very effective.

PARASITIC DISEASES

Epidemiology

- These are the most severe threats of turbot farming due to:
  - Turbot anatomical and physiological characteristics
  - Turbot culture system
  - Turbot special susceptibility to parasitic diseases.
- Mortalities can become very high
- Diagnosis is not always easy
- Absence of effective treatments.
- Research is currently focused on these diseases

  - **Amoebic Gill Disease AGD (*N.pemaquidensis* and *N.aestuarina)***
  - **Scuticociliatosis (*Philasterides dicentrarchi*) (**
  - **Microsporidosis *(Tetramicra brevifilum*)**
  - **Intestinal Myxosporidiosis (*Enteromyxum scophthalmi)***
  - **Trichodiniasis *(Trichodona* spp*)***

Amoebic Gill Disease AGD by *N.pemaquidensis* and *N.aestuarina*

(Protozoa, genus Neoparamoeba)

Epidemiology:

- Very dangerous disease of Atlantic salmon that can affect other marine species like turbot.
- High mortalities
- Predisposing factors such as: high temperatures, water quality, stressful managements, etc.

Clinical picture
Behaviour

- Lethargic fish
- Increased opercular movement frequency
- Fish at the tank bottom with its ventral side looking up.

External Appearance:

- External appearance close to normal

Internal signs
Characteristic gill pathology

- Gills appear pale with abundant mucus
- Swollen filaments
- Presence of white patches is typical
- Lesions more evident on the dorsal part of the gills.

Diagnosis

- Relative easy but it requires some practice
- Clinical picture
- Internal lesions
- Gill microscopic examination
    - Typical cells of amoeboid morphology can by observed in gill imprints. These imprints are prepared from the mucus of the dorsal part of the gill, where normally most of the parasites are accumulated, and stained with a quick haematological staining, as the Diff-Quick^{R} .
- Confirmation through histopathology, (observation of typical lesions: epithelial hyperplasia and lamellar fusion).
- Chronic Amoeba infections are complicated by secondary infections with *Flexibacter* and/or *Vibrio* that can confuse diagnosis and can result in wrong and ineffective treatments.

Treatment:

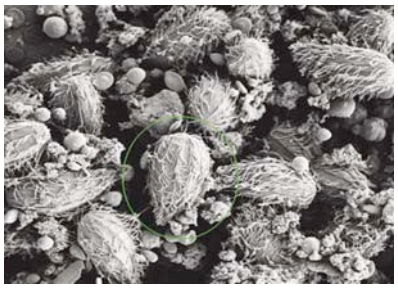
- Two fresh water baths for one or two hours every 3 or 4 days
- Quite effective although complicated.

Prevention:

- The only possible prevention is through the correct management practices and hygiene.

Scuticociliatosis or infection by histophagous ciliate *Philasterides dicentrarchi* (scuticociliate protozoan histophagous ciliates Ciliophora)

Epidemiology:



Unidentified scuticociliate from the brain of farmed turbot. Helsesituasjonen hos marin oppdrettsfisk Renate Johansen, i i l

- These ciliates are normally free-living saprophyte protozoa.
- Under stressful conditions or poor water quality that cause fish immunosuppression, ciliates become aggressive pathogens.
- Initial external parasitosis eventually spreads to almost all the internal organs.
- The parasite has:
  - particular piriform morphology
  - one caudal flagellum /cilium
  - It moves quickly and always forward
- Very severe disease
- Affects young and adult fish, with chronic mortalities, that can become very high (20-50%)

Clinical picture

Behaviour

- Anorexia
- Erratic and inverted swimming
- Swimming behaviour alterations

External Appearance

- Darkening of the ventral skin
- Reddening of the fin bases
- Exophthalmia
- Abdominal dilatation (Ascites)
- External erosions over opercula and dorsal side (advanced cases)
- Cutaneous ulcers

Internal signs

- Ascites
- Congestion of internal organs.

Diagnosis:

- Fast parasite detection is very important (due to the severity of the disease) when it is external and before the systemic invasion.
- Observation of the ciliates in fresh skin and gill smears as well as in the ascitic fluid.
- Possible not to find parasites on the skin and gills but only on internal organs, with squashes of the brain (and the rest of the organs) and preparations of ascitic and eyes liquid.
- Definitive diagnosis through histological analysis. Histological examination reveals hyperplasia and necrosis of the gills, epidermis, dermis and muscular tissue without inflammatory response.

Treatment:

- There is no treatment for the systemic phase
- Baths of disinfectants (formalin) can only treat external parasitosis

Prophylaxis

- Immunostimulants and vitamins could be beneficial
- Proper management practices and strict hygiene
- Avoid stressful situations
- Routine examinations for the early detection of the parasite

Microsporidosis *by* *Tetramicra brevifilum* microsporean parasite

Epidemiology

- One of the most frequent parasitic diseases in turbot
- Affects young and adult fish
- High mortalities are reported in some cases but if disease is endemic in farm, it usually causes trickling mortalities caused by stressful situations or bad environmental conditions.
- Often associated with other bacterial or parasitic pathogens.

Clinical picture

Behaviour

External Appearance

- Affected fish look dark and thin.
- Small cysts or whitish nodules (xenomas) can be observed on
    - skin and fins

Internal Signs

- Small cysts or whitish nodules (xenomas) can be observed on
    - internal muscular fibres
    - almost all internal organs like kidney, spleen and digestive tube.

Diagnosis

- External appearance and internal lesions
- Observation of spores inside the xenomas in fresh skin smears and internal organs squashes.
- The microsporean spore has a typical oval or bullet morphology and a big vacuola on one side.
- Histology (Definite diagnosis).

Treatment

- No known treatment.
- Immunostimulants and vitamins
- Improve general management practices for hygiene and disinfection.
- Density reduction

Intestinal Myxosporidiosis by histozoic mixosporean *Enteromyxum scophthalmi*

Epidemiology:

- Very severe haemorrhagic enteritis
- Currently the most serious threat for the industrial turbot culture
- Not many reported cases
- Prognosis is always the same: 100 % mortality in 6 months to a year.
- All sizes of fish are sensitive
- Adult fish on market size are the most affected.
- Severity and economical impact of the disease is unquestionable.
- Transmission by an intermediate host (invertebrate or actinosporean) cannot be ruled out.
- Recent studies have shown that there is direct transmission fish to fish, by cohabitation
- Aggressive and extremely easy transmission
- Involvement of wild fish as a reservoir of the infection.

Clinical picture

Behaviour

- Anorexia
- Progressive weight loss

External Appearance

- Eyes sunken and bony ridge of the cranium very pronounced.
- Numerous white cysts on the skin and gills

Internal signs

- Ascites
- Pale internal organs.
- Severe haemorrhages in the digestive tract (mainly final part)

Diagnosis

- Pathognomonic external symptoms and intestinal signs
- Other chronic diseases can give similar appearance.
- Histology (definitive diagnosis with low sensitivity at the beginning of infection)
- Future development of molecular techniques for parasite detection.

Treatment

- As in Microsporidosis there is no available treatment.

Prevention

- Density reduction
    - Complete disinfection of facilities

Trichodiniasis by gill and skin parasite *Trichodina* spp (as Salmonids)

Epidemiology

- *Trichodina spp* – more a commensal than a genuine ectoparasite.
- *Trichodina, Trichodinella, Tripartiella, Foliella* differ only in shape, size and hooks.
- *Tripartiella* sp. *Trichodinella* sp. are smaller than skin *Trichodina*
- Damage caused is comparable

Susceptible species

- All species and age groups.

Temperature

- All temperature ranges.

Mortality

- Depends on infection rate and fish size
- High mortality rate only occurs in cases of massive invasion
- Mainly affects rainbow trout fry and fingerlings.

Transmission

- Infected fish, water
- Undisinfected farm equipment
- Live food for ornamental fish
- Plants

Clinical Picture
Behaviour
External Appearance

- Grey-blue turbid layer on the skin
- Mucus and gill injuries
- Fin damage in fry and small ornamental fish
- Gill swelling
- Gill necrosis

Internal Signs
Diagnosis

- Microscopic examination at 60-160x magnification
- gill or skin scrape preparation.
- Video *Trichodina* gill can be seen as YouTube video http://youtu.be/i-Eld7_aRJ4
- Video *Trichodina* skin can be seen as YouTube video http://youtu.be/pM9S3l7cKVQ

Prevention

- *Trichodina* often occurs in combination with poor environmental quality producing a decrease of general health conditions
- Hygiene in hatcheries
- Quarantine for ornamental fish

Treatment

- Long- term baths (2 - 3g/10m^3) with malachite green (for non-food species). Combination of malachite green and Formaldehyde
- Short- term baths using:
  - Formaldehyde
  - chloride
- Liming for big ponds
- Sodium chloride for ornamental fish and sensitive domestic fish fry as short term baths: 1-1.5%, 20-30 min

- Long- term bath: 0.2-0.3% for at least 10-12 hours
- Treatment with salt is generally not 100% successful.

Action

- No legal action is required.

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