

# Healthy pond fish



- Recognize fish diseases, find out causes
- Treat successfully with sera treatments

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# 1 Prevention is better than the cure!

Stress affects the immune system and weakens disease resistance. It therefore is – just as in humans – one of the main factors for fish disease outbreaks. Stress is caused by different factors. Maintenance mistakes (too many, insufficient or wrong measures taken), a fish stock that does not harmonize, adding too many fish, strongly varying temperatures, overfeeding and correspondingly high organic water pollution along with a large number of pathogens in the water are among the most common ones. Frequently, diseases then break out whose unnoticed corresponding pathogens were already present in the pond (secondary parasites, among others).

## How does stress develop in a pond? – Examples

- Fish transfers and transports
- Varying temperatures, e.g. in spring and in autumn
- Frightened fish, e.g. due to keeping unsuitable species together or due to permanent hierarchy fights
- Frequent maintenance in the pond, e.g. due to permanent redesigns
- Ponds without places to hide or retreat
- Too strong water agitation
- Unsuitable water parameters
- Improper application of chemical agents (e.g. unsuitable fertilizers, substances from surrounding soil being washed in, wrong application of treatments)
- Poor hygienic conditions, e.g. by insufficient or wrong care
- Overfeeding or wrong/deficient nutrition due to feeding poor quality food
- Overstocking

**Avoiding stress =  
preventing diseases**

You will find extensive and well founded information about keeping your fish stress free in the **sera** guide “Relax at your garden pond throughout the year” and on [www.sera.de](http://www.sera.de). Your specialized retailer can counsel you in detail which fish are suitable for keeping together, and which special features and water parameters they require. If you then dedicate one to two hours per week to your hobby it will provide you unspoiled pleasure for a long time. In case a disease ever actually occurs, this guide and the **sera treatments** will provide excellent support for helping your pond fish quickly and effectively.

We want you to enjoy your pond and your healthy, lively fish to the fullest.



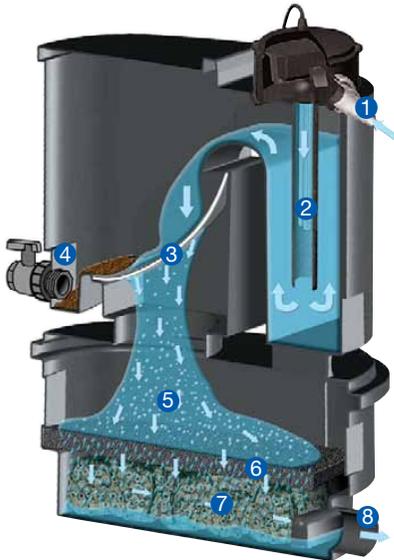
# 1 Prevention is better than the cure!

## Tip

The **sera UV-C Systems** reduce the number of pathogens in fresh and salt water aquariums as well as in ponds in a merely physical way, without chemical agents. Many pathogens as well as annoying algae are reduced or even almost entirely removed by directed use of a UV-C lamp. Filter bacteria remain largely unaffected as

most of them cling to the filter material (**sera siporax pond** is particularly well suited) and to the bottom gravel. The **sera UV-C Systems** therefore provide an important contribution to disease prevention and largely contribute to high life quality in ponds.

**sera KOI Professional 12000 Pond Filter with 24 Watt UV-C System**



- 1 Water intake
- 2 UV-C clarifier
- 3 Stainless steel split sieve 200 µm
- 4 Sludge outlet

**sera KOI Professional 24000 Pond Filter with option to connect two 55 Watt sera pond UV-C Systems**



- 5 Oxygen enrichment
- 6 Matala mat
- 7 Biofiltration with **sera siporax pond**
- 8 Outlet, crystal clear healthy water

# 2 Recognizing fish diseases

Unfortunately, fish diseases may occur even when best care conditions are provided. It is important to recognize these diseases, allocate them correctly and treat them. Some basic knowledge about the most common fish diseases is required to do so.

You should observe the fish for disease symptoms and unusual behavior every day when feeding them as to ensure you can judge their health status. Be extremely vigilant even if only one fish separates from the others or behaves conspicuously in another way.

Generally, external and internal diseases are distinguished, depending on where they occur.

**External diseases** mainly occur on the fins, the skin and the gills. They can usually be recognized in early stages and therefore be treated in time.

**Internal diseases** are less easy to recognize. However, upon careful observation almost all diseases lead to untypical behavior. This includes loss of appetite, conspicuous swimming behavior, apathy and color changes.

Attentive fishkeepers therefore can quickly notice something is wrong also in case of internal diseases.

Regular and careful observation allows to recognize many diseases already in their early stages. The affected fish are not yet weakened too much, and chances are good that healthy fish will not be infected at all.

Correct diagnosis is a precondition for successful treatment. **sera treatments** are tailored to specific diseases and do not unnecessarily burden the fish or the pond.

A general rule applies for all diseases: treating quickly considerably increases the chances for recovery. This in particular applies for very contagious diseases.

We will provide you with exemplary pictures and symptom descriptions for diagnosis support along with treatment recommendations in the following chapters. Please take your time and carefully read the sections about all possible disease causes as well as the general useful advice at the end of this guide booklet. Some disease symptoms look very similar at first. A hasty and, accordingly, possibly wrong diagnosis might lead to a wrong treatment with far reaching consequences. If in doubt, please consult a specialized veterinarian.



Tip

Observation



Diagnosis



Treatment

## 2 Recognizing fish diseases



### Tip – Broad range treatments

Carefully observing the fish is of course not as easy in a pond as it is in an aquarium. It will therefore not always be possible to get a precise diagnosis, especially in large natural ponds and rather shy fish. The **sera** product range therefore includes three broad range treatments specially developed for ponds – **sera pond omnipur**, **sera pond omnisan** and **sera pond cyprinopur** – that allow for a gentle, successful treatment even if the precise disease cause is unknown. The broad effect ranges of these treatments each cover a large part of the pathogens that commonly affect ornamental pond fish.



The contents of this guide were compiled by an expert team with all required care and according to newest scientific findings. Nevertheless, this short brochure can only give an overview about some of the most common fish diseases and their causes. Rarely occurring diseases or those that cannot be treated at all or only with support from a veterinarian (e.g. ulcers caused by cancer, nerve damages and genetic deformations) are not included here. In such cases, we wish to refer you to further specific literature, e.g. to the easily understandable and abundantly illustrated book, “Krankheiten der Aquarienfische” by the

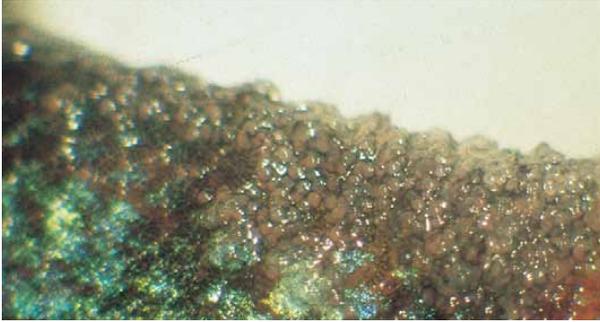
**sera** specialist Dieter Untergasser, issued by the Kosmos Verlag (available only in German language).

Please note that the chemical and biological conditions in different ponds may differ very strongly. It is therefore not possible to precisely predict the exact reaction for each single pond and for each animal species. This in particular applies if chemical substances have entered the pond with water, organic pollution or previous treatments and might cause unpredictable cross reactions with the treatments. A general warranty and liability for personal injuries, property damage or financial loss due to the treatment suggestions in this guide is therefore excluded by the editor.



## 2.1 Diseases caused by viruses

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*Lymphocystis*

### Observation

Firm, globular cysts measuring 0.5 to 1 mm on the skin and the fins (mucous membrane cells strongly enlarged by the virus).

**Diagnosis: *Lymphocystis***

Treatment: page 24



Koi with carp pox

### Observation

Gelatinous, pale to pink colored skin elevations shaped round to oval, sized between 5 and 10 mm, form on the body surface. Mostly occurs on Koi in spring.

**Diagnosis: Carp pox**

Treatment: page 24



## 2.1 Diseases caused by viruses



Koi with bleeding skin



Secondary infection by bacteria



Bleeding skin

### Observation

Apathy, balance problems, extensive or punctual bleedings, pale gills.

Late stage: protruding eyes, puffed out anus, slimy fish waste, bloated belly and protruding scales. The disease mainly breaks out at temperatures about 15°C (59°F).

**Diagnosis:** *Rhabdovirus carpio*, SVC (Spring Viremia of Carp)

Treatment: page 25



## 2.2 Diseases caused by bacteria



Columnaris disease

### Observation

Clamped fins, white lips, white edged scales and white coatings in the head and back area; skin tears open; loss of scales; spreads wider within hours.

**Diagnosis:** *Columnaris disease*

Treatment: page 26



## 2.2 Diseases caused by bacteria



Fin rot in its final stage

### Observation

Fins rot away with white edges, in final stages up to the fin base.

### Diagnosis: Fin rot

Treatment: page 26



Bacterial gill rot (gill lid removed)

### Observation

Pale gills, milky skin areas, the gill filaments decompose in final stages.

### Diagnosis: Bacterial gill rot (mostly secondary infection, e.g. after a parasite infestation)

Treatment: page 26



## 2.2 Diseases caused by bacteria



Foci of infection – often caused by bloodsucking parasites and skin flukes

### Observation

Small bleeding spots on the skin, the fins and the gills, or boils and ulcers that break up bleeding. Foci of infection are often caused by bloodsucking parasites and skin flukes.

**Diagnosis:** Infection by *Aeromonas* or *Pseudomonas* bacteria

Treatment: page 26



Dropsy with distinct scale protrusion

### Observation

Protruding eyes, puffed out anus, slimy fish waste, bloated belly and protruding scales (not all symptoms are always fully distinctive).

**Diagnosis:** Dropsy (caused by bacteria)

Treatment: page 26



## 2.2 Diseases caused by bacteria



Goldfish with ulcer caused by Erythrodermatitis



Erythrodermatitis in its final stage

### Observation

Cyprinids get red spots that develop into deep holes and ulcers with white edges; ulcers grown on the outer body side break through into the body cavity in final stages.

### Diagnosis: Erythrodermatitis

Treatment: page 27



## 2.3 Diseases caused by fungi



Goldfish with fungal infection on the side

### Observation

White, cotton-like outgrowths on the skin with long filaments standing away (often after a previous injury).

### Diagnosis: Fungal infection (Mycosis)

Treatment: page 28



## 2.4 Diseases caused by flagellates



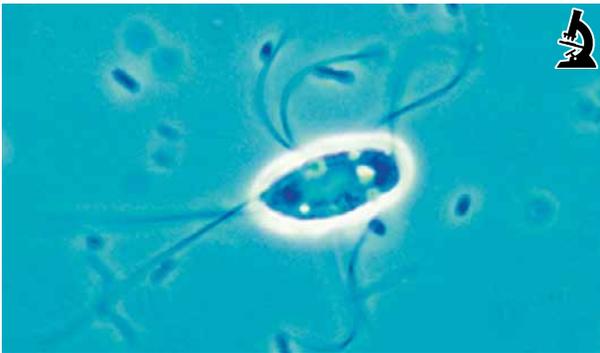
Koi with skin slime caused by *Ichthyobodo necator*

### Observation

Color changes to gray or milky in some areas of the skin (reddish in case of stronger infestation); long finned fish have frayed fins; clamped fins.

**Diagnosis:** *Ichthyobodo necator*  
(formerly: *Costia necatrix*)

Treatment: page 28



*Spiroplasma* sp.

### Observation

Decomposing fins, slimy, whitish fish waste, holes in and around the head, possibly emaciation.

**Diagnosis:** Intestinal flagellates (*Hexamita* sp., *Spiroplasma* sp. as well as other parasites such as *Protoopalina* sp., *Trichomonas* sp., *Cryptobia* sp.)

Treatment: page 29



## 2.4 Diseases caused by flagellates



*Piscinoodinium*

### Observation

The fish scrub themselves on decoration and swim hectically in early stages, later on fine whitish yellow dots (< 0.3 mm) on skin and fins; frequently infestation of the gills; fish looks – especially in backlight – as if dusted with flour; velvet-like coating.

**Diagnosis: *Piscinoodinium*, Velvet disease**

Treatment: page 29



## 2.5 Diseases caused by ciliates



Goldfish with “Ich”

### Observation

Clearly visible white spots (0.4 – 1.5 mm) on skin and fins, clamped fins and scrubbing on decoration.

**Diagnosis: *Ichthyophthirius multifiliis*  
(white spot disease)**

Treatment: page 30



## 2.5 Diseases caused by ciliates

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Infestation with *Apiosoma* sp.

### Observation

Furry coating after mucous membrane injuries; many elongated protozoans on a short stalk (no long threads as in case of fungal infections) are visible with a strong magnifier.

**Diagnosis:** *Apiosoma* (formerly: *Glossatella*) or *Epistylis* (formerly: *Heteropolaria*)

Treatment: page 31



*Trichodina* infection

### Observation

Isolated, whitish thickened areas on the mucous membrane (partially stringy); small pale areas on the skin; apathy and loss of appetite. The fish scrub themselves and occasionally wince with their fins.

**Diagnosis:** *Trichodina*, *Tetrahymena*, *Chilodonella*

Treatment: page 31



## 2.6 Diseases caused by Plathelminthes (flatworms)



Gyrodactylidae

### Observation

The fish scrub themselves and become apathetic. Cloudy skin and small, motile worms on the skin (partially visible with the naked eye, otherwise detectable with a magnifier; mostly smaller than 1 mm).

**Diagnosis: Skin flukes / Gyrodactylidae**

Treatment: page 32



Gill filaments with *Dactylogyrus* infestation

### Observation

Breathing becomes stronger every day until the fish stay under the surface panting; sometimes one-sided breathing; one or both gill lids closed or spread open; small flukes usually sized less than 1 mm sit on the gills (possibly visible on a sedated fish with a magnifier); fish scrub themselves at the gill lid.

**Diagnosis: Gill flukes / Dactylogyridae**

Treatment: page 32



## 2.7 Diseases caused by fish leeches



Fish leech

### Observation

Circular bloody inflamed areas measuring 3 – 8 mm on the skin of the fish; up to 5 cm (2 in.) long (often shorter) worms with suction cups at both ends of the body and a ring pattern; can be found on aquatic plants or on the fish themselves.

**Diagnosis:** Fish leech / *Piscicola* sp.

Treatment: page 33



## 2.8 Diseases caused by crustaceans



*Argulus* on a Koi

### Observation

Fish jump and swim hectically; flat (louse-like), almost transparent crustaceans sized 4 – 14 mm with two black eyes visible on the skin of the fish; red sting marks on the fish skin.

**Diagnosis:** Fish louse / e.g. *Argulus*

Treatment: page 34



## 2.8 Diseases caused by crustaceans



*Lernaea* on a caudal fin

### Observation

White, bar shaped crustaceans with two small sacs at the end, they stick deeply and firmly in the skin; anemia and emaciation of the fish.

**Diagnosis: Anchor worm / *Lernaea***

Treatment: page 34



*Ergasilus* on the gills (gill lid removed)  
Photo: Dr. Dirk Kleingeld

### Observation

White to grayish blue crustaceans sized 0.5 – 3 mm on the gill filaments.

**Diagnosis: Parasitic copepod / *Ergasilus***

Treatment: page 34



## 2.8 Diseases caused by crustaceans



Parasitic isopod

### Observation

Clearly segmented, oval, opaque, yellowish to brownish arthropods [1 – 5 cm (0.4 – 2 in.)] are attached to the fish; bloody, dot-shaped sting marks.

### Diagnosis: Parasitic isopods

Treatment: page 34



## 2.9 Multiple infections



Goldfish with multiple infection

### Observation

Strong mucus secretion, often with fungal infection in some areas, numerous other symptoms possible.

### Diagnosis: Multiple infection (a differentiated diagnosis is usually possible only by a specialist)

Treatment: page 35



# 3 Deficiency diseases and malnutrition

## Observation

Deformation of gill lids, fins and spine in offspring.

**Cause: Mineral and vitamin deficiency** caused by too soft water and unsuitable food low in vitamins

Treatment: page 36



Fatty liver degeneration

## Observation

Listlessness, too thin or too thick animals, poor development.

**Cause: Low quality, monotonous food** leading to **liver fattening**, among others

Treatment: page 36



# 4 Maintenance mistakes and intoxications

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Emaciated Koi with slimy skin

## Observation

Pale colors, possibly conspicuous behavior.

**Cause:** Feeling unwell, caused by unsuitable or polluted water, or by not keeping the fish according to their requirements

Treatment: page 37



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## Observation

Mucous membrane rubbed off, skin injuries.

**Cause:** Injuries, e.g. by catching with a coarse fish net, transport injuries, injuries by trying hectically to escape (bouncing into sharp edged objects) or by territorial fights

Treatment: page 37



# 4 Maintenance mistakes and intoxications

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Air bubble disease  
Photo: Dr. Sandra Lechleiter

## Observation

Clear small blisters under the skin (0.5 – 2 mm).

**Cause: Air bubble disease** (oversaturation of the water with gas)

Treatment: page 38

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## Observation

Slimy, milky skin, cloudy bleedings underneath; thick cloudy coatings on the eyes; brownish coatings on the gills.

**Cause: Acidosis**

Treatment: page 38



# 4 Maintenance mistakes and intoxications



Damaged gills after an ammonia intoxication (gill lid removed)

## Observation

Whitish skin slime; frayed fins; gill filaments dying off.

**Cause:** Alkalosis or ammonia intoxication

Treatment: page 38



## Observation

Mucous membrane comes off, fins fall off.

**Cause:** Osmotic shock

Treatment: page 39



## Observation

Fish become apathetic and die suddenly in spite of beautiful colors, often without other outer disease symptoms; Koi jump above the water surface.

**Cause:** Acute nitrite intoxication

Treatment: page 40



# 5 Treatment chart

Disease	Treatment in ponds
<i>Aeromonas</i> or <i>Pseudomonas</i>	sera pond omnipur, sera KOI BAKTO TABS
Anchor worm ( <i>Lernaea</i> )	sera pond cyprinopur
<i>Apiosoma</i> or <i>Epistylis</i>	sera pond omnipur or sera pond omnisan
Carp pox	sera pond cyprinopur
<i>Columnaris</i> disease	sera pond omnipur, sera KOI BAKTO TABS
Dropsy	sera KOI BAKTO TABS, sera pond omnipur or sera pond cyprinopur
Erythrodermatitis	sera pond cyprinopur, sera baktopur direct (quarantine) or sera pond omnipur
Fin rot	sera pond omnipur, sera KOI BAKTO TABS
Fish leech	sera pond cyprinopur
Fish louse ( <i>Argulus</i> )	sera pond cyprinopur
Fungal infection (Mycosis)	sera pond omnisan
Gill flukes	sera pond omnipur
Gill rot (bacterial)	sera pond omnipur, sera KOI BAKTO TABS
<i>Ichthyobodo necator</i> ( <i>Costia</i> )	sera pond omnisan or sera pond omnipur
<i>Ichthyophthirius multifiliis</i> (white spot disease)	sera pond omnisan or sera pond omnipur
Injuries (infected)	sera pond omnisan or sera pond omnipur
Intestinal flagellates	sera KOI BAKTO TABS, sera baktopur direct (quarantine)
<i>Lymphocystis</i>	sera pond cyprinopur
Multiple infection	sera pond omnipur or sera pond omnisan
Parasitic copepods ( <i>Ergasilus</i> )	sera pond cyprinopur
Parasitic isopods	sera pond cyprinopur
Skin flukes	sera pond omnipur
Spring viremia	sera pond cyprinopur, sera KOI BAKTO TABS
<i>Trichodina</i> , <i>Tetrahymana</i> , <i>Chilodonella</i>	sera pond omnisan or sera pond omnipur
Velvet disease ( <i>Piscinoodinium</i> )	sera ectopur (in high dosages)

# 6 Treating fish diseases

## 6.1 Treating virus caused diseases



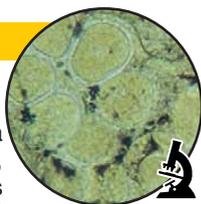
The best measure against virus caused diseases is to strengthen the immune system. Be sure to maintain good water values and provide your fish with all required nutrients – especially with vitamins (e.g. **sera KOI MULTIVITAMIN**). Fish with active disease resistance are considerably less frequently affected by virus infections than stressed animals. If ever they should be infected they will become healthy again more quickly.

You can suppress further spreading of viruses in your fish stock by using the disinfecting treatment **sera pond cyprinopur**. Gently increasing the water temperature supports and accelerates recovery in case of many viral infections. The immune system of the fish is then highly active, and the treatments are more effective (above about 12°C (54°F) water temperature). It is therefore preferable to isolate the affected fish and treat them in a separate, heatable quarantine tank at elevated temperature, – provided this is possible.

### Lymphocystis

Diagnosis: page 7

After intruding into a mucous membrane cell, the virus multiplies strongly, and the infected cell grows into a giant Lymphocystis that finally bursts and releases an enormous number of the pathogens into the water. These viruses then can infect the mucous membrane cells of the same fish or of other, not yet affected fish. Treatment with **sera pond cyprinopur** is suitable for suppressing this spreading within the garden pond. The treatment prevents the viruses



*Lymphocystis*  
in a skin swab

attaching to new cells. The infected skin spots heal within a few weeks.

Duration of the treatment depends on the course of the disease. Treating for two weeks is often necessary. In that case add only 0.5 ml instead of 1 ml per each 20 liters (5.3 US gal.) of pond water daily. You should carry out a partial water change after about a week, as well as for finishing the treatment. Otherwise please proceed as recommended in the information for use. Due to the long treatment duration, affected fish are best treated in a quarantine tank, as invertebrates (e.g. snails) and plants might suffer otherwise. The recommended larger partial water change will cause no problems this way, and you may gently increase the temperature with a heater for supporting the treatment. The healed fish need to be adapted very slowly (lower the water temperature by not more than 1°C (1.8°F) per day) back to lower temperatures before they can be transferred back.

### Carp pox

Diagnosis: page 7

These are not real pox but a Herpes infection, which however is not identical with the dreaded Koi Herpes Virus (KHV). It cannot be transferred to humans. The disease mainly breaks out in case of stress or weakness (often after the winter). It often takes a harmless course. The skin changes can heal by themselves under suitable care conditions.

You can carry out a treatment with **sera pond cyprinopur** according to the information for use for prevention or for inhibiting transfer to other fish. It should only be carried out if the temperature within the pond rises above 12°C (54°F). The vitamin preparation **sera KOI MULTIVITAMIN** strengthens the own disease resistance forces of the fish and may counteract an outbreak.

## 6.1 Treating virus caused diseases

### **Rhabdovirus carpio, spring viremia**

Diagnosis: page 8

Often accompanied by a secondary bacterial infection. Often manifests itself as “infectious dropsy” in final stages (however, dropsy may also occur as a symptom of many other disease causes that need not be linked to spring viremia).

Spring viremia of cyprinids is an acute, contagious virus infection. It gets into a pond via newly added, infected fish. Fish that have survived the disease become immune but remain latent virus transmitters for their entire life.

The viruses multiply only slowly at low temperatures. They only begin to multiply strongly when temperatures rise in spring. The fish, being weakened by the exhausting winter, are now particularly susceptible for this infection. Spring viremia becomes acute at temperatures between 15 and 17°C (59 and 63°F). Many or even all fish may die quickly, sometimes within a week, if it is not treated. The disease subsides at water temperatures above 20°C (68°F), and no deaths occur above 25°C (77°F). It is therefore particularly advisable to raise the temperature in a quarantine tank. However, the fish must not simply be put back into the cold pond water after they survived the disease. Maintain an appropriately long adaptation phase during which you lower the temperature again stepwise (lower by not more than 1°C (1.8°F) per day), or wait until pond temperatures have accordingly risen in the course of spring or summer.

Prevention is particularly important in case of virus diseases. Using high quality food rich in vitamins strengthens the immune system of the fish throughout the year. **sera KOI Professional Spring/Autumn Food** and **sera KOI Professional Spirulina Color Food** are ideally suited during spring and for conditioning the fish in autumn. You should additionally add **sera KOI MULTIVITAMIN** during this dangerous time and carefully maintain good water quality and sufficient oxygen supply.



In case spring viremia should break out in spite of the preventive measures you can suppress the further spreading of viruses with **sera pond cyprinopur** and combat secondary bacterial infections with **sera baktopur direct** or **sera KOI BAKTO TABS**. Fish with a bloated belly can often not be saved and excrete large amounts of viruses and bacteria. You should therefore separate them from the other fish during the treatment and put them into a separate treatment tank, wherever possible.

## 6.2 Treating bacterial diseases

Bacteria are present in every pond and fulfill important tasks in there, e.g. the breakdown of ichthyotoxic nitrogen compounds. However, some of the bacteria species may cause diseases. This in particular applies for fish with injuries, a weakened immune system and in case of high pathogen density. There should be hardly any problems caused by bacteria in an appropriately maintained pond.

The diseases described in the following are caused by different bacteria species. Precise species identification is usually only possible by a specialized microbiological laboratory. However, knowing the precise species is almost always not important for a treatment. The first symptoms for a bacterial infection may include fin clamping and the fish tending to hide.

The preparations **sera pond omnipur**, **sera pond cyprinopur** and **sera KOI BAKTO TABS** are treatments for treating in a pond that can safely heal most bacterial infections occurring in fish. Treating in time is very important as later infection stages increasingly affect internal organs, and the damages quickly become irreparable.

The broad range treatment **sera pond omnipur** effectively treats most ornamental fish diseases in ponds – in particular bacterial infections. **sera pond cyprinopur** has disinfecting and recovery supporting effects. The antibiologically effective, tasty, medicinal food tablets **sera KOI BAKTO TABS** even can treat some very advanced infections. They can always be used (simply feed them instead of the usual food) if the ill fish still take up food. Partial water changes while using the medicinal food tablets are usually only required in very small ponds as to maintain unobjectionable water quality. **sera baktopur direct** (tablets for water treatment) contains the same active agent and can be used in a quarantine tank, e.g. in case of fish that do not eat any more. You may use the preparations **sera baktopur direct** and **sera KOI BAKTO TABS** as well as liquid **sera baktopur** in combination (treatment in a quarantine tank). This is in

particularly advisable in case of advanced, severe infections. The care product **sera ectopur** provides support especially if the mucous membranes are also affected. It releases disinfecting oxygen and stimulates mucous membrane regeneration due to the included salt.

Proper water quality and good aeration must be maintained in case of all bacterial infections. You should generally not feed – possibly except for adding **sera KOI BAKTO TABS** – during the treatment as to prevent additional water pollution. During and after the treatment it makes sense to strengthen the immune system of the animals by additional application of vitamins (**sera KOI MULTIVITAMIN**).

### Columnaris disease

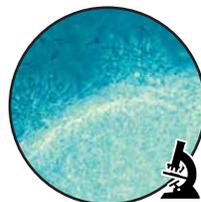
Diagnosis: page 8

Treatment: see above

Treatment should begin without delay as the disease quickly develops and spreads. Lowering the pH value to just under pH 7 (e.g. with **sera pH-minus**) supports the treatment since the bacteria prefer alkaline water. Please make sure in advance whether the fish you keep tolerate this acidification.



Scale with areas dissolved by an infection



Agglomerates of *Columnaris* bacteria in a mucous membrane skin swab

## 6.2 Treating bacterial diseases

### Fin rot

Diagnosis: page 9  
Treatment: page 26

This disease frequently occurs in case of poor hygienic conditions and overstocking. These bacteria, small numbers of which are also present in the tank otherwise, become a serious threat only under such conditions.



Fin rot in its final stage

### Bacterial gill rot

Diagnosis: page 9  
Treatment: page 26

### *Aeromonas* or *Pseudomonas* bacteria

Diagnosis: page 10  
Treatment: page 26

### Dropsy

Diagnosis: page 10  
Treatment: page 26

Long lasting stress situations, e.g. strongly organically polluted water, weaken the immune system of the fish, making the organism vulnerable for bacterial infections. Often, only a few of the fish are affected. The disease usually begins with a bacterial infection of the intestines. This becomes visible by the excretion of slimy fish waste. During the further course the intestinal mucous membrane begins to decompose (it comes off as white slime threads). Nutrition cannot be digested any more. The damaged intestinal mucous membrane has become penetrable for pathogens, leading to other organs being infected or degenerate due to lacking nutrients in this stage. When finally the kidney function is affected, unexcreted liquid accumulates in the body cavity (bloated belly), in the scale pockets (protruding scales) or at the background of the eyes (exophthalmus). Additional swimming bladder infections usually lead to abnormal

swimming behavior. Fish showing these symptoms can often not be saved any more.

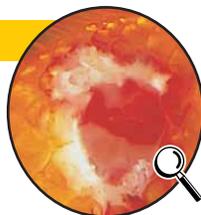
An extensive treatment with the above mentioned treatments must be carried out if only one of these symptoms is observed. It is ideal to put the affected fish into a quarantine tank and use a combination of both **sera baktopur** preparations plus – provided the fish still eat – **sera KOI BAKTO TABS**. You should also treat the main tank with **sera pond omnipur** or **sera pond cyprinopur** after you have removed the conspicuous fish, as to reliably prevent the disease from spreading. Be sure to maintain proper water quality in any case.

### Erythrodermatitis

Diagnosis: page 11

Erythrodermatitis outbreaks usually only occur in case of fish whose disease resistance is weakened by poor keeping conditions (especially poor water quality and poor quality food). Chances for a quick and entire recovery are good if the disease is treated in time.

However, intense treatment in a separate treatment tank is required if the fish already have ulcers that break up. The temperature should be slowly increased to 22 – 25°C (72 – 77°F) (aerate well and maintain excellent water quality). The treatment can be carried out with **sera pond omnipur**. You can alternatively use **sera baktopur direct**, combined with a five day **sera pond cyprinopur** treatment. At the same time, adding **sera ectopur** will support the healing process. The treatments should be used in slight overdosage (about 1.5 times) in a quarantine tank in case of this extremely severe disease. A large water change (at least 50%) should be carried out after the treatment. The wounds already start to heal at this time. However, cicatrization takes longer. The fish treated in warm water in a separate tank must not be put back into the cold pond without a previous adaptation phase.



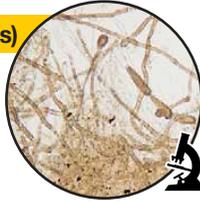
Hole caused by Erythrodermatitis

## 6.3 Treating fungal infections

### Fungal infection (Mycosis)

Diagnosis: page 11

Fungi (e.g. *Saprolegnia*) are breakdown organisms present in every pond. They provide an important contribution to hygiene by utilizing waste substances such as fish waste or dead plant parts. As long as the mucous membrane remains uninjured the fungi cannot harm the fish since it provides reliable protection against intruding fungus spores (their multiplication stages). However, if the mucous membrane is damaged, e.g. due to injuries or a parasite infection, spores can adhere within the skin and germinate. Once the fish are infested, the fungus can also overgrow healthy skin areas and inner organs, and it may even kill the fish. Low water temperatures support fungal infections.



Fungus hyphae and spore capsules of *Saprolegnia*

It is therefore important to immediately add **sera KOI PROTECT** (additionally also **sera pond bio humin**) to the pond water even in case of small skin abrasions upon catching and transport as a preventive measure.

The mucous membrane protecting components it contains quickly seal small injuries and abrasions. You can successfully treat fungal infections broken out with **sera pond omnisan**. Simultaneous application of **sera ectopur** supports the effect, accelerates healing and reduces the risk of secondary infections by protozoans and bacteria.

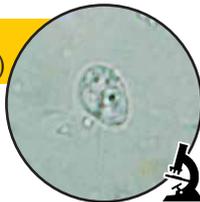


## 6.4 Treating flagellate infections

### *Ichthyobodo necator* (formerly: *Costia necatrix*)

Diagnosis: page 12

*Ichthyobodo* or *Costia* is a single celled secondary parasite that only multiplies without restraint if the fish are stressed and already weakened. Being an obligate parasite, the organism exclusively feeds on the mucous membrane of fish and dies in open water after a short time. Strong infestation leads to destruction of large skin areas, causing the death of the fish. Treat safely and successfully with **sera pond omnisan**. Afterwards, the care product **sera ectopur** allows for an aftertreatment that supports recovery.

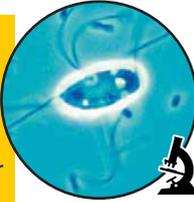


*Ichthyobodo necator*

## 6.4 Treating flagellate infections

### Intestinal flagellates

(*Hexamita* sp., *Spironucleus* sp. as well as other parasites such as *Protoopalina* sp., *Trichomonas* sp., *Cryptobia* sp.) and/or hole-in-the-head disease



*Spirionucleus* sp.

Diagnosis: page 12

A flagellate infestation of the intestines plus the frequently occurring subsequent severe bacterial infection lead to insufficient uptake of vitamins and minerals. This deficiency becomes visible by the so-called hole-in-the-head disease, among others. However, the appearance of hole-in-the-head disease is often also caused by malnutrition and too soft water containing insufficient minerals alone.

The widespread single celled intestinal flagellates are harmless in low density but can multiply very strongly within the intestines in case of stress and unsuitable or poor quality fish nutrition. They will then harm the infected fish very badly and may even be fatal. The same applies for severe intestinal infestation with certain bacteria. The pathogens withdraw important nutrients, minerals and vitamins from the food pulp, affect digestion and damage the intestinal mucous membrane. The fish organism tries to compensate the subsequent deficiency of minerals, among others, by decomposing and reutilizing cartilaginous tissue at the head. This causes the typical holes. Recovery of the fishes' digestive tract is a long lasting process and needs to be supported by an antibacterial treatment in many cases if there is a strong contribution of pathogenic bacteria. This treatment is very effectively carried out with **sera baktopur direct** in a quarantine tank or with **sera KOI BAKTO TABS** (provided the fish take up nutrition).

A varied diet close to nature plus regular addition of **sera pond bio balance** (contains valuable minerals and stabilizes water quality) as required and **sera KOI MULTIVITAMIN** prevent hole-in-the-head disease and support the healing process. Unsuitable poor

quality food may enhance the harmful multiplication of intestinal flagellates and bacteria. All **sera** foods optimally match the requirements of the fish as exclusively aquatic organisms are used as protein and fat sources. They therefore ensure healthy development and vitality. The high quality **sera** foods are entirely digested, thus avoiding unnecessary water pollution. **sera KOI Professional Spirulina Color Food** is particularly well suited for regenerating the intestinal flora.



### *Piscinoodinium*, Velvet disease

Diagnosis: page 13

*Piscinoodinium* is a single celled ectoparasite on the body surface that is often mistaken for *Ichthyophthirius* (white spot disease) due to its appearance. However, the spots caused by *Piscinoodinium* are considerably smaller in comparison. Longer, rather highly concentrated salt baths with **sera ectopur** in a quarantine tank achieve good success. The final salt concentration must be adjusted to the fish species in question. For instance, cyprinids tolerate salt very well (at over 5 g/l the salt is nevertheless added in several steps for safety reasons). In a normal to slightly elevated application concentration (0.1 to 1 g/l), **sera ectopur** also leads to alleviation in the pond itself and supports self healing.



*Piscinoodinium pillulare* in a skin swab

## 6.5 Treating ciliate infections

### *Ichthyophthirius multifiliis* (white spot disease)

Diagnosis: page 13



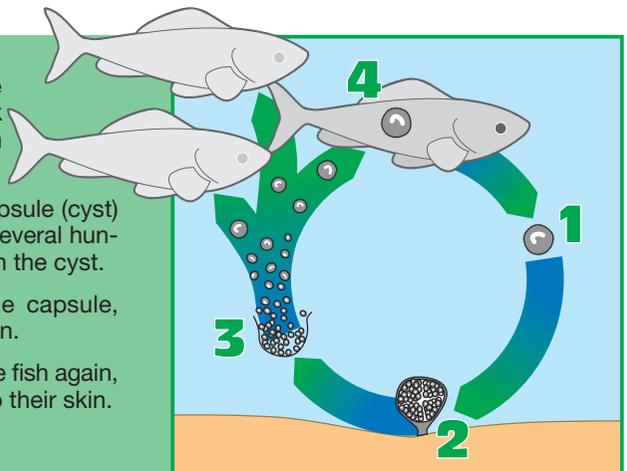
*Ichthyophthirius multifiliis*

The treatment should by all means begin as soon as possible. The disease can literally spread at an explosive rate via swarmer stages of this parasite in the rather densely inhabited limited environment a pond provides. The **sera** range provides you with a reliable treatment for treating against these parasites in a pond: **sera pond omnisan**. A recovery supporting aftertreatment can be carried out with the care product **sera ectopur**.

The water should be aerated well during the treatment. The white spots on the fish skin remain visible for a few days also after a successful treatment but become increasingly transparent (spots with live parasites appear straight white) and finally disappear entirely. Only in case you observe the formation of new spots for certain you should surmise pathogens have survived or were introduced again, making a further treatment necessary.

White spot disease can be diagnosed rather unmistakably. However, in some cases infections by *Lymphocystis* (viruses) or with certain sporozoan lead to a surprisingly similar appearance. Some reports about suspected resistance, sometimes after having treated properly against “Ich” for several times, might be due to such understandable false diagnoses. There is another possible confusion with the spawning rash in the head region of male goldfish during the spawning season (a sign of being ready for mating – not a disease)!

- 1 The adult parasites leave the fish and, swimming freely, look for well-protected places with little water flow.
- 2 The parasite forms a firm capsule (cyst) and divides several times. Several hundred swarmers develop within the cyst.
- 3 The swarmers penetrate the capsule, swim around and divide again.
- 4 The swarmers infest the same fish again, or other fish, penetrating into their skin.



Life cycle of *Ichthyophthirius multifiliis*

## 6.5 Treating ciliate infections

**Apiosoma** (formerly: *Glossatella*) or **Epistylis** (formerly: *Heteropolaria*)

Diagnosis: page 14

*Apiosoma* sp. and *Epistylis colisarum* are very similar protozoans that settle on existing wounds on the fish skin and thus avoid their healing (they are not parasites in the original sense). In the further course, adjacent healthy skin areas can also be infected, and further pathogens – e.g. fungi and bacteria – may settle. Using **sera KOI PROTECT** prevents smaller wounds being infected. In case of slight infestations, using **sera ectopur** is usually sufficient. Treatment with **sera pond omnipur** provides help in case of a stronger infestation by these ciliates.



*Apiosoma* sp.



**Trichodina, Tetrahymena, Chilodonella**

Diagnosis: page 14

These ciliates are mainly so-called secondary parasites. Mass multiplication usually only occurs if the fish has been previously harmed by another disease, or if the water conditions are poor. The skin and gill damages caused by the protozoan may be fatal. Quick action is therefore required. Be sure in particular to maintain good water quality and treat with **sera pond omnisan** or **sera pond omnipur**. Aftertreatment with **sera ectopur** is advisable also in this case.



*Trichodina*

## 6.6 Treating flatworm infections

Flatworms include many important parasites. Planaria are independently living members of this group. They belong to the Turbellaria. Flukes (Monogenea) including skin and gill flukes are real parasites. Among the Trematodes, fishkeepers may know about scale worms. The fourth flatworm group, tapeworms (Cestoda) can also be found in ornamental fish.

**sera pond omnipur** is effective against parasitic flatworms in garden ponds. The care product **sera ectopur** has proven well many times as a preventive measure, in case of slight infestations, for accompanying a treatment or for supporting recovery after a treatment.

## 6.6 Treating flatworm infections

Unlike the Monogenea, **Digenetic trematodes** require one or several intermediate hosts for completing their development cycle. Snails serve as first intermediate hosts. Later larvae stages may infect fish and cause damage while wandering through the body of their host (e.g. in the eyes as a so-called **worm cataract**). **Black spot disease** is another common symptom of an infestation by the larvae. Fish may also be the final hosts, i.e. the host of the adult, mature worms. Fish can be severely weakened or even killed in case of strong infestation by the larvae or adult trematodes. Most fish tolerate a slight infestation by **flukes** (Monogenea) well. The injuries caused by the hooks of the clasping apparatus of the worms only become a problem if mass multiplication occurs due to other weakening influences. In that case, more and more secondary infections appear on the affected skin or gill regions.



Metacercaria cysts on the gill filaments

### Skin flukes / Gyrodactylidae

Diagnosis: page 15

Flukes of the order Gyrodactylidae are more likely to be found on the skin than on the gills of the fish. They can also be distinguished from gill flukes (*Dactylogyrus*) by their lack of pigment eyes at the front end. The worms attach to the skin of the fish with the clasping apparatus at their back end. Their mucous membrane becomes thicker as a defensive reac-



*Gyrodactylus* sp. with three larvae, one inside the other

tion. The occurring skin injuries often lead to secondary infections. While an infestation with only a few flukes often runs symptom free, a mass infestation may quickly cause the death of many fish. Therefore treat with **sera pond omnipur** according to the information for use in time.

### Gill flukes / Dactylogyridae

Diagnosis: page 15



Gill filaments with *Dactylogyrus* infestation

Gill flukes (*Dactylogyridae*) live as parasites mainly on the gills of fish. The gill filament irritations and injuries caused by their clasping apparatus induce increased mucus formation that inhibits gas exchange more and more, finally making it possible that the fish suffocate.

*Dactylogyrus* can be distinguished from *Gyrodactylus*, among others, by the presence of pigment eyes at the front end. The differences to the livebearing skin flukes is relevant for the treatment: As the gill flukes lay eggs whose shell is impermeable for the active agent, a second treatment must be carried out as to kill the larvae that have hatched in the meantime as well. In case of unclear diagnosis better surmise a gill fluke infestation and treat twice with **sera pond omnipur** for safety reasons. Development of the worm larvae depends on the temperature. The development time in the pond should usually be between 5 and 14 days, depending on the water temperature. The second treatment should be carried out somewhat sooner or later (usually scheduled after 7 days), according to the current water temperature.

## 6.7 Treating fish leech infections

### Fish leech / *Piscicola* sp.

Diagnosis: page 16

Fish leeches belong to the **jointed worms (Annelida)** phylum which also includes many well known non-parasitic species such as earth-worms or Tubifex. Fish leeches use their oral suction cup to attach to fishes and suck their blood. While doing so they inject hirudine into the wound, a substance that inhibits blood coagulation. The full worm lets go of the fish at the latest after 2 days. While sucking blood it injures the skin of the fish (less frequently gills or fins). The loss of blood itself – including secondary bleedings – always causes weakening, in case of smaller fish sometimes even immediate death. Dangerous secondary infections often occur at the spot where the leech sucked blood. Furthermore, the leeches may transmit parasite stages while sucking blood that they took up the previous time they sucked blood from another fish.



Fish leech

Fish leeches or cocoons with their offspring can be introduced with newly purchased fish, live food, aquatic plants or water birds

## 6.8 Treating crustacean infections

The large group of crustaceans (Crustacea) also includes some species that live parasitically on pond fish. In spite of their sometimes misleading names (e.g. fish **louse** and anchor **worm**) and their often unusual appearance, all parasites mentioned in the following are crustaceans.

Bloodsucking crustaceans are a threat for fish not only because of the loss of blood and the possible infection of the wounds, but also transmit different pathogens from one fish to the next one. There is an additional group of crustaceans that do not live parasitically themselves but serve as intermediate hosts for other parasites. Fish can therefore become infected with parasite

stages if they eat these crustaceans (e.g. Copepods may be intermediate hosts for tapeworm larvae).

landing on the pond. Frequent water changes, collecting the worms and carefully cleaning the rocks, the bottom ground and the plants reduces and finally entirely removes the leech population. (Unfortunately this is a rather laborious but necessary procedure.)

In case it is necessary to remove leeches from the fish itself, e.g. in case of a mass infestation, you should remove the worms very carefully with an edgeless pair of tweezers close to the front suction cup. Avoid squeezing the stomach of the worm (in the middle), as the leech in this case regurgitates its stomach contents into the wound, thus increasing the risk of transmitting a disease. The same applies for other measures that might irritate the worm (e.g. by sprinkling salt directly on the worm). It is safer to remove the worm from the tank only after it left the fish by itself. **sera pond cyprinopur** helps combating the leeches and the diseases caused by them. Applying **sera ectopur** supports wound healing of the suction spots and prevents infections.

You can prevent introduction of these crustaceans by not using potentially dangerous frozen and live food (all **sera** foods are guaranteed to be parasite free) and being careful when purchasing new animals and plants (e.g. by quarantine measures). Also be aware of water birds that may introduce these crustaceans into the pond.

**sera pond cyprinopur** is used in case parasitic crustaceans occur in spite of preventive measures. Applying **sera ectopur** supports wound healing and prevents infections.

## 6.8 Treating crustacean infections

Strict hygienic measures such as repeated water changes and the careful cleaning of rocks, bottom ground and plants reduce the population of the parasitic crustaceans until they finally disappear entirely (please also refer to the information about **sera med Professional Argulol** in case of severe problems with parasitic crustaceans).

### Fish louse / e.g. *Argulus*

Diagnosis: page 16  
Treatment: see above

Fish lice are good swimmers. They look for a fish as a host in free water and attach to its skin using their two suction cups. They suck blood (sometimes for weeks) and often change the spots they attach to while doing so. Some species additionally inject a toxin or an allergen, which may cause infection or intoxication symptoms up to death. Furthermore, they may transmit pathogens from one fish to another while sucking blood, including spring viremia and Erythrodermatitis in Koi. The affected fish are always weakened due to blood loss. There are frequent secondary infections.



*Argulus*

Some members of the **copepod** group are intermediate hosts for dangerous parasitic worm species. Fish can become infected if they eat them. Other copepod species are parasites themselves (e.g. anchor worms and gill infecting copepods such as *Ergasilus* sp.) and as such threaten the fish. These parasitic copepods attach to fish by means of special structures and suck their blood. As an adaptation to their specific way of life, their body shape can often hardly be recognized as a crustacean.

### Anchor worm / *Lernaea*

Diagnosis: page 17  
Treatment: see above

The crustacean *Lernaea* is usually called “anchor worm” by ornamental fish keepers, as it is deeply burrowed in the fish skin with a branched attaching organ on its front end, and has an elongated body shape without any visible limbs. There are two sacs at the back end of females in which the eggs develop. The fish are weakened very much by the constant loss of blood and severe infections at the deep attachment spots.

### Parasitic copepod / *Ergasilus*

Diagnosis: page 17  
Treatment: see above

The crustacean *Ergasilus* has pointed clasping hooks that it uses to cling to the gills of the host fish for its entire life. Only the females live as parasites on the fish where they feed on skin cells. The males swim freely in the water. The females develop two large egg sacs at the back end. Infected fish suffer from constant severe shortness of breath due to the constant gill irritation and the increased formation of mucus. Partially irreparable damages and dangerous bleedings occur at the gills. There are frequent secondary infections.



Gill infecting copepod, Photo: Dr. Sandra Lechleiter

### Parasitic isopods

Diagnosis: page 18  
Treatment: see above

Isopods also belong to the crustaceans. Some species parasitize on fish and suck blood there. The loss of blood and the sting injuries weaken the fish.

## 6.9 Treating multiple infections

**Multiple infection** (a differentiated diagnosis is usually possible only by a specialist)

Diagnosis: page 18



Fish can be infected by several pathogen species at the same time. In such cases, mucous membrane swelling can often be observed as an unspecific symptom. There often is also a gray to whitish color change. With a microscope, it is often possible to detect both skin flukes and different protozoans such as *Ichthyobodo* (*Costia*), *Chilodonella*, *Trichodina* and *Tetrahymena* in a skin swab. Bacteria and fungi can also often be found. The fish often scrub themselves on the ground or on objects in early stages, later on they stand in the water flow of the filter outlet apathetically, swaying and with clamped fins. In advanced stages, mucous membrane shreds come off, and other unspecific symptoms occur. Depending on which pathogens are involved, the life of single fish or of the entire fish stock may be in danger sooner or later.

Skin swab showing a multiple infection: *Ichthyophthirius*, *Chilodonella*, *Trichodina*, *Costia* and *Piscinoodinium*

Obtaining a complete and reliable differentiated diagnosis is usually possible only for experts with appropriate equipment. This often means unreasonable effort or is not even logistically possible. The **sera** product range includes the reliable broad range treatment **sera pond omnipur** for such cases. This treatment covers almost the entire pathogen range and prevents secondary infections. You can again use **sera ectopur** as a support also in case of a multiple infection.

The cumulative occurrence of several pathogens at once indicates problematic keeping conditions. Therefore please check the water parameters and other conditions. Immediately carry out necessary changes (e.g. reducing the number of fish, filter maintenance, water change etc.) and support the disease resistance of your fish by adding vitamin preparations (**sera KOI MULTIVITAMIN**).



## 7 Preventing and treating deficiencies and malnutrition

**Mineral and vitamin deficiency** caused by too soft water and unsuitable food low in vitamins

Cause: page 19

**Prevention/Recommendation:** Fish withdraw minerals and trace elements from the water via their skin and the gills. The balanced mineral level of **sera pond bio balance** as well as the iodine and magnesium in **sera KOI PROTECT** along with important vitamins from **sera KOI MULTIVITAMIN** (e.g. vitamin D<sub>3</sub> for skeleton buildup) compensate deficiencies – e.g. in case of very soft water due to long lasting rain. The fish are thus effectively protected against not genetically caused deformations (often on the gills or the fins). Sufficient supply with minerals and food rich in vitamins (e.g. **sera KOI ROYAL MINI** or **sera goldy**) is crucial especially in early development stages. However, deficiencies may also lead to pathogenic physical changes also in adult fish.

**Low quality, monotonous food** leading to **liver fattening**, among others

Cause: page 19

**Prevention/Recommendation:** Monotonous and wrong nutrition with low quality food manufactured from poor quality, unsuitable ingredients leads to deficiencies and phys-

iological problems. Such food can only be digested to an insufficient extent, causing unnecessary water pollution. Furthermore, there is the problem that your fish are on the one hand excessively fattened by cheap fattening food and on the other hand receive insufficient essential nutrients such as vitamins, essential amino acids and omega fatty acids. Food sold loosely or in transparent plastic bags is exposed to light and atmospheric oxygen. The fats quickly become rancid, and the vitamins decompose. Some low quality foods even contain extremely toxic mold. Disease patterns such as a fattened liver, intestinal inflammations and related subsequent diseases. Many traditionally fed live foods, raw materials or bread are a serious threat to the health of your fish. The first ones often transmit dangerous pathogens, whereas the latter ones are not suited for the digestive tract of the fish due to their composition.

The high quality **sera** foods ensure that you supply your fish close to nature, well balanced and extensively. This appropriate nutrition effectively prevents the often fatal fattening of the liver and other nutrition caused diseases, which are common especially with cyprinids.



## 8 Preventing and remedying maintenance mistakes and intoxications

Feeling unwell, caused by unsuitable or polluted water, or by not keeping the fish according to their requirements

Cause: page 20

**Prevention/Recommendation:** Obtain detailed information about the special requirements of the fish you keep, use **sera** quality food and check all important water parameters. Regular partial water changes (frequency and extent appropriate for the according pond size) and using **sera KOI PROTECT**, as well as **sera pond bio nitrivec** for breaking down organic pollution, ensure constantly good water quality.

**Injuries**, e.g. by catching with a coarse fish net, transport injuries, injuries by trying hectically to escape (bouncing into sharp edged objects) or by territorial fights

Cause: page 20

**Prevention/Recommendation:** Avoid injuries of any kind as far as possible, as the wounds often become infected and may lead to severe diseases. Always carry out necessary maintenance measures in the pond very carefully and calmly as to avoid unnecessary stress and panic escape reactions that might injure the fish. You should always use the fine mesh, rounded **sera pond fish nets** for catching them. Be sure to provide a sufficient number of hideaways, appropriate fish stock density and a suitable combination of fish species as to avoid dangerous fights among the fish. A double dose of **sera KOI PROTECT** (plus **sera pond bio humin**, if applicable) provides help in case the fish ever get injured nevertheless. Use **sera ectopur** additionally in case of deeper injuries, and treat with **sera pond omnisan** if required.



## 8 Preventing and remedying maintenance mistakes and intoxications

### Air bubble disease (oversaturation of the water with gas)

Cause: page 21

**Prevention/Recommendation:** Gas oversaturation may for instance occur after a larger water change with colder water. Cold, well aerated water (e.g. directly from the faucet) dissolves more gas than possibly warm pond water that has stood for quite some time. Gas oversaturation then occurs when the added water quickly warms up in the warmer pond, since the warmer water cannot keep as much gas in solution. The gas oversaturation, which becomes visible by small air bubbles within the mucous membrane of the fish as well as on other surfaces, may cause an embolism within the veins. In case of gas oversaturation, you should agitate the water surface well (e.g. by increased activity of the pump), as to allow for intense exchange with the air and, accordingly, removal of excess gases.

However, you should generally ensure carefully to not alter the temperature by more than a few degrees during water changes or when transferring fish (e.g. in case of a treatment in a quarantine tank). Strongly varying temperatures – e.g. also due to rapid weather changes – weaken the disease resistance of the fish.

### Acidosis

Cause: page 21

**Prevention/Recommendation:** Measure the pH value with the **sera pH-Test**. Too low or strongly varying values are often related to too low carbonate hardness (KH). You should therefore also check the KH level (**sera kH-Test**). Please be aware that the pH value may vary during the day and may become considerably lower especially at night. If required, you can raise the pH value with **sera pond bio balance** and at



the same time ensure sufficient buffering (due to the increased KH). Additionally, using **sera KOI PROTECT** helps alleviate the damages and makes them heal quicker.



### Alkalosis or ammonia intoxication

Cause: page 22

**Prevention/Recommendation:** Whitish skin slime occurs at pH values above 9, the fins may become frayed and the gills can get burned. Check the pH value using the **sera pH-Test** (depends on the daytime, it is usually highest at noon) and lower it with **sera pH-minus** if required. Ammonia intoxications cause symptoms similar to those of too high pH values. Therefore you should also check the ammonium level using the **sera NH<sub>4</sub>/NH<sub>3</sub>-Test**. At high pH levels, the ammonium is more and more converted into its extremely ichthyotoxic ammonia form. The measured value should ideally be below the detection level. In case of levels above 0.5 mg/l ammonium you should immediately react with a partial water change and by adding **sera pond toxivec**, especially if the pH value is above 7. Ammonia is fatal even in very low dosage.



## 8 Preventing and remedying maintenance mistakes and intoxications

### Osmotic shock

Cause: page 22

**Prevention/Recommendation:** You should urgently avoid strong conductivity variations, as they may occur when transferring fish or when carrying out a large water change. The sudden change to a considerably higher or lower salinity than the usual one cannot be compensated by the fish.

If fish are transferred from water with a high conductivity (high salinity) into water with a lower conductivity without an adaptation phase they will suffer from an osmotic shock (also the other way round). The mucous membrane comes off, and the organism of the fish is extremely stressed and weakened. Secondary diseases occur frequently. In case of large conductivity differences, the fine cartilaginous joints in the fin rays can burst due to the high osmotic pressure. The fins then fall off in large chunks.

Avoid osmotic shocks by checking the pH value and the conductivity of the transport water and the pond water before transferring the fish. If in doubt, and if you do not have a conductivity meter at hand, please ask your retailer whether the fish were kept under salt addition when purchasing new fish. You must of course also be careful when re-transferring fish from a salt bath. The fish are generally less sensitive to conductivity increases, i.e. when adding salt. Rather quick addition of salt improves the therapeutic benefits of a salt bath. However, you should nevertheless adjust the conductivity stepwise if you want to maintain a high final concentration.

Adaptation can be achieved by adding water containing less salt to the water that contains more salt or by adding **sera ectopur** to the less salty water. Differences between 100 and 200  $\mu\text{S}/\text{cm}$  are negligible [for example, a single preventive dosage of **sera ectopur** with 0.1 g/l or 5 g per each 50 l (13.2 US gal.) increases the conductivity by only 200  $\mu\text{S}/\text{cm}$ ]. The water conditions can be adjusted to the according desired levels in small steps with adaptation phases of several hours each.



# 8 Preventing and remedying maintenance mistakes and intoxications

## Acute nitrite intoxication

Cause: page 22

**Prevention/Recommendation:** Check the nitrite level with the **sera NO<sub>2</sub>-Test**. In case of dangerously elevated levels (above 0.5 mg/l) you should immediately react with a large partial water change and by adding **sera pond toxivec**. A slight salinity increase with **sera ectopur** reduces the toxicity of nitrite towards the fish to a certain extent.

In the long term you can effectively prevent the accumulation of toxic nitrite by using a filter with a – considering the water amount – sufficient settling area for bacteria that break down pollutants (especially well suited: the bioactive filter system consisting of **sera siporax pond** with **sera pond filter**

**biostart**; furthermore: regular application of **sera pond bio nitrivec** for maintaining a healthy bacterial flora in the pond water). Even long lasting low level nitrite pollution may cause permanent damages.

Biological water purification



## 8 Preventing and remedying maintenance mistakes and intoxications

Simply pour **sera pond filter biostart** onto **sera siporax** pond. The filter will immediately become biologically active.

Add **sera pond bio nitrivec** to the pond water. The pollutant breakdown will immediately begin or improve.



## 8 Preventing and remedying maintenance mistakes and intoxications

### Further intoxication causes

Intoxications may be acute or gradual. Sometimes the only symptom is that the fish startle more easily. A precise diagnosis according to the behavior and the appearance of the fish is thus often not possible. Therefore proceed very carefully when researching the causes if you observe the fish being unwell and cannot explain it with the usual pathogens. Also consider unusual causes such as the use of herbicides or insecticides in the garden (they could have entered the pond with the rain) or having used new decoration elements that could, for example, be impregnated with toxic substances.

**Lacking oxygen** is likely if the fish suddenly dwell underneath the surface and gasp for air. This can be fatal in extreme cases. Even slight oxygen undersupply may cause deformations in young fish. Check the oxygen level with the **sera O<sub>2</sub>-Test**, **sera O<sub>2</sub> plus** and **sera air plus air pumps** provide quick help in case of acute oxygen deficiencies. Water agitation by decorative brook or fountain elements (**sera** offers numerous attractive alternatives) ensures sufficient aeration.

Check the hygienic conditions in the pond as to prevent oxygen deficiencies. A large amount of organic material compiles especially in overstocked, abundantly fed ponds. Its breakdown consumes oxygen. Make sure you siphon off the sludge and remove leaves and decomposing plant parts whenever necessary. Also make sure the filter is well maintained and works effectively (bioactive filter system: **sera siporax pond**, **sera pond filter biostart** and **sera pond bio nitrivec**). Plants enrich the water with oxygen during daytime. However, they as well consume oxygen at night, without sunlight and do not produce any. This may lead to an oxygen deficiency especially in warm summer nights (warm water binds less oxygen than cold water!). Therefore, be sure to provide sufficient aeration and effective filtration also at night.

Rot processes occur if anaerobic zones form, i.e. regions that are not supplied with oxygen. This may, for instance, happen in the filter if the pump fails, or in case of firm, non-aerated bottom ground. Organic material is broken down anaerobically (without oxygen consumption) there. This leads to the forma-



## 8 Preventing and remedying maintenance mistakes and intoxications

tion of **hydrogen sulfide** which stinks like rotten eggs, and **nitrite** – both of them are highly ichthyotoxic substances. Therefore, be sure to check the function of your filter regularly and loosen the bottom ground while siphoning off the sludge.

**Heavy metals** may also lead to severe chronic or acute intoxications. They are introduced by, for example, old copper pipes, lead containing wire on aquatic plants or unsuitable decoration elements. Lead and mercury are particularly toxic. Invertebrates and amphibians react very sensitive to copper. Zinc and even iron (in concentrations above 0.5 mg/l) are also harmful. If in doubt, check the water values, e.g. by means of the **sera Cu-Test**. **sera KOI PROTECT** and **sera pond toxivec** bind and neutralize heavy metals. Furthermore, they remove corrosive **chlorine**.

In case of acute intoxications – also with toxic substances not mentioned here – it is always advisable to carry out a large water change and to remove the remaining toxic substances with **sera pond super carbon**.



## 9 sera med Professional treatments



### Highly effective and well tolerated

In close cooperation with the working group of the well known parasitologist, Prof. Dr. Heinz Mehlhorn (Heinrich-Heine-Universität Düsseldorf/Germany), **sera** succeeded in marketing a range of unique, highly effective over the counter treatments, some of which a patent is already applied for. The products mainly appeal to versed, experienced users who look for quick and specific support from highly effective treatments after having diagnosed a specific disease. Such high performance treatments require a certain amount of care while using them. Therefore, be sure to treat according to the corresponding information for use as to ensure safe and unproblematic application.

Currently, the **sera med Professional** range comprises **sera med Professional Protazol**, **sera med Professional Tremazol**, **sera med Professional Nematol**, **sera med Professional Argulol** and **sera med Professional Flagellol**. Each of these treatments is optimally designed for professional use and works in a safe, effective and directed way even in extremely persistent cases.

In some fields the Professional treatments add to the well proven, reliable **sera treatments** of the standard range. In some other areas the preparations of this range are unrivaled – also concerning competitors – and we keep on researching...

### Tip

Please also read the detailed descriptions about the specific diseases on pages 24 to 35 as well as the advice on quarantine tanks on page 57.

Pond fish should be treated with the **sera med Professional treatments** – except **sera med Professional Argulol** – only in a quarantine tank, not in the pond itself. Treating seriously ill fish in a separate tank is cost efficient (less treatment and water consumption) and allows for directed treatment of the affected fish as well as close observation of the treatment success. The main argument against using the Professional preparations **Flagellol**, **Protazol**, **Tremazol** and **Nematol** in ponds is that a large water change (at least 80%) is required to conclude the treatment, as otherwise

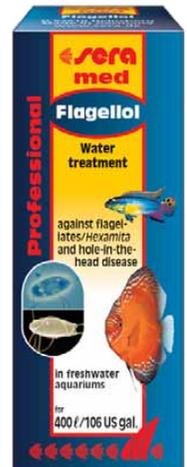
there is a risk of bacterial blooms and the resulting oxygen deficiency. Such bacterial blooms may occur under unfavorable conditions due to the biological breakdown of the non-toxic solvents included in the treatments. These solvents are indispensable for the excellent efficacy of these preparations.

Please also note that the treatment times stated in the information for use leaflets are sufficient for achieving full efficacy of the corresponding treatment when treating in a quarantine tank. Leaving the treatment in the water longer than the intended time span or even entirely skipping the water change does not lead to quicker or more effective healing. Repeated treatments are possible if required.

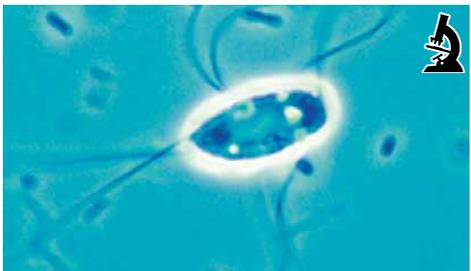
### 9.1 sera med Professional Flagellol

This treatment effectively rids ornamental fish of intestinal flagellates and other single celled intestinal parasites. Furthermore it is effective against the cause of velvet disease (*Piscinoodinium pillulare*). The preparation additionally contains vitamins K and C that support quick recovery – especially in case of hole-in-the-head disease.

Infected pond fish are treated with **Flagellol** in a quarantine tank. Be sure to aerate well while doing so. In single cases – in case of particularly persistent flagellate strains – you can extend the recommended treatment duration from three days to seven days. In case cloudiness should occur during this time, you can carry out a large water change (about 80%) before re-dosing the treatment. After (at the maximum) seven days the treatment is concluded with another water change, or the fish are put back into the pond.



## 9.1 sera med Professional Flagello



*Spironucleus* sp.



*Piscinoodinium*

### Observation

Decomposing fins, slimy, whitish fish waste, holes in and around the head, possibly emaciation.

**Diagnosis: Intestinal flagellates**  
 (*Hexamita* sp., *Spironucleus* sp. as well as other parasites such as *Protoopalina* sp., *Trichomonas* sp., *Cryptobia* sp.)

see also page 29

### Observation

The fish scrub themselves on decoration and swim hectically in early stages, later on fine whitish yellow dots (< 0.3 mm) on skin and fins; frequently infestation of the gills; fish looks – especially in backlight – as if dusted with flour; velvet-like coating.

**Diagnosis: *Piscinoodinium pillulare*, Velvet disease**

see also page 29

## 9.2 sera med Professional Protazol



Infections by *Ichthyophthirius multifiliis* (causes white spot disease) and many other single celled parasites (e.g. *Ichthyobodo*, *Apiosoma*, *Trichodina*, *Chilodonella*) as well as fungal infections are reliably, quickly and effectively removed by **sera med Professional Protazol**. This well tolerated treatment remains colorless in the water. Pond fish are treated with this treatment in a quarantine tank according to information for use.





Goldfish with fungal infection on the side

### Observation

White, cotton-like outgrowths on the skin with long filaments standing away (often after a previous injury).

### Diagnosis: Fungal infection (Mycosis)

see also page 28



Koi with skin slime caused by *Ichthyobodo necator*

### Observation

Color changes to gray or milky in some areas of the skin (reddish in case of stronger infestation); long finned fish have frayed fins; clamped fins.

### Diagnosis: *Ichthyobodo necator* (formerly: *Costia necatrix*)

see also page 28



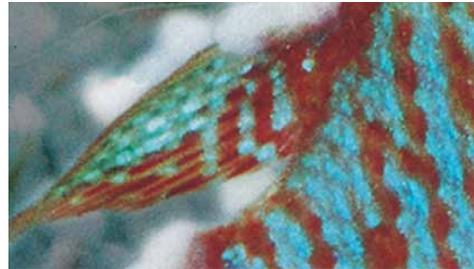
Goldfish with "Ich"

### Observation

Clearly visible white spots (0.4 – 1.5 mm) on skin and fins, clamped fins and scrubbing on decoration.

### Diagnosis: *Ichthyophthirius multifiliis* (white spot disease)

see also page 30



Infestation with *Apiosoma* sp.

### Observation

Furry coating after mucous membrane injuries; many elongated protozoans on a short stalk (no long threads as in case of fungal infections) are visible with a strong magnifier.

### Diagnosis: *Apiosoma* (formerly: *Glossatella*) or *Epistylis* (formerly: *Heteropolaria*)

see also page 31

## 9.2 sera med Professional Protazol



*Trichodina* infection

### Observation

Isolated, whitish thickened areas on the mucous membrane (partially stringy); small pale areas on the skin; apathy and loss of appetite. The fish scrub themselves and occasionally wince with their fins.

**Diagnosis: *Trichodina*, *Tetrahymena*, *Chilodonella***

see also page 31

## 9.3 sera med Professional Tremazol



**sera med Professional Tremazol** contains the highly effective agent Praziquantel, which is successfully used against flatworm infections in human and veterinarian medicine since a long time ago. The patented, highly effective agent dissolving complex ensures even distribution of the otherwise poorly soluble substance in water, making the active agent get to the pathogen very quickly.

The effect spectrum of the treatment ranges from gill and skin flukes to tapeworms and digenetic trematodes (symptoms include worm cataract). Besides its excellent efficacy it is also very well tolerated.

Treat infected pond fish in a quarantine tank and provide good aeration, according to the information leaflet. Prophylactic application in a short term bath is possible in case of newly purchased animals or plants that might introduce pathogens.





Gyrodactylidae

### Observation

The fish scrub themselves and become apathetic. Cloudy skin and small, motile worms on the skin (partially visible with the naked eye, otherwise detectable with a magnifier; mostly smaller than 1 mm).

**Diagnosis: Skin flukes / Gyrodactylidea**

see also page 32



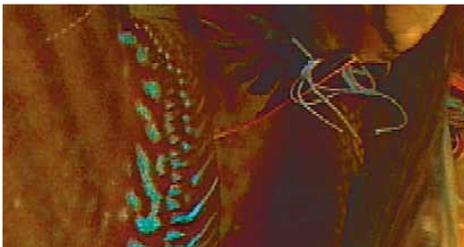
Gill filaments with *Dactylogyrus* infestation

### Observation

Breathing becomes stronger every day until the fish stay under the surface panting; sometimes one-sided breathing; one or both gill lids closed or spread open; small flukes usually sized less than 1 mm sit on the gills (possibly visible on a sedated fish with a magnifier); fish scrub themselves at the gill lid.

**Diagnosis: Gill flukes / Dactylogyridea**

see also page 32



Tapeworms

### Observation

Emaciation, loss of appetite, gelatinous fish waste; sometimes so-called proglottides (whitish, tape-shaped worm segments) can be found constricted in the fish waste, or the worm end hangs out of the anus of the infected fish.

**Diagnosis: Tapeworms / Cestoda**

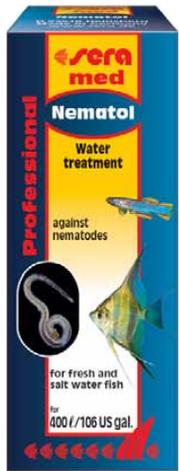
Tapeworms (Cestoda) live in the intestines of their hosts where they withdraw important nutrients from the pre-digested nutrition pulp. The infected fish become emaciated and suffer from deficiency symptoms. The worms attach to the intestinal wall with their front end, which often leads to irritations and secondary infections. Small fish may suffer from ileus.

## 9.4 sera med Professional Nematol



This treatment reliably allows to remove parasitic threadworms. The cylindrical, usually slender threadworms or nematodes live in the intestines of the fish. Their larvae wander through different organs. The fish may die if this leads to irreversible damage of vital organs.

Treat in a quarantine tank and be aware that the treatment is not tolerated by invertebrates (e.g. crustaceans and snails).



*Camallanus cotti*



Thin, long worm in the intestines

### Observation

Reddish worm ends hang out of the anus; whitish fish waste, emaciation due to loss of blood, apathy.

### Diagnosis: *Camallanus sp.*

*Camallanus* worms parasitize in the rectum of fish. There they attach to the intestinal wall with their front end that resembles a milling head, and suck blood. The intestinal wall may get perforated and increasingly permeable for pathogens by the claspings. Due to their blood meals, the worms have a brownish red color. The end of the adult females hangs out of the anus of the infected fish by a few millimeters. In case of being disturbed it quickly retreats into the intestines.

### Observation

Frightened behavior, loss of appetite, emaciation, slimy fish waste.

### Diagnosis: *Capillaria sp.*

A slight infection of the intestines with this very thin, long worm often remains unnoticed for a long time. It can thus spread gradually over the entire fish stock. In particular, juvenile fish are permanently harmed by growth problems.

## 9.5 sera med Professional Argulol

sera med

The innovative **sera med Professional Argulol** quickly and thoroughly rids the pond from all undesirable crustaceans! Parasitic crustaceans such as fish lice (*Argulus*), anchor worms, gill infecting copepods, parasitic isopods and small crustaceans that may be intermediate hosts for other parasites, often occur in ponds. They harm the pond fish by sucking their blood, among others. Besides the loss of blood, this usually leads to dangerous inflammations at the affected spots and transmits pathogens (e.g. spring viremia). Accordingly, every year numerous pond fish suffer and die after an unnoticed infection with parasitic crustaceans.

Simply distribute the well tolerated, highly concentrated treatment **sera med Professional Argulol** in your pond as to rid your fish from this secretive pests. The crustaceans (in the water and on the fish) will be removed after just one day. The treatment is broken down biologically, therefore no remainders remain in the pond. Water changes or filtration through active carbon are thus not necessary. Repeating the treatment after about three weeks is advisable as to kill crustacean larvae that have hatched from eggs in the meantime as well. Please note that other invertebrates such as snails, mussels, crayfish, insects and their larvae do not tolerate the treatment. According to our observations, **Argulol** is tolerated by amphibians and plants without any problems. Sturgeons may react sensitively.



Professional



*Argulus* on a Koi



*Lernaea* on a caudal fin

### Observation

Fish jump and swim hectically; flat (louse-like), almost transparent crustaceans sized 4 – 14 mm with two black eyes visible on the skin of the fish; red sting marks on the fish skin.

**Diagnosis: Fish louse / e.g. *Argulus***

see also page 34

### Observation

White, bar shaped crustaceans with two small sacs at the end, they stick deeply and firmly in the skin; anemia and emaciation of the fish.

**Diagnosis: Anchor worm / *Lernaea***

see also page 34



*Ergasilus* on the gills (gill lid removed)  
Photo: Dr. Dirk Kleingeld

**Observation**

White to grayish blue crustaceans sized 0.5 – 3 mm on the gill filaments.

**Diagnosis: Parasitic copepod / *Ergasilus***

see also page 34



Parasitic isopod

**Observation**

Clearly segmented, oval, opaque, yellowish to brownish arthropods [1 – 5 cm (0.4 – 2 in.)] are attached to the fish; bloody, dot-shaped sting marks.

**Diagnosis: Parasitic isopods**

see also page 34

# 10 General recommendations for application

## About risks and side effects...

Some factors may affect an effective and safe treatment in the pond or even lead to undesirable side effects. You should generally read the information for use carefully before using any kind of treatment. Make sure in particular that the treatment is suitable for the intended application, and that the information for use, the label and the outer package do not contain any warning notes concerning the animals and plants you keep.

Furthermore, you should only treat ponds with unobjectionable water chemistry. The application of some treatments may make the water conditions “turn over” by affecting biological filtration, e.g. if there is strong organic pollution (check ammonium/ammonia, nitrite and nitrate, for instance).

Water temperature is also a very important factor in garden ponds. Treatments generally do not work too well at temperatures below 12°C (54°F). However, infections also hardly occur at such low temperatures. The pathogens hibernate just like their hosts, the fish. Be especially careful to ensure sufficient aeration when temperatures are high in summer.

Close observation is important especially if water chemistry is not in a stable equilibrium, or in case of extreme water temperatures. It may even be necessary to stop the treatment by carrying out a water change if cloudiness should occur during the treatment or if the fish signalize lacking oxygen (e.g. by gasping for air at the surface). Therefore make sure you provide very good water quality and sufficient aeration before, during and after a treatment. At the same

time you are considerably increasing the chances that your fish recover successfully and quickly by doing so.



### Tip

Being poikilothermic animals that cannot actively regulate their body temperature but adapt it to the surrounding temperatures, fish are very calm at low temperatures. Their metabolism and their immune system function only to a limited extent. On the other hand, the pathogens are also hardly active at low temperatures.

Therefore, acute infectious diseases are usually not likely at very low water temperatures. You should carry out treatments and larger maintenance measures only at higher water temperatures above 12°C (54°F), as to avoid disturbing hibernation of the inactive, sensitive fish. However, a vitamin treatment that strengthens disease resistance, such as **sera KOI MULTIVITAMIN** (see page 56), and a prophylactic salt treatment with **sera ectopur** (0.1 to 0.2 g/l, better predissolve it before adding to the water at low temperatures) may begin somewhat sooner.

# 10 General recommendations for application

## Do not use during a treatment

Active carbon must not be used during a treatment as it binds medicinal agents and thus reduces or even cancels the efficacy of the treatment. Some of the active treatment agents can also be broken down or bound by a particularly large and active bio-filter and plenty of bottom gravel. It may therefore be advisable in single cases to slightly (e.g. to 1.5 times as much) increase the treatment dosage as to maintain full efficacy under such special conditions. Using water conditioners, especially ones with finely ground rock powder, immediately before (within 1 – 2 days) or during a treatment may also lead to slightly diminished efficacy due to binding the agents. Therefore it is best not to use water conditioners during this limited period. Their use, however, is even more reasonable after the treatment (see page 56, “Concluding the treatment”).

UV-C lamps for water disinfection should in any case be switched off during the treatment. The high energy light destroys many active agents.

## Filtration during the treatment

Information for use leaflets often recommend removing biological filters from the water circuit during the treatment. This is a precautionary measure, as some treatments may also harm filter bacteria and – as stated above – very active filters might reduce the efficacy of the treatment. However, disconnecting the filter is usually laborious and inconvenient. You would need to spread the filter material, e.g. in a tub with pond water, or ideally operate the filter connected to a separate tank especially in case of long lasting treatments. Rot processes might occur if water does not flow through the filter material for too long (it can get critical after half an hour), which possibly leads to anaerobic conditions. This leads to the formation of, among others, highly toxic hydrogen sulfide that may poison the pond inhabitants if the filter is put back into operation again without being cleaned. Pathogens may also be present within the filter itself, which might cause a new infection after the filter has been connected again, which is another disadvantage. A stable, biologically well established filter with suitable filter materials



# 10 General recommendations for application

(e.g. **sera siporax pond**) usually gets through a treatment without any problems. It can therefore remain switched on. Appropriate treatment usage usually harms only a small percentage of the filter bacteria. These can be replaced easily by adding **sera pond bio nitrivec** afterwards.

However, by all means be sure to keep the filter appropriately clean before and after the treatment. It must not contain any rotting sludge. Cleaning is done by gentle squeezing or rinsing with pond water in a bowl (do not rinse under running or even hot water).



## Feeding during a treatment

It is best to not feed at all, or – if you keep juvenile fish or the treatment duration exceeds three days – only extremely sparingly during a treatment. As already described, many treatments harm the filter bacteria or affect the biological equilibrium in another way, therefore excess organic pollution may quickly make the water “turn over”.

## Supporting measures – sera ectopur

Preferably do not use any other water conditioners or even other treatments, except if expressly recommended. There might be unpredictable cross reactions. There are some important exceptions, including the care product **sera ectopur**. It can reasonably complement and support different treatments, and it is suitable also as an after-treatment and for prevention.

**sera ectopur** releases disinfecting oxygen, which makes breathing easier for the ill fish, and it increases salinity, which stimulates mucous membrane growth. Healing is supported. In some cases (very slight infection or prevention), application of **sera ectopur** can even replace using a treatment. Generally, normal table salt (NaCl) without additives (e.g. anti-caking agents) can also be used for stimulating mucous membrane regrowth. You should nevertheless consider that – even if you find sufficiently pure salt – there is no disinfecting and breath alleviating oxygen release as with **sera ectopur**. You can therefore only achieve a partial effect.

The recommended normal dosage of **sera ectopur** is about 0.01 to 0.02%. This concentration is unproblematic even for fish that otherwise might react sensitive to elevated salt levels. Higher salt concentrations (about 0.03% to 0.3%, i.e. 0.3 to 3 g/l) should only be used in case of acute stress situations or a disease (gradual addition) and be lowered stepwise by normal partial water changes after these problems have vanished. Make sure you know exactly about the salt tolerance of the fish in question before applying high salt concentrations (e.g. in a short term bath). Cyprinids generally tolerate increased salt concentrations very well.



# 10 General recommendations for application

## Vitamins

Using vitamin preparations is another exception. It is also safe and recommendable in combination with treatments. Just as in humans, vitamins fulfill many vital functions within the fish organism. They are, among others, required for a strong, active immune system. The own disease resistance – provided it is optimally functioning – is the best possible protection against diseases an organism can have. If you feed your fish high quality **sera** food, you have already ensured a good basic supply with vitamins and all other important nutrients. Please be aware that the included vitamins may increasingly be broken down by the effects of atmospheric oxygen, light and moisture. It is therefore ideal to choose packing units that you can consume within several weeks to a few months.

You should additionally support the immune system with an extra vitamin supply in stress situations (e.g. fish transfers, courtship, brood care, temperature changes) or if pathogens got into the pond. Use **sera KOI MULTIVITAMIN** in such situations. You can add the preparation directly to the water according to the information for use or soak the food with it just before feeding. Regular addition (once or twice weekly) or using the vitamin drops as a treatment (once daily) for several weeks are both possible. Such treatments are advisable in the mentioned stress situations, for conditioning pond fish in autumn and spring, and during a disease. Continue the treatment for at least a week after the disease symptoms have vanished as to support recovery and minimize the risk of a relapse.

## Concluding the treatment

It is advisable to remove treatment remainders by active carbon (**sera pond super carbon**) after the treatment is finished. This avoids unnecessary water pollution by active agent residues. A partial water change improves water quality and supports recovery of the fish. It is especially important in small ponds (a partial water change is not always required in large ponds). A considerably longer treatment application time caused by not carrying out these measures does not improve efficacy but – on the contrary – may lead to undesirable side effects.

The pond water or, in case of a partial water change, the fresh water should by all means be conditioned with **sera KOI PROTECT** after the treatment is finished. This will create stress free conditions for the fish as quickly as possible. You can quickly and effectively top up an affected filter bacteria flora by adding **sera pond bio nitrivec**.

You must of course also be careful with dosages considerably higher than stated in the information for use. Calculate the dosage according to the actual amount of water, not for the entire volume of the pond (roughly estimate and deduct bottom ground, rocks and decoration elements). Slight, accidentally administered overdoses are covered by the safety margin. In case of more than double dosage you should generally carry out a partial water change for safety reasons.



# 10 General recommendations for application



## Tip – Quarantine tank

Some diseases should be treated in a quarantine tank. This in particular applies if only a few animals are infected and you wish to avoid infecting the other fish, or if applying a treatment in the large volume of the pond is not practicable, e.g. due to required partial water changes. Necessity to raise the temperature may be another important reason for treating in a quarantine tank – this especially applies for virus infections.

If in need you can even use a bucket with an airstone (**sera air plus air pump**) as a quarantine tank if you have to treat only for a short time and the fish are not too big. A larger tank with good aeration and a heater is of course better. The water you use should have the same temperature and the same pH value (also check other values if required) as the pond water. A filter is not necessarily required if you keep the fish in the tank only for a couple of days. However, in that case it is very important that you change the water more frequently. For instance, you should carry out a partial water change every other day when using **sera baktapur direct** as to maintain optimal water quality.

The water temperature is slowly raised (**sera aquarium heater thermostat**) after adding the fish, if required (especially in case of virus diseases). Please be aware that the cured fish must not simply be put back into a cold pond from a heated quarantine tank. The temperature difference might lead to a relapse or to other diseases in the weakened animals. You can lower the temperature of the quarantine tank very slowly [by not more than 1°C (1.8°F) per day] again and put the fish back into the pond after an appropriate adaptation phase under observation. You can alternatively also wait until pond temperatures have sufficiently risen in case you carried out the treatment in spring. When treating in quarantine during winter it may be necessary to keep the fish in the separate tank until spring.



## Important

All **sera treatments** have been carefully checked considering their efficacy against the corresponding pathogens and their safety for users, the kept animals and the environment before they were ready for marketing. As a pharmaceutical manufacturer, **sera** is subject to regular observation by the authorities in charge. The close cooperation with successful breeders and retailers as well as the valuable feedback from our customers allows us to recognize possible problems or desires at any time

and immediately react in an appropriate way. Our cooperation with scientists from different universities, plus of course the quality control and research activities of the highly qualified **sera** laboratory team ensures highest safety standards and new developments according to the current state in science and technology.

# 11 Checklist

Some problems are not easy to sort out. Beginners – but also experienced fishkeepers – should not hesitate to seek advice from their specialized retailer, breeder or veterinarian. The **sera** Team (info@sera.de) will of course be pleased to provide support at any time if you have special questions about our products.

The list below covers the most important conditions in your pond and will support you in finding out about causes. When carefully completed, this list will give yourself or an expert you consult a quick overview about possible problem sources. Please read our recommendations about pond setup and care as well as special questions such as plant care, algae growth etc. in our broad guide booklet range, or inform yourself on our internet site ([www.sera.de](http://www.sera.de)).

## 1 How large is your pond?

Dimensions in cm:

Length \_\_\_\_\_ x width \_\_\_\_\_ x depth \_\_\_\_\_

Result: \_\_\_\_\_ cm<sup>3</sup>

divided by 1000 = \_\_\_\_\_ liters (volume)  
(or read off the water meter when filling)

Remember to roughly estimate the volumes of the bottom gravel and the decoration elements and to deduct them from the water volume.

## 2 When did you set up the pond?

_____	_____
_____	_____

## 3 Which filter do you use?

Model: \_\_\_\_\_

Filter materials: \_\_\_\_\_

## 4 Which fish species do you keep? How many of each species?

_____	_____
_____	_____
_____	_____
_____	_____

# 11 Checklist

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**5** Do you also keep animals other than fish in the pond?

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**6** How many plants are there in the pond, and which species?

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**7** When did you last add new fish or plants?

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**8** Which additional devices (e.g. UV-C clarifiers) and decoration elements do you have in the pond?

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**9** Which water conditioners (e.g. sera KOI PROTECT) or treatments are used or were recently used?

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# 11 Checklist

**10** How often do you carry out water changes?  
How much water do you change while doing so?

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**11** When and how do you clean the filter?

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**12** Feeding

a) Which food types?

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c) Which food additives (e.g. vitamin preparations) do you use?

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b) How often do you feed? Are there remainders?

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**13** Which water parameters do you measure?

Measuring date \_\_\_\_\_

pH \_\_\_\_\_

Temperature \_\_\_\_\_

GH \_\_\_\_\_

KH \_\_\_\_\_

NH<sub>4</sub>/NH<sub>3</sub> \_\_\_\_\_

NO<sub>2</sub> \_\_\_\_\_

NO<sub>3</sub> \_\_\_\_\_

PO<sub>4</sub> \_\_\_\_\_

Cu \_\_\_\_\_

Fe \_\_\_\_\_

Further advisable measuring parameters: Conductivity, chlorine, oxygen, carbon dioxide. Please fill in as far as available.

Do also check the parameters of the tap water you use for comparison. Sometimes the tap water contains undesirable substances or provides unsuitable water parameters.

# 11 Checklist

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**14** When was the disease first noticed?

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**15** Which symptoms did you observe?

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**16** Which fish are affected (old ones, young ones, a specific species)?

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**17** How severe is the disease?  
(Do the fish eat? Have some already died? etc.)

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**18** Did you notice anything else that is unusual?

E.g. on the plants or other water inhabitants, or did you carry out unusual activities in or near the pond (e.g. did you use herbicides in the garden)?

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# 12 Natural food throughout the year

	January	February	March [above approx. 8°C (46°F) water temperature]	April	May	June
<b>Koi</b>			KOI ROYAL	KOI ROYAL	KOI ROYAL KOI COLOR	KOI ROYAL KOI COLOR
<b>Young Koi</b>			KOI ROYAL MINI	KOI ROYAL MINI	KOI ROYAL MINI	KOI ROYAL MINI
<b>Goldfish and other fish</b>			goldy mix royal	goldy	flakes granulat mix royal goldy goldy gran goldy color spirulina	flakes granulat mix royal goldy goldy gran goldy color spirulina
<b>Sturgeons</b>	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules

	July	August	September	October [below approx. 8°C (46°F) water temperature]	November [below approx. 8°C (46°F) water temperature]	December
<b>Koi</b>	KOI ROYAL KOI COLOR	KOI ROYAL KOI COLOR	KOI ROYAL KOI COLOR	KOI ROYAL	KOI ROYAL	
<b>Young Koi</b>	KOI ROYAL MINI	KOI ROYAL MINI	KOI ROYAL MINI	KOI ROYAL MINI	KOI ROYAL MINI	
<b>Goldfish and other fish</b>	flakes granulat mix royal goldy goldy gran goldy color spirulina	flakes granulat mix royal goldy goldy gran goldy color spirulina	flakes granulat mix royal goldy goldy gran goldy color spirulina	goldy mix royal	goldy mix royal	
<b>Sturgeons</b>	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules	Sturgeon Granules



**Spirulina Color Food**  
from 8°C (46°F)



**Spring/Autumn Food**  
below 17°C (63°F)



**Summer Food**  
from 17°C (63°F)



**Winter Food**  
below 12°C (54°F)



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For natural garden ponds

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