The present invention relates to a pharmaceutical composition or a food or feed composition comprising vitamin K3.
Treatment of parasite diseases using vitamin K3

All patent and non-patent references cited in the present application are hereby incorporated by reference in their entirety.

Field of invention

The present invention relates to a composition comprising vitamin K3 and methods for treatment of parasitic diseases in an animal or human being using a pharmaceutical composition or a food or feed composition comprising vitamin K3.

Background

Vitamin K3 is found in all plant cells. It is also produced by some bacteria, including bacteria lining the gastro-intestinal tract of humans. Vitamin K3 acts as an electron acceptor used in respiration, photosynthesis and other processes. Vitamin K3 is fat soluble and necessary for the production of prothrombin and five other blood clotting factors in humans. It also regulates bone calcification. It is converted into menaquinone in the liver.

The chemical formula of vitamin K3 is C₈H₈O₂. Synonyms of vitamin K3 are menadione, 2-Methyl-1,4-naphthalendione and 2-Methyl-1,4-naphthoquinone.

Vitamin K3 is added as an inexpensive vitamin K supplement in commercial animal feed compositions. Vitamin K3 has also been used to control the relocation of plants and animals contained in the ballast water of ships (US Patent 6,340,468, Cutler et al. 2002).

Summary of invention

It has surprisingly been found that vitamin K3 can be used for treating parasites and parasitic diseases in an individual, such as an animal or human being. In particular, vitamin K3 has been found to be effective in the treatment of fish suffering from parasite infestation.

Parasitism is a form of symbiosis ("living together"), a phenomenon in which two organisms which are phylogenetically unrelated co-exist over a prolonged period of time. The requirement for a prolonged interaction precludes predatory or episodic
interactions (such as a mosquito feeding on a host), which are usually not seen as symbiotic relationships.

All fish are potential hosts to many different species of parasites. Small numbers of parasites are common and probably do little harm. However, all parasites have tremendous reproductive potential and can, under ideal conditions, quickly overwhelm fish in a confinement, such as a commercial fish farm.

Different parasites have in the past often required different treatments with different anti-parasitic species. While a traditional and general anti-parasite treatment may be effective against some parasites, there is a need for a more effective and more broadly based anti-parasite treatment method.

The present invention is effective in treating a number of parasite species in a variety of infested animals, such as fish. Fish species and parasites capable of being treated in accordance with the present invention are described in more detail herein below. Both ornamental fish and industrial fish species can be treated in accordance with the present invention.

Endoparasites are uncommon in ornamental fish. However, there is a wide diversity of blood parasites, worms that colonize the intestines and other parasites that can invade various organs and tissues. Many require an intermediate host, such as snails, birds or the introduction of an infected fish, and so are rare in pond/aquarium fish. There are a variety of clinical signs which might indicate the presence of endoparasites. Lethargy accompanied by emaciation is a common sign, as are worms protruding from the anus. Identification of sporozoan and protozoan endoparasites often requires microscopic examination of tissues.

For hobbyists, endoparasites are the most common parasite problem. With few exceptions, these parasites are not life-threatening in small numbers, indeed small populations are fairly normal. The danger from endoparasites comes from their tremendous reproductive potential. In a natural environment this rarely leads to severe outbreaks, as only small numbers of juveniles would survive and find a host after hatching. Limited physical contact between fish would prevent parasites being transferred to a new host, so limiting the spread of the infestation although individual fish may be severely parasitised.
The confines of a pond or tank in a commercial fish farm, with fish constantly coming into contact with each other, provide ideal conditions for fish-to-fish parasite transfer. The ready-availability of fish hosts results in high survival rates of juveniles hatched from eggs and cysts deposited in the pond. This can lead to serious parasite outbreaks affecting many different fish species.

The situation changes when the fish are stressed, or the cuticle is being affected by adverse water quality such high ammonia/nitrite levels, inappropriate pH or other toxins. Under such conditions the consistency and protective properties of the cuticle can be severely altered, allowing parasites to proliferate.

In large numbers ectoparasites can cause severe damage to the integument from their feeding activities and/or their constant movement and attachment structures such as hooks and suckers. This in turn can often lead to secondary bacterial infections, typically body ulcers and bacterial gill disease.

The irritation caused by ectoparasites often leads to excess mucus production, seen as a grey, slime film, and epithelial hyperplasia, causing respiratory problems if the gills are affected.

The larger parasites such as leeches, lice and anchor worms are visible with the naked eye. Typical signs of parasite infestations are rubbing, 'flashing' [there is a flash of silver from the underside of the fish it turns its body to rub against something], focal redness and inflammation on the body - often at the base of the dorsal fin, flared operculum, respiratory difficulties, lethargy and bacterial ulcers. However, it is important to realise that these 'symptoms' are not exclusive to parasites and may be caused by poor water quality or other diseases.

Most ectoparasites are too small to be seen with the naked eye. It simply is not possible to be certain that parasites are not present without taking e.g. a mucus and gill sample for microscopic examination.

In one preferred embodiment, the present invention discloses a composition, such as an edible composition, for example a food composition or a feed composition, such as a food supplement or a feed supplement, or a general dietary supplement, or a pharmaceutical composition, wherein said composition comprises vitamin K3 in a nutritionally and/or therapeutically effective amount.
The present invention is suitable for use in treating, ameliorating or curing parasitic diseases in an individual, such as an animal, a human being, a mammal, an avian species and a fish species.

Definitions

Bathing: Bathing means that the individual such as the fish is immersed in a treatment solution comprising the antiparasitically active compound comprising vitamin K3.

Biotrophic parasites are parasites that cannot survive in a dead host and therefore keep their hosts alive.

Composition: The term "composition," as in pharmaceutical composition, is intended to encompass a product comprising the active ingredient(s), and the inert ingredient(s) that make up the carrier, as well as any product which results, directly or indirectly, from combination, complexation or aggregation of any two or more of the ingredients, or from dissociation of one or more of the ingredients, or from other types of reactions or interactions of one or more of the ingredients. Accordingly, the pharmaceutical compositions of the present invention encompass any composition made by admixing a compound of the present invention and a pharmaceutically acceptable carrier.

Ectoparasite: Ectoparasites are found on the external surfaces of the host.

Endoparasite: Endoparasites are found in the internal tissues and organs of the host.

Epiparasite: Epiparasites are parasites that feed on another parasite.

Host: see definition of parasite.

Molluscicides are pesticides used to control molluscs, such as motts, slugs and snails.

Parasite: A parasite lives in a close relationship with another organism, its host, and causes it harm. The parasite is dependent on its host for its life functions. The parasite has to be in its host to live, grow, and multiply.
Parasitoids (necrotrophs) are parasites that use another organism’s tissue for their own nutritional benefit until the host dies from loss of needed tissues or nutrients.

Vitamin K3: Vitamin K3 is a fat-soluble vitamin precursor that is converted into menaquinone in the liver. The chemical formula of vitamin K3 is C₉H₈O₂. Synonyms of vitamin K3 are menadione, 2-Methyl-1,4-napthalendione and 2-Methyl-1,4-naphthoquinone.

**Detailed description of the invention**

The present invention relates to a method for the treatment of a subject suffering from a parasitic disease, or at risk of contracting a parasitic disease, comprising the step of administering to said subject a composition comprising vitamin K3 in a therapeutically effective amount.

There is also provided a use of vitamin K3 in the manufacture of a medicament for the treatment of a subject suffering from a parasitic disease, or at risk of contracting a parasitic disease, comprising the step of administering to said subject a composition comprising vitamin K3 in a therapeutically effective amount.

There is also provided a composition comprising vitamin K3 for use in a treatment of a subject suffering from a parasitic disease, or at risk of contracting a parasitic disease, comprising the step of administering to said subject a composition comprising vitamin K3 in a therapeutically effective amount.

A vast variety of parasites can be treated in a number of different subject species in accordance with the present invention. Different parasite species of relevance for the present invention are disclosed herein below in more detail. It will be understood that the present invention is effective in treating, i.e. eliminating or reducing in number, at least some of said parasites in a subject having been infested with said parasite species.

Parasites that live inside the body of the host are called endoparasites (e.g., hookworms that live in the gut) and those that live on the outside are called ectoparasites (e.g., some mites). An epiparasite is a parasite that feeds on another parasite. The present invention relates to treatment of parasitic disease caused by endoparasites, ectoparasites as well as epiparasites.
Many endoparasites acquire hosts by gaining entrance to their tissue; others enter the host when it consumes certain raw foods, as in the case of the nematode Ascaris lumbricoides, an endoparasite of the human intestine.

Parasitoids (necrotrophs) are parasites that use another organism's tissue for their own nutritional benefit until the host dies from loss of needed tissues or nutrients. In contrast, Biotrophic parasites cannot survive in a dead host and therefore keep their hosts alive. Many viruses, for example, are biotrophic because they use the host's genetic and cellular processes to multiply. The present invention relates to treatment of parasitic disease caused by parasitoids as well as biotrophic parasites.

Parasites in accordance with the present invention include, but is not limited to the types of parasites described herein below.

- A wound parasite is a parasite which feeds on a lesion of the host. It is a parasite with a saprophytic tendency.

- A facultative parasite is an organism able to develop on either lesioned or non lesioned tissues.

- An obligate parasite is a parasite that can only feed on the living tissues of the host.

- A strict parasite is a parasite that can grow on a single species of host.

Parasitic infestations constitute considerable problems in the fish farming industry as well as in wild fish. This applies especially to farmed fish in fresh water and seawater. In addition to the costs that are associated with treatment, lower classification ratings of slaughtered fish and reduced growth rate due to reduced feed intake contribute to the economic losses for the fish farmer.

Fish parasites are broadly classified into two groups: ectoparasites and endoparasites. Ectoparasites are found on the external surfaces of fish such as skin, fins and gills, while endoparasites are found in the internal tissues and organs.

The fish parasites treated by the present invention can be any type parasites. Some common parasites are described below.
I. Protozoa

- A. Ciliates
  - 1. Ichthyophthirius multifiliis
  - 2. Chilodonella
  - 3. Tetrahymena
  - 4. Trichodina
  - 5. Ambiphyra
  - 6. Apiosoma
  - 7. Epistylis
  - 8. Capriniana
  - 9. Treatment of Ciliated Protozoan Infections
- B. Flagellates
  - 1. Hexamita / Spironucleus
  - 2. Ichthyobodo
  - 3. Piscinooidinium
  - 4. Cryptobia
- C. Myxozoa
- D. Microsporidia
- E. Coccidia

II. Monogenean Trematodes

III. Digenean Trematodes

IV. Nematodes

- A. Camillanus
- B. Capillaria
- C. Eustrongylides

V. Cestodes

VI. Parasitic Crustacea

- A. Ergasilus
- B. Lernaea
- C. Argulus

VII. Leeches

Protozoa

Most of the commonly encountered fish parasites are protozoans. With practice, these can be among the easiest to identify, and are usually among the easiest to control. Protozoans are single-celled organisms, many of which are free-living in the aquatic environment. Typically, no intermediate host is required for the parasite to reproduce (direct life cycle). Consequently, they can build up to very high numbers when fish are
crowded causing weight loss, debilitation, and mortality. Five groups of protozoans are
described in this publication: 1) ciliates, 2) flagellates, 3) myxozoans, 4) microsporidians, and 5) coccidians.

1) Ciliates

Most of the protozoans identified by aquarists will be ciliates. These organisms have
tiny hair-like structures called cilia that are used for locomotion and/or feeding. Ciliates
have a direct life cycle and many are common inhabitants of pond-reared fish. Most
species do not seem to bother host fish until numbers become excessive. In aquaria,
which are usually closed systems, ciliates should be eliminated. Uncontrollable or
recurrent infestations with ciliated protozoans are indicative of a husbandry problem.
Many of the parasites proliferate in organic debris accumulated in the bottom of a tank or vat. Ciliates are easily transmitted from tank to tank by nets, hoses, or caretakers’
wet hands. Symptoms typical of ciliates include skin and gill irritation displayed by
flashing, rubbing, and rapid breathing.

Examples of ciliates include *Ichthyophthirius multifiliis*, *Chilodonella*, *Tetrahymena*,
*Trichodina*, *Ambiphyra*, *Apiosoma*, *Epistylis* and *Capniana*.

*Ichthyophthirius multifiliis*
The disease called "Ich" or "white spot disease" has been a problem to aquarists for
generations. Fish infected with this organism typically develop small blister-like raised
lesions along the body wall and/or fins. If the infection is restricted to the gills, no white
spots will be seen. The gills will appear swollen and be covered with thick mucus.
Identification of the parasite on the gills, skin, and/or fins is necessary to conclude that
fish has an "ich" infection. The mature parasite is very large, up to 1000 µm in
diameter, is very dark in color due to the thick cilia covering the entire cell, and moves
with an amoeboid motion. Classically, *I. multifiliis* is identified by its large horseshoe-
shaped macronucleus. This feature is not always readily visible, however, and should
not be the sole criterion for identification. Immature forms of *I. multifiliis* are smaller
and more translucent in appearance.

If only one parasite is seen, the entire system should be treated immediately. "Ich" is
an obligate parasite and capable of causing massive mortality within a short time.
Because the encysted stage is resistant to chemicals, a single treatment is not
sufficient to treat "Ich". Repeating the selected treatment (Table 1) every other day (at
water temperatures 68-77°F) for three to five treatments will disrupt the life cycle and control the outbreak. Daily cleaning of the tank or vat helps to remove encysted forms from the environment.

*Chilodonella*

*Chilodonella* is a ciliated protozoan that causes infected fish to secrete excessive mucus. Infected fish may flash and show similar signs of irritation. Many fish die when infestations become moderate (five to nine organisms per low power field on the microscope) to heavy (greater than ten organisms per low power field). *Chilodonella* is easily identified using a light microscope to examine scrapings of skin mucus or gill filaments. It is a large, heart-shaped ciliate (60 to 80 m) with bands of cilia along the long axis of the organism. *Chilodonella* can be controlled with any of the chemicals listed in Table 1, and one treatment is usually adequate. *Chilodonella* has been eliminated in tanks using recirculating water systems by maintaining 0.02% salt solution.

*Tetrahymena*

*Tetrahymena* is a protozoan commonly found living in organic debris at the bottom of an aquarium or vat. *Tetrahymena* is a teardrop-shaped ciliate that moves along the outside of the host. The presence of *Tetrahymena* on the body surface in low numbers is probably not significant. It is commonly found on dead material and is associated with high organic loads. Therefore, observing *Tetrahymena* on fish, which have been on the tank bottom, does not imply the parasite is the primary cause of death. One treatment of a chemical listed in Table 1 should be adequate for control.

Identification of *Tetrahymena* internally is a significant but untreatable problem. A common site of internal infection is the eye. Affected fish will have one or both eyes markedly enlarged (exophthalmia). Squash preparations made from fresh material reveal large numbers (=> 10 per low power field) of *Tetrahymena* associated with fluids in the eye. Fish infected with *Tetrahymena* internally should be removed from the collection and destroyed.

*Trichodina*

*Trichodina* is one of the most common ciliates present on the skin and gills of pond-reared fish. Low numbers are not harmful, but when fish are crowded or stressed, and water quality deteriorates, the parasite multiplies rapidly and causes serious damage.
Typically, heavily infested fish do not eat well and lose condition. Weakened fish become susceptible to opportunistic bacterial pathogens in the water. *Trichodina* can be observed on scrapings of skin mucus, fin, or on gill filaments. Its erratic darting movement and the presence of a circular, toothed disc within its body easily identify it. *

*Trichodina* can be controlled with any of the treatments from Table 1. One application should be sufficient. Correction of environmental problems is necessary for complete control.

*Ambiphyra*

*Ambiphyra*, previously called *Scyphidia*, is a sedentary ciliate that is found on the skin, fins, or gills of host fish. Its cylindrical shape, row of oral cilia, and middle bank of cilia identify *Ambiphyra*. It is common on pond-reared fish, and when present in low numbers, it is not a problem. High organic loads and deterioration of water quality are often associated with heavy, debilitating *Ambiphyra* infestations. This parasite can be controlled with one application of any of the treatments listed in Table 1.

*Apiosoma*

*Apiosoma*, formerly known as *Glossatella*, is another sedentary ciliate common on pond-reared fish. *Apiosoma* can cause disease if their numbers become excessive. The organism can be found on gills, skin, or fins. The vase-like shape and oral cilia are characteristic. *Apiosoma* can be controlled with one application of one of the treatments from Table 1.

*Epistylis*

*Epistylis* is a stalked ciliate that attaches to the skin or fins of the host. *Epistylis* is of greater concern than many of the ciliates because it is believed to secrete proteolytic ("protein-eating") enzymes that create a wound, suitable for bacterial invasion, at the attachment site. It is similar in appearance to *Apiosoma* except for the non-contractile long stalk and its ability to form colonies. In contrast to the other ciliates discussed above, the preferred treatment for *Epistylis* is salt. Fish can be placed into a 0.02% salt solution as an indefinite bath, or a 3% salt dip. More than one treatment may be required to control the problem.

*Capriniana*

*Capriniana*, historically called *Trichophyra*, is a sessile ciliate that attaches to the host's gills with a sucker. They have characteristic cilia attached to an amorphous-
shaped body. In heavy infestations, *Capriniana* can cause respiratory distress in the host. One treatment from a chemical listed in Table 1 should be adequate.

*Treatment of ciliated protozoan infections*

Several chemicals commonly used to control ciliated protozoans in freshwater fish are listed below. As stated above, most ciliate infestations respond to one chemical treatment; however, fish that do not improve as expected should be rechecked and retreated if necessary. Overtreatment with chemicals can cause serious damage to fish.

Copper sulphate is an excellent compound for use in ponds to control external parasites and algae; however, it is extremely toxic to fish. Its killing action is directly proportional to the concentration of copper ions (Cu^{2+}) in the water. As the alkalinity of the water increases, the concentration of copper ions in solution decreases. Consequently, a therapeutic level of copper in water of high alkalinity would be lethal to fish in water of low alkalinity. Conversely, a therapeutic concentration of copper in water of low alkalinity would be insufficient to have the desired action in water of higher alkalinity. For this reason, the alkalinity of the water to be treated must be known in order to determine the amount of copper sulphate needed. The amount of copper sulphate needed in mg/L is the total alkalinity (in mg/L) divided by 100. For example, if the total alkalinity in a pond is 100 mg/L, the concentration of copper sulphate needed would be 100/100 or 1 mg/L.

Potassium permanganate is effective against ciliates as well as fungus and external columnaris bacteria, and it can be used in a pond or vat. Multiple treatments with potassium permanganate are not recommended as it can burn gills. Aeration should be available when potassium permanganate is used because it is an algicide and can cause an oxygen depletion. Potassium permanganate at the prescribed dosage (2 mg/L) does not seem to affect the nitrifying bacteria in a biological filter; however, ammonia, nitrite, and pH should be closely monitored following treatment.

Formalin is an excellent parasiticide for use in small volumes of water such as vats or aquaria. It is not recommended for pond use because it is a strong algicide and chemically removes oxygen from the water. Vigorous aeration should always be provided when formalin is used.
Used in proper amounts, salt effectively controls protozoans on the gills, skin, and fins of fish. This is an effective treatment for small volumes of water such as aquaria or tanks. Use in ponds as a treatment is generally not recommended due to the large amount of salt and high cost of treatment that would be needed to be effective. Salt should never be used on fish that navigate by electrical field such as knifefish and elephant nose fish.

When using any treatment for fish, a bioassay (a test to determine safe concentration) should be conducted on a few fish before large numbers of fish are exposed. Fish species can react differently to various concentrations of the chemical; therefore, fish undergoing treatment must be monitored closely for adverse reactions. If the fish negatively react to treatment, the chemical should be flushed immediately from the system, or the fish should be moved to fresh water.

2) Flagellates

Flagellated protozoans are small parasites that can infect fish externally and internally. They are characterized by one or more flagella that cause the parasite to move in a whip-like or jerky motion. Because of their small size, their movement, observed at 200 or 400x magnification under the microscope, usually identifies flagellates. Common flagellates that infest fish are given below.

*Hexamita / Spironucleus*

*Hexamita* is a small intestinal parasite commonly found in the intestinal tract of freshwater fish. Sick fish are extremely thin and the abdomen may be distended. The intestines may contain a yellow mucoid (mucus-like) material. Recent taxonomic studies have labeled the intestinal flagellate of freshwater angelfish as *Spironucleus*. *Hexamita* or *Spironucleus* can be diagnosed by making a squash preparation of the intestine and examining it at 200 or 400x magnification. The flagellates can be seen where the mucosa (intestinal lining) is broken. They move by spiraling and in heavy infestations, they will be too numerous to be overlooked.

The recommended treatment for *Hexamita / Spironucleus* is metronidazole (Flagyl). Metronidazole can be administered in a bath at a concentration of 5 mg/L (18.9 mg/gallon) every other day for three treatments. Medicated feed is even more effective at a dosage of 50 mg/kg body weight (or 10 mg/gm food) for five consecutive days.
Ichthyobodo

Ichthyobodo, formerly known as Costia, is a commonly encountered external flagellate. Ichthyobodo-infected fish secrete copious amounts of mucus. Mucus secretion is so heavy that catfish farmers popularly refer to the disease as "blue slime disease". Infected angelfish also produce excessive mucus that can give dark colored fish a gray or blue coloration along the dorsal body wall. Infected fish flash and lose condition, often characterized by a thin, unthrifty appearance. Ichthyobodo can be located on the gills, skin, and fins, however, it is difficult to identify because of its small size. The easiest way to identify Ichthyobodo is by its corkscrew swimming pattern.

With a good microscope, the attached organism can be seen at 400x magnification. The organism is easily controlled using one application of one of the treatments listed in Table 1.

Piscinoodinium

Piscinoodinium is a sedentary flagellate that attaches to the skin, fin, and gills of fish. The common name for Piscinoodinium infection is "Gold Dust" or "Velvet" Disease. The parasite has an amber pigment, visible on heavily infected fish. Affected fish will flash, go off feed, and die. Piscinoodinium is most pathogenic to young fish. The life cycle of this parasite can be completed in 10-14 days at 73-77°F, but lower temperatures can slow the life cycle. Also, the cyst stage is highly resistant to chemical treatment.

Therefore, several applications of a treatment (Table 1) may be necessary to eliminate the parasite. For non-food species, chloroquin (10mg/L prolonged bath) has been reported to be efficacious.

Cryptobia

Cryptobia is a flagellated protozoan common in cichlids. They are often mistaken for Hexamita as they are similar in appearance. However, Cryptobia are more drop-shaped, with two flagella, one on each end. Also, Cryptobia "wiggles" in a dart-like manner, whereas Hexamita "spirals". Cryptobia typically is associated with granulomas, in which the fish "walls off" the parasite. These parasites have been observed primarily in the stomach, but may be present in other organs. Fish afflicted with Cryptobia may become thin, lethargic and develop a dark skin pigmentation. A variety of treatments are presently being studied with limited success. Nutritional management has proven to take an active role in its control.
3) Myxozoa
Myxozoa are parasites that are widely dispersed in native and pond-reared fish populations. Most infections in fish create minimal problems, but heavy infestations can become serious, especially in young fish. Myxozoans are parasites affecting a wide range of tissues. They are an extremely abundant and diverse group of organisms, speciated by spore shape and size. Spores can be observed in squash preparations of the affected area at 200 or 400x magnification or by histologic sections.

Clinical signs vary, depending on the target organ. For example, fish may have excess mucus production, observed with *Henneguya* infections.

4) Microsporidia
Microsporidians are intracellular parasites that require host tissue for reproduction. Fish acquire the parasite by ingesting infective spores from infected fish or food. Replication within spores (schizogony) causes enlargement of host cells (hypertrophy). Infected fish may develop small tumor-like masses in various tissues. Diagnosis is confirmed by finding spores in affected tissues, either in wet mount preparations, or in histologic sections.

Clinical signs depend on the tissue infected and can range from no visible lesions to mortalities. In the most serious cases, cysts enlarge to a point that organ function is impaired and severe morbidity and/or mortality results. A common microsporidian infection is *Pleistophora*, which infects skeletal muscle.

There is no treatment for microsporidian infections in fish. Spores are highly resistant to environmental conditions and can survive for long periods. Elimination of the infected stock and disinfection of the environment is recommended.
5) Coccidia

*Coccidia* are intracellular parasites described in a variety of wild-caught and cultured fish. Their role in the disease process is poorly understood, but there is increasing evidence that they are potential pathogens. The most common species encountered in fish are intestinal infections. Inflammation and death of the tissue can occur, which can affect organ function. Other infection sites include reproductive organs, liver, spleen, and swim bladder.

Clinical signs depend on target organ affected but may include general malaise, poor reproductive capacity, and chronic weight loss. A definitive diagnosis of tissue coccidia should be completed with histologic or electron microscopy. Several compounds have been used to control coccidiosis with some success; however, consultation with an experienced fish health professional is recommended. Maintaining a proper environment and reducing stress appear to be important in preventing coccidia outbreaks in cultured fish.

**Monogenean Trematodes**

Monogenean trematodes, also called flatworms or flukes, commonly invade the gills, skin, and fins of fish. Monogeneans have a direct life cycle (no intermediate host) and are host- and site-specific. In fact, some adults will remain permanently attached to a single site on the host.

Freshwater fish infested with skin-inhabiting flukes become lethargic, swim near the surface, seek the sides of the pool or pond, and their appetite dwindles. They may be seen rubbing the bottom or sides of the holding facility (flashing). The skin where the flukes are attached shows areas of scale loss and may ooze a pinkish fluid. Gills may be swollen and pale, respiration rate may be increased, and fish will be less tolerant of low oxygen conditions. "Piping", gulping air at the water surface, may be observed in severe respiratory distress. Large numbers (>10 organisms per low power field) of monogeneans on either the skin or gills may result in significant damage and mortality. Secondary infection by bacteria and fungus is common on tissue with monogenean damage.

*Gyrodactylus* and *Dactylogyrus* are the two most common genera of monogeneans that infect freshwater fish. They differ in their reproductive strategies and their method of attachment to the host fish. *Gyrodactylus* have no eyespots, two pairs of anchor hooks, and are generally found on the skin and fins of fish. They are live bearers.
(viviparous) in which the adult parasite can be seen with a fully developed embryo inside the adult's reproductive tract. This reproductive strategy allows populations of *Gyrodactylus* to multiply quickly, particularly in closed systems where water exchange is minimal.

*Dactylogyrus* prefers to attach to gills. They have two to four eyespots, one pair of large anchor hooks, and are egg layers. The eggs hatch into free-swimming larvae and are carried to a new host by water currents and their own ciliated movement. The eggs can be resilient to chemical treatment, and multiple applications of a treatment are usually recommended to control this group of organisms.

Treatment of monogeneans is usually not satisfactory unless the primary cause of increased fluke infestations is found and alleviated. The treatment of choice for freshwater fish is formalin, administered as a short-term or prolonged bath (Table 1). Fish that are sick do not tolerate formalin well, so they need to be carefully monitored during treatment. Potassium permanganate can also be effective in controlling monogeneans.

**Digenean Trematodes**

Digenean trematodes have a complex life cycle involving a series of hosts. Fish can be the primary or intermediate host depending on the digenean species. They are found externally or internally, in any organ. For the majority of digenean trematodes, pathogenicity to the host is limited.

The life stage most commonly observed in fish is the metacercaria, which encysts in fish tissues. Again, metacercaria that live in fish rarely cause major problems. However, in the ornamental fish industry, digenetic trematodes from the family Heterophyidae, have been responsible for substantial mortalities in pond-raised fish. These digeneans become encysted into gill tissue and respiratory distress is eminent.

Another example of a metacercaria that could cause problems in cultured fish is the genus *Posthodiplostomum* or the white grub. This has caused mortalities in baitfish, but usually the only negative effect is reduced growth rate, even when the infection rate is high. In cases where mortalities occur, there are unusually high numbers in the eye, head, and throughout the visceral organs.
Another fluke is Clinostonum, often called yellow grub. It is a large trematode and although it does not cause any major problems for fish, it is readily seen and will make fish unmarketable for aesthetic reasons.

The best control of digenean trematodes is to break the life cycle of the parasite. Elimination of the first intermediate host, the freshwater snail is often recommended. Copper sulphate in ponds has been used with limited success and is most effective against snails when applied at night, due to their nocturnal feeding activity.

Nematodes

Nematodes, also called roundworms, occur worldwide in all animals. They can infect all organs of the host, causing loss of function of the damaged area. Signs of nematodiasis include anemia, emaciation, unthriftiness and reduced vitality. Three common nematodes affecting fish are described.

1) Camillanus

Camillanus is easily recognized as a small thread-like worm protruding from the anus of the fish. Control of this nematode in non-food fish is with fenbendazole, a common antihelminthic. Fenbendazole can be mixed with fish feed (using gelatin as a binder) at a rate of 0.25% for treatment. It should be fed for three days, and repeated in three weeks.

2) Capillaria

Capillaria is a large roundworm commonly found in the gut of angelfish, often recognized by its double operculated eggs in the female worm. Heavy infestations are associated with debilitated fish, but a few worms per fish may be benign. Fenbendazole is recommended for treatment (see above).

3) Eustrongylides

Eustrongylides is a nematode that uses fish as its intermediate host. The definitive host is a wading bird, a common visitor to ponds. The worm encysts in the peritoneum or muscle of the fish and appears to cause little damage. Because of the large size of the worms, infected fish may appear unsuitable for retail sales. Protecting fish from wading birds and eliminating the intermediate host, the oligocheate or Tubifex (soft-bodied worms), are the best means to prevent infection.
Cestodes

Cestodes, also called tapeworms, are found in a wide variety of animals, including fish. The life cycle of cestodes is extremely varied with fish used as the primary or intermediate host. Cestodes infect the alimentary tract, muscle or other internal organs. Larval cestodes called plerocercoids are some of the most damaging parasites to freshwater fish. Plerocercoids decrease carcass value if present in muscle, and impair reproduction when they infect gonadal tissue. Problems also occur when the cestode damages vital organs such as the brain, eye or heart.

One of the most serious adult cestodes that affect fish is the Asian tapeworm, *Bothriocephalus acheilognathi*. It has been introduced to the United States with grass carp and has caused serious problems with bait minnow producers.

Praziquantel at 2 - 10 mg/L for 1 to 3 hours in a bath is effective in treating adult cestode infections in ornamental fish. At this time, there is no treatment that can be used for food fish. Also, there is no successful treatment for plerocercoids. Ponds can be disinfected to eradicate the intermediate host, the copepod.

Parasitic Crustacea

Parasitic Crustacea are increasingly serious problems in cultured fish and can impact wild populations. Most parasitic Crustacea of freshwater fish can be seen with the naked eye as they attach to the gills, body and fins of the host. Three major genera are discussed below.

1) *Ergasilus*

*Ergasilus* are often incidental findings on wild or pond-raised fish and probably cause few problems in small numbers. However, their feeding activity causes severe focal damage and heavy infestations can be debilitating. Most affect the gills of freshwater fish, commonly seen in warm weather. A 3% salt dip, followed by 0.2 %-prolonged bath for three weeks, may be effective in eliminating this parasite.

2) *Lernaea*

*Lernaea*, also known as anchor worm, is a common parasite of goldfish and koi, especially during the summer months. The copepod attaches to the fish, mates, and the male dies. The female then penetrates under the skin of the fish and differentiates into an adult. Heavy infections lead to debilitation and secondary bacterial or fungal
infections. Removal of the parasite by hand with forceps may control lernaeid infestations with careful monitoring of the wound. A 3% salt dip followed by 0.2%-prolonged immersion has been used to effectively control *Lernaea* in goldfish and koi ponds.

3) *Argulus*

*Argulus* or fish louse is a large parasite that attaches to the external surface of the host and can be easily seen with the unaided eye. *Argulus* is uncommon in freshwater aquarium fish but may occur if wild or pond-raised fish are introduced into the tank. It is especially common on goldfish and koi.

Individual parasites can be removed from fish with forceps, but this does not eliminate parasites in the environment. A prolonged immersion of 0.02 - 0.2% salt may control re-infection to the fish host.

**Leeches**

Leeches are occasionally seen in wild and pond-raised fish. They have a direct life cycle with immature and mature worms being parasitic on host's blood. Pathogenesis varies with number and size of worms and duration of feeding. Heavily infested fish often have chronic anemia. Fish may develop secondary bacterial and fungal infections at the attachment site.

Leeches resemble trematodes but are much larger and have anterior and posterior suckers. Dips in 3% saltwater are effective in controlling leeches. Ponds with heavy leech infestation require drainage, treatment with chlorinated lime, followed by several weeks of drying. This will destroy the adults and their cocoons containing eggs.
Table 1. Chemical treatments for the control of external ciliates. "X" indicates that the chemical should not be used for this type of treatment.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Dip</th>
<th>Short-term Bath</th>
<th>Prolonged (Indefinite) Immersion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper sulphate</td>
<td>X</td>
<td>X</td>
<td>total alkalinity/100 (up to 2.5 mg/L), Do not use if total alkalinity &lt; 50mg/L</td>
</tr>
<tr>
<td>Potassium permanganate</td>
<td>X</td>
<td>10 mg/L, 30 min</td>
<td>2 mg/L</td>
</tr>
<tr>
<td>Formalin</td>
<td>X</td>
<td>150-250 mg/L, 30 min</td>
<td>15-25 mg/L (2 drops/gallon or 1 mL/10 gallons)</td>
</tr>
<tr>
<td>Salt</td>
<td>3%, Duration is species dependent.</td>
<td>1%, 30 min to 1 hr, species dependent</td>
<td>0.02-0.2%</td>
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</tbody>
</table>

Infestation with sea lice (Lepeophtheirus salmonis and Caligus elongatus) is considered to be one of the most important disease problems in the farming of salmonids, especially in Atlantic salmon (Salmo Salar) and rainbow trout (Oncorhynchus mykiss).

There are a variety of clinical signs which might indicate the presence of endoparasites. Lethargy accompanied by emaciation is a common sign, as are worms protruding from the anus. Identification of sporozoan and protozoan endoparasites often requires microscopic examination of tissues.

In one preferred embodiment the present invention relates to control of parasitic diseases in fish, such as farmed fish and more specifically, a novel composition for treating and/or preventing infestations endoparasites and/or ectoparasites.

In one preferred embodiment the farmed fish comprises fresh waterfish. In another preferred embodiment the farmed fish comprises seawater fish.

In another preferred embodiment the treatment of fish for parasitic disease comprises administration of a pharmaceutical composition comprising vitamin K3 and/or fish feed comprising vitamin K3.

In one preferred embodiment the ectoparasites comprises Gyrodactylus salaries.

In one preferred embodiment the fish can be selected from, but is not limited to, the group consisting of Albacore Tuna (Thunnus alalunga), Arrowtooth Flounder.
(Atheresthes stomias), Atlantic Cod (Gadus morhua), Atlantic Cutlassfish (Trichiurus lepturus), Atlantic Salmon (Salmo salar), Atlantic Wolfish (Anarhichas lupus), Black Drum (Pogonias cromis), Black Pomfret (Parastromateus niger), Blackback Flounder (Sole, Pleuronectes americanus), Blacktip Shark (Carcharhinus limbatus), Catfish (Ictalurus furcatus), Crab, Blue (Callinectes sapidus), Marlin (Makaira nigricans), Rockfish (Sebastes auriculatus), Puffer (Sphoeroides annulatus), Scorpionfish (Scorpaena guttata), Sheepshead (Semicossyphus pulcher), Rockfish (Sebastes pinniger), Snapper (Lutjanus purpureus), Catfish (Ictalurus punctatus), Rockfish (Sebastes goodei, Sebastes nebulosus), Chinook (Oncorhynchus tsawytscha), Chub Mackerel (Scomber japonicus), Coho Salmon (Silver, Medium Red) (Oncorhynchus kisutch), Thresher Shark (Alopias vulpinus), Grouper (Epinephelus fulva), Cusk (Brosme brosme), Mahi-mahi (Coryphaena hippurus), Sole (Microstomus pacificus), Sole (Pleuronectes vetulus), Escolar (Lepidocybium flavobrunneum), Dory (Zeus faber), Ocean Perch (Sebastes norvegicus), Snapper (Lutjanus griseus), Sole (Flounder) (Glyptocephalus cynoglossus), Barracuda (Sphyraena barracuda), Haddock (Melanogrammus aeglefinus), Tuna (Euthynnus affinis), Snapper (Lutjanus synagris), Lingcod (Ophiodon elongatus), Milkfish (Chanos chanos), Tilapia (Tilapia mossambica), Nile Tilapia (Tilapia nilotica), Puffer (Sphoeroides maculatus), Tilefish (Caulolatilus princeps), Oiltfish (Ruvettus pretiosus), Orange Roughy (Hoplostethus atlanticus), Barracuda (Sphyraena argentea), (Bonito (Sarda chilensis), Cod (Alaska Cod, Gadus macrocephalus), Jack (Caranx caninus), Jack (Selene peruviana), Ocean Perch (Sebastes alutus), Mackerel (Scomber scombrus), Spanish (Scomberomorus sierra), Snapper (Lutjanus peru), Patagonian Toothfish (Dissostichus eleginoides), Sole (Flounder, Eopsetta Jordan), Pink Salmon (Humpback) (Oncorhynchus gorbuscha), Pollock (Pollachius virens), Rockfish (Sebastes maliger), Trout, Rainbow (Steelhead) (Oncorhynchus mykiss), Drum (Redfish) (Sciaenops ocellatus), Porgy (Chrysophrys auratus), Snapper (Lutjanus campechanus), Rockfish (Sebastes proriger), Sole (Flounder, Errex zachirus), Rockfish (Sebastes aleutianus), Schoolmaster (Lutjanus apodus), Sheepshead (Archosargus probatocephalus), Shark, Mako (Isurus oxyrinchus), Snapper (Lutjanus vivanus), Butterfish (Pampus argenteus), Rockfish (Sebastes brevispinis), Skipjack Tuna (Katsuwonus pelamis), Spinefoot (Siganus javus), Croaker or Corvina (Roncador stearnsi), Flounder (Platichthys stellatus), Marlin (Tetrapturus audax), Bass (Morone chrysops x saxatilis), Swordfish (Xiphias gladius), Carp (Barbodes schwanefeldi), Pollock (Alaska Pollock, Theragra chalcogramma), Hake (Urophycis tenuis), Rockfish (Sebastes entomelas), Flounder (Scophthalmus
aquosus), Croaker (Yellowfish, Pseudosciaena manchurica), Rockfish (Sebastes ruberrimus), Tuna (Thunnus albacares), Yellowstripe Scad (Selaroides leptolepis), Yellowtail (Seriola lalandei), Flounder (Limanda ferruginea), Rockfish (Sebastes flavidus) and Snapper (Ocyurus chrysurus) Arctic char (Salvelinus alpinus), Turbot, Greenland halibut (Reinhartdius hippoclossoides) and Halibut (Hippoglossus hippoclossus).

In one preferred embodiment the fish can be selected from, but is not limited to, the group consisting of Ablennes hians, Acanthopagrus berda, Acanthophthalmus semicinctus, Acanthophthalmus lineatus, Acanthophthalmus sp., Acanthophthalmus ostegus, Acentrogobius janthinopterus, Alectis sp., Ambassidae, Ambassis buruensis, Ambassis commersoni auctorum, Ambassis miops, Amblygaster sirm, Amphacanthus oramin, Siganus canaliculatus, Anabas testudineus, Anguilla bicolor pacifica, Anguilla celebensis, Anguilla marmorata, Anguilla mauritiana, Anguilla marmorata, Anguilla sp., Anguillidae, Anodontostoma chacunda, Anomalopidae, Anomalops katoptron, Anyperodon leucogrammicus, Apogon ellioti, Apogon sp. auctorum, Hypseleotris bipartite, Apogonichthys ellioti, Apogon ellioti, Apogonidae, Apolocetus niger, Parastromateus niger, Ariidae, Aristichthys nobilis, Arius manillensis, Arius sp., Arius thallassinus, Netuma thalassina, Arothron manilensis, Arothron mappa, Atherina balabacensis, Atherinidae, Atule mate, Bagridae, Batistes flavimarginatus, Pseudobalistes flavimarginatus, Balistidae, "banak", Belonidae, Belontiidae, Berycidae, Beryx splendens, Bodianus mesothorax, "boloan", Botia macracanthus, Butts amboinensis, Caesio cuning, Caesio erythrogaster, Caesio cuning, Caesio lunaris, Caesionidae, Capoeta tetrazona, Puntius tetrazona, Carangidae, Carangoides armatus, Caranx affinis, Atule mate, Caranx armatus, Carangoides armatus, Caranx sextasciatus, Caranx sp., Caranx speciosus, Gnathanodon speciosus, Carassius auratus, Carassius carassius, Carassius sp., "catfish", Centropomidae, Cephalopholis sonnerati, Chaetodon collare, Chaetodontidae, Chanidae, Channa striata, Channidae, Chanos chanos, Characidae, Cheilinus diagrammus, Oxycheilinus diagrammus, Cheilio inermis, Choerodon anchorago, Chonophorus melanocephalus, Cichlidae, Cirrhina mrigala, Cirrhinus mrigala, Cirrhinus mrigala, Claris batrachus, Claris macrocephalus, Claridae, Clupeidae, Cobitidae, Colisa lalia, Trichogaster lailia "colored tilapia", Creisson validus, Acentrogobius janthinopterus, Ctenopharyngodon idella, Cymbacephalus nematophthalmus, Cyprinidae, Cyprinus carpio, Cyprinus carpio carpio, Cyprinus carpio carpio, Cyprinus carpio, Cyprinus sp., Decapterus macrosoma, Decapterus sp., Dipterygonotus
In one preferred embodiment the one or more parasite(s) can be selected from, but is not limited to, the group consisting of Acanthocephala gen sp., Acanthocephala gen sp. auctorum, Acanthocephalus sp., Acanthocephalus sp., Acanthocelidae, Acanthogyrus sp., Acanthosentis sp., Acanthogyrus sp., Actinocleidus sp. auctorum, Ancyrocephalidae gen sp., Ancyrocephalinae gen sp., Ancyrocephalinae gen sp., Ancyrocephalus manilensis, Angiodyctyidae, Anilocra dimidiate, Anisakidae gen Sp., Anisakinae gen sp. auctorum, Anisakidae gen sp., Anisakis sp., Atherina philippinensis, Aonchotheca philippinensis, Aonchotheca philippinensis, Aphanurus stossichi, Apiosoma sp., Argulidae, Argulus indicus, Argulus japonicus, Argulus sp., Ascaridida gen sp., Ascocotyle sp., Aspinatrium virgatarum, Atractotrematidae, Azygia pristipomai, Azgyiidae, Bendenia malaboni, Bomolochidae, Bomolochus bellones, Bothriocephalidae, Bothriocephalidae gen sp. auctorum, Bothriocephalus sp., Bothriocephalus acheilognathi, Bothriocephalus sp., Bothriocephalus travassosi, Boviena serialis, Brachadena cheilinonis, Lecithophyllum cheilinonis, Branchiura gen sp., Bucephalidae, Bucephaloides philippinorum, Prosorhynchoides philippinorum, Bucephaloides sibi, Prosorhynchoides sibi Bucephalus fragilis, Bucephalus leognathi, Bucephalus paraheterotentaculatus, Bucephalus pseudovaricus, Bucephalus various Bucephalus various, Buncocotylidae, Caballeroctyla philippina, Caligidae, Caligidae gen sp., Caligodes laciniatus, Caligus epidemicus, Caligus mirabilis, Caligus productus, Caligus patulus, Caligus productus, Caligus robustus, Caligus sp., Caligus sp. auctorum, Caligus patulus, Caligus tylosuri, Camallanidae, Camallanidae gen sp., Camallanus (Camallanus) carangis, Camallanus (Camallanus) marinus, Camallanus (Camallanus) paracarangis, Camallanus ophicephali, Neocamallanus ophicephali, Camallanus sp., Camallanus (Zeylanema) anabantis, Capillaria philippinensis, Aonchotheca philippinensis, Capillariidae, Capsalidae, Carassotrema philippinense, Carneophallus brevicaea, Caryophyllidea gen. sp., Cavisoma magnus, Cavisomidae, Centrocestus caninus, Centrocestus sp., Ceratomyxa sp., Ceratomyxidae, Cercaria dorsocauda, Cercarioides sp., Cestoda gen sp., Chilodonella sp., Chilodonellidae, Chloromyxidae, Chloromyxum ellipticum, Chloromyxum sp., Cichlidogyrus longicornis, Cichlidogyrus longicornis longicornis, Cichlidogyrus longicornis, Cichlidogyrus sclerosus, Cichlidogyrus sp., Cichlidogyrus tiberianus, Cichlidogyrus tilapia, Clavella
In one preferred embodiment the treatment of fish parasites involves bathing or immersing the fish in a treatment solution comprising vitamin K3 - optionally in combination with one or more additional antiparasitic compounds. This embodiment includes, but is not limited to skin and gill parasites.

Bathing in formalin is a widespread treatment against many parasites, especially in fresh water, while bathing in organophosphates (metrifonate, dichlorvos, azamethiphos), pyrethroids (pyrethrum, cypermethrin, deltamethrin) or hydrogen peroxide are the most common bath treatments against e.g. sea lice (Lepeophtheirus salmonis, Caligus elongatus). These substances act directly on the parasites via the water, and a possible absorption of the active substance into the fish itself is unimportant for the effect of the active substances on the parasite.

The present invention also relates to oral co-administration of a composition comprising vitamin K3 and furthermore administrating one or more additional agents effective against parasites.

Substances for oral administration that are effective against parasitic infestations are known in the art. Substances such as chitin synthesis inhibitors, diflubenzuron and teflubenzuron, and ivermectin are examples of substances, which, if administered orally, can be effective against certain parasitic diseases in fish. In addition to the substances mentioned above, wrasse (Labridae) has been used extensively to keep sea lice infestations under control. All of these agents can be used in combination with vitamin K3.
Anti-parasite compositions can thus compise one or more additional agents, which can be e.g. selected from, but is not limited to, the group consisting of Malachite Green, Formalin, Acriflavine, praziquantel, salt, a solution of copper sulfate and citric acid, a formaldehyde and malachite formulation, potassium permanganate, formaldehyde/malachite, 0,0-dimethyl-1-hydroxy-2,2,2-trichloroethylyphosphonate, garlic, Supa Verm™, DesaFin™, Quick Cure™, Aquari Sol™, AP Formalin™, Clout 100 Tabs™, CyroPro™, Debride DW™, Fizz Tabs - Oxy Clear™, Fizz Tabs - Parasite Treatment™, Fluke-Tabs™, Furanase™, Hikari Prazisol™, ICH-X by Pond Solutions™, Interpet Anti-Parasite™, Jungle Pond Anchor Away™, KoiRx AQUA-PRAZI™, KoiRx Terminate™, Kordon Pond Formalin™, Kordon Pond Permoxy™, Kordon Pond Rid Ich™, Nox - Ich™, Paracide Green™, Pond Care® Dimilin, ProFormLA™, TetraPond® Desa-Fin, Trichloracide™, Para-Trex, Praziquantel, metronidazole, Fenbendazole, Piperazine, Levimazole, Praziquantel 0.0057%, Flubenol 0.03%, Metronidazole 0.30%, Ormetoprim-sulfa and Oxytetracycline, Maracide or any combination thereof.

In one preferred embodiment vitamin K3 is used for the treatment of a parasitic disease in a fish species in combination with a salt treatments. Basically, salt will strip or re-stimulate (depending upon the concentration) the slime coat produced by the fish, increasing antibodies and making bacteria, fungus, and parasites more vulnerable to medications such as antibiotics or fungicides. The following salts can be used in a salt treatment for your fish: Aquarium, solar (without anti-caking additives), meat curing, sea, kosher, rock, pickling, and ice cream salts, or regular non-iodized table salt. The additives mentioned above may include a type known as sodium ferrocyanide or yellow prussiate of soda. This is deadly to fish. The "cyanide" part should clue you in to that.

For a constant preventative treatment, use a low concentration of about 0.3%. If you have live plants in your aquarium, you may want to consider about half that amount. For a concentrated "dip" to be used in treatment of external parasites, the concentration should be 1%. You must be very careful when using these dips. All fish will react differently to salt treatments, and especially smaller fish must be monitored very closely. Generally this will be done in a hospital/quarantine tank, as water changes are the only way to remove salt from your main tank. The temperature should be kept between 75-80 degrees with good aeration. Dissolve your salt completely before adding your fish. Do not leave your fish in this solution longer than 30 minutes. Then place it in a container of aged water, preferably not taken from the main (still infected) tank. Give the tank a thorough cleaning while your fish recuperates.
In one preferred embodiment individual infected fish will be fed feed pellets comprising vitamin K3. In another preferred embodiment vitamin K3 is dissolved in water for treatment of fish, such as L. salmonis. In yet another preferred embodiment oil soluble components of the vitamin K3 can be used as an emulsion or as a dispenser.

In one preferred embodiment Vitamin K3 can be used in concentrations between 0.5 ppm and 1500 ppm both as food adherent and as a bath treatment such as between 0.5 ppm and 1450 ppm, for example between 0.5 ppm and 1400 ppm, such as between 0.5 ppm and 1350 ppm, for example between 0.5 ppm and 1300 ppm, such as between 0.5 ppm and 1250 ppm, for example between 0.5 ppm and 1200 ppm, such as between 0.5 ppm and 1150 ppm, for example between 0.5 ppm and 1100 ppm, such as between 0.5 ppm and 1050 ppm, for example between 0.5 ppm and 1000 ppm, such as between 0.5 ppm and 950 ppm, for example between 0.5 ppm and 900 ppm, such as between 0.5 ppm and 850 ppm, for example between 0.5 ppm and 800 ppm, such as between 0.5 ppm and 750 ppm, for example between 0.5 ppm and 700 ppm, such as between 0.5 ppm and 650 ppm, for example between 0.5 ppm and 600 ppm, such as between 0.5 ppm and 550 ppm, for example between 0.5 ppm and 500 ppm, such as between 0.5 ppm and 450 ppm, for example between 0.5 ppm and 400 ppm, such as between 0.5 ppm and 350 ppm, for example between 0.5 ppm and 300 ppm, such as between 0.5 ppm and 250 ppm, for example between 0.5 ppm and 200 ppm, such as between 0.5 ppm and 150 ppm, for example between 0.5 ppm and 100 ppm, such as between 0.5 ppm and 50 ppm, for example between 0.5 ppm and 45 ppm, such as between 0.5 ppm and 40 ppm, for example between 0.5 ppm and 35 ppm, such as between 0.5 ppm and 30 ppm, for example between 0.5 ppm and 25 ppm, such as between 0.5 ppm and 20 ppm, for example between 0.5 ppm and 15 ppm, such as between 0.5 ppm and 10 ppm, for example between 0.5 ppm and 9 ppm, such as between 0.5 ppm and 8 ppm, for example between 0.5 ppm and 7 ppm, such as between 0.5 ppm and 6 ppm, for example between 0.5 ppm and 5 ppm, such as between 0.5 ppm and 4 ppm, for example between 0.5 ppm and 3 ppm, such as between 0.5 ppm and 2 ppm, for example between 0.5 ppm and 1 ppm, such as between 1 ppm and 1500 ppm, for example between 5 ppm and 1500 ppm, such as between 10 ppm and 1500 ppm, for example between 15 ppm and 1500 ppm, such as between 20 ppm and 1500 ppm, for example between 25 ppm and 1500 ppm, such as between 30 ppm and 1500 ppm, for example between 35 ppm and 1500 ppm, such as between 40 ppm and 1500 ppm, for example between 45 ppm and 1500 ppm, such as between 50 ppm and 1500 ppm, for example between 100 ppm and 1500 ppm, such as between 150 ppm and 1500 ppm,
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In one preferred embodiment Vitamin K3 can be used in concentrations between 0.5 ppm and 2000 ppm both as food adherent and as a bath treatment such as between 0.5 ppm and 1950 ppm, for example between 0.5 ppm and 1900 ppm, such as between 0.5 ppm and 1850 ppm, for example between 0.5 ppm and 1800 ppm, such as between 0.5 ppm and 1750 ppm, for example between 0.5 ppm and 1700 ppm, such as between 0.5 ppm and 1650 ppm, for example between 0.5 ppm and 1600 ppm, such as between 0.5 ppm and 1550 ppm, for example between 0.5 ppm and 1500 ppm, such as between 0.5 ppm and 1450 ppm, for example between 0.5 ppm and 1400 ppm, such as between 0.5 ppm and 1350 ppm, for example between 0.5 ppm and 1300 ppm, such as between 0.5 ppm and 1250 ppm, for example between 0.5 ppm and 1200 ppm, such as between 0.5 ppm and 1150 ppm, for example between 0.5 ppm and 1100 ppm, such as between 0.5 ppm and 1050 ppm, for example between 0.5 ppm and 1000 ppm, such as between 0.5 ppm and 950 ppm, for example between 0.5 ppm and 900 ppm, such as between 0.5 ppm and 850 ppm, for example between 0.5 ppm and 800 ppm, such as between 0.5 ppm and 750 ppm, for example between 0.5 ppm and 700 ppm, such as between 0.5 ppm and 650 ppm, for example between 0.5 ppm and 600 ppm, such as between 0.5 ppm and 550 ppm, for example between 0.5 ppm and 500 ppm, such as between 0.5 ppm and 450 ppm, for example between 0.5 ppm and 400 ppm, such as between 0.5 ppm and 350 ppm, for example between 0.5 ppm and 300 ppm, such as between 0.5 ppm and 250 ppm,
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In one embodiment a fish feed composition or a dietary supplement comprising vitamin K₃ is used for the treatment of parasitic disease in fish.
The natural fish prey for carnivorous fish such as salmonoids has with respect to the major components, the following typical composition on dry weight basis: 10-90 wt% of protein, 20-50 wt% of lipids, 5-50 wt% of ashes and nitrogen free extracts. The variation in composition of the natural prey for carnivorous fish is relatively large. This is i.e. caused by the fact that in smaller prey fish the volume of the stomach constitutes a relatively larger proportion of the total weight as compared to that in larger prey fish. Additionally, seasonal fluctuations will affect the composition of the fish prey which e.g. implies that the lipid content is at the highest level in some seasons and at the lowest level in other seasons.

Dietary nutrients are essential for the construction of living tissues. They also are a source of stored energy for fish digestion, absorption, growth, reproduction and the other life processes. The nutritional value of a dietary ingredient is in part dependant on its ability to supply energy. Physiological fuel values are used to calculate and balance available energy values in prepared diets. They typically average 4, 4, and 9 kcal/g for protein, carbohydrate and lipid, respectively.

To create an optimum diet, the ratio of protein to energy must be determined separately for each fish species. Excess energy relative to protein content in the diet may result in high lipid deposition. Because fish feed to meet their energy requirements, diets with excessive energy levels may result in decreased feed intake and reduced weight gain. Similarly, a diet with inadequate energy content can result in reduced weight gain because the fish cannot eat enough feed to satisfy their energy requirements for growth. Properly formulated prepared feeds have a well-balanced energy to protein ratio.

Fish nutrition has advanced dramatically in recent years with development of balanced commercial diets that promote optimal fish growth and health. Furthermore, the development of new species-specific diet formulations supports the fish farming industry.

Commercially available dry feed compositions for carnivorous fish have a content of nutrients which differs significantly from that of the natural prey fish. Thus, such feed compositions commonly have a relatively high content of carbohydrates which are incorporated to act as a binding/structure forming agent in the pellets/granules of the
feed. The carbohydrate sources are typically starch-containing cereals such as wheat or cereal starches.

**Primary ingredients of a fish feed composition**

Prepared or artificial fish diets may be either complete or supplemental. Complete fish diets supply all the ingredients (protein, carbohydrates, fats, vitamins, and minerals) necessary for the optimal growth and health of the fish. Most fish farmers use complete diets, those containing all the required protein (18-50%), lipid (5-45%), carbohydrate (5-25%), ash (< 15%), phosphorus (< 5%), water (< 12%), and trace amounts of vitamins, and minerals. When fish are reared in high density indoor systems or confined in cages and cannot forage freely on natural feeds, they must be provided a complete diet.

In contrast, supplemental (incomplete, partial) diets are intended only to help support the natural food (insects, algae, small fish) normally available to the fish. Supplemental diets do not contain a full complement of vitamins or minerals, but are used to help fortify the naturally available diet with extra protein, carbohydrate and/or lipid.

**Protein**

Because protein is the most expensive part of fish feed, it is important to accurately determine the protein requirements for each species and size of cultured fish. Proteins are formed by linkages of individual amino acids. 10 of the amino acids are essential meaning that they cannot be synthesized by fish. The 10 essential amino acids that must be supplied by the diet are: methionine, arginine, threonine, tryptophan, histidine, isoleucine, lysine, leucine, valine and phenylalanine. Of these, lysine and methionine are often the first limiting amino acids. Fish feeds prepared with plant (soybean meal) protein typically are low in methionine; therefore, extra methionine must be added to soybean-meal based diets in order to promote optimal growth and health.

Protein levels in aquaculture feeds generally average 18-20% for marine shrimp, 28-32% for catfish, 32-38% for tilapia, 38-42% for hybrid striped bass. Protein requirements usually are lower for herbivorous fish (plant eating) and omnivorous fish (plant-animal eaters) than they are for carnivorous (flesh-eating) fish, and are higher for fish reared in high density (recirculating aquaculture) than low density (pond aquaculture) systems.
Protein requirements generally are higher for smaller fish. As fish grow larger, their protein requirements usually decrease. Protein requirements also vary with rearing environment, water temperature and water quality, as well as the genetic composition and feeding rates of the fish. Protein is used for fish growth if adequate levels of fats and carbohydrates are present in the diet. If not, protein may be used for energy and life support rather than growth.

The protein source may be a liquid or dry non-milk protein source, such as stick water (also referred to as size), fish meal, blood meal, meat meal, bone meal, liquid or dry yeast or proteins derived from a vegetable source including as examples soy beans, peas, maize or cereals. Evidently, a protein source of marine origin has an amino acid composition which is nutritionally appropriate for growing fish, i.e. such a protein contains essential amino acids in the appropriate amounts. This may not be the case with other protein sources, and it may therefore, when non-marine proteins are used in accordance with the invention, be required to supplement the feed composition with appropriate amounts of certain essential amino acids with respect to which the selected protein is deficient, including as examples tryptophan and methionine. A currently preferred protein source is a marine protein source such as fish meal or fish material having a water content in excess of 10 wt% including the semi-manufactured press cake material from fish meal production and stick water also from the processing of fish raw material for fish meal production. In certain fish feed compositions e.g. the so-called "weaning" feed compositions, it is preferred to select fish protein sources of a high quality e.g. having a low content of soluble nitrogen components, a low content of biogenic amines, a low content of carbohydrate, a low content of lipids or containing lipids having a low degree of rancidity. Furthermore, the digestibility of the protein should be high such as at least 90%.

**Lipids**

Lipids (fats) are high-energy nutrients that can be utilized to partially spare (substitute for) protein in aquaculture feeds. Lipids supply about twice the energy as proteins and carbohydrates. Lipids typically comprise about 15%-50% of fish diets, supply essential fatty acids (EFA) and serve as transporters for fat-soluble vitamins.

Simple lipids include fatty acids and triacylglycerols. Fish typically require fatty acids of the omega 3 and 6 (n-3 and n-6) families. Fatty acids can be: a) saturated fatty acids (SFA, no double bonds), b) polyunsaturated fatty acids (PUFA, >2 double bonds), or c)...
highly unsaturated fatty acids (HUFA; > 4 double bonds). Marine fish oils are naturally high (>30%) in omega 3 HUFA, and are excellent sources of lipids for the manufacture of fish diets.

Marine fish typically require n-3 HUFA for optimal growth and health, usually in quantities ranging from 0.5-2.0% of dry diet. The two major EFA of this group are eicosapentaenoic acid (EPA: 20:5n-3) and docosahexaenoic acid (DHA:22:6n-3). Freshwater fish do not require the long chain HUFA, but often require an 18 carbon n-3 fatty acid, linolenic acid (18:3-n-3), in quantities ranging from 0.5 to 1.5% of dry diet. This fatty acid cannot be produced by freshwater fish and must be supplied in the diet.

Many freshwater fish can take this fatty acid, and through enzyme systems elongate (add carbon atoms) to the hydrocarbon chain, and then further desaturate (add double bonds) to this longer hydrocarbon chain. Through these enzyme systems, freshwater fish can manufacture the longer chain n-3 HUFA, EPA and DHA, which are necessary for other metabolic functions and as cellular membrane components. Marine fish typically do not possess these elongation and desaturation enzyme systems, and require long chain n-3 HUFA in their diets. Other fish species, such as tilapia, require fatty acids of the n-6 family, while still others, such as carp or eels, require a combination of n-3 and n-6 fatty acids.

The lipid can be any vegetable lipid and/or marine lipid which may either be solid or liquid at room temperature. One presently preferred lipid is a fish oil, including an at least partially hydrogenated fish oil. However, the lipid may also be selected from other sources such as oils and fats from other animal sources and vegetable oils and fats.

**Carbohydrates**

Carbohydrates (starches and sugars) are the most economical and inexpensive sources of energy for fish diets. Although not essential, carbohydrates are included in aquaculture diets to reduce feed costs and for their binding activity during feed manufacturing. Dietary starches are useful in the extrusion manufacture of floating feeds. Cooking starch during the extrusion process makes it more biologically available to fish.

In fish, carbohydrates are stored as glycogen that can be mobilized to satisfy energy demands. They are a major energy source for mammals, but are not used efficiently by fish. For example, mammals can extract about 4 kcal of energy from 1 gram of
carbohydrate, whereas fish can only extract about 1.6 kcal from the same amount of carbohydrate. Up to about 20% of dietary carbohydrates can be used by fish.

**Vitamins**

Vitamins are organic compounds necessary in the diet for normal fish growth and health. They often are not synthesized by fish, and must be supplied in the diet. The two groups of vitamins are water-soluble and fat-soluble. Water-soluble vitamins include: the B vitamins, choline, inositol, folic acid, pantothenic acid, biotin and ascorbic acid (vitamin C). The fat-soluble vitamins include A vitamins, retinols; the D vitamins, cholecaciferols; E vitamins, the tocopherols (antioxidants); and K vitamins such as vitamin K3. Deficiency of each vitamin has certain specific symptoms, but reduced growth is the most common symptom of any vitamin deficiency.

A useful source of vitamins is yeast cell mass either in the form a dry yeast or as a liquid yeast cell suspension, i.e. yeast cream.

**Minerals**

Minerals are inorganic elements necessary in the diet for normal body functions. They can be divided into two groups (macro-minerals and micro-minerals) based on the quantity required in the diet and the amount present in fish. Common macro-minerals are sodium, chloride, potassium and phosphorous. These minerals regulate osmotic balance and aid in bone formation and integrity. Micro-minerals (trace minerals) are required in small amounts as components in enzyme and hormone systems. Common trace minerals are copper, chromium, iodine, zinc and selenium. Fish can absorb many minerals directly from the water through their gills and skin, allowing them to compensate to some extent for mineral deficiencies in their diet.

A useful source of mineral micronutrients is yeast cell mass either in the form a dry yeast or as a liquid yeast cell suspension, i.e. yeast cream.

**Secondary ingredients of a fish feed composition**

The feed composition may comprise an emulsifying agent (emulsifier), such as a fatty acid, a mono- di- or triglyceride, an organic ester of mono- glycerides, a polyglycerol ester of fatty acids, a propylene glycol ester, a sorbitan ester of fatty acids, a polyoxyethylene sorbitan ester, a sodium stearoyl lactylate, a calcium stearoyl lactylate, a sucrose ester of fatty acids, a sucro- glyceride, a lecithin or a mixture of such
emulsifiers. Particularly preferred emulsifying agents are water-insoluble. In specific embodiments the emulsifier is derived from a marine source.

The amount of emulsifying agent is typically in the range of 0.1 to 5 wt%, calculated on the amount of lipid such as in the range of 0.5 to 2 wt%. Based on the finished feed product, the amount of emulsifying agent is typically in the range of 0.05 to 1 wt%. It may be preferred to select an emulsifying agent which is solid at room temperature and having a relatively high melting point such as in the range of 50-60 °C. It has been found that by incorporating such an emulsifying agent, the finished feed mixture particles when cooled to ambient temperature set relatively rapidly to provide solid, coherent feed particles which essentially do not disintegrate when administered to the fish breeding environments.

In useful specific embodiments of the invention, the feed composition contains a hydrocolloid such as a non-protein hydrocolloid, preferably a polysaccharide of vegetable or microbial origin. In this context, useful hydrocolloids include a gum such as e.g. guar gum, xanthan gum, gum arabic, LBG, gellan gum, a pectin, a carrageenan, an alginate, a starch including starch derivatives and a water soluble cellulose derivative such as CMC.

In accordance with the invention, the feed composition may comprise further ingredients such as water soluble and water-insoluble vitamins, mineral components, flavouring agents or antioxidants such as e.g. ascorbic acid, ascorbyl palmitate, ascorbyl stearate, BHA (butylated hydroxyanisole), BHT (butylated hydroxytoluene), propyl gallate and tocopherols or preserving agents.

In accordance with the invention, the feed composition can also be supplemented with pharmaceutically active substances. Such active substances typically include antibiotics, vaccines and substances which have a stimulatory effect on the immune system of the growing fish.

**Feed Types**

The present invention relates to different types of fish feed comprising vitamin K3 as described below.

Commercial fish diets are manufactured as either extruded (floating or buoyant) or pressure-pelleted (sinking) feeds. Both floating and sinking feed can produce
satisfactory growth, but some fish species prefer floating, others sinking. Shrimp, for example, will not accept a floating feed, but most fish species can be trained to accept a floating pellet.

Extruded feeds are more expensive due to the higher manufacturing costs. Usually, it is advantageous to feed a floating (extruded) feed, because the farmer can directly observe the feeding intensity of his fish and adjust feeding rates accordingly. Determining whether feeding rates are too low or too high is important in maximizing fish growth and feed use efficiency.

Feed is available in a variety of sizes ranging from fine crumbles for small fish to large (1/2 inch or larger) pellets. The pellet size should be approximately 20-30% of the size of the fish species mouth gape. Feeding too small a pellet results in inefficient feeding because more energy is used in finding and eating more pellets. Conversely, pellets that are too large will depress feeding and, in the extreme, cause choking.

The composition is suitable for use as a fish feed composition and using the range of 0.7- 5.6 gram of Hydroxyproline per kg fish feed composition. Aqua feed should contain 0.5 to 15 g Hydroxyproline per kg diet. The fish feed composition can be dried e.g. freeze-dried, frozen, algae wafers, floating or sinking flake fish feed composition, floating or sinking stick fish feed composition, pellet fish feed composition or slowly dissolving fish feed composition. The fish feed composition can also be used for feeding of a fish population to be used as "live feed".

**Feeding rate and feeding frequency**

The present invention relates, in one embodiment, to a fish feed comprising vitamin K3 for treatment of parasitic disease. The feeding rate, frequency and method can be selected from, but is not limited to, the description below.

Feeding rates and frequencies are in part a function of fish size. Small larval fish and fry need to be fed a high protein diet frequently and usually in excess. Small fish have a high energy demand and must eat nearly continuously and be fed almost hourly. Feeding small fish in excess is not as much of a problem as overfeeding larger fish because small fish require only a small amount of feed relative to the volume of water in the culture system.
As fish grow, feeding rates and frequencies should be lowered, and protein content reduced. However, rather than switching to a lower protein diet, feeding less allows the grower to use the same feed (protein level) throughout the grow-out period, thereby simplifying feed inventory and storage.

Feeding fish is labour-intensive and expensive. Feeding frequency is dependent on labour availability, farm size, and the fish species and sizes grown. Large catfish farms with many ponds usually feed only once per day because of time and labour limitations, while smaller farms may feed twice per day. Generally, growth and feed conversion increase with feeding frequency. In indoor, intensive fish culture systems, fish may be fed as many as 5 times per day in order to maximize growth at optimum temperatures.

Many factors affect the feeding rates of fish. These include time of day, season, water temperature, dissolved oxygen levels, and other water quality variables. For example, feeding fish grown in ponds early in the morning when the lowest dissolved oxygen levels occur is not advisable. In contrast, in recirculating aquaculture systems where oxygen is continuously supplied, fish can be fed at nearly any time. During the winter and at low water temperatures, feeding rates of warmwater fishes in ponds decline and feeding rates should decrease proportionally.

Feed acceptability, palatability and digestibility vary with the ingredients and feed quality. Fish farmers pay careful attention to feeding activity in order to help determine feed acceptance, calculate feed conversion ratios and feed efficiencies, monitor feed costs, and track feed demand throughout the year.

Farmers can calculate optimum feeding rates based on the average size in length or weight and the number of fish in the tank, raceway, or pond. Farmed fish typically are fed 1-4% of their body weight per day.

Fish can be fed by hand, by automatic feeders, and by demand feeders. Many fish farmers like to hand feed their fish each day to assure that the fish are healthy, feeding vigorously, and exhibiting no problems. Large catfish farms often drive feed trucks with compressed air blowers to distribute (toss) feed uniformly throughout the pond.

There are a variety of automatic (timed) feeders ranging in design from belt feeders that work on wind-up springs, to electric vibrating feeders, to timed feeders that can be programmed to feed hourly and for extended periods. Demand feeders do not require...
electricity or batteries. They usually are suspended above fish tanks and raceways and work by allowing the fish to trigger feed release by striking a moving rod that extends into the water. Whenever a fish strikes the trigger, a small amount of feed is released into the tank. Some growers use night lights and bug zappers to attract and kill flying insects and bugs to provide a supplemental source of natural food for their fish.

The present fish feed can, in one embodiment, be used for feeding of herbivorous fish (plant eating), omnivorous fish (plant-animal eaters) and carnivorous (flesh-eating) fish.

Examples of fish suitable for the invention include, but are not limited to, Albacore Tuna (Thunnus alalunga), Arrowtooth Flounder (Atheresthes stomias), Atlantic Cod (Gadus morhua), Atlantic Cutlassfish (Trichurus lepturus), Atlantic Salmon (Salmo salar), Atlantic Wolffish (Anarhichas lupus), Black Drum (Pogonias cromis), Black Pomfret (Parastromateus nigen), Blackback Flounder (Sole, Pleuronectes americanus), Blacktip Shark (Carcharhinus limbatus), Catfish (Ictalurus furcatus), Crab, Blue (Callinectes sapidus), Marlin (Makaira nigricans), Rockfish (Sebastes auriculatus), Puffer (Sphoeroides annulatus), Scorpionfish (Scorpaena guttata), Sheephead (Semicossyphus pulcher), Rockfish (Sebastes pinniger, Snapper (Lutjanus purpureus), Catfish (Ictalurus punctatus), Rockfish (Sebastes goodei, Sebastes nebulosus), Chinook (Oncorhynchus tshawytscha), Chub Mackerel (Scomber japonicus), Coho Salmon (Silver, Medium Red) (Oncorhynchus kisutch), Thresher Shark (Alopias vulpinus), Grouper (Epinephelus fulva), Cusk (Brosme brosme), Mahi-mahi (Coryphaena hippurus), Sole (Microstomus pacificus), Sole (Pleuronectes vetulus), Escolar (Lepidocybium flavobrunneum), Dory (Zeus faber), Ocean Perch (Sebastes norvegicus), Snapper (Lutjanus griseus), Sole (Flounder) (Glyptocephalus cynoglossus), Barracuda (Sphyraena barracuda), Haddock (Melanogrammus aeglefinus), Tuna (Euthynnus affinis), Snapper (Lutjanus synagris), Lingcod (Ophiodon elongatus), Milkfish (Chanos chanos), Tilapia (Tilapia mossambica), Nile Tilapia (Tilapia nilotica), Puffer (Sphoeroides maculatus), Tilefish (Caulolatilus princeps), Olfish (Ruvettus pretiosus), Orange Roughy (Hoplostethus atlanticus), Barracuda (Sphyraena argentea), (Bonito (Sarda chiliensis), Cod (Alaska Cod, Gadus macrocephalus), Jack (Caranx caninus), Jack (Selene peruviana), Ocean Perch (Sebastes alutus), Mackerel (Scomber scombrus), Spanish (Scomberomorus sierra), Snapper (Lutjanus peru), Patagonian Toothfish (Dissostichus eleginoides), Sole (Flounder, Eopsetta Jordan), Pink Salmon (Humpback) (Oncorhynchus gorbuscha), Pollock (Pollachius virens), Rockfish (Sebastes maliger), Trout, Rainbow (Steelhead)
(Oncorhynchus mykiss), Drum (Redfish) (Sciaenops ocellatus), Porgy (Chrysophrys auratus), Snapper (Lutjanus campechanus), Rockfish (Sebastes proriger), Sole (Flounder, Errex zachirus), Rockfish (Sebastes aleutianus), Schoolmaster (Lutjanus apodus), Sheepshead (Archosargus probatocephalus), Shark, Mako (Isurus oxyrinchus), Snapper (Lutjanus viganus), Butterfish (Pampus argenteus), Rockfish (Sebastes brevispinis), Skipjack Tuna (Katsuwonus pelamis), Spinefoot (Siganus javus), Croaker or Corvina (Roncador stearnsi), Flounder (Platicthys stellatus), Marlin (Tetrapturus audax), Bass (Morone chrysops x saxatilis), Swordfish (Xiphias gladius), Carp (Barbodes schwanefeldi), Pollock (Alaska Pollock, Theragra chalcogramma), Hake (Urophycis tenuis), Rockfish (Sebastes entomelas), Flounder (Scophthalmus aquosus), Croaker (Yellowfish, Pseudosciaena manchurica), Rockfish (Sebastes ruberrimus), Tuna (Thunnus albacares), Yellowstripe Scad (Selaroides leptolepis), Yellowtail (Seriola lalandei), Flounder (Limanda ferruginea), Rockfish (Sebastes flavidus) and Snapper (Ocyurus chrysurgus) Arctic char (Salvelinus alpinus), Turbot, Greenland halibut (Reinhartdius hippoglossoides) Halibut (Hippoglossus hippoglossus)

**Combinations of fish and parasites**

In one embodiment vitamin K3 is used for chemotherapy treatment of fish with helmints in the fish intestine lumen. In this preferred embodiment vitamin K3 is administrated orally to the hosts. The fish species include in this preferred embodiment, but is not limited to, the group consisting of Grass carp, Silver carp, Common carp, bighead carp, Crucian Carp, Nile Tilapia, Roho Labeo, Catla, White Amur Bream, Milkfish, Marine flatfishes such as Turbot and Atlantic- Pacific Halibut, Sea bream, Wolf fishes and Atlantic cod, Mud Carp, Japanese eel, Black Carp and Salmonids such as Atlantic Salmon, Rainbow trout, Arctic char, Chinook salmon, Tunas as Southern bluefin tuna, yellowtail (Seriola), amberjack, Barramundi and cobia.

In another preferred embodiment vitamin K3 is used to treat any parasitic disease in the fish species listed above.

The present invention also relates to treatment of fish with Helminths of the genus's Bothriocephalus, Eubotrium, Proteocephalus, Hysterothylacium and families Allocreadiidene, Opecoelidae, Gorgoderidae, Hemiuridae and Deroginidiae. In one embodiment the parasites mentioned above are sensitive to oral treatment with Vitamin K3. The host of the parasites mentioned above can in one embodiment be any of the fish species listed in this document.
In another preferred embodiment the present invention relates to protozoan intestine parasites such as Flagelates and Amoeba, Ciliates, Microsporidians and Myxozoans and crustaceans such as Mytilicola intestinalis. In one embodiment the protozoan intestine parasites mentioned above are sensitive to oral treatment with Vitamin K3. The host of the parasites mentioned above can in one embodiment be any of the fish species listed in this document.

In another preferred embodiment Vitamin K3 is administrated as a bath treatments towards ectoparasitic diseases such as Neoparamoeba spp. (Sarcomastigophora) Loma salmonae, Benedenia seriola, Heteraxine heterocerca, Neobenedenia melleni, the Myxosporidian Kudoa spp., Ichthyobodo necator, Trichodina spp. and Crustaceans such as Lepeophtheirus salmonis, Caligus spp. and parasitic isopods as Ceratothoa spp, Salmonicola Salmonea and S.spp. Ergasilus spp., Salmonicola salmonea, Argulus, Ergasilus spp., Lernaea, Lernaeocera branchialis, Probopryrus, Cymothoa, Olencira, Lironeca, Loxocephalus, Sacculina, Argulus and Helminths of the genuses Gyrodachylus.spp and Dactylogyros spp. and Order Hirundea. The host of the parasites mentioned above can in one embodiment be any of the fish species listed in this document.

**Preparation of fish feed**

The fish feed composition described in the present invention can in one embodiment be prepared as described below.

The conventional processes for preparing such types of fish feed normally include an extrusion pelleting process whereby the carbohydrate-containing feed mixture is precoked at temperatures above the starch gelatinization temperature followed by an extrusion step wherein the feed mixture is cooked together with the other feed ingredients at a temperature above 100°C, resulting in solid, dry feed pellets. In the known methods of manufacturing dry fish feed, carbohydrates in amounts from about 8 to about 30 wt% is an ingredient which in the industry is considered as required to obtain a fish feed having a sufficient long term stability towards disintegration and deformation during storage and distribution.

In a further aspect, the invention provides, a method of preparing a fish feed composition, the method comprising as a first step the mixing of a lipid and an
emulsifying agent. If it is required to melt the emulsifying agent, the lipid is pre-heated to a temperature above the melting point of the emulsifying agent e.g. to a temperature in the range of about 55-65°C. In a subsequent step, the protein source as defined above is added to the resulting mixture in the form of an aqueous suspension and/or solution or as a slurry of protein. The protein content of the aqueous suspension and/or solution may vary, but is preferably in the range of 10-90 wt%, such as 20 to 80 wt% protein, including a content of 30 to 70 wt% and e.g. from 40 to 60 wt% protein.

The mixture resulting from the above subsequent step is then subjected to emulsifying conditions using a conventional homogenising or an emulsifying apparatus to obtain a water- in-lipid or a lipid-in-water emulsion, depending on the type of emulsifying agent used. Subsequently, the resulting emulsion is formed into particles by a forming process e.g. pelleting at a temperature not exceeding 100°C and, if required, the particles are dried e.g. using air drying, hot air drying, freeze drying or drum drying to obtain the feed composition. However, when a high melting emulsifying agent is used a drying step is generally not required to obtain solid and coherent feed particles.

In a still further aspect, the invention relates to an alternative method for preparing a fish feed composition which method comprises as a first step the preparation of an emulsion comprising a lipid, an aqueous phase and at least one emulsifying agent. The aqueous phase may optionally contain protein in an amounts as mentioned above, i.e. in the range of 10-90 wt%, such as 20 to 80 wt% protein, including a content of 30 to 70 wt% and e.g. from 40 to 60 wt% protein.

In a subsequent step, this emulsion is combined with at least one dry protein-containing ingredient to obtain a fish feed mixture which is subsequently formed and, if required, dried to obtain the fish feed composition.

In either of the above methods, the aqueous suspension and/or solution may also contain at least one further structurizing or consistency controlling ingredient selected from a thickening agent, a viscosity enhancing agent and a stabilizing agent including as an example, a non-protein hydrocolloid such as a polysaccharide of vegetable or microbial origin, preferably a carrageenan or a gum, a wetting agent such as a ketone or an alcohol, preferably ethanol, a flavouring agent such as betaine, a mineral compound and/or a vitamin.
In particular it has been found that the addition of a wetting agent including an alcohol or a ketone to the emulsion mixture facilitates an effective emulsification and subsequent mixing with the other ingredients of the feed composition. A suitable amount of an alcohol or ketone is 5-15 wt% of the emulsion and 1-5 wt%, calculated on the feed composition after mixing. Evidently, part of an added alcohol or ketone will evaporate from the feed composition during mixing and storage of the finished feed composition.

It is an important aspect of the methods according to the invention that the process temperature is low, whereby a deterioration of the dietary quality of the protein and lipid content is avoided and the energy consumption is low. Thus, the processes are preferably carried out at temperatures which are in the range of 10-1100 °C, preferably at the lowest possible temperatures where efficient mixing of the component can still be attained. Thus, the process temperature may preferably be within a range of 15-80 °C such as a range of 20-60 °C.

**Pharmaceutical Compositions**

Another aspect of the present invention provides pharmaceutical compositions which comprise vitamin K3 and a pharmaceutically acceptable carrier and optionally additional therapeutic ingredients.

The compositions include compositions suitable for oral, rectal, topical, parenteral (including subcutaneous, intramuscular, and intravenous), ocular (ophthalmic), pulmonary (nasal or buccal inhalation), or nasal administration, although the most suitable route in any given case will depend on the nature and severity of the conditions being treated and on the nature of the active ingredient. They may be conveniently presented in unit dosage form and prepared by any of the methods well-known in the art of pharmacy.

In practical use, vitamin K3 can be combined as the active ingredient in intimate admixture with a pharmaceutical carrier according to conventional pharmaceutical compounding techniques. The carrier may take a wide variety of forms depending on the form of preparation desired for administration, e.g., oral or parenteral (including intravenous). In preparing the compositions for oral dosage form, any of the usual pharmaceutical media may be employed, such as, for example, water, glycols, oils,
alcohols, flavoring agents, preservatives, coloring agents and the like in the case of oral liquid preparations, such as, for example, suspensions, elixirs and solutions; or carriers such as starches, sugars, microcrystalline cellulose, diluents, granulating agents, lubricants, binders, disintegrating agents and the like in the case of oral solid preparations such as, for example, powders, hard and soft capsules and tablets, with the solid oral preparations being preferred over the liquid preparations.

Because of their ease of administration, tablets and capsules represent the most advantageous oral dosage unit form in which case solid pharmaceutical carriers are obviously employed. If desired, tablets may be coated by standard aqueous or nonaqueous techniques. Such compositions and preparations should contain at least 0.1 percent of active compound. The percentage of active compound in these compositions may, of course, be varied and may conveniently be between about 2 percent to about 60 percent of the weight of the unit. The amount of active compound in such therapeutically useful compositions is such that an effective dosage will be obtained. The active compounds can also be administered intranasally as, for example, liquid drops or spray.

The tablets, pills, capsules, and the like may also contain a binder such as gum tragacanth, acacia, corn starch or gelatin; excipients such as dicalcium phosphate; a disintegrating agent such as corn starch, potato starch, alginic acid; a lubricant such as magnesium stearate; and a sweetening agent such as sucrose, lactose or saccharin. When a dosage unit form is a capsule, it may contain, in addition to materials of the above type, a liquid carrier such as a fatty oil.

Various other materials may be present as coatings or to modify the physical form of the dosage unit. For instance, tablets may be coated with shellac, sugar or both. A syrup or elixir may contain, in addition to the active ingredient, sucrose as a sweetening agent, methyl and propylparabens as preservatives, a dye and a flavoring agent.

The composition comprising vitamin k3 may also be administered parenterally. Solutions or suspensions of these active compounds can be prepared in water suitably mixed with a surfactant such as hydroxypropylcellulose. Dispersions can also be prepared in glycerol, liquid polyethylene glycols and mixtures thereof in oils. Under
ordinary conditions of storage and use, these preparations contain a preservative to prevent the growth of microorganisms.

The pharmaceutical forms suitable for injectable use include sterile aqueous solutions or dispersions and sterile powders for the extemporaneous preparation of sterile injectable solutions or dispersions. In all cases, the form must be sterile and must be fluid to the extent that easy syringability exists. It must be stable under the conditions of manufacture and storage and must be preserved against the contaminating action of microorganisms such as bacteria and fungi. The carrier can be a solvent or dispersion medium containing, for example, water, ethanol, polyol (e.g. glycerol, propylene glycol and liquid polyethylene glycol), suitable mixtures thereof, and vegetable oils.

**Administration and Dose Ranges**

Any suitable route of administration may be employed for providing the individual with an effective dose of a compound of the present invention. For example, oral, rectal, topical, parenteral, ocular, pulmonary, nasal, and the like may be employed. Dosage forms include tablets, troches, dispersions, suspensions, solutions, capsules, creams, ointments, aerosols, and the like.

The effective dosage of active ingredient employed may vary depending on the particular compound employed, the mode of administration, the type, weight, age and gender of the treated individual and the type and severity of the parasitic disease. Such dosage may be ascertained readily by a person skilled in the art.

When treating parasitic disease with the compound comprising vitamin K3, generally satisfactory results are obtained when the compounds of the present invention are administered at a daily dosage of from about 0.1 milligram to about 100 milligram per kilogram of animal body weight, preferably given as a single daily dose or in divided doses two to six times a day, or in sustained release form. For most large mammals, the total daily dosage is from about 1.0 milligrams to about 1000 milligrams, preferably from about 1 milligram to about 50 milligrams. The dosage regimen may be adjusted within this range or even outside of this range to provide the optimal therapeutic response.
Oral administration will usually be carried out using tablets. Examples of doses in tablets are 0.5 mg, 1 mg, 2 mg, 5 mg, 10 mg, 25 mg, 50 mg, 100 mg, and 250 mg. Other oral forms can also have the same dosages (e.g. capsules).

5 **Vitamin K3 as a Molluscicide**

Molluscicides are pesticides used to control molluscs, such as motts, slugs and snails. These substances include metaldehyde, methiocarb and aluminium sulphate. They should be used with caution, as they can be harmful to non-target animals. Most molluscicides are not used in organic gardening, though there are exceptions, such as iron phosphate.

Due to its low implicance on human health and low environmental concerns, use of vitamin K3 in gardens as molluscicide to treat slug pests or other plant pests can also possible be applied.

**Treatment of parasitic disease in avian species**

In one embodiment the present invention relates to the use of vitamin K3 for treatment of parasitic disease in avian species.

The present invention also relates to a composition comprising vitamin K3 and methods for treatment of parasitic diseases in avian species using a pharmaceutical composition or a food or feed composition comprising vitamin K3.

In one preferred embodiment the present invention relates to the use of vitamin K3 for treatment of parasitic disease in avian species poultry farming such as chicken farming. Poultry farming is raising chickens, turkeys, ducks and other fowl for meat or eggs. Poultry farms can be: 1. Breeding farms where they raise poultry for meat, or 2. Layer farms where they produce eggs.

In preferred embodiment the one or more avian species can be selected from, but is not limited to, the group consisting of Abbott’s Lesser Sulphur Crested, Cockatoo, Abessinian Parrots, Poicephalus, Abyssinian Ringnecks, Psittacula, Adelaide Rosellas, Platycercus, African Greys / Grey Parrots, Kongo Greys, Timnehs, African Ringnecks, Albatross, Alexandrine Parakeets aka Alexandrine Parrot, Alexandrian Parrots, Alpine Parakeets, Kakarikis, Amazons, Amboina King Parrots, Alisterus, Andamanen Long-
tailed Parakeets, Psittacula, Andaman Island Parakeets, Andaman Moustached Parakeets, Psittacula, Andean Parakeets, Bolborhynchus, Angola Brown Parrots, Poicephalus, Anhingas, Anis, Antbed Parrots, Psephotus, Antbirds, Antipodes Island / Green Parakeets, Kakarikis, Antipodes Red-Fronted Parakeets, Kakarikis, Apostlebirds, Aracari, Toucans, Aru-Red-cheeked Parrots, Geoffroyus, Asities, Astrapia, Auks / Auklets, Australian King Parrots, Alisterus, Ayamara Parakeets, Bolborhynchus, Babblers, Babi Moustached Parakeet, Psittacula, Bangs' Black Parrots, Coracopsis, Bank's or Banksian Black Cockatoos, Red-tailed Cockatoos, Barbets, Bare-eyed Cockatoos, Barn Owls, Barraband's Parrots, Splendour Parrots, Barred Parakeet aka Peruvian Barred Parakeets, Bolborhynchus, Bats, Beautiful Parakeets, Bee Bee Parrots, Tovi Parakeets, Bee Eaters, Behn's Parakeets, Brotogeris, Bell Birds, Beni Blue-winged Parakeets, Brotogeris, Beni Cobalt-winged Parakeets, Brotogeris, Biak Red-cheeked Parrots, Geoffroyus, Birds of Paradise, Bismarck's Hanging Parrots, Loriculus, Bittern, Black-billed Amazons, Blackbirds, Black-fronted Parakeets, Tahiti Parakeets, Kakarikis, Black-headed Caiques, Pionites, Black / Lesser Vasa Parrots, Coracopsis, Black-lored Parrots, Tanygnathus, Black Palm Cockatoos, Black-winged Parrots, Hapalopsittaca, Blood-winged Parakeets, Aprosmictus, Blossom-headed Parakeets, Roseata, Blue and Gold Macaws, Bluebirds, Blue-backed Parrots, Tanygnathus, Blue-bonnet Parrots, Psephotus, Blue-cheeked Rosellas (Platycercus), Blue-collard Parrots(Geoffroyus), Blue-crowned Hanging Parrots (Loriculus), Blue-crowned Parrots (Tanygnathus), Blue-crowned Racket-tailed Parrots (Prioniturus), Blue-eyed Cockatoos, Blue-headed Pionus / Parrots (Pionus), Blue-headed Racket-tailed Parrots (Prioniturus), Blue-naped Parrots, Blue-crowned Parrots (Tanygnathus), Blue-necked Red-cheeked Parrots (Geoffroyus), Blue-rumped Parrots (Psittinus), Bluethroats, Blue-winged Grass Parakeet (Grasskeet) (Columboides) aka Malabar Parakeet, Blue-winged Parakeet (Psittacula), Blue-winged Racket-tailed Parrots (Prioniturus), Blyth's Parakeets (Psittacula), Bobolinks, Bobwhites, Bolivian Monk Parakeets, Bonaparte's Hanging Parrots (Loriculus), Boobies, Bourke's Parakeets (Grasskeets), Bourns' Hanging Parrots (Loriculus), Bornean Crested Fireback, Bowerbirds, Brazilian Barraband's Parrots (Splendour Parrots), Brehm's Parrots (Psittacula), Broadbills, Broad-billed Parrots (Lophopsittacus), Bronze-winged Pionus (Pionus), Brotogeris Parakeets, Brown-headed Parakeets (Kakarikis), Brown-headed Parakeet (Poicephalus), Brown-hooded Parrots (Splendour Parrots), Brown-necked Parrots (Cape Parrots), Brown's Rosellas (Northern Rosella), Budgies / Budgerigars (Melopsittidae), Bulbuls, Bunting, Buru
Island King Parrots (King Parrots), Burbidgei's / Burbidge's Blue-backed Parrots (Tanygnathus), Burmese Blossom-headed Parakeets (Psittacula), Burmese Peacocks, Buru Great-billed Parrots (Tanygnathus), Buru Island King Parrots (Alisterus), Buru Red-cheeked Parrots (Geoffroyus), Buru Racket-tailed Parrots (Prioniturus mad), Bush-Shrikes, Butcherbirds, Button-grass Parrots (Grasskeet), Button Quails, Bushtits, Bustards, Butung Hanging Parrots (Loriculus), Buzzards, Cacique, Caica Parrots (Splendour Parrots), Caiques (Pionitinae), Canaries, Canary-winged Parakeets (Brotogeris), Cape Parrots (Poicephalus), Caracaras, Cardinals, Carnaby's White-tailed Black Cockatoo, Carolina Parakeets (Conuropsis) - Extinct, Cassowaries, Catbirds, Cebu Hanging Parrots (Loriculus), Cecilia's Rosellas, Celebes Hanging Parrots (Loriculus), Central Island Hanging Parrots (Loriculus), Ceylon Hanging Parrots (Loriculus), Chachalacas, Chapman's Rusty-faced Parrots (Hapalopsittaca), Chatham Red-fronted Parakeets (Kakarikis), Chats, Chestnut-crowned Parakeets (Psephotus-Antbed Parrots), Chickadees, Chickens, Chinquis Peacocks, Chuck Will's Widow, Cisticolas, Citron Cockatoos, Cloncurry Parrots (Platycercus), Cobalt-winged Parakeets, Cockatiels, Cockatoos, Codajas Golden-winged Parakeets (Brotogeris), Colombian Brown-hooded Parrots aka Red-necklaced Parrot (Splendour Parrots), Columbian Sordid Parrots (Pionus), Common Rosellas, Comoro Little Vasa Parrots (Coracopsis), Comoro Vasa Parrots (Coracopsis), Condors, Conures, Coots, Coral-billed Pionus / Parrot (Pionus), Cormorants, Corncrake, Cottingas, Coxin's Fig Parrots (Diophthalma), Cracids, Crakes, Cranes, Creepers, Crimson Horned Pheasant, Crimson Red Shining Parrots (Prosopeia), Crimson Rosellas (Platycercus), Crimson-winged Parrots (Arosmictus), Crows, Cowbirds, Cuckoos, Cuckoo-Rollers, Curassows, Currawongs, Curlews, Dacnis, Damaraland Brown Parrots (Poicephalus), Dammerman's Moustached Parakeets (Psittacula), Derbyan Parakeets aka Derbyan Parrots (Psittacula), Desmarest's Fig Parrots (Desmarestii), Dickcissel, Dippers, Diving-Petrels, Djampea Great-billed Parrots (Tanygnathus), Dodos (extinct), Doherty's Hanging Parrots (Loriculus), Dollarbirds, Double-eyed Fig Parrots, Dovekies, Doves, Dowitchers, Ducks, Ducorps's Cockatoos aka Ducorps Cockatoo, Dunlins, Du Pont's Blue-backed Parrots (Tanygnathus), Dusky Pionus (Pionus fuscus), Drongos, Eagles, Eleanora Cockatoos, East African Brown Parrots (Poicephalus), Eastern King Parrots (Alisterus), Eastern Rosellas (Platycercus), Eastern Tovi Parakeets (Brotogeris), Echo or Mauritius Parakeets (Echo or Eques), Eclectuses (Eclectus Roratus), Ecuadorian Sordid Parrots (Pionus), Egres, Elegant Parrots / Elegant Grass Parakeet, Elf Owls, Emerald-collared Parakeets (Psittacula), Emus, Euphonias, Everett's Blue-backed
Parrots (Tanygnathus), Fairy-Bluebirds (see also "Leafbirds"), Fairy-Wrens, Falcons, Fernwrens, Fig Parrots (Psittaculirostrinae), Finches, Finfoots, Fisch's Parakeets (Psittacula), Fitzroys Cockatoos, Flamingos, Flickers (Woodpeckers), Flores Great-billed Parrots (Tanygnathus), Flowerpeckers, Flower-piercers, Flycatchers, Forbe's Yellow-fronted Parakeets (Kakarikis), Fowl, Furnarids (Ovenbirds), Freer's Blue-backed Parrots (Tanygnathus), Friarbirds (Honeyeaters), Frigatebirds, Frogmouths, Fulmars, Galah or Rose-breasted Cockatoos / Roseate, Gallinules / Swamphens, Gang Gang Cockatoos, Gannets, Geese, Geoffroyus (Long-winged Parrots), Gilolo Parrots (Geoffroyus), Glossy Black Cockatoos, Godwits, Goffin's Cockatoos, Golden-fronted Parakeets (Bolborhynchus), Golden-mantled Racket-tailed Parrots (Prioniturus), Golden-mantled Rosellas (Platycercus), Golden Parakeets (Brotogeris), Golden-winged Parakeets (Brotogeris), Goliath Palm Cockatoo, Gori Red-cheeked Parrots (Geoffroyus), Goshawks, Gould's Red-tailed Black Cockatoo, Grey-cheeked Parakeets (Brotogeris), Guaiabero Parrots (Bolbopsittacus), Guam Rails, Guans, Guilemots, Guineas, Gulls, Gustave's Parakeets, Grackles, Grass Parakeets / Parrots, Grassquit, Great-billed Parrots (Tanygnathus), Greater Blue-rumped Parrots (Psittinus), Greater Madarasz's Parrots (Psittacula), Greater Palm Cockatoo (Goliath), Greater Red-cheeked Parrots (Geoffroyus), Greater Sulfur Crested Cockatoo (Eleanora), Greater Vasa Parrots Coracopsis), Great White Cockatoo, Grebes, Green-fronted Hanging Parrots, Green Hanging Parrots (Loriculus exilis), Green Leek Parrots (Splendour Parrots), Green Parrots (Alisterus), Green Rosellas (Platycercus), Green-winged King Parrots (Alisterus), Grey-breasted Parakeets (Quaker Parrots), Grey-headed Parrots (Pionus), Grey-cheeked Parakeets (Brotogeris), Grey Parrots, Ground Parrots (Pezoporus), Grey Peacock-pheasants, Ground-Rollers, Grouse (Chicken), Grosbeaks, Guaiabero Parrots (Bolbopsittacus), Gustave's Parakeets (Brotogeris), Hallstrom's Parrots (Psittacula), Halmahera King Parrots (Alisterus), Hamerkop, Hanging Parrots (Loriculus), Harriers, Hartert's Orange-fronted Hanging Parrots (Loriculus), Hawk-headed Parrots (Deroptyus), Hawks, Hellmayr's Rusty-faced Parrots (Hapalopsittaca), Helmet-Shrikes, Herons, Hoatzins, Honeycreeper, Honeyeaters, Hooded Parrots (Psophotus), Hoopoes, Hornbills, Horned Parakeets (Eunymphicus), Hummingbirds, Huon Parrots (Psittacula), Huon Red-cheeked Parrots (Geoffroyus), Ibises, Indian Moustached / Indian Red-breasted Parakeets (Psittacula), Indian Ringneck Parrots / Parakeets (Psittacula), Indigobirds, Indigo-winged Parakeets (Hapalopsittaca), Indo-Burmese Alexandrine Parakeets (Psittacula), Intermediate Parakeets (Psittacula)
Intermedia), loras, Jacamars, Jacanas, Jackdaws, Jaegers, Japanese White-Eyes (songbirds), Jardine's Parrots (Poicephalus), Java Moustached Parakeets, Jays, Jobi Red-cheeked Parrots (Geoffroyus), Juncos, Junglefowl (Pheasants), Kago, Kakapo (Strigopidae / Strigops Habroptilus), Kakarikis Parrots or Parakeets (Cyanoramphus), Kakas aka Nestor Parrots (Nestor), Kakapo Parrots (Strigopidae), Kala Parrots (Meridionalis), Kandavu Red Shining Parrots (Prosopeia), Kangaroo Island Crimson Rosellas (Platycercus), Kangean Moustached Parakeets (Psittacula), Kea (Nestorinae), Kenya Jardine's Parrots (Poicephalus), Kenya Meyer Parrots (Poicephalus), Kermadec Red-fronted Parakeets (Kakarikis), Killdeers (Plovers), Kingbirds, King Fishers / Kookaburas, Kinglets, King Lory, King Parrots, Kites, Kittiwake, Kiwis, Knots (Shorebirds), Kookaburras, Koro Red-shining Parrots (Prosopeia), Kuhl's Kape Parrots (Poicephalus), Laos Alexandrine Parakeets (Psittacula), Lapwings, Larks, Leadbeater's Cockatoos, Leafbirds (see also "Fairy-Bluebirds"), Lesser Bronze Winged Parrots (Pionus), Lesser Comoro Vasa Parrots (Coracopsis), Lesser Red-cheeked Parrots (Geoffroyus), Lesser Sulfur Crested Cockatoo, Lesser Vasa Parrots (Coracopsis), Lilac-collared Parrots (Geoffroyus), Limpkin, Lineolated Parakeets (Bolborhynchus), Little Corella Cockatoos (Bare eyed), Little Major Mitchell's Cockatoo, Little Red-tailed Black Cockatoo, Liocichlas, Long-billed Corella, Longspurs, Long-tailed Parakeets (Psittacula), Long-winged Parrots (Geoffroyus), Loons, Lord Howe Red-fronted Parakeets (Kakarikis), Lorentz's Painted Tiger Parrots (Psittacella picta lorentzi), Lories / Lorikeets, Louisana Parakeets (Conures), Lovebirds, Lyrebirds, Macaws, Macquarie Red-fronted Parakeets (Kakarikis), Madarasz's Parrots (Psittacella), Madu Great-billed Parrots (Tanygnathus), Malabar Parakeets (Psittacula), Mallee Ringneck Parrots (Platycercus), Magpie Jays, Magpies, Major Mitchell's Cockatoos (Leadbeaters), Mallards (Ducks), Manakins, Many-Colors Parrots/Parakeets (Psephotus), Margarit's Parakeets (Bolborhynchus), Mauritius Parakeets (Echo) (Psittacula), Maroon-fronted Parrots (Rhynchopitta), Marsh-Tyrants (Tyrant Flycatcher), Martins, Masai Red-headed Parrots (Poicephalus), Mascarene Parrots (Psittacidae), Masked Shining Parrots (Prosopeia), Mathew's Cockatoo, Mathews' Pink Cockatoo, Mathew's Red-tailed Black Cockatoo, Maximilian's Pionus (Pionus), Mayr's Painted Tiger Parrots (Psittacella), Mayr's Parrots (Psittacella), Meadowlarks, Mealy Parrots, Medium Sulphur Crested Cockatoo (Eleanora), Mendoza (Grey-breasted) Monk Parakeets, Merlins (Falcons), Mesia, Mesites, Meyer's Parrots (Poicephalus), Mejiros (Japanese White-Eyes), Middle Sulphur-crested Cockatoo, Mimids (Thrashers), Mindanao Guaiabero Parrots (Bolbopsittacus), Mindanao Hanging
Parrots (Loriculus), Mindanao Racket-tailed Parrots (Prioniturus), Mindoro Hanging Parrots (Loriculus), Mindoro Racket-tailed Parrots (Prioniturus), Minivets, Minlas, Misima Red-cheeked Parrots (Geoffroyus), Moas, Mockingbirds, Modest Parrots (Psittacella), Moluccan Cockatoos, Moluccan King-Parrots (Alisterus), Moluccan Hanging Parrots (Loriculus), Monk Parakeets (Quaker Parrots), Moszkowski Green-winged King Parrots (Alisterus), Motmots, Mountain Racket-tailed Parrots (Prioniturus), Mountain Parakeets (Bolborhynchus), Mount Goliath Parrots (Psittacella), Mount Malingdang Racket-tailed Parrots (Prioniturus), Mousebirds, Mulga Parrots / Mulga Parakeets (Psephotus), Müller's Parrots, Müller's Blue-backed Parrots (Tanygnathus), Murres, Murrelets, Mustached Parakeets / Parrots (Psittacula), Mynahs, Naretha Blue-Bonnet Parrots (Psephotus), Natuna Long-tailed Parakeets (Psittacula), Neumann's Ring-necked Parakeets (Psittacula), Neophemas Bourkes Parrots (Psittacula), Nepalese Alexandrine Parakeets (Psittacula), Nestor Parrots aka Kaka (Nestor), Neumann's Red-cheeked Parrots (Geoffroyus), Neumann's Ringnecked Parakeets (Psittacula), New Caledonian Red-fronted Parakeets (Kakarikis), New Guinea Red-winged Parrots (Aprosmictus), New Zealand Mountain Parrots (Kea), New Zealand Parrots (Meridionalis - Nestor Parrots), Newton's Parakeets (Psittacula) - EXTINCT, Niam-Niam Parrots (Poicephalus), Nias Moustached Parakeets (Psittacula), Nicobar Long-tailed Parakeets (Psittacula), Nightjaws, Night-Herons (Herons), Nightingales, Nightjars, Night Parrots (Geopsittacus), Niiltava (Flycatchers), Noddy, Norfolk Island Kaka (Productus - Extinct Parrot), Norfolk Parakeets (Kakarikis), Northern Crimson Rosellas (Platycercus), Northern Kaka / Northern Nestor (Nestor), Northern Rosellas (Platycercus), Nunbirds, Nutcrackers, Nuthatches, Obi Red-cheeked Parrots (Geoffroyus), Orange-bellied Parrots (Neophema), Orange-bellied Parrots (Poicephalus - Reichenow's), Orange-chinned Parakeets (Brotogeris - Tovi), Orange-crowned Parrots (Poicephalus), Orange-faced Parrots (Poicephalus), Orange Flanked Parakeet (Grey-cheeks / Brotogeris), Orange-fronted Hanging Parrots (Loriculus), Orange-fronted Parakeets (Alpine / Kakarikis), Orange Winged Parakeet (Grey-cheeks / Brotogeris), Orange-chinned Parakeets (Tovi - Brotogeris), Orange Flanked Parakeet (Grey-cheeks), Orange Winged Parakeet (Grey-cheeks - Brotogeris), Orioles, Oropendolas, Osprey, Ostrich, Ouvean Parakeets (Eunymphicus), Ovenbirds, Owlet-Nightjars, Owl Parrots (Strigops), Owls, Oxpeckers, Oystercatchers, Painted Parrots (Psittacella), Pale-headed Rosellas (Platycercus), Paler Adelaide Rosellas (Platycercus), Paler Blue Headed Parrots (Pionus), Paler Brehm's Parrots (Psittacella), Paler Mallee Ringneck Parrots (Platycercus), Paler Port Lincoln Parrots (Platycercus),
Paler Red-billed Parrots (Pionus), Paler Red-rumped Parrots (Psephotus), Pallid Caiques (Pionites), Pallid Yellow-vented Blue-Bonnets (Psephotus), Palmchats, Palm Cockatoo, Panay Hanging Parrots (Loriculus), Papuan Red-winged Parrots (Aprosmictus), Paradise Parrots (Psephotus), Paraguayan Monk, Parakeets, Pardalotes, Parotia, Parrotlets, Parula, Peafowl (Pheasants), Peacocks / Indian Blue, Pebblers (Splendour Parrots), Pekin Robins, Peleng Island King Parrots (Aisterus), Pelicans, Peling Hanging Parrots (Loriculus), Pennant’s Parakeets (Rosellas - Crimson), Penguins, Perija Red-billed Parrots (Pionusi), Peruvian Barred Parakeets (Bolborhynchus), Peruvian Black-winged Parrots (Hapalopsittaca), Pesquet’s Parrots (Psittrichas), Petrels, Phalaropes, Pheasants, Philippine Cockatoo, Philippine Hanging Parrots (Loriculus), Pitohuis, Plain Parakeets (Brotogeris), Plum-crowned Pionus (Pionus), Plum-headed Parakeets aka Plum Head (Psittacula), Phoebe, Piculet, Pigeons, Pillas, Pileated Parrots (Splendour Parrots), Pink Cockatoo, Pionus, Pittas, Plain Parakeets (Brotogeris), Plains-Wanderers, Plovers, Pochards, Pocket Parrots (Brotogeris), Poicephalus, Port Lincoln Parrots (Platycercus), Purple Martins, Prairie Chicken, Praslin Parrots (Coracopsis), Pratincoles, Princess Parrots aka Princess of Wales (Splendour Parrots), Pucheran’s Red-cheeked Parrots (Geoffroyus), Ptarmigans, Puffins, Purple-bellied Parrots (Triclaria), Pyrrhuloxia, Pygmy Parrots (Micropsittininae), Quails, Quaker Parrots (Monk Parakeets), Queen Alexandra Parrots / Parakeets (Splendour Parrots), Queensland King Parrots (King Parrots), Quetzals, Rails, Racket-tailed Parrots (Prioniturus), Rand’s Modest Parrots (Psittacella), Raptors, Eagles, Falcons, Hawks, Osprey, Owls, Vultures, Ravens, Razorbills, Red-backed Parrots (Pionus), Red-backed Western Rosellas (Platycercus), Red-billed Hanging Parrots (Green Hanging Parrots), Red-billed Parakeets (Bolborhynchus), Red-billed Hanging Parrots (Green Hanging Parrots), Red-billed Parrots (Pionus), Red-bellied Parrots: Conures or Abessinian Parrots, Red-breasted Parrots: Conures or Abessinian Parrots, Red-capped Parrots (Pionopsitta), Red-cheeked Parrots (Geoffroyus), Red-collared long-tailed Parakeets (Psittacula), Red-crowned Parakeets (Cyanoramphus), Red-crowned Hanging Parrots (Celebes Hanging Parrots), Red-fan Parrots (Hawk-headed Parrot), Red-fronted Kakarikis (Kakarikis), Red-forested Parrots (Amazons), Red-rumped Parrots, Red Shining Parrots (Prosopeia), Red-shouldered Parakeets (Swift Parrots), Red-spotted Racket-tailed Parrots (Prioniturus), Redstarts, Red-tailed Cockatoos, Red-vented Blue-Bonnets (Psephotus), Red-vented or Philippine Cockatoo, Red-vented Parrots (Poicephalus), Red-winged Lories (Red-winged Parrots), Red-winged Parrots (Aprosmictus), Reedlings, Regent
Rock-Pebblers (Polytelis - Splendour Parakeet), Reichenow's Blue-Headed Parrots (Pionus), Reichenow's Orange-bellied Parrots (Poicephalus), Rennell Singing Parrots (Geoffroyus), Restless- or Tschudi's Parrot (Pionus), Reunion Ring-necked Parakeets (Psittacula), Rhabdomis, Rhea, Ribeiro’s Scaly-headed Parrots (Pionus), Riflebirds, Ring-neck Parrots / Parakeets aka Ringnecks (Psittacula), Ring Ouzel, Rio Negro Parakeets Brotoeris), Roadrunners, Roberts' Parakeets (Bolborhynchus), Robins, Rockfowl, Rock Parrots (Grasskeet) - Petrophila, Rodriguez Ring-necked Parakeets (Newton's Parakeets - Extinct), Rollers, Roseate Cockatoo, Rose-breasted Cockatoos / Roseate (Gallah), Rosellas (Platycercus), Rose-faced Parrots, Rufous-tailed Parrots (Tanygnathus), Rufous-fronted Parakeets (Bolborhynchus), Rüppell's Parrots (Poicephalus), Rusty-faced Parrots (Hapalopsittaca), Saffron-headed Parrots (Splendour Parrots), Salawati King Parrots (Alisterus), Salamander, Salomonenkakadu (Ducorps), Salomonsen's Blue-naped Parrots (Tanygnathus), Salomonsen's Racket-tailed Parrots (Prioniturus), Salvadori's Green-winged King Parrots (Alisterus), Salvin's Rusty-faced Parrots (Hapalopsittaca), Samar Guaiabero Parrots (Bolbopsittacus), Sapsuckers (Woodpeckers), Sanderlings, Sandgrouse, Sangihe Hanging Parrots (Loriculus), Sandpipers, SantaremTui Parakeets (Brotoeris), Sapsuckers, Satyr Tragopans, Scaly-headed Pionus (Maximilian Pionus), Scarlet-breasted Parrots (Splendour Parrots), Scarlet Parrots (Alisterus), Sclater's Hanging Parrots (Loriculus), Scrubfowl, Scrub-Jays, Scrubwrens, Seabirds / Shorebirds, Secretarybirds, Seriemas, Senegal Parrots (Poicephalus), Seriemas, Seychelles Little Vasa Parrots (Coracopsis), Seychelles Parakeets (Psittacula) - Extinct, Shags, Shearwaters, Shining Parrots (Prosopoeia), Short-billed Corella Cockatoos (Bare-eyed Cockatoo), Short-tailed Parrots (Poicephalus), Short-tailed Parrots or Sharp-tailed Parrots (Graydidascalus), Shrikes, Sibia, Sicklebills, Sierra Parakeets (Bolborhynchus), Simeuluean Moustached Parakeets (Psittacula), Singing Parrots (Geoffroyus), Siquijor Hanging Parrots (Loriculus), Siamat Blue-rumped Parrots (Psittinus), Siy Parrots (Pionus), Skilts, Skuas, Skimmers, Slender-billed Corella or Slender-billed Cockatoos (Long-billed), Slaty-headed Parakeets (Psittacula), Slender-billed Kea (Nestor), Smew, Snipes, Soft Bills, Snow Mountains Modest Parrots (Psittacella), Society Kakarikis, Softbills, Solomono Besar (Abbott), Solomon Island Cockatoo, Somalia Red-bellied Parrots (Poicephalus), South African Brown Parrots (Poicephalus), Sparrows,
Splendid or Scarlett-chested Parrots (Grasskeet), Spinifex Parrots (Splendour Parrots), Spoonbills, Standardwing, Starlings, Stilts, Storks, Storm Birds (Channel Billed Cuckoos), Storm-Petrels, Superb Parrots (Splendour Parrots), Stresemann’s Orange-fronted Hanging Parrots (Loriculus), Sula Island King Parrots (Alisterus), Sulu Racket-tailed Parrots, Sulphur-crested Cockatoo, Sumba Cockatoo (Citron-crested Cockatoo), Sumba Great-billed Parrots (Tanygnathus), Sunbirds, Sunbittern, Sungrebes, Surfbirds (Shorebirds), Swifts, Swallows, Swamphens, Swiftlets, Swift Parrots (Swift Parrots), Tablas Racket-tailed Parrots (Prioniturus), Tahiti Parakeets (Kakarikis), Takahe, Talaud / Talautese Blue-naped Parrots (Tanygnathus), Talaud Racket-tailed Parrots (Prioniturus), Taliabu Racket-tailed Parrots (Prioniturus), Tanagers, Tanimbar Great-billed Parrots (Tanygnathus), Tanimbar Red-cheeked Parrots (Geoffroyus), Tansanian Brown-headed Parrots (Poicephalus), Tasmanian Rosellas (Platycercus), Tasmanian Yellow-tailed Black Cockatoo, Tattlers (Shorebirds), Taveuni Parakeets (Prosopoeia), Teals, Tepui Parrotlets, Terns, Thayeri-kumlieni, Thick-billed Parrots (Rhynchopsitta), Thick-knees, Thick-mouth Parakeets (Bolborhynchus), Thin-mouth Parakeets (Brotogeris), Timor Cockatoo, Timor Great-billed Parrots (Tanygnathus), Timor-winged Parrots (Aprosmictus), Thornbills, Thrashers, Thrushes, Tiger Parrots (Psittacella), Timor Sulphur-crested Cockatoo, Timor Red-winged Parrots (Aprosmictus), Timor-winged Parrots (Jonquillaceus), Tinamous, Tinkerbirds (Barbets), Titmouses / Tits, Todies, Togian Hanging Parrots (Loriculus), Toucanets, Toucans, Turacos, Tovi Parakeets aka Bee Bee Parrots aka Orange-chinned Parakeets (Brotogeris), Towhees, Townsends, Turquoise or Turquoiseine Parrots (Grass Parakeets), Tragopan Pheasants, Transvaal Meyers Parrots (South African), Treecreepers (Certhia), Treepie, Triton Cockatoo, Trogons, Tropicbirds, Troupial, Trumpetbird, Trumpeters, Tucaros, Tui Parakeets (Brotogeris), Tuipara Parakeets, Transvaal Meyers Parrots, Tucuman Parrots (Pionus), Tui Parakeets (Brotogeris), Turkeys, Turnstones, Twenty-Eight Parrots (Platycercus), Tyrants, Uganda Yellow Shouldered Parrots aka Kenya Meyer, Meyer’s Parrot (Poicephalus - Meyeri Saturatus), Umbrella Cockatoos aka Umbrella Crested Cockatoo, Uganda Yellow-shouldered Parrots (Poicephalus), Vangas, Van Oort’s Palm Cockatoo, Varied Parrots / Parakeets (Mulga Parrots), Vasa Parrots (Coracopinae / Coracopsis), Veery, Verdins, Vireos, Vulturine Parrots (Vulturina), Vultures, Vanua Levu Red-Shining Parrots (Prosopoeia), Varied Parrots (Psephotus), Vasa Parrots (Coracopsis), Velez’s Rusty-faced Parrots (Hapalopsittaca), Vernal Hanging Parrots (Loriculus), Violaceous Parrots (Dusky Parrots), Violet Parrots (Dusky Parrots), Vulturine Parrots (Gypopsitta), Wagtails, Wallace’s Hanging Parrots
(Loriculus), Warblers, Waterstradt's Racket-tailed Parrots (Mindanao Racket-tailed Parrots), Waterthrushes, Waxwings, Weavers, Western Corella, Western Galah / Roseate Cockatoo, Western Rock Pebblers (Polytelis - Splendour Parrots), Western Rosellas (Platycercus), Western Vasa Parrots (Coracopsis), Wetar Red-winged Parrots (Aprosmictus), Wheatears, Whimbrels, White-bellied Caiques (Pionites), White-breasted Caiques (White-bellied Caiques), White-capped Pionus aka White Crowned Pionus, White Cap Parrots / Pionus (Pionus), White-cheeked Mealy Rosellas (Pale-headed Rosellas), White Cockatoo, White-capped aka White-crowned Pionus (Pionus), White-headed Pionus / Parrots (Pionus), White Parakeets (Brotogeris), White-winged Parakeets (Brotogeris), Whip-Poor-Wills, White / White-crested Cockatoo, White-eared Cockatoo, White-tailed Black Cockatoo (Carnaby), White-winged Parakeets (Brotogeris), Widows, Willets, Woodpeckers, Woodcocks, Woodhoopoes, Woodstars, Worcester's Hanging Parrots (Loriculus), Wrens, Wrentits, Wrynecks (Allies), Yellow-cheeked Rosellas (Western Rosellas), Yellow-chevroned Parakeets (Brotogeris), Yellow-collared Parakeets (Twenty-Eight Parakeets), Yellow-crowned Parakeets: Please go to Western Rosellas or Kakarikis, Yellow-eared Cockatoo (Yellow-tailed), Yellow faced Amazon (Salvatoria xanthops), Yellow-faced Parrots (Poicephalus), Yellow-fronted Parakeets (Kakarikis), Yellow-headed Parrots (Singing Parrots), Yellowlegs, Yellow Princess Parrots (Splendour Parrots), Yellow Rosellas (Platycercus), Yellow-tailed Black Cockatoos, Yellow-tailed Caiques (Pionites leucogaster xanthurus), Yellow-thigthed Caiques (Pionites leucogaster xanthomeria), Yellow-throated Hanging Parrots (Loriculus), Yellow-vented Blue-bonnet Parrots (Blue-bonnet Parrots), Yellow-vented Parrots (Senegal Parrots / Poicephalus), Zanzibar Brown-headed Parrots (Poicephalus).

In one preferred embodiment the one or more avian species is one or more cocks, hens or chickens.

In one embodiment the one or more cocks, hens or chickens can be selected from, but is not limited to, the group consisting of AC, Achal Tekkinski, Ameraucana (Gallus - Domesticus), American Game Fowl, Ancona (Gallus - Domesticus), Andalusian, Appenzell, Araucana, Araucana aka Easter Egg Chicken (Gallus - Gallus), Asbos, Aseel, Asil, Asturian Painted Hen, Pinta Asturiana, Augsburgers, Australian Game Fowl, Australian Pit Games, Australorp, Avam Cemani, Ayam Bangkok, Ayam Bali, Bandara, Baheij, Bantam, Barbu d'Anvers, Barbu de Watermaal, Barnevelders, Barred Hollands, Barred Plymouth Rocks, Barred Rock Bantams, Barthuhners, Barthuhners,
Bearded Belgian D'Uccle aka D'Uccle, Mille Fleur, B.B. D'Uccle, s - Domesticus), Bearded Chickens, Belgian d'Everberg Bantams, Belgian d'Uccle Bantams, Belgian Quail Bantams, Berat, Bergische Kraeher, Bigawi, Bielefelders, Black Australorps, Black Jersey Giants, Black Marias, Black Rosecomb Bantams, Blomme Hna, Blue Andalusians, Booted Bantams, Brabanter, Braekels, Brahmas Chicken aka Brahms, Brahma, Chittagongs, Gray Shanghais, Brahma Pootras, Brazil Game (Shamo-Typ), Breda Fowl, Bresse, Broilers, Buckeye, Buff Rocks, Buttercup Buttercup aka Sicilian Buttercup (Gallus - Domesticus), Campines, Catalanas Catalan aka Buff Catalana, Catalana Del Prat, Buff Catalan, Ceylon Jungle Fowl aka Junglefowl (Gallus lufayet), Chabo, Chanteclers, Chibi, Cochins aka Chinese Shanghais, Cochin Bantam aka Pekin, Corals, Cornish, Crevecoeurs, Cubalayas, Dakan, Delawares, Denizli Fowl, Dominiques aka American Dominique, Domestic Chicken, Dominique Chicken, Dominiker, Dorking, Faverolles, Fayouni, Filipino Fighter, Frieslands, Frizzle, Gallus Inauris, Game Fowl, Ga Noi Don & Ga Noi Cua (Vietnamese Fighters), Gauloise, Gimmizahs, Golden Comets, Golden Montazahs, Gournay, Gauloise, Greater Prairie-chicken (Tympanuchus cupido), Groningen Gulls, Groninger Meeuwen, Guelderlands (Breda), Hedemora Hens, Hamburgs, Hinaidori, Hint Horoz (Türkischer Kampfer), Hollands, Hollands Hoens, Houdans, Huiyuan Bearded Chickens, Hungarian Yellows, Indian Games, Iowa Blues, Irish Game Fowl, Isa Browns, Jaerhøns, Japanese Bantams aka Chabo, Japanese Chabo, Japanese Gamefowl, Java's, Jersey Giants aka Jersey Black Giants (Gallus - Domesticus), Jungle Fowl, Kinpa, Koeyoshi, Ko Shamo, KraaiKops, Kraienkoppe, Kulanga, Kurekodori, Kuro Gashiwa / Kurokashiwa, La Fleche, Lakenvelder, Lamonas, Langshans aka Black Langshan, Legbars, Leghorns, Lincolnshire Buffs, Longcrows, Longtails, Malays (Gallus - Domesticus), Malines, Manx Rumpies, Malgache (Madagaskar Nackthals), Marans, Marsh Daisy, Matrouhs, Mechels, Merleraults, Mille Fleur d'Uccle Bantams, Minohiki, Minorca aka Red Faced Black Spanish Chicken (Gallus - Domesticus), Moonies, Modern Games, Modern Game Bantams, Naked Necks, Nankin Bantams, Natal Game, New Hampshire, Niederrheiners, Norfolk Greys, North Holland Blues, Norwegian Jaerhøns, Ohiki, Okina Chabo, Ölands, Old Dutch Bantams, Old English Games, Old English Game Fowl, Onagadori, Orloffs, Orpington, Orusts, Owlbeards, Paduans, Bavilly, Pekins, Penedesencas, Phoenix, Pinta Asturiana or Asturian Painted Hen, Plymouth Rocks (Gallus - Domesticus), Polish aka Crested Dutch Chicken, Poland Chicken, Paduan Chicken (Gallus - Domesticus), Porcelain Mille Fleur Bantams, Prat, Production Blacks, Production Reds, Pyncheons, Quail Bantams, Red Cap, Red Stars, Rhinelanders,
Rhodebars, Rhode Islands aka Domestic Chicken (Gallus - Domesticus), Rocks, Ruhlaer Bantams, Rosecomb Bantams, Rumpless Fowl, Sabelpoot, Saipan "Jungle Fowl" aka Saipan Junglefowl (Gallus - Domesticus), Salmon Faverolles, Satsumadori, Scots Dumpy, Scots Grays, Sebright Bantams, Seramas, Shamos, Shepherd's Plaid, Shokoku, ShowGirls, Sicilian Buttercups, Silver Montazah, Silkies aka Silkie Bantam (Gallus - Domesticus), Spanish, Spitzhauben, Styrian, Spite, Sulmtalers, - Sultans (Gallus - Domesticus), Sumatra, Sundanese (Soedanese Vechter), Sussex, Sri Rama, Svart Hôna, Swedish Spotted / Flower or Black, Swiss Hen, Taiwan, Tasmanian Native Hen, Thai Game, Tomaru, Tosa Chibi, Totenko, Transylvanian Naked Necks, Turkens aka Naked Neck, Transylvania Naked Neck (Gallus - Domesticus), Tuzo (Nankin-Shamo), Twentse Hoens, Vorwerks, Welbars, Welsummers, Westfalische Totleger, White-faced Black Spanish (Gallus - Domesticus), White Rocks, Wyandottes (Gallus - Gallus), Wybars, Yamato Gunkei, Yakido, Yokohamas, Yurlowers.

In one preferred embodiment the one or more avian species is one or more chickens.

In one embodiment the one or more chickens can be selected from, but is not limited to, the group consisting of Ambers, Ameraucanas, American Game Bantam, American Game Fowl, Anconas, Andalusians, Antwerp Belgian bantams, Appenzellers, Araucanas, Ardenners, Asbos, Aseels, Asils, Assendelfters, Asturian Painted Hen, Augsburgers, Australian Games, Australian Pit Fowl, Australorps, Autosexing Breeds, Ayam Bekisar, Ayam Cemani, Ayam Kedu, Ayam Pelung, Barbu d'Anvers, Barbu d'Everberg, Barbu de Watermaal, Barnevelders, Barred Hollands, Barred Plymouth Rocks, Barred Plymouth Rock hen, Barred Rock bantams, Barthunners, Basque Hens, Bassettes, Bearded Chickens, Belgian d'Everberg bantams, Belgian Quail bantams, Bengals, Berat, Bergische Kraeher, Bielefelders, Bigawi, Black Australorps, Black Jersey Giants, Black Marias, Black Rosecomb bantams, Black Rosecomb, Black Stars, Blomme Hôna, Blue Andalusians, Booted bantams, Brabantonne, Brabanters, Braekels, Brahmas, Brazilian chickens, Brazilian Game Fowl, Breda Fowl, Bresse, Brinkotters, broilers, Buckeyes, Burmese bantams, Buttercups, California Grays, California Whites, Cambars, Campines, Caribbean Chickens, Castellana Negra, Catalanas, Caumont, Cemani, Chabo (Japanese bantams), Chaamse, Chanteclers, Chick Marley, China Game Fowl, Chity, Cochins, bantam, Chief, Cochins, large fowl, Collonca, Colombian Chickens, Corals, Cornish, Cornish crosses, Coucou de Rennes, Crevecœurs, Criolla, Dandarawi, d'Anvers bantams, Delawares, Denizli fowl, Dominiques, Michigan" the Dominique rooster, Domnicks, Dorkings, Dresdners,
d'Uccle bantams, Dutch bantams, Easter Egg chickens, Empordanesa, Estaires, Famennes, Faverolles, Fayoumi, Finnish Chickens, Flower Hens, Friesians, Frizzles, My Black Frizzle cock "Feather Boa", Ga Noi, Gallina di Polverara, Game Bantam American, Game Bantam Old English, Game Fowl American, Game Fowl Australian, Game Fowl Australian Pit, Game Fowl Brazilian, Game Fowl China, Game Fowl Indian, Game Fowl Irish, Game Fowl Madagascar, Game Fowl Modern, Game Fowl Modern bantams, Game Fowl Old English, Game Fowl Spanish, Game Fowl, Thai, Gauloise, Golden Comets, Gotlands, Gournay, Greek chickens, Groninger Meeuwen, Grubbe bantams, Guelderlands, Hamburgs, Hanayee, Hawaiian chickens, Hedereona Hens, Hervés, Hollands, Hollands Hoens, Houdans, Hsian, Huiyuang Bearded Chickens, Hungarian Yellows, Icelandic Fowl, Indian Games, Iowa Blues, Iranian Chickens: Chity, Hanayee, Kabotary, Siyahe Kantony, Talayee, Zireh E., Irish Game Fowl, ISA Browns, Ixworths, Jaerhøns, Japanese bantams, Javanaise, Javas, Jersey Giants, Jitokko, Junglefowl Ceylon, Junglefowl Gray, Junglefowl Green, Junglefowl Red, Junglefowl Sonnerat's, Kabotary, Key West chickens, Ko Sham, Koekoeks, Koeyoshi, Kraaikops, Kraienkoppe, Kuro Gashiwa, La Fleche, Lakenvelders, Lamonas, Langshans, Legbars, Leghorns, Lincolnshire Buffs, Longcrowsers, Berat, Bergische, Kraeher, Denizli, Koeyoshi, Kuro Gashiwa, Pelung, Tomaru, Totenko, Yurlov Crower, Longtails: Jitokko, Kuro Gashiwa, Minohiki, Ohiki, Onagadori, Phoenix, Satsumadori, Shokoku, Tomaru, Totenko, Yokohama, Madagascar Game Fowl, Malays, Malines, Mantes, Manx Rumpies, Marans, Marsh Daisy, meat birds, Mechels, Merlraul, Mille Fleur d'Uccle bantams, Mille Fleur bantam, Mille Fleur d'Uccle Minohiki, Minorcas, Modern Games, Modern Game bantams, Moonies, Naked Necks, Naledi, Nankin bantams, New Hampshires, Niederrheiners, Norfolk Greys, North Holland Blues, Norwegian Jaerhøns, Ohiki, Olands, Olansk bantams, Old Dutch bantams, Old English Game bantams, "Syllable," a Blue-Silver Duckwing OEG bantam cock, Onagadori, Orloffs, Orpingtons, Orusts, Ovambos, Owlbeards, Paduans (Polish), Partridge Fowl, Green-legged, Partridge Fowl, Yellow-legged, Pavilly, Pekins, Pelung, Penedesena, Pheasant Fowl, Phoenix.

In one preferred embodiment the one or more avian species is one or more ducks.

In one embodiment the one or more ducks can be selected from, but is not limited to, the group consisting of Abacot Ranger Ducks (a.k.a Streicher), American Black Ducks, American Coots (Puddle Ducks) - Belongs to the Rail family, American Saxony Ducks American Saxony Ducks, American Scoters (aka Black Scoter), American Wigeons,
Anconas, Australian Spotteds, Australian Wood Ducks, Aylesbury Ducks, Baer’s Pochards, Bali Ducks, Black-bellied Whistling Ducks (Whistling Duck), Black Ducks (Puddle Ducks), African Black Duck, Anas sparsa, American Black Duck, Anas rubripes, Pacific Black Duck, Anas superciliosa, Black East Indies, Black Scoters (aka American Scoter), Blue Ducks, Blue-billed Ducks, Blue Swedish Ducks, Buff Ducks, Buffleheads (Diving Ducks), Burdekin Duck, aka Radjah Shelduck, Brazilian Ducks, Bronze-winged Ducks, Call Ducks (Anas platyrhynchos) - Mallards, Campells aka Khaki Campbell Ducks, Canvasbacks (Diving Ducks), Cayugas, Coast Ducks, Comb Ducks, Crested Ducks, Dabbling Ducks, Diving Ducks, Eiders, Ferruginous Ducks, Freckled Ducks, Eurasian Wigeon, Falcated Ducks or Falcated Teals, Fulvous Whistling-Ducks (Dendrocygna bicolor), Gadwalls (Puddle Ducks), Garganey Ducks, Goldeneye Ducks (Diving Ducks - The three species are: - Common Goldeneye (Bucephala clangula), - Barrow’s Goldeneye (Bucephala islandica), - Bufflehead Bucephala albeola), Green-winged Teals, Khaki Campbell, Kromsnaveleend, Harlequin Ducks, Hawaiian Duck aka Koloa (Anas wyvelliana), Hookbill Ducks, Indian Runner Ducks (Anas platyrhynchos), Labrador Ducks, Long-tailed Ducks, Magpie Ducks, Mallard Ducks aka Puddle Ducks (Anas - Platyrhynchos), Mandarin Ducks (Aix galericulata), Maned Ducks, Marbled Ducks or Marbled Teals, Merganser Ducks, Common Merganser, Hooded Merganser, Masked Ducks, Mexican Ducks, Mottled Ducks, Muscovy Ducks, North American Wood aka Carolina Duck, Swamp Duck, Woody, Squealer, Summer Duck (Aix sponsa), Oldsquaws, Orpington Ducks, Orpington (OSU), Overberg Ducks, Pekin Ducks aka Domestic Duck, White Pekin Duck (Anas - Domesticus), Pink-eared Ducks, Pink-headed Ducks, Prairie Ducks (Mallards), Pintails, Pochards, Pommeranian Ducks, Puddle Ducks, Putangitangis (Paradise Shelduck), Pygmy Goose, Red-crested Pochard, Redheads, Ring-necked Ducks, Ruddy Ducks, Rouen Ducks, Runner Ducks, Salvadori’s Teals or Salvadori’s Ducks, Saxony Ducks, Scaups, Scoters, Shelducks, Shovelers / Northern Shovelers, Silver Appleyards, Smew, Spot-billed Ducks, Steller’s Eider, Steamer Ducks, Swedish Blue Ducks, Swedish Yellow Ducks, Teal Ducks, Black Teal aka New Zealand Scaup, Aythya novaeseelandiae, Baikal Teal (Anas formosa), Blue-winged Teal, Brown Teal, Anas aucklandica, Cape Teal, Anas capensis, Chestnut Teal, Anas castanea, Cinnamon Teal, Anas cyanoptera, Common Teal, Anas crecca, Green-winged Teal, Anas carolinensis, Grey Teals, Anas gracilis, Marbled Teal, Marmaronetta angustirostris, Ringed Teal,Callonetta leucophrys, Silver Teal, Anas versicolor, Silver Teal (Anas versicolor), dabbling duck, Sunda Teal, Anas gibberifrons, Torrent Ducks,

In one preferred embodiment the one or more avian species is a goose.


In one preferred embodiment the one or more avian species is a turkey.


In one preferred embodiment the one or more avian species is an ostrich.

Five subspecies of ostrich are recognized:

- S. c. australis in Southern Africa, called the Southern Ostrich.
- S. c. massaicus in East Africa, sometimes called the Masai Ostrich.
- S. c. syriacus in the Middle East, sometimes called the Arabian Ostrich or Middle Eastern Ostrich.
• S. c. molybdophanes in Somalia, Ethiopia, and northern Kenya, is called the Somali Ostrich.

**Poultry feed**

The present invention also relates to a poultry feed comprising vitamin K3.

In addition, to vitamin K3 the poultry feed in one embodiment comprises:

1. Grains (whole, living grains are way better than cracked, and a mixture is way better than pure corn)
2. Greens (grass, weeds, fresh veggie parings from kitchen)
3. Protein (in summer, they get enough bugs - but in colder weather they need protein supplementation, including perhaps the following: yellow-jackets from restaurant traps, soybeans, worms, milk, meat, sea fish is the very best)
4. Water
5. Hard grit (do not confuse this with oyster shell or calcium — these dissolve in the chicken's digestive system, grit does not — grit is used in place of "teeth"); quartz-based sand with angular edges (not rounded, as often is found in riverbeds) can be collected wherever you find it.
6. Calcium (crushed oyster shell, other shells, ground or hammered bone) (There's lots of calcium in greens, if they get to forage all day.)
7. Vitamins A (and D if the weather is cloudy for long stretches)
8. Salt (best given separately, free choice; kelp is the very supreme choice for this, if you can get it — it supplies all the minerals in the world — see below)

In one embodiment of the the invention relates to a poultry feed comprising vitamin K3 and the following:

1) GRAINS: Scratch grain mix, from feed store, containing many kinds of grain. Extra yellow corn (cracked) — it gives them warmth in the winter, we're told
GRAINS MUST NEVER BE WET AND MOLDY -- CAN KILL!

2) GREENS: Grass forage, Garden clippings and Kitchen trimmings (thrown in the compost pile near their coop)
3) PROTEIN (MAINLY SOYBEANS)

4) OYSTER SHELL: Crushed, is kept in their coop

5) MINERALS

6) GRIT: Collect angular granite grit from trips to areas that have it. Tiny chicks need tiny grit, so get a variety of sizes. A little lasts a long time. The girls will pick and choose a few choice pieces now and then. Fun to watch them study and try out the different grains of grit.
Examples

Example 1: Treating sea lice with Vitamin K3

Active ingredient; Menadione Sodium Bisulfit (Vitamin K3).

Target specie: Sea lice (*Lepeophtheirus salmonis*).

Host specie: Atlantic salmon (*Salmon salar L*).

The effect of Menadione (Vitamin K3) on sea lice in vitro and attached to their natural host, the Atlantic salmon has been investigated.

The experiments;

1. LC 50 study for Menadione in Atlantic salmon
2. LC 50 study for Menadione in juvenile sea lice
3. LC 50 study for Menadione in adult sea lice (not conduced)
4. Effect study for Menadione on sea lice attached to Atlantic salmon.

Trial 30.05 SS

Single dose toxicity study for Menadione in Atlantic salmon.

80 Atlantic salmon averaging approximately 200 grams were divided on 8 groups, each group consisting of 10 fish and differentiated be fin and jaw tagging. The fish were group by group exposed for different concentrations of Menadione dissolved in sea water, for 60 minutes. After the challenge in a 60 liter bucket with oxygen supply, the fish were released back to the holding tank. The fish were monitored before during and after the challenge.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of fish</th>
<th>Weight (approx.)</th>
<th>Finn Tagging</th>
<th>Concentration</th>
<th>Duration of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>200 gr.</td>
<td>Right maxillae</td>
<td>5 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>200 gr.</td>
<td>Left maxillae</td>
<td>10 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>200 gr.</td>
<td>Right pelvic</td>
<td>25 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>200 gr.</td>
<td>Left pelvic</td>
<td>50 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>200 gr.</td>
<td>Upper tail</td>
<td>100 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>200 gr.</td>
<td>Lower tail</td>
<td>500 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>200 gr.</td>
<td>Adipose fin</td>
<td>1000 ppm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>200 gr.</td>
<td>non</td>
<td>0</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>
Results

The Atlantic salmon revealed a LC50 against Menadione between 100 and 25 ppm, 24 hours post treatment. All Menadione challenged fish were clearly affected following a 60 minutes bath treatment at all doses tested.

Trial 3 1.05 SS

Single dose toxicity study for Menadione in juvenile sea lice

The sea lice nauplia larva was challenged with 3 different menadione doses in petri dishes with sea water. Each petri dish contained 20 juveniles. The doses tested were 0.5, 2 and 5 ppm menadione. A fourth petri dish contained only sea water serving as a negative control group. The nauplies in the petri dishes were continuously exposed up to 6 and half hours.

<table>
<thead>
<tr>
<th>Group</th>
<th>Tagging</th>
<th>Bath concentration</th>
<th>Mortality during treatment</th>
<th>Mortality 2 hours post treatment</th>
<th>Mortality 24 hours post treatment</th>
<th>Mortality 48 hours post treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right maxillae</td>
<td>5 ppm</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6 fish are affected after treatment</td>
</tr>
<tr>
<td>2</td>
<td>Left maxillae</td>
<td>10 ppm</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Some fish are affected at the end of treatment</td>
</tr>
<tr>
<td>3</td>
<td>Right pelvic</td>
<td>25 ppm</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>Fish are affected after treatment, some problems with equilibrium</td>
</tr>
<tr>
<td>4</td>
<td>Left pelvic</td>
<td>50 ppm</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1 affected after 55 minutes</td>
</tr>
<tr>
<td>5</td>
<td>Upper tail</td>
<td>100 ppm</td>
<td>10</td>
<td></td>
<td></td>
<td>2</td>
<td>2 affected after 55 minutes, 5 affected after 60 minutes</td>
</tr>
<tr>
<td>6</td>
<td>Lower tail</td>
<td>500 ppm</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>All are affected after 34 minutes</td>
</tr>
<tr>
<td>7</td>
<td>Adipose fin</td>
<td>1000 ppm</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>Fish are affected after 2 minutes. No gill movement after 40 minutes</td>
</tr>
<tr>
<td>8</td>
<td>non</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>No visible abnormalities</td>
</tr>
</tbody>
</table>

The Atlantic salmon revealed a LC50 against Menadione between 100 and 25 ppm, 24 hours post treatment. All Menadione challenged fish were clearly affected following a 60 minutes bath treatment at all doses tested.

Trial 3 1.05 SS

Single dose toxicity study for Menadione in juvenile sea lice

The sea lice nauplia larva was challenged with 3 different menadione doses in petri dishes with sea water. Each petri dish contained 20 juveniles. The doses tested were 0.5, 2 and 5 ppm menadione. A fourth petri dish contained only sea water serving as a negative control group. The nauplies in the petri dishes were continuously exposed up to 6 and half hours.
Results

The results show that menadione is a very potent substance against juvenile sea lice. All challenged juveniles were clearly affected after only 30 minutes in the petri dish.

Final study

Menadione challenge experiment on Atlantic salmon infected with attached sea lice in chalimus stage 2 and 3.

The test fish, averaging approximately 200 gram were infected with copepodids on the 29th of December 2005. The fish were held in two tanks during the challenge. The infection level was calculated to be around 20-30 sea lice per fish.

On the 17th of January 2006, after the sea lice had reached the chalimus 3 stage, the fish, who had been divided 6 different groups, was bath treated in 60 liter buckets containing different concentrations of menadione. The water was aerated during the 30 minutes exposure period. Each group consisted of 14 fish, was held in one tank and differentiated by fin and jaw clipping prior to challenge.

Based on a sea lice recording on 10 fish one week after challenge the infection was averaging 22 chalimus per fish.

The test fish were investigated for the effect of the menadione bath treatment approximately one week after the challenge.

<table>
<thead>
<tr>
<th>Group no.</th>
<th>Number of fish</th>
<th>Compound</th>
<th>Dose (ppm)</th>
<th>Treatment duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>Control</td>
<td>0</td>
<td>30 minutes</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>Vitamin K3</td>
<td>0.5</td>
<td>30 minutes</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>Vitamin K3</td>
<td>1</td>
<td>30 minutes</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>Vitamin K3</td>
<td>2</td>
<td>30 minutes</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>Vitamin K3</td>
<td>5</td>
<td>30 minutes</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>No treatment</td>
<td></td>
<td>Control to control</td>
</tr>
</tbody>
</table>

Results

Number of sea lice one week post challenge
The trial must be regarded as highly successful. The sea lice infections were good and the sea lice recordings for the two control groups shows that the bath treatment itself did not have any impact on the final result.

The results showed that the effect of menadione against sea lice is highly dose response depended. For fish bath treated with 5 ppm menadione for 30 minutes, a reduction of 75 percent of the attached sea lice was recorded.

### Conclusions

Based on the results from trial 30.05 SS and the bath treatment of infected fish it seems that menadione is not suitable for treating Atlantic salmon against sea lice. In the single dose toxicity study fish challenged with menadione were clearly affected after a 5 ppm challenge for 60 minutes. In the 10 ppm menadione exposure fish were clearly affected after 40 minutes. Based on these results it was decided that the fish could not be challenged with higher concentration the 5 ppm for 30 minutes.

The results from the study with infected fish showed that a menadione bath challenge dose of 5 ppm for 30 minutes reduced the levels of sea lice with 75 % on the. There was a strong dose response correlation, however, a 75 % reduction of sea lice following bath treatment 5 ppm is not sufficient when conducted in laboratory trials. The toxicity studies on Atlantic salmon revealed that the fish were sluggish after a 40 minutes bath treatment in 10 ppm. This suggest that the therapeutic margin for menadione in Atlantic salmon is narrow and the treatment dose can not be increased above 5 ppm.

Based on the findings on the conducted studies menadione is not regarded suitable for bath treatment against sea lice treatments in Atlantic salmon.
Example 2: Use of Menadion as a chemotherapeutic for intestine parasites

Menadionsodium bisulfite or 1-naphthalenesulfonic acid, chemical formula (CnHgO5S.Na) has been shown to have toxic effects at higher concentration, although the substance in lower concentration is commercially used in medicine or as a vitamin in animal food.

Hence it may be possible to concentrate menadion in the intestine of animals and force a toxic reaction to all helminths and protozoan's in the intestine lumen, without creating a severe toxic effect on the host harbouring these parasites.

This was tested using Atlantic salmon smolts, mean weight 82.5gr. SD 17.4 gr. Infected with a prevalence of 45.7% of the tapeworm Eubothrium crassum. The experimental set up was to feed the salmons with commercial food pellets containing 50 and 100 ppm. of menadion, coated on food pellets using a fish oil solution. As a control, fish oil alone was added. Fish were fed for seven days in three tanks each containing 40 fish, exposed to either of the treatments. The initial infection was 45.7% prior to experimental start. After feeding the Salmons with a food amount of 2% of their bodyweight daily, for seven days, the prevalence of Eubothrium crassum was 10% in the highest mendion concentration given in food pellets (4 out of 40 fish), in the lowest concentration added to the food-pellets we found 9 out of 40 infected and finally in the control groups coated with fish oil only, the occurrence of infected fish was 21 out of 40. Hence, the highest concentration of menadion added to the food pellets gave a significant reduction P>0.05 Chi-Square compared to the control group, with respect to occurrence of E. crassum in the salmons hosts. Although a reduction, the lowest concentration of menadion added gave no significant reduction, compared to the control group. We could not observe any difference in feeding incidence between the different treatment groups in the experiment. Thus, a pronounced reduction in appetite of the fish, due to the menadione added is not obvious. Food amount in the fish are, however, not calculated and a smaller appetite reduction may be present.

Conclusion: The experiment indicates that Menadion (Vitamin K3), when added to food, has a potential as a chemotherapeutica in use to fight macroparasites in the intestine-lumen of fish and probably also all vertebrates. The experimental results here are probably weakened by leakage of active menadion out of the food-pellets, when they were added to the water. Hence the concentration in the intestine lumen is
reduced and a better administration would be to homogenize the component into the food pellet in order to reduce leakage when added to water as in fish farming or to ornamental fish.

5 The meadione (Vitamin K3) has a potential a chemotherapeutic administrated orally to the hosts for all helmints in fish intestine lumen. Fish species used commercially as Grass carp, Silver carp, Common carp, bighead carp, Crucian Carp, Nile Tilapia, Roho Labeo, Catla, White Amur Bream, Milkfish, Marine flatfishes, Sea bream, Wolf fishes and Atlantic cod, Mud Carp, Japanese eel, Black Carp and Atlantic Salmon, may potentially be subjects for such treatment. Helminths of the genus's Bothriocephalus, Eubotrium, Proteocephalus, Hysterothylacium and families Allocreadiidae, Opecoelidae, Gorgoderidae, Hemiuridae and Deroginidae, Moreover it is likely that protozoan intestine parasites as Flagelates and Amoeba are subjects to the effects of oral treatment with Menadion (Vitamin K3).
Claims

1. A composition comprising vitamin k3.

2. The composition according to claim 1 comprising an amount of from 1 % (w/w) to 90 % (w/w) of a vitamin k3.

3. The composition according to claim 2, wherein the vitamin K3 is present in an amount of from 1% (w/w) to 85% (w/w); such as from 1% (w/w) to 80% (w/w); for example from 1% (w/w) to 75% (w/w), such as from 1% (w/w) to 70% (w/w); for example from 1% (w/w) to 65% (w/w), such as from 1% (w/w) to 60% (w/w); for example from 1% (w/w) to 55% (w/w), such as from 1% (w/w) to 50% (w/w);

   for example from 1% (w/w) to 48% (w/w); such as from 1% (w/w) to 46% (w/w);
   for example from 1% (w/w) to 44% (w/w); such as from 1% (w/w) to 42% (w/w);
   for example from 1% (w/w) to 40% (w/w); such as from 1% (w/w) to 38% (w/w);
   for example from 1% (w/w) to 36% (w/w); such as from 1% (w/w) to 34% (w/w);
   for example from 1% (w/w) to 32% (w/w); such as from 1% (w/w) to 30% (w/w);
   for example from 1% (w/w) to 28% (w/w); such as from 1% (w/w) to 26% (w/w);
   for example from 1% (w/w) to 24% (w/w); such as from 1% (w/w) to 22% (w/w);
   for example from 1% (w/w) to 20% (w/w); such as from 1% (w/w) to 18% (w/w);
   for example from 1% (w/w) to 16% (w/w); such as from 1% (w/w) to 14% (w/w);
   for example from 1% (w/w) to 12% (w/w); such as from 1% (w/w) to 10% (w/w);
   for example from 1% (w/w) to 5% (w/w); such as from 2% (w/w) to 85% (w/w);
   such as from 2% (w/w) to 80% (w/w); for example from 2% (w/w) to 75% (w/w), such as from 2% (w/w) to 70% (w/w); for example from 2% (w/w) to 65% (w/w), such as from 2% (w/w) to 60% (w/w); for example from 2% (w/w) to 55% (w/w), such as from 2% (w/w) to 50% (w/w); for example from 2% (w/w) to 48% (w/w);

   such as from 2% (w/w) to 46% (w/w); for example from 2% (w/w) to 44% (w/w);
   such as from 2% (w/w) to 42% (w/w); for example from 2% (w/w) to 40% (w/w);
   such as from 2% (w/w) to 38% (w/w); for example from 2% (w/w) to 36% (w/w);
   such as from 2% (w/w) to 34% (w/w); for example from 2% (w/w) to 32% (w/w);
   such as from 2% (w/w) to 30% (w/w); for example from 2% (w/w) to 28% (w/w);
   such as from 2% (w/w) to 26% (w/w); for example from 2% (w/w) to 24% (w/w);
   such as from 2% (w/w) to 22% (w/w); for example from 2% (w/w) to 20% (w/w);
   such as from 2% (w/w) to 18% (w/w); for example from 2% (w/w) to 16% (w/w);
   such as from 2% (w/w) to 14% (w/w); for example from 2% (w/w) to 12% (w/w);
   such as from 2% (w/w) to 10% (w/w); for example from 2% (w/w) to 5% (w/w);
such as from 4% (w/w) to 85% (w/w); such as from 4% (w/w) to 80% (w/w); for example from 4% (w/w) to 75% (w/w), such as from 4% (w/w) to 70% (w/w); for example from 4% (w/w) to 65% (w/w), such as from 4% (w/w) to 60% (w/w); for example from 4% (w/w) to 55% (w/w), such as from 4% (w/w) to 50% (w/w); for example from 4% (w/w) to 48% (w/w); such as from 4% (w/w) to 46% (w/w); for example from 4% (w/w) to 44% (w/w); such as from 4% (w/w) to 42% (w/w); for example from 4% (w/w) to 40% (w/w); such as from 4% (w/w) to 38% (w/w); for example from 4% (w/w) to 36% (w/w); such as from 4% (w/w) to 34% (w/w); for example from 4% (w/w) to 32% (w/w); such as from 4% (w/w) to 30% (w/w); for example from 4% (w/w) to 28% (w/w); such as from 4% (w/w) to 26% (w/w); for example from 4% (w/w) to 24% (w/w); such as from 4% (w/w) to 22% (w/w); for example from 4% (w/w) to 20% (w/w); such as from 4% (w/w) to 18% (w/w); for example from 4% (w/w) to 16% (w/w); such as from 4% (w/w) to 14% (w/w); for example from 4% (w/w) to 12% (w/w); such as from 4% (w/w) to 10% (w/w); such as from 6% (w/w) to 85% (w/w); such as from 6% (w/w) to 80% (w/w); for example from 6% (w/w) to 75% (w/w), such as from 6% (w/w) to 70% (w/w); for example from 6% (w/w) to 65% (w/w), such as from 6% (w/w) to 60% (w/w); for example from 6% (w/w) to 55% (w/w), for example from 6% (w/w) to 50% (w/w); such as from 6% (w/w) to 48% (w/w), for example from 6% (w/w) to 46% (w/w); for example from 6% (w/w) to 44% (w/w); such as from 6% (w/w) to 42% (w/w); for example from 6% (w/w) to 40% (w/w); such as from 6% (w/w) to 38% (w/w); for example from 6% (w/w) to 36% (w/w); such as from 6% (w/w) to 34% (w/w); for example from 6% (w/w) to 32% (w/w); such as from 6% (w/w) to 30% (w/w); for example from 6% (w/w) to 28% (w/w); such as from 6% (w/w) to 26% (w/w); for example from 6% (w/w) to 24% (w/w); such as from 6% (w/w) to 22% (w/w); for example from 6% (w/w) to 20% (w/w); such as from 6% (w/w) to 18% (w/w); for example from 6% (w/w) to 16% (w/w); such as from 6% (w/w) to 14% (w/w); for example from 6% (w/w) to 12% (w/w); such as from 6% (w/w) to 10% (w/w); such as from 8% (w/w) to 85% (w/w); such as from 8% (w/w) to 80% (w/w); for example from 8% (w/w) to 75% (w/w), such as from 8% (w/w) to 70% (w/w); for example from 8% (w/w) to 65% (w/w), such as from 8% (w/w) to 60% (w/w); for example from 8% (w/w) to 55% (w/w), for example from 8% (w/w) to 50% (w/w); such as from 8% (w/w) to 48% (w/w), such as from 8% (w/w) to 46% (w/w); for example from 8% (w/w) to 44% (w/w); such as from 8% (w/w) to 42% (w/w); for example from 8% (w/w) to 40% (w/w); such as from 8% (w/w) to 38% (w/w); for
example from 8 % (w/w) to 36 % (w/w); such as from 8 % (w/w) to 34 % (w/w); for example from 8 % (w/w) to 32 % (w/w); such as from 8 % (w/w) to 30 % (w/w); for example from 8 % (w/w) to 28 % (w/w); such as from 8 % (w/w) to 26 % (w/w); for example from 8 % (w/w) to 24 % (w/w); such as from 8 % (w/w) to 22 % (w/w); for example from 8 % (w/w) to 20 % (w/w); such as from 8 % (w/w) to 18 % (w/w); for example from 8 % (w/w) to 16 % (w/w); such as from 8 % (w/w) to 14 % (w/w); for example from 8 % (w/w) to 12 % (w/w); such as from 8 % (w/w) to 10 % (w/w); such as from 10% (w/w) to 85% (w/w); such as from 10% (w/w) to 80% (w/w); for example from 10% (w/w) to 75% (w/w), such as from 10% (w/w) to 70% (w/w); for example from 10% (w/w) to 65% (w/w), such as from 10% (w/w) to 60% (w/w); for example from 10% (w/w) to 55% (w/w), for example from 10% (w/w) to 50% (w/w); for example from 10% (w/w) to 48% (w/w), such as from 10% (w/w) to 46% (w/w); for example from 10% (w/w) to 44% (w/w); such as from 10% (w/w) to 42% (w/w); for example from 10% (w/w) to 40% (w/w); such as from 10% (w/w) to 38% (w/w); for example from 10% (w/w) to 36% (w/w); such as from 10% (w/w) to 34% (w/w); for example from 10% (w/w) to 32% (w/w); such as from 10% (w/w) to 30% (w/w); for example from 10% (w/w) to 28% (w/w); such as from 10% (w/w) to 26% (w/w); for example from 10% (w/w) to 24% (w/w); such as from 10% (w/w) to 22% (w/w); for example from 10% (w/w) to 20% (w/w); such as from 10% (w/w) to 18% (w/w); for example from 10% (w/w) to 16% (w/w); such as from 10% (w/w) to 15% (w/w); for example from 12% (w/w) to 60% (w/w); for example from 12% (w/w) to 55% (w/w), such as from 12% (w/w) to 50% (w/w); for example from 12% (w/w) to 48% (w/w); such as from 12% (w/w) to 46% (w/w); for example from 12% (w/w) to 44% (w/w); such as from 12% (w/w) to 42% (w/w); for example from 12% (w/w) to 40% (w/w); such as from 12% (w/w) to 38% (w/w); for example from 12% (w/w) to 36% (w/w); such as from 12% (w/w) to 34% (w/w); for example from 12% (w/w) to 32% (w/w); such as from 12% (w/w) to 30% (w/w); for example from 12% (w/w) to 28% (w/w); such as from 12% (w/w) to 26% (w/w); for example from 12% (w/w) to 24% (w/w); such as from 12% (w/w) to 22% (w/w); for example from 12% (w/w) to 20% (w/w); such as from 12% (w/w) to 18% (w/w); for example from 12% (w/w) to 16% (w/w), such as from 12% (w/w) to 15% (w/w); for example from 12% (w/w) to 14% (w/w); such as from 12% (w/w) to 12% (w/w); for example from 12% (w/w) to 10% (w/w); such as from 12% (w/w) to 8% (w/w); for example from 12% (w/w) to 6% (w/w); such as from 12% (w/w) to 4% (w/w); for example from 12% (w/w) to 2% (w/w); such as from 12% (w/w) to 1% (w/w); for example from 12% (w/w) to 0% (w/w), such as from 12% (w/w) to 0% (w/w).
14 % (w/w), such as from 14% (w/w) to 85% (w/w); such as from 14% (w/w) to
80% (w/w); for example from 14% (w/w) to 75% (w/w), such as from 14% (w/w)
to 70% (w/w); for example from 14% (w/w) to 65% (w/w), such as from 14%
(w/w) to 60% (w/w); for example from 14% (w/w) to 55% (w/w), for example
from 14 % (w/w) to 50% (w/w); such as from 14 % (w/w) to 48% (w/w), such as
from 14% (w/w) to 46% (w/w); for example from 14 % (w/w) to 44 % (w/w); such
as from 14% (w/w) to 42% (w/w); for example from 14% (w/w) to 40% (w/w);
such as from 14 % (w/w) to 38% (w/w); for example from 14% (w/w) to 36
% (w/w); such as from 14% (w/w) to 34% (w/w); for example from 14% (w/w) to
32% (w/w); such as from 14% (w/w) to 30% (w/w); for example from 14% (w/w)
to 28% (w/w); such as from 14% (w/w) to 26% (w/w); for example from 14%
(w/w) to 24% (w/w); such as from 14% (w/w) to 22% (w/w); for example from
14% (w/w) to 20% (w/w); such as from 14% (w/w) to 18% (w/w); for example
from 14% (w/w) to 16% (w/w); such as from 16% (w/w) to 85% (w/w); such as
from 16% (w/w) to 80% (w/w); for example from 16% (w/w) to 75% (w/w), such
as from 16% (w/w) to 70% (w/w); for example from 16% (w/w) to 65% (w/w),
such as from 16% (w/w) to 60% (w/w); for example from 16% (w/w) to 55%
(w/w), such as from 16% (w/w) to 50% (w/w); for example from 16% (w/w) to
48% (w/w), such as from 16% (w/w) to 46% (w/w); for example from 16% (w/w)
to 44% (w/w); such as from 16% (w/w) to 42% (w/w); for example from 16%
(w/w) to 40% (w/w); such as from 16% (w/w) to 38% (w/w); for example from
16% (w/w) to 36% (w/w); such as from 16% (w/w) to 34% (w/w); for example from
16% (w/w) to 32% (w/w); such as from 16% (w/w) to 30% (w/w); for example from
16% (w/w) to 28% (w/w); such as from 16% (w/w) to 26% (w/w); for example from
16% (w/w) to 24% (w/w); such as from 16% (w/w) to 22%
(w/w); for example from 16% (w/w) to 20% (w/w); such as from 16% (w/w) to
18% (w/w); such as from 18% (w/w) to 85% (w/w); such as from 18% (w/w) to
80% (w/w); for example from 18% (w/w) to 75% (w/w), such as from 18% (w/w)
to 70% (w/w); for example from 18% (w/w) to 65% (w/w), such as from 18%
(w/w) to 60% (w/w); for example from 18% (w/w) to 55% (w/w), such as from 18%
(w/w) to 50% (w/w); for example from 18% (w/w) to 48% (w/w), such as from 18%
(w/w) to 46% (w/w); for example from 18% (w/w) to 44% (w/w); such as
from 18% (w/w) to 42% (w/w); for example from 18% (w/w) to 40% (w/w); such
as from 18% (w/w) to 38% (w/w); for example from 18% (w/w) to 36% (w/w);
such as from 18% (w/w) to 34% (w/w); for example from 18% (w/w) to 32
such as from 18 %(w/w) to 30 %(w/w); for example from 18 %(w/w) to 28 %(w/w); such as from 18 %(w/w) to 26 %(w/w); for example from 18 %(w/w) to 24 %(w/w); such as from 18 %(w/w) to 22 %(w/w); for example from 18 %
(w/w) to 20 %(w/w); such as from 20% (w/w) to 85% (w/w); such as from 20%
(w/w) to 80% (w/w); for example from 20% (w/w) to 75% (w/w), such as from
20% (w/w) to 70% (w/w); for example from 20% (w/w) to 65% (w/w), such as
from 20% (w/w) to 60% (w/w); for example from 20% (w/w) to 55% (w/w), such
as from 20 %(w/w) to 50% (w/w); such as from 20 %(w/w) to 48% (w/w), such
as from 20 %(w/w) to 46 %(w/w); for example from 20 %(w/w) to 44 %(w/w);
such as from 20 %(w/w) to 42 %(w/w); for example from 20 %(w/w) to 40
%(w/w); such as from 20 %(w/w) to 38 %(w/w); for example from 20 %(w/w) to
36 %(w/w); such as from 20 %(w/w) to 34 %(w/w); for example from 20 %(w/w)
to 32 %(w/w); such as from 20 %(w/w) to 30 %(w/w); for example from 20
%(w/w) to 28 %(w/w); such as from 20 %(w/w) to 26 %(w/w); for example from
20 %(w/w) to 24 %(w/w); such as from 20 %(w/w) to 22 %(w/w); such as from
22% (w/w) to 85% (w/w); such as from 22% (w/w) to 80% (w/w); for example
from 22% (w/w) to 75% (w/w), such as from 22% (w/w) to 70% (w/w); for
example from 22% (w/w) to 65% (w/w), such as from 22% (w/w) to 60% (w/w);
for example from 22% (w/w) to 55% (w/w), such as from 22 %%(w/w) to 50%
(w/w); for example from 22 %%(w/w) to 48% (w/w), such as from 22 %%(w/w) to 46
%(w/w); for example from 22 %%(w/w) to 44 %(w/w); such as from 22 %%(w/w) to
42 %(w/w); for example from 22 %%(w/w) to 40 %(w/w); such as from 22 %%(w/w)
to 38 %(w/w); for example from 22 %%(w/w) to 36 %(w/w); such as from 22
%(w/w) to 34 %(w/w); for example from 22 %(w/w) to 32 %(w/w); such as from
22 %(w/w) to 30 %(w/w); for example from 22 %(w/w) to 28 %(w/w); such as
from 22 %(w/w) to 26 %(w/w); for example from 22 %(w/w) to 24 %(w/w); such
as from 24% (w/w) to 85% (w/w); such as from 24% (w/w) to 80% (w/w); for
eexample from 24% (w/w) to 75% (w/w), such as from 24% (w/w) to 70% (w/w);
for example from 24% (w/w) to 65% (w/w), such as from 24% (w/w) to 60%
(w/w); for example from 24% (w/w) to 55% (w/w), such as from 24 %%(w/w) to
50% (w/w); such as from 24 %%(w/w) to 48% (w/w), such as from 24 %%(w/w) to
46 %(w/w); for example from 24 %%(w/w) to 44 %(w/w); such as from 24 %%(w/w)
to 42 %(w/w); for example from 24 %%(w/w) to 40 %(w/w); such as from 24
%(w/w) to 38 %(w/w); for example from 24 %(w/w) to 36 %(w/w); such as from
24 %(w/w) to 34 %(w/w); for example from 24 %(w/w) to 32 %(w/w); such as
from 24 % (w/w) to 30 % (w/w); for example from 24 % (w/w) to 28 % (w/w); such as from 24 % (w/w) to 26 % (w/w); such as from 28 % (w/w) to 85 % (w/w); such as from 26 % (w/w) to 80 % (w/w); for example from 26 % (w/w) to 75 % (w/w), such as from 26 % (w/w) to 70 % (w/w); for example from 26 % (w/w) to 65 % (w/w), such as from 26 % (w/w) to 60 % (w/w); for example from 26 % (w/w) to 55 % (w/w), such as from 26 % (w/w) to 50 % (w/w); for example from 26 % (w/w) to 48 % (w/w), such as from 26 % (w/w) to 46 % (w/w); for example from 26 % (w/w) to 40 % (w/w); such as from 26 % (w/w) to 38 % (w/w); for example from 26 % (w/w) to 36 % (w/w); such as from 26 % (w/w) to 34 % (w/w); for example from 26 % (w/w) to 32 % (w/w); such as from 26 % (w/w) to 30 % (w/w); for example from 26 % (w/w) to 28 % (w/w); such as from 28 % (w/w) to 85 % (w/w); for example from 28 % (w/w) to 80 % (w/w); for example from 28 % (w/w) to 75 % (w/w), such as from 28 % (w/w) to 70 % (w/w); for example from 28 % (w/w) to 65 % (w/w), such as from 28 % (w/w) to 60 % (w/w); for example from 28 % (w/w) to 55 % (w/w), such as from 28 % (w/w) to 50 % (w/w); for example from 28 % (w/w) to 48 % (w/w), such as from 28 % (w/w) to 46 % (w/w); for example from 28 % (w/w) to 44 % (w/w); such as from 28 % (w/w) to 42 % (w/w); for example from 28 % (w/w) to 40 % (w/w); such as from 28 % (w/w) to 38 % (w/w); for example from 28 % (w/w) to 36 % (w/w); such as from 28 % (w/w) to 34 % (w/w); for example from 28 % (w/w) to 32 % (w/w); such as from 28 % (w/w) to 30 % (w/w); such as from 30 % (w/w) to 85 % (w/w); such as from 30 % (w/w) to 80 % (w/w); for example from 30 % (w/w) to 75 % (w/w), such as from 30 % (w/w) to 70 % (w/w); for example from 30 % (w/w) to 65 % (w/w), such as from 30 % (w/w) to 60 % (w/w); for example from 30 % (w/w) to 55 % (w/w), such as from 30 % (w/w) to 50 % (w/w); for example from 30 % (w/w) to 48 % (w/w), such as from 30 % (w/w) to 46 % (w/w); for example from 30 % (w/w) to 44 % (w/w); such as from 30 % (w/w) to 42 % (w/w); for example from 30 % (w/w) to 40 % (w/w); such as from 30 % (w/w) to 38 % (w/w); for example from 30 % (w/w) to 36 % (w/w); such as from 30 % (w/w) to 34 % (w/w); for example from 30 % (w/w) to 32 % (w/w); such as from 32 % (w/w) to 85 % (w/w); such as from 32 % (w/w) to 80 % (w/w); for example from 32 % (w/w) to 75 % (w/w), such as from 32 % (w/w) to 70 % (w/w); for example from 32 % (w/w) to 65 % (w/w), such as from 32 % (w/w) to 60 % (w/w); for example from 32 % (w/w) to 55 % (w/w), such as from 32 % (w/w) to 50 % (w/w); for example from 32 % (w/w) to 48 %
(w/w), such as from 32 % (w/w) to 46 % (w/w); for example from 32 % (w/w) to 44 % (w/w); such as from 32 % (w/w) to 42 % (w/w); for example from 32 % (w/w) to 40 % (w/w); such as from 32 % (w/w) to 38 % (w/w); for example from 32 % (w/w) to 36 % (w/w); such as from 32 % (w/w) to 34 % (w/w); such as from 34 % (w/w) to 85% (w/w); such as from 34% (w/w) to 80% (w/w); for example from 34% (w/w) to 75% (w/w), such as from 34% (w/w) to 70% (w/w); for example from 34% (w/w) to 65% (w/w), such as from 34% (w/w) to 60% (w/w); for example from 34% (w/w) to 55% (w/w), such as from 34% (w/w) to 50% (w/w); for example from 34% (w/w) to 48% (w/w), such as from 34% (w/w) to 46% (w/w); for example from 34% (w/w) to 44% (w/w); such as from 34% (w/w) to 42% (w/w); for example from 34% (w/w) to 40% (w/w); such as from 34% (w/w) to 38% (w/w); for example from 34% (w/w) to 36% (w/w); such as from 36% (w/w) to 85% (w/w); such as from 36% (w/w) to 80% (w/w); for example from 36% (w/w) to 75% (w/w), such as from 36% (w/w) to 70% (w/w); for example from 36% (w/w) to 65% (w/w), such as from 36% (w/w) to 60% (w/w); for example from 36% (w/w) to 55% (w/w), such as from 36% (w/w) to 50% (w/w); such as from for example from 36% (w/w) to 48% (w/w), such as from 36% (w/w) to 46% (w/w); for example from 36% (w/w) to 44% (w/w); such as from 36% (w/w) to 42% (w/w); for example from 36% (w/w) to 40% (w/w); such as from 36% (w/w) to 38% (w/w); such as from 38% (w/w) to 85% (w/w); such as from 38% (w/w) to 80% (w/w); for example from 38% (w/w) to 75% (w/w), such as from 38% (w/w) to 70% (w/w); for example from 38% (w/w) to 65% (w/w), such as from 38% (w/w) to 60% (w/w); for example from 38% (w/w) to 55% (w/w), such as from 38% (w/w) to 50% (w/w); for example from for example from 38% (w/w) to 48% (w/w), such as from 38% (w/w) to 46% (w/w); for example from 38% (w/w) to 44% (w/w); such as from 38% (w/w) to 42% (w/w); for example from 38% (w/w) to 40% (w/w); such as from 40% (w/w) to 85% (w/w); such as from 40% (w/w) to 80% (w/w); for example from 40% (w/w) to 75% (w/w), such as from 40% (w/w) to 70% (w/w); for example from 40% (w/w) to 65% (w/w), such as from 40% (w/w) to 60% (w/w); for example from 40% (w/w) to 55% (w/w), such as from 40% (w/w) to 50% (w/w); such as from 40% (w/w) to 48% (w/w), such as from 40% (w/w) to 46% (w/w); for example from 40% (w/w) to 44% (w/w); such as from 40% (w/w) to 42% (w/w).
4. The composition according to any of claims 1 to 3 further comprising one or more protein sources selected from the group consisting of liquid milk protein source, dry milk protein source, liquid non-milk protein source, dry non-milk protein source, stick water, fish meal, blood meal, meat meal, bone meal, liquid yeast, dry yeast, soy beans, peas, maize or cereals.

5. The composition according to any of claims 1 to 3 further comprising one or more amino acids and/or nucleotides.

6. The composition according to any of claims 1 to 3 further comprising one or more lipids.

7. The composition according to any of claims 1 to 3 further comprising one or more carbohydrate sources.

8. The composition according to any of claims 1 to 3 further comprising one or more vitamins.

9. The composition according to any of claims 1 to 3 further comprising one or more minerals.

10. The composition according to any of claims 1 to 3 further comprising one or more emulsifying agents.

11. The composition according to any of claims 1 to 3 further comprising one or more hydrocolloids.

12. The composition according to any of claims 1 to 3 further comprising one or more flavouring agents.

13. The composition according to any of claims 1 to 3 further comprising one or more antioxidants.

14. The composition according to any of claims 1 to 3 further comprising one or more preserving agents.

15. The composition according to any of claims 1 to 3 further comprising one or more pharmaceutically active substances.

16. The composition according to any of claims 1 to 3 for use in a solid, semi-solid or liquid animal feed composition.

17. The composition according to claim 1, wherein the amount of vitamin K3 is in the range of from about 0.01 gram vitamin K3 per kg composition to about 20
gram vitamin K3 per kg composition, such as from about 0.02 gram vitamin K3 per kg composition to about 18 gram vitamin K3 per kg composition, for example from about 0.04 gram vitamin K3 per kg composition to about 16 gram vitamin K3 per kg composition, such as from about 0.06 gram vitamin K3 per kg composition to about 14 gram vitamin K3 per kg composition, for example from about 0.08 gram vitamin K3 per kg composition to about 12 gram vitamin K3 per kg composition, such as from about 0.1 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 0.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 0.3 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 0.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 0.5 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 0.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 0.7 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 0.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 0.9 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 1.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 1.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 1.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 1.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 1.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 2.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 2.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 2.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 2.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 2.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 3.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 3.2 gram
vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 3.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 3.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 3.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 4.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 4.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 4.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 4.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 4.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 5.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 5.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 5.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 5.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 5.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 6.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 6.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 6.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 6.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 6.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 7.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 7.2 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 7.4 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 7.6 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, such as from about 7.8 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition, for example from about 8.0 gram vitamin K3 per kg composition to about 10 gram vitamin K3 per kg composition,
such as from about 0.2 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 0.3 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 0.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 0.5 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 0.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 0.7 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 0.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 0.9 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 1.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 1.2 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 1.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 1.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 1.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 2.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 2.2 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 2.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 2.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 2.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 3.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 3.2 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 3.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 3.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 3.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 4.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 4.2 gram vitamin K3 per kg composition to about 8 gram...
vitamin K3 per kg composition, for example from about 4.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 4.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 4.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 5.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 5.2 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 5.4 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 5.6 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 5.8 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, for example from about 6.0 gram vitamin K3 per kg composition to about 8 gram vitamin K3 per kg composition, such as from about 0.2 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 0.3 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 0.4 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 0.5 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 0.6 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 0.7 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 0.8 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 0.9 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 1.0 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 1.2 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 1.4 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 1.6 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 1.8 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 2.0 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 2.2 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 2.4 gram vitamin K3 per
kg composition to about 6 gram vitamin K3 per kg composition, such as from about 2.6 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 2.8 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 3.0 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 3.2 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 3.4 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 3.6 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 3.8 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 4.0 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 4.2 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 4.4 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 4.6 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, for example from about 4.8 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition, such as from about 5.0 gram vitamin K3 per kg composition to about 6 gram vitamin K3 per kg composition.

18. The composition according to any of claims 1 to 16, wherein the amount of vitamin K3 is in concentrations between 0.5 ppm and 1500 ppm such as between 0.5 ppm and 1450 ppm, for example between 0.5 ppm and 1400 ppm, such as between 0.5 ppm and 1350 ppm, for example between 0.5 ppm and 1300 ppm, such as between 0.5 ppm and 1250 ppm, for example between 0.5 ppm and 1200 ppm, such as between 0.5 ppm and 1150 ppm, for example between 0.5 ppm and 1100 ppm, such as between 0.5 ppm and 1050 ppm, for example between 0.5 ppm and 1000 ppm, such as between 0.5 ppm and 950 ppm, for example between 0.5 ppm and 900 ppm, such as between 0.5 ppm and 850 ppm, for example between 0.5 ppm and 800 ppm, such as between 0.5 ppm and 750 ppm, for example between 0.5 ppm and 700 ppm, such as between 0.5 ppm and 650 ppm, for example between 0.5 ppm and 600 ppm, such as between 0.5 ppm and 550 ppm, for example between 0.5 ppm and 500 ppm, such as between 0.5 ppm and 450 ppm, for example between 0.5 ppm and 400 ppm, such as between 0.5 ppm and 350 ppm, for example between 0.5 ppm and 300 ppm, for example between 0.5 ppm and 250 ppm, for example between 0.5 ppm and 200 ppm, for example between 0.5 ppm and 150 ppm, for example between 0.5 ppm and 100 ppm, for example between 0.5 ppm and 50 ppm, for example between 0.5 ppm and 25 ppm, for example between 0.5 ppm and 10 ppm, for example between 0.5 ppm and 5 ppm, for example between 0.5 ppm and 2.5 ppm, for example between 0.5 ppm and 1 ppm, for example between 0.5 ppm and 0.5 ppm.
ppm and 300 ppm, such as between 0.5 ppm and 250 ppm, for example between 0.5 ppm and 200 ppm, such as between 0.5 ppm and 150 ppm, for example between 0.5 ppm and 100 ppm, such as between 0.5 ppm and 50 ppm, for example between 0.5 ppm and 45 ppm, such as between 0.5 ppm and 40 ppm, for example between 0.5 ppm and 35 ppm, such as between 0.5 ppm and 30 ppm, for example between 0.5 ppm and 25 ppm, such as between 0.5 ppm and 20 ppm, for example between 0.5 ppm and 15 ppm, such as between 0.5 ppm and 10 ppm, for example between 0.5 ppm and 9 ppm, such as between 0.5 ppm and 8 ppm, for example between 0.5 ppm and 7 ppm, such as between 0.5 ppm and 6 ppm, for example between 0.5 ppm and 5 ppm, such as between 0.5 ppm and 4 ppm, for example between 0.5 ppm and 3 ppm, such as between 0.5 ppm and 2 ppm, for example between 0.5 ppm and 1 ppm, such as between 1 ppm and 1500 ppm, for example between 5 ppm and 1500 ppm, such as between 10 ppm and 1500 ppm, for example between 15 ppm and 1500 ppm, such as between 20 ppm and 1500 ppm, for example between 25 ppm and 1500 ppm, such as between 30 ppm and 1500 ppm, for example between 35 ppm and 1500 ppm, such as between 40 ppm and 1500 ppm, for example between 45 ppm and 1500 ppm, such as between 50 ppm and 1500 ppm, for example between 100 ppm and 1500 ppm, such as between 150 ppm and 1500 ppm, for example between 200 ppm and 1500 ppm, such as between 250 ppm and 1500 ppm, for example between 300 ppm and 1500 ppm, such as between 350 ppm and 1500 ppm, for example between 400 ppm and 1500 ppm, such as between 450 ppm and 1500 ppm, for example between 500 ppm and 1500 ppm, such as between 550 ppm and 1500 ppm, for example between 600 ppm and 1500 ppm, such as between 650 ppm and 1500 ppm, for example between 700 ppm and 1500 ppm, such as between 750 ppm and 1500 ppm, for example between 800 ppm and 1500 ppm, such as between 850 ppm and 1500 ppm, for example between 900 ppm and 1500 ppm, such as between 950 ppm and 1500 ppm, for example between 1000 ppm and 1500 ppm, such as between 1050 ppm and 1500 ppm, for example between 1100 ppm and 1500 ppm, such as between 1150 ppm and 1500 ppm, for example between 1200 ppm and 1500 ppm, such as between 1250 ppm and 1500 ppm, for example between 1300 ppm and 1500 ppm, such as between 1350 ppm and 1500 ppm, for example between 1400 ppm and 1500 ppm, such as between 1450 ppm and 1500 ppm.
19. The composition according to any of the claims 1-18, wherein the composition is a dried composition.

20. The composition according to claim 19, wherein the dried composition is a freeze-dried composition.

21. The composition according to any of the claims 1-18, wherein the composition is a frozen composition.

22. The composition according to any of the claims 1-18, wherein the composition is an algae wafers composition.

23. The composition according to any of the claims 1-18, wherein the composition is a flake composition.

24. The composition according to claim 23, wherein the flake composition is a floating flake composition.

25. The composition according to claim 23, wherein the flake composition is a sinking flake composition.

26. The composition according to any of the claims 1-18, wherein the composition is a stick composition.

27. The composition according to claim 26, wherein the stick composition is a floating stick composition.

28. The composition according to any of the claims 1-18, wherein the stick composition is a sinking stick composition.

29. The composition according to any of the claims 1-18, wherein the composition is a pellet composition.

30. The composition according to any of the claims 1-18, wherein the composition is a controlled release composition.

31. The composition according to any of the claims 1-30, wherein the fish are fed by hand, by automatic feeders or by demand feeders.

32. The composition according to any of the preceding claims for use as a first fish feed.

33. Use of the composition according to any of the claims 1-30 in a method for feeding a fish population.
(Pampus argenteus), Rockfish (Sebastes brevispinis), Skipjack Tuna (Katsuwonus pelamis), Spinefoot (Siganus javus), Croaker or Corvina (Roncador stearnsi), Flounder (Platichthys stellatus), Marlin (Tetrapturus audax), Bass (Morone chrysops x saxatilis), Swordfish (Xiphias gladius), Carp (Barbodes schwanefeldi), Pollock (Alaska Pollock, Theragra chalcogramma), Hake (Urophycis tenuis), Rockfish (Sebastes entomelas), Flounder (Scophthalmus aquosus), Croaker (Yellowfish, Pseudosciaena manchurica), Rockfish (Sebastes ruberrimus), Tuna (Thunnus albacares), Yellowstripe Scad (Selaroides leptolepis), Yellowtail (Seriola lalandei), Flounder (Limanda ferruginea), Rockfish (Sebastes flavidus) and Snapper (Ocyurus chrysurus)

Arctic char (Salvelinus alpinus), Turbot, Greenland halibut (Reinhartdius hippoglossoides) and Halibut (Hippoglossus hippoglossus).

35. The use of the composition according to claim 33, wherein the first fish population can be selected from the group consisting of Ablennes hians, Acanthopagrus berda, Acanthophthalmus semicinctus, Acanthuridae, Acanthurus lineatus, Acanthurus sp., Acanthurus triostegus, Acentrogobius janthinopterus, Alectis sp., Ambassidae, Ambassus buruensis, Ambassius commersoni auctorum, Ambassus miops, Ambassus miops, Amblygaster sirm, Amphacanthus oramin, Siganus canaliculars, Anabantidae, Anabas testudineus, Anguilla bicolor pacifica, Anguilla celebensis, Anguilla marmorata, Anguilla mauritiana, Anguilla marmorata, Anguilla sp., Anguillidae, Anodontostoma chacunda, Anomalopidae, Anomalops katoptron, Anyperodon leucogrammicus, Apogon ellioti, Apogon sp. auctorum, Hypseleotris bipartite, Apogonichthys ellioti, Apogon ellioti, Apogonidae, Apolectus niger, Parastromateus niger, Ariidae, Aristichthys nobilis, Arius manillensis, Arius sp., Arius thalassinus, Netuma thalassina, Arothron manilensis, Arothron mappa, Atherina balabacensis, Atherinidae, Atule mate, Bagridae, Balistidae flavimarginatus, Pseudobalistes flavimarginatus, Balistidae, "banak", Belonidae, Belontiidae, Berycidae, Beryx splendens, Bodianus mesothorax, "boloan", Botia macracanthus, Butts amboinensis, Caesio cuning, Caesio erythrogaster, Caesio cuning, Caesio lunaris, Caesionidae, Capoeta tetrazona, Puntius tetrazona, Carangidae, Carangoides armatus, Caranx affinis, Atule mate, Caranx armatus, Carangoides armatus, Caranx sexfasciatus, Caranx sp., Caranx speciosus, Gnathanodon speciosus, Carassius auratus, Carassius carassius, Carassius sp., "catfish", Centropomidae, Cephalopholis sonnerati,

36. The use of the composition according to claim 33, wherein the first fish population is selected from the group consisting of Grass carp, Silver carp, Common carp, bighead carp, Crucian Carp, Nile Tilapia, Roho Labeo, Catla, White Amur Bream, Milkfish, Marine flatfishes such as Turbot and Atlantic-Pacific Halibut, Sea bream, Wolf fishes and Atlantic cod, Mud Carp, Japanese eel, Black Carp and Salmonids such as Atlantic Salmon, Rainbow trout, Arctic char, Chinook salmon, Tunas as Southern bluefin tuna, yellowtail (Seriola), amberjack, Barramundi and cobia.

37. The use of the composition according to claim 34, wherein the first fish population is subsequently used as a "live feed composition" in a method for feeding a second fish population.

38. The use of the composition according to claim 37, wherein the second fish population is selected from the group consisting of Albacore Tuna (Thunnus alalunga), Arrowtooth Flounder (Atheresthes stomias), Atlantic Cod (Gadus morhua), Atlantic Cutlassfish (Trichiurus lepturus), Atlantic Salmon (Salmo salar), Atlantic Wolffish (Anarhichas lupus), Black Drum (Pogonias cromis), Black Pomfret (Parastromateus niger), Blackback Flounder (Sole, Pleuronectes americanus), Blacktip Shark (Carcharhinus limbatus), Catfish (Ictalurus
furcatus), Crab, Blue (Callinectes sapidus), Marlin (Makaira nigricans), Rockfish (Sebastes auriculatus), Puffer (Sphoeroides annulatus), Scorpionfish (Scorpaena guttata), Sheephead (Semicossyphus pulcher), Rockfish (Sebastes pinniger), Snapper (Lutjanus purpureus), Catfish (Ictalurus punctatus), Rockfish (Sebastes goodei, Sebastes nebulosus), Chinook (Oncorhynchus tshawytscha), Chub Mackerel (Scomber japonicus), Coho Salmon (Silver, Medium Red) (Oncorhynchus kisutch), Thresher Shark (Alopias vulpinus), Grouper (Epinephelus fulva), Cusk (Brosme brosme), Mahi-mahi (Coryphaena hippurus), Sole (Microstomus pacificus), Sole (Pleuronectes vetulus), Escolar (Lepidocybium flavobrunneum), Dory (Zeus faber), Ocean Perch (Sebastes norvegicus), Snapper (Lutjanus griseus), Sole (Flounder) (Glyptocephalus cynoglossus), Barracuda (Sphyraena barracuda), Haddock (Melanogrammus aeglefinus), Tuna (Euthynnus affinis), Snapper (Lutjanus synagris), Lingcod (Ophiodon elongatus), Milkfish (Chanos chanos), Tilapia (Tilapia mossambica), Nile Tilapia (Tilapia nilotica), Puffer (Sphoeroides maculatus), Tilefish (Caulolatilus princeps), Oilfish (Ruvettus pretiosus), Orange Roughy (Hoplostethus atlanticus), Barracuda (Sphyraena argentea), (Bonito (Sarda chilensis), Cod (Alaska Cod, Gadus macrocephalus), Jack (Caranx caninus), Jack (Selene peruviana), Ocean Perch (Sebastes alutus), Mackerel (Scomber scombrus), Spanish (Scomberomorus sierra), Snapper (Lutjanus peru), Patagonian Toothfish (Dissostichus eleginoides), Sole (Flounder, Eopsetta jordani), Pink Salmon (Humpback) (Oncorhynchus gorbuscha), Pollock (Pollachius virens), Rockfish (Sebastes maliger), Trout, Rainbow (Steelhead) (Oncorhynchus mykiss), Drum (Redfish) (Sciaenops ocellatus), Porgy (Chrysophrys auratus), Snapper (Lutjanus campechanus), Rockfish (Sebastes proriger), Sole (Flounder, Errex zachirus), Rockfish (Sebastes aleutianus), Schoolmaster (Lutjanus apodus), Sheepshead (Archosargus probatocephalus), Shark, Mako (Isurus oxyrinchus), Snapper (Lutjanus vivanus), Butterfish (Pampus argenteus), Rockfish (Sebastes brevispinis), Skipjack Tuna (Katsuwonus pelamis), Spinefoot (Siganus javus), Croaker or Corvina (Ronendorf stearnsi), Flounder (Platichthys stellatus), Marlin (Tetrapturus audax), Bass (Morone chrysops x saxatilis), Swordfish (Xiphias gladius), Carp (Barbodes schwanefeldi), Pollock (Alaska Pollock, Theragra chalcogramma), Hake (Urophycis tenuis), Rockfish (Sebastes entomelas), Flounder (Scophthalmus aquosus), Croaker (Yellowfish, Pseudosciaena manchurica),
Rockfish (Sebastes ruberrimus), Tuna (Thunnus albacares), Yellowstripe Scad (Selaroides leptolepis), Yellowtail (Seriola lalandei), Flounder (Limanda ferruginea), Rockfish (Sebastes flavidus) and Snapper (Ocyurus chrysurus).

Acanthurus sp., Teuthis virgata, Siganus virgatus, Thysanophrys nematophthalmus, Cymbacephalus nematophthalmus "tilapia", Tilapia mossambica, Oreochromis mossambicus, Tilapia nilotica, Oreochromis niloticus niloticus, Tilapia sp., Tilapia zillii, "top minnow", Trichiuridae, Trichiurus haumela, Trichiurus lepturus, Trichiurus lepturus, Trichogaster laevis, Trichogaster pectoralis, Trichogaster trichopterus, Tylosurus acus, Tylosurus acus acus, Tylosurus acus melanotus, Tylosurus crocodilus, Tylosurus crocodilus crocodilus, Tylosurus crocodilus crocodilus, Tylosurus punctulatus, Tylosurus sp., Xiphophorus maculates, Xiphophorus sp., Xyrichtys sp.

40. The use of the composition according to claim 37, wherein the second fish population is selected from the group consisting of Grass carp, Silver carp, Common carp, bighead carp, Crucian Carp, Nile Tilapia, Roho Labeo, Catla, White Amur Bream, Milkfish, Marine flatfishes such as Turbot and Atlantic-Pacific Halibut, Sea bream, Wolf fishes and Atlantic cod, Mud Carp, Japanese eel, Black Carp and Salmonids such as Atlantic Salmon, Rainbow trout, Arctic char, Chinook salmon, Tunas as Southern bluefin tuna, yellowtail (Seriola), amberjack, Barramundi and cobia.

41. The use of the composition according to claims 33 to 40 wherein the composition is used in a complete feed.

42. The use of the composition according to claims 33 to 40 wherein the composition is used in a supplementary feed.

43. A pharmaceutical composition comprising a therapeutically effective amount of vitamin K3.

44. The composition according to any of claim 43 further comprising a physiologically acceptable carrier.

45. The composition according to any of claims 43 further comprising a pharmaceutically acceptable carrier.

46. A method for treatment of parasitic disease comprising the steps of administering to an individual an effective amount of the composition according to claim 43 to 45 to said individual.

47. The method according to claim 46, wherein the amount of vitamin K3 is in the range of from about 0.01 milligram vitamin K3 per kg body weight per dose to about 20 milligram vitamin K3 per kg body weight per dose, such as from about 0.02 milligram vitamin K3 per kg body weight per dose to about 18 milligram.
vitamin K3 per kg body weight per dose, for example from about 0.04 milligram vitamin K3 per kg body weight per dose to about 16 milligram vitamin K3 per kg body weight per dose, such as from about 0.06 milligram vitamin K3 per kg body weight per dose to about 14 milligram vitamin K3 per kg body weight per dose, for example from about 0.08 milligram vitamin K3 per kg body weight per dose to about 12 milligram vitamin K3 per kg body weight per dose, such as from about 0.1 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 0.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 0.3 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 0.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 0.5 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 0.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 0.7 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 0.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 1.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 1.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 1.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 1.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 1.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 2.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 2.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 2.4 milligram vitamin K3 per kg body weight per dose to
about 10 milligram vitamin K3 per kg body weight per dose, such as from about 2.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 2.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 3.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 3.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 3.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 3.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 3.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 4.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 4.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 4.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 4.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 4.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 5.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 5.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 5.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 5.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 5.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 6.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 6.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 6.4 milligram vitamin K3 per kg body weight per dose to
about 10 milligram vitamin K3 per kg body weight per dose, such as from about 6.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 6.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 7.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 7.2 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 7.4 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 7.6 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 7.8 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, for example from about 8.0 milligram vitamin K3 per kg body weight per dose to about 10 milligram vitamin K3 per kg body weight per dose, such as from about 0.2 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, for example from about 0.3 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 0.4 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, for example from about 0.5 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 0.6 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, for example from about 0.7 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 0.8 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, for example from about 0.9 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 1.0 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, for example from about 1.2 milligram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 1.4 millgram vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg body weight per dose, such as from about 1.6 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
1.8 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 2.0 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 2.2 milligram vitamin K3 per kg body
weight per dose to about 8 milligram vitamin K3 per kg body weight per dose,
for example from about 2.4 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
2.6 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 2.8 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 3.0 milligram vitamin K3 per kg body
weight per dose to about 8 milligram vitamin K3 per kg body weight per dose,
for example from about 3.2 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
3.4 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 3.6 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 3.8 milligram vitamin K3 per kg body
weight per dose to about 8 milligram vitamin K3 per kg body weight per dose,
for example from about 4.0 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
4.2 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 4.4 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 4.6 milligram vitamin K3 per kg body
weight per dose to about 8 milligram vitamin K3 per kg body weight per dose,
for example from about 4.8 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
5.0 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 5.2 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 5.4 milligram vitamin K3 per kg body
weight per dose to about 8 milligram vitamin K3 per kg body weight per dose,
for example from about 5.6 milligram vitamin K3 per kg body weight per dose to
about 8 milligram vitamin K3 per kg body weight per dose, such as from about
5.8 milligram vitamin K3 per kg body weight per dose to about 8 milligram
vitamin K3 per kg body weight per dose, for example from about 6.0 milligram
vitamin K3 per kg body weight per dose to about 8 milligram vitamin K3 per kg
body weight per dose, such as from about 0.2 milligram vitamin K3 per kg body
weight per dose to about 6 milligram vitamin K3 per kg body weight per dose,
for example from about 0.3 milligram vitamin K3 per kg body weight per dose to
about 6 milligram vitamin K3 per kg body weight per dose, such as from about
0.4 milligram vitamin K3 per kg body weight per dose to about 6 milligram
vitamin K3 per kg body weight per dose, for example from about 0.5 milligram
vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg
body weight per dose, such as from about 0.6 milligram vitamin K3 per kg body
weight per dose to about 6 milligram vitamin K3 per kg body weight per dose,
for example from about 0.7 milligram vitamin K3 per kg body weight per dose to
about 6 milligram vitamin K3 per kg body weight per dose, such as from about
0.8 milligram vitamin K3 per kg body weight per dose to about 6 milligram
vitamin K3 per kg body weight per dose, for example from about 0.9 milligram
vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg
body weight per dose, such as from about 1.0 milligram vitamin K3 per kg body
weight per dose to about 6 milligram vitamin K3 per kg body weight per dose,
for example from about 1.2 milligram vitamin K3 per kg body weight per dose to
about 6 milligram vitamin K3 per kg body weight per dose, such as from about
1.4 milligram vitamin K3 per kg body weight per dose to about 6 milligram
vitamin K3 per kg body weight per dose, for example from about 1.6 milligram
vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg
body weight per dose, such as from about 1.8 milligram vitamin K3 per kg body
weight per dose to about 6 milligram vitamin K3 per kg body weight per dose,
for example from about 2.0 milligram vitamin K3 per kg body weight per dose to
about 6 milligram vitamin K3 per kg body weight per dose, such as from about
2.2 milligram vitamin K3 per kg body weight per dose to about 6 milligram
vitamin K3 per kg body weight per dose, for example from about 2.4 milligram
vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg
body weight per dose, such as from about 2.6 milligram vitamin K3 per kg body
weight per dose to about 6 milligram vitamin K3 per kg body weight per dose,
for example from about 2.8 milligram vitamin K3 per kg body weight per dose to
about 6 milligram vitamin K3 per kg body weight per dose, such as from about 3.0 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, for example from about 3.2 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, such as from about 3.4 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, for example from about 3.6 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, such as from about 3.8 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, for example from about 4.0 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, such as from about 4.2 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, for example from about 4.4 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, such as from about 4.6 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, for example from about 4.8 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose, such as from about 5.0 milligram vitamin K3 per kg body weight per dose to about 6 milligram vitamin K3 per kg body weight per dose.

48. The method of claim 43, wherein the individual is mammal such as a pig or cow.

49. The method of claim 43, wherein the individual is a human being.

50. The method of claim 43, wherein the individual is an avian species.

51. The method of claim 43, wherein the individual is a fish.

52. The method of claim 51, wherein the fish is selected from the group consisting of Albacore Tuna (*Thunnus alalunga*), Arrowtooth Flounder (*Atheresthes stomias*), Atlantic Cod (*Gadus morhua*), Atlantic Cutlassfish (*Trichiurus lepturus*), Atlantic Salmon (*Salmo salar*), Atlantic Wolffish (*Anarhichas lupus*), Black Drum (*Pogonias cromis*), Black Pomfret (*Parastromateus niger*), Blackback Flounder (*Sole, Pleuronectes americanus*), Blacktip Shark (*Carcharhinus limbatus*), Catfish (*Ictalurus furcatus*), Crab, Blue (*Callinectes sapidus*), Marlin (*Makaira nigricans*), Rockfish (*Sebastes auriculatus*), Puffer (*Sphoeroides annulatus*), Scorpionfish (*Scorpaena guttata*), Sheephead
(Semicossyphus pulcher), Rockfish (Sebastes pinniger), Snapper (Lutjanus purpureus), Catfish (Ictalurus punctatus), Rockfish (Sebastes goodei, Sebastes nebulosus), Chinook (Oncorhynchus tshawytscha), Chub Mackerel (Scomber japonicus), Coho Salmon (Silver, Medium Red) (Oncorhynchus kisutch), Thresher Shark (Alopias vulpinus), Groupers (Epinephelus fulva), Cusk (Brosme brosme), Mahi-mahi (Coryphaena hippurus), Sole (Microstomus pacificus), Sole (Pleuronectes vetulus), Escolar (Lepidocybium flavobrunneum), Dory (Zeus faberi), Ocean Perch (Sebastes norvegicus), Snapper (Lutjanus griseus), Sole (Flounder) (Glyptocephalus cynoglossus), Barracuda (Sphyraena barracuda), Haddock (Melanogrammus aeglefinus), Tuna (Euthynnus affinis), Snapper (Lutjanus synagris), Lingcod (Ophiodon elongatus), Milkfish (Chanos chanos), Tilapia (Tilapia mossambica), Nile Tilapia (Tilapia nilotica), Puffer (Sphoeroides maculatus), Tilefish (Caulolatilus princeps), Oilfish (Ruvettus pretiosus), Orange Roughy (Hoplostethus atlanticus), Barracuda (Sphyraena argentea), (Bonito (Sarda chilensis), Cod (Alaska Cod, Gadus macrocephalus), Jack (Caranx caninus), Jack (Selene peruviana), Ocean Perch (Sebastes alutus), Mackerel (Scomber scombrus), Spanish (Scomberomorus sierra), Snapper (Lutjanus peru), Patagonian Toothfish (Dissostichus eleginoides), (Sole (Flounder, Eopsettajordani), Pink Salmon (Humpback) (Oncorhynchus gorbuscha), Pollock (Pollachius virens), Rockfish (Sebastes maliger), Trout, Rainbow (Steelhead) (Oncorhynchus mykiss), Drum (Redfish) (Sciaenops ocellatus), Porgy (Chrysophrys auratus), Snapper (Lutjanus campechanus), Rockfish (Sebastes proriger), Sole (Flounder, Errex zachirus), Rockfish (Sebastes aleutianus), Schoolmaster (Lutjanus apodus), Sheepshead (Archosargus probatocephalus), Shark, Mako (Isurus oxyrinchus), Snapper (Lutjanus vivanus), Butterfish (Pampus argenteus), Rockfish (Sebastes brevispinis), Skipjack Tuna (Katsuwonous pelamis), Spinefoot (Siganus javus), Croaker or Corvina (Roncador stearnsi), Flounder (Platichthys stellatus), Marlin (Tetrapurus audax), Bass (Morone chrysops x saxatilis), Swordfish (Xiphias gladius), Carp (Barbodes schwanefeldi), Pollock (Alaska Pollock, Theragra chalcogramma), Hake (Urophycis tenuis), Rockfish (Sebastes entomelas), Flounder (Scophthalmus aquosus), Croaker (Yellowfish, Pseudosciaena manchurica), Rockfish (Sebastes ruberrimus), Tuna (Thunnus albacares), Yellowstripe Scad (Selanoides leptolepis), Yellowtail (Seriola lalandei), Flounder (Limanda ferruginea), Rockfish (Sebastes flavidus) and Snapper (Ocyurus
chrysurus) Arctic char (Salvelinus alpinus), Turbot, Greenland halibut (Reinhartdius hippoglossoides) and Halibut (Hippoglossus hippoglossus).

haumela, Trichiurus lepturus, Trichiurus lepturus, Trichogaster lalia, Trichogaster pectoralis, Trichogaster trichopterus, Tylosurus acus, Tylosurus acus acus, Tylosurus acus melanotus, Tylosurus crocodilus, Tylosurus crocodilus crocodilus, Tylosurus crocodilus crocodilus, Tylosurus punctulatus, Tylosurus sp., Xiphophorus maculates, Xiphophorus sp., Xyrichtys sp.

54. The method of claim 51, wherein the fish is selected from the group consisting of Grass carp, Silver carp, Common carp, bighead carp, Crucian Carp, Nile Tilapia, Roho Labeo, Catla, White Amur Bream, Milkfish, Marine flatfishes such as Turbot and Atlantic-Pacific Halibut, Sea bream, Wolf fishes and Atlantic cod, Mud Carp, Japanese eel, Black Carp and Salmonids such as Atlantic Salmon, Rainbow trout, Arctic char, Chinook salmon, Tunas as Southern bluefin tuna, yellowtail (Seriola), amberjack, Barramundi and cobia.

55. The method of claim 43, wherein the parasitic disease is caused by one or more endoparasite(s).

56. The method of claim 43, wherein the parasitic disease is caused by one or more sporozoan endoparasite(s).

57. The method of claim 43, wherein the parasitic disease is caused by one or more protozoan endoparasite(s).

58. The method of claim 43, wherein the parasitic disease is caused by one or more ectoparasite(s).

59. The method of claim 43, wherein the parasitic disease is caused by one or more epiparasite(s).

60. The method of claim 43, wherein the parasitic disease is caused by one or more parasitoid(s).

61. The method of claim 43, wherein the parasitic disease is caused by one or more biotrophic parasite(s).

62. The method of claim 43, wherein the parasitic disease is caused by one or more protozoa.

63. The method of claim 43, wherein the parasitic disease is caused by one or more ciliate(s).

64. The method of claim 63, wherein the one or more ciliate(s) comprises *Ichthyophthirius multifiliis*. 
65. The method of claim 63, wherein the one or more ciliate(s) comprises *Chilodonella*.
66. The method of claim 63, wherein the one or more ciliate(s) comprises *Tetrahymena*.
67. The method of claim 63, wherein the one or more ciliate(s) comprises *Trichodina*.
68. The method of claim 63, wherein the one or more ciliate(s) comprises *Ambiphyra*.
69. The method of claim 63, wherein the one or more ciliate(s) comprises *Apiosoma*.
70. The method of claim 63, wherein the one or more ciliate(s) comprises *Epistylis*.
71. The method of claim 63, wherein the one or more ciliate(s) comprises *Capniana*.
72. The method of claim 43, wherein the parasitic disease is caused by one or more Flagellate(s).
73. The method of claim 72, wherein the one or more Flagellate(s) comprises *Hexamita I Spironucleus*.
74. The method of claim 72, wherein the one or more Flagellate(s) comprises *Ichthyobodo*.
75. The method of claim 72, wherein the one or more Flagellate(s) comprises *Piscinoodinium*.
76. The method of claim 72, wherein the one or more Flagellate(s) comprises *Cryptobia*.
77. The method of claim 43, wherein the parasitic disease is caused by one or more Myxozoa.
78. The method of claim 43, wherein the parasitic disease is caused by one or more Microsporidia.
79. The method of claim 43, wherein the parasitic disease is caused by one or more *Coccidia*. 
80. The method of claim 43, wherein the parasitic disease is caused by one or more Monogenean Trematode(s).

81. The method of claim 80, wherein the one or more Monogenean Trematode(s) comprises Gyrodactylus.

82. The method of claim 80, wherein the one or more Monogenean Trematode(s) comprises Dactylogyrus.

83. The method of claim 43, wherein the parasitic disease is caused by one or more Digenean Trematode(s).

84. The method of claim 43, wherein the parasitic disease is caused by one or more Nematode(s).

85. The method of claim 84, wherein the one or more Nematode(s) comprises *Camillanus*.

86. The method of claim 84, wherein the one or more Nematode(s) comprises *Capillaria*.

87. The method of claim 84, wherein the one or more Nematode(s) comprises *Eustrongylides*.

88. The method of claim 43, wherein the parasitic disease is caused by one or more Cestode(s).

89. The method of claim 43, wherein the parasitic disease is caused by one or more Parasitic Crustacea.

90. The method of claim 89, wherein the one or more Parasitic Crustacea comprises *Ergasilus*.

91. The method of claim 89, wherein the one or more Parasitic Crustacea comprises *Lernaea*.

92. The method of claim 89, wherein the one or more Parasitic Crustacea comprises *Argulus*.

93. The method of claim 43, wherein the parasitic disease is caused by one or more Leeches.

94. The method of claim 43, wherein the parasitic disease is caused by one or more wound parasite(s).
95. The method of claim 43, wherein the parasitic disease is caused by one or more facultative parasite(s).

96. The method of claim 43, wherein the parasitic disease is caused by one or more obligate parasite(s).

97. The method of claim 43, wherein the parasitic disease is caused by one or more strict parasite(s).

98. The method of claim 43, wherein the parasitic disease is caused by one or more parasites selected from the group consisting of Acanthocephala gen sp., Acanthocephala gen sp. auctorum, Acanthocephalus sp., Acanthocephalus sp., Acanthocelidus sp. auctorum, Ancyrocephalinae gen sp., Aephenidiogenes barbarus, Alcicornis cirrudisoides, Alitropus typicus, Allocreadiidae, Allometabenedeniella orbicularis, Allometabenedeniella platani, Allometabenedeniella orbicularis, Ambiphyra sp., Amyloodinium ocellatum, Amyloodinium sp., Ancylodiscoidinae gen. sp., Ancyrocephalidae gen sp., Ancyrocephalinae gen sp., Ancyrocephalinae gen sp. auctorum, Ancyrocephalus manilensis, Angiodictyidae, Anilocra dimidiate, Anisakidae, Anisakidae gen Sp., Anisakinae gen sp. auctorum, Anisakidae gen sp., Anisakis sp., Aonchotheca philippinensis, Aphanurus stossichi, Ascaridida gen sp., Ascarophis beryx, Ascarophis erythrichthys, Ascocotyle sp., Aspinatrium virgatarum, Atractotrematidae, Azygia pristipomai, Azygiidae, Bendenia malaboni, Bodonidae, Bomolochidae, Bomolochus bellonis, Bothriocephalidae, Bothriocephalidae gen sp. auctorum, Bothriocephalus sp., Bothriocephalus acheilognathi, Bothriocephalus sp., Bothriocephalus traversosi, Bovienia serialis, Brachadena cheilionis, Lecithophyllum cheilionis, Branchiura gen sp., Bucephalidae, Bucephaloidea philippinorum, Prosohynchoides philippinorum, Bucephaloidea sibi, Prosohynchoides sibi Bucephalus fragilis, Bucephalus leognathi, Bucephalus paraheterotentaculatus, Bucephalus pseudovaricaric, Bucephalus various Bucephalus various, Bunocotylidae, Caballeroctyla philippina, Caligidae, Caligidae gen sp., Caligodes laciniatus, Caligus epidemicus, Caligus mirabilis, Caligus productus, Caligus patulus, Caligus productus, Caligus robustus, Caligus sp., Caligus sp. auctorum, Caligus patulus, Caligus tylosuri, Camallanidae, Camallanidae gen sp., Camallanus
(Camallanus) carangis, Camallanus (Camallanus) marinus, Camallanus (Camallanus) paracarangis, Camallanus ophicephali, Neocamallanus ophicephali, Camallanus sp., Camallanus (Zeylanema) anabantis, Capillaria philippinensis, Aonchotheca philippinensis, Capillariidae, Capsalidae, Carassotrema philippinense, Carneophallus brevicaeca, Caryophyllidea gen. sp., Cavisoma magnus, Cavisomidae, Centrocestus caninus, Centrocestus sp., Ceratomyxa sp., Ceratomyxidae, Cerca dorsiocauda, Cercarioides sp., Cestoda gen sp., Chilodonella sp., Chilodonellidae, Chloromyxidae, Chloromyxum ellipticum, Chloromyxum sp., Cichlidogyrus longicornis, Cichlidogyrus longicornis longicornis, Cichlidogyrus longicornis, Cichlidogyrus sclerosus, Cichlidogyrus sp., Cichlidogyrus tiberianus, Cichlidogyrus tilapia, Clavella tenuis, Hatschekia tenuis, Cleptodiscus bulbosus, Clinostomidae, Clinostomoides gen. sp., Clinostomoides brieni, Clinostomum complanatum, Clinostomum dalagi, Clinostomum complanatum, Clinostomum ophicephali, Clinostomoides brieni, Clinostomum philippinensis, Clinostomum sp., Coccomyxa hoffmani, Colobomatus goodingi, Contracaecum sp., Copepoda gen sp., Castia sp., Ichthyobodo sp., Cristaria plicata, Cryptobia branchialis, Cryptobia sp., Cryptogonimidae, Cucullanidae, Cucullanus lutjani, Cymothoa eremite, Cymothoa stromatei, Cymothoa eremite, Cymothoidae, Cystidicolidae, Dactylogyridae, Dactylogyrus sp., Deretrema (Luxitrema) philippinensis, Deretrema sp. auctorum, Deretrema (Luxitrema) philippinensis, Dictysarcidae, Didymozoidae, Didymozoidae gen. sp., Didymozoon bravohollisae, Digenea gen. sp., Dinoflagellida gen sp., Diorchitrema pseudocirrata, Stellantchasmus falcatus, Diphyllolothriidae, Diplectanidae, Diplectanum sp., Diplosentidae, Diplostomulum sp., Echinochasmus novalichesensis, Echinorhynchidae, Echinostomatidae, Ectenurus lemeriensis, Erilepturus lemeriensis, Eimeria carpelli, Goussia carpelli, Eimeriidae, Elthusa propinququa, Encotyllabe caballeroi, Enterogyrus cichlidarum, Epistylidae, Epistylis sp., Ergasilidae, Ergasilus coleus, Ergasilus philippinensis, Ergasilus rotundicorpus, Ergasilus sp., Erilepturus hamati, Erilepturus lemeriensis, Euclorostomum multicaecum, Eyelavera typical, Fellodistomidae, Filisoma rizalinum, Galactosomum anguillarum, Gangesia sp., Gasterocotylidae, Gauhatiana batrachii, Genolinea awa, Glugeidae, Gnathiidae, Gnathiidae gen. sp., Gnathostoma spinigerum, Gnathostomatidae, Gorgoderidae, Goussia carpelli, Gyliauchenidae,
Pseudallacanthochasmus grandispinus, Pseudoanthocotyle pavlovskyi, Pseudobunocotyla awa, Genolinea awa, Pseudometadena celebesensis, Pseudometadena sp., Pseudopeocoloides carangis, Pseudorhabdosynochus epinepheli, Pygidiopsis genata, Pygidiopsis marivilai, Quadrigyridae, Raphidascaris sp., Renicola ovata auctorum, Renicola richardsonae, Renicola richardsonae, Rhipidocotyle eggletoni, Rhipidocotyle laruei, Riboscyphidia sp., Rocinela typicus, Alitropus typicus, Scaphanocephalus adamsi, Scolex pleuronectis, Scolex polymorphus, Scolex pleuronectis, Scyphidia sp. auctorum, Riboscyphidia sp., Scyphidiidae, Septemcapsula yasunagai, Septemcapsulidae, Silurodiscoides sp., Spinitectus palawanensis, Spirocamallanus philippinensis, Procamallanus (Spirocamallanus) guttatusi, Procamallanus (Spirocamallanus) philippinensis, Spirocamallanus spiralis, Procamallanus (Spirocamallanus) spiralis, Sporozoa gen sp., Stamnusoma formosanum, Centrocestus caninus, Centrocestus sp., Centrocestus laruei, Transversotrema haasi, Transversotrema patialense, Transversotrema patialense, Trichodina acuta, Trichodina acuta auctorum, Trichodina compacta, Trichodina centrostrigata, Trichodina compacta, Trichodina heterodentata, Trichodina kupermani, Trichodina mutabilis, Trichodina nigra, Trichodina nobilis, Trichodina reticulate, Trichodina siluri, Trichodina sp., Trichodina velasquezae, Trichodinella acuta, Trichodinella carpi, Trichodinella epizootica, Trichodinella heterodentata, Tripartiella tilapiae, Trichodenidae, Trichodenidae gen. sp., Tripartiella clavodonta, Tripartiella spatula, Tripartiella sp., Tripartiella spatula, Tripartiella tilapiae, Tripartiella pricei, Trypanosoma sp., Trypanosomatidae, Unionidae, Unionidae gen. sp. auctorum, Cristaria plicata, Waretrema piscicola, Waretrematidae, Zeylanema anabantis, Camallanus (Zeylanema) anabantis, Zeylanema philippinensis, Camallanus sp., Zoogonidae.

99. The method of claim 43, wherein the parasitic disease is caused by sea lice.

100. The method of claim 43, wherein the parasitic disease is caused by Lepeophtheirus salmonis.
101. The method of claim 43, wherein the parasitic disease is caused by Caligus elongatus.

102. The method of claim 43, wherein the parasitic disease is caused by one or more Helminth(s).

103. The method according to claim 102, wherein the one or more Helminth(s) is selected from the group consisting of Bothriocephalus, Eubotrium, Proteocephalus, Hysterothyacium and families Allocreadiidene, Opecoelidae, Gorgoderidae, Hemiuridae and Deroginidaei.

104. The method of claim 43, wherein the parasitic disease is caused by one or more protozoan intestine parasite(s).

105. The method according to claim 104, wherein the one or more protozoan intestine parasite(s) can be selected from the group consisting of Flagelates, Amoeba, Ciliates, Microsporidians, Myxozoans, crustaceans, Mytilicola intestinalis.

106. The method of claim 43, wherein the parasitic disease comprises ectoparasitic disease.

107. The method according to claim 106, wherein the ectoparasitic disease can be selected from the group consisting of Neoparamoeba spp. (Sarcomastigophora) Loma salmonae, Benedenia seriolae, Heteraxine heterocerca, Neobenedenia melleni, the Myxosporidian Kudoa spp., Ichthyobodinc necator, Trichodina spp., Crustaceans, Lepeophtheirus salmonis, Caligus spp., parasitic isopods, Ceratothoa spp, Salmonicola Salmonea, S.spp. Ergasilus spp., Salmonicola salmonea, Argulus, Ergasilus spp., Lernaeacera branchialis, Probopryrus, Cymothoa, Olencira, Lironeca, Loxothylacus, Sacculina, Argulus, Helminths, Gyrodachylus.spp, Dactylogyrus spp. and Order Hirundea.

108. The method of claim 43, wherein the parasitic disease is located in one or more external organ(s).

109. The method of claim 108, wherein the one or more external organ(s) can be selected from, but is not limited to, the group consisting of skin, gills and fins.

110. The method of claim 43, wherein the parasitic disease is located in one or more internal organ(s).
111. The method of claim 110, wherein the internal organ(s) can be selected from, but is not limited to, the group consisting of heart, liver, spleen, stomach, alimentary tract, intestine, anus, reproductive organs, peritoneum, muscle, skeletal muscle, brain, eyes, and/or swim bladder.

112. The method of claim 43, wherein the composition is administrated orally.

113. The method of claim 43, wherein the composition is administrated sublingually.

114. The method of claim 43, wherein the composition is administrated nasally.

115. The method of claim 43, wherein the composition is administrated by inhalation.

116. The method of claim 43, wherein the composition is administrated by injection

117. The method of claim 43, wherein the composition is administrated intravenously.

118. The method of claim 43, wherein the composition is administrated intramuscularly.

119. The method of claim 43, wherein the composition is administrated intrathecally.

120. The method of claim 43, wherein the composition is administrated subcutaneously.

121. The method of claim 43, wherein the composition is administrated by implantation.

122. The method of claim 43, wherein the composition is administrated rectally.

123. The method of claim 43, wherein the composition is administrated vaginally.

124. The method of claim 43, wherein the composition is administrated by the ocular route.

125. The method of claim 43, wherein the composition is administrated by applying it to the skin (cutaneously) for a local (topical) effect.
126. The method of claim 43, wherein the composition is administrated by applying it to the skin (cutaneously) for bodywide (systemic) effect.

127. The method of claim 43, wherein the composition is administrated by delivering it through the skin (transdermally) for a systemic effect.

128. A method for treatment of an individual in need thereof comprising the steps of co-administrating to said individual
   a. one or more antiparasitic agent(s) and
   b. Vitamin K3

129. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises formalin.

130. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises organophosphates.

131. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises metrifonate.

132. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises dichlorvos.

133. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises azamethiphos.

134. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises pyrethroids.

135. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises pyrethrum.

136. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises cypermethrin.

137. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises deltamethrin.

138. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises hydrogen peroxide.

139. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises one or more chitin synthesis inhibitors.
140. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises diflubenzuron.

141. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises teflubenzuron.

142. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises ivermectin.

143. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises wrasse (Labridae).

144. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises copper sulphate.

145. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises potassium permanganate.

146. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises chloroquin.

147. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises Fenbendazole.

148. The method of claim 128, wherein the one or more antiparasitic agent(s) comprises saltwater.

149. The method of claim 128, wherein the one or more antiparasitic agent(s) can be selected from the group consisting of Malachite Green, Formalin, Acriflavin, praziquantel, salt, a solution of copper sulfate and citric acid, a formaldehyde and malachite formulation, potassium permanganate, formaldehyde/malachite, 0,0-dimethyl-1-hydroxy 2,2,2-trichloroethylphosphonate, chlorinated lime, garlic, Supa Verm™, DesaFin™, Quick Cure™, Aquari Sol™, AP Formalin™, Clout 100 Tabs™, CyroPro™, Debride DW™, Fizz Tabs - Oxy Clear™, Fizz Tabs - Parasite Treatment™, Fluke-Tabs™, Furanase™, Hikari Prazi Pro™, ICH-X by Pond Solutions™, Interpet Anti-Parasite™, Jungle Pond Anchor Away™, KoiRx AQUA-PRAZI™, KoiRx Terminate™, Kordon Pond Formalin™, Kordon Pond Permoxyn™, Kordon Pond Rid Ich™, Nox - Ich™, Paracide Green™, Pond Care® Dimilin, ProForm-LA™, TetraPond® Desa-Fin, Trichloracide™, Para-Trex, Praziquantel, metronidazole, Fenbendazole, Piperazine, Levimasole, Praziquantel 0.0057%,
Flubenol 0.03%, Metronidazole 0.30%, Ormetoprim-sulfa and Oxytetracycline, Maracide or any combination thereof.

150. The method of any of the claims 128 to 149, where the steps are carried out sequentially in any order.

151. The method of any of the claims 128 to 149, where the steps are carried out simultaneously.

152. The method of any of the claims 128 to 149, where the steps are carried out repeatedly.

153. The method of any of the claims 128 to 149, wherein the co-administration comprises bathing.

154. The method of claim 153, wherein bathing comprises bathing in a salt comprising solution.

155. The method of claim 153, wherein the bathing comprises short-term bathing.

156. The method of claim 153, wherein the bathing comprises prolonged bathing.

157. The method of any of the claims 128 to 149, wherein the co-administration comprises dipping.

158. The method of any of the claims 128 to 149, wherein the co-administration comprises oral administration.

159. The method of any of the claims 128 to 149, wherein the co-administration comprises mixing with fish food.

160. The method of any of claims 43 to 159, wherein the treatment is prophylactic.

161. The method of any of claims 43 to 159, wherein the treatment is ameliorating.

162. The method of any of claims 43 to 159, wherein the treatment is curative.

163. Use of a composition comprising vitamin K3 as a molluscicide.

164. The use according to claim 163, wherein the molluscicide is used to control one or more molluscs.
165. The use according to claim 164, wherein the one or more molluscs comprises one or more motts.

166. The use according to claim 164, wherein the one or more molluscs comprises one or more slugs.

167. The use according to claim 164, wherein the one or more molluscs comprises one or more snails.

168. The use according to claim 163, wherein the molluscicide is used to control one or more slug pests.

169. The use according to claim 163, wherein the molluscicide is used to control one or more plant pests.

170. The use according to claim 163, wherein vitamin K3 is administered together with one or more molluscidies different from vitamin K3.

171. The use according to claim 170, wherein the one or more molluscidies different from vitamin K3 comprises metaldehyde.

172. The use according to claim 170, wherein the one or more molluscidies different from vitamin K3 comprises methiocarb.

173. The use according to claim 170, wherein the one or more molluscidies different from vitamin K3 comprises aluminium sulphate.

174. The use according to claim 170, wherein the one or more molluscidies different from vitamin K3 comprises iron phosphate.
A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K31/122 A61K31/426

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, BIOSIS, WPI Data, PAJ, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>UDAGAWA MIHO: &quot;The effect of dietary vitamin K (phyloquinone and menadione) levels on the vertebral formation in mummichog Fundulus heteroclitus&quot; FISHERIES SCIENCE (TOKYO), vol. 67, no. 1, February 2001 (2001-02), pages 104-109, XP002512046 table 1</td>
<td>1-19</td>
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<td>X</td>
<td>GB 1 070 668 A (ABBOTT LAB) 1 June 1967 (1967-06-01) page 1, lines 52-63</td>
<td>1-19</td>
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X Further documents are listed in the continuation of Box C.  

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  

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Date of the actual completion of the international search: 27 January 2009

Date of mailing of the international search report: 09/02/2009

Name and mailing address of the ISA:
European Patent Office, P.B. 5816 Patentlaan 2  
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Fax. (+31-70) 340-3016

Authorized officer: Cattel, James

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<td>✗</td>
<td>US 2 367 302 A (MOORE MARJORIE B ET AL) 16 January 1945 (1945-01-16) claim 1</td>
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<td>KAVITA ARORA ET AL: &quot;Antimalarial efficacy of methylene blue and menadione and their effect on glutathione metabolism of Plasmodium yoelii-infected albino mice&quot; PARASITOLOGY RESEARCH; FOUNDED AS ZEITSCHRIFT FUR PARASITENKUNDE, SPRINGER, BERLIN, DE, vol. 97, no. 6, 1 December 2005 (2005-12-01), pages 521-526, XP019345733 ISSN: 1432-1955 seec &quot;Chemicals&quot; figure 1b</td>
<td>1-19, 43-48</td>
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<td>GB 1070668 A</td>
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<td>US-2367302 A</td>
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