MYXOSPORIDIAN PARASITES OF FRESH WATER FISH (Catla catla) IN CULTURE PONDS, KRISHNA DISTRICT, A.P.

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Abstract
The myxosporean species are typically defined by the size and shape of the spores released by vertebrate hosts. These are previously thought to be multicellular protozoans to be considered animals by many scientists. Recent molecular studies suggest that they are related to Bilateria with being closer, but with Bilateria being somewhat closer in some genetic studies. The examination of fresh water fishes captured in the culture system water bodies of Krishna district, Andhra Pradesh, India revealed the presences of two Myxosporidian Myxobolus sps, Ceratomyxa sps. In catla catla which were collected from Feb-2014 to Feb-2015. The infested fishes showed some macroscopic creamy whitish nodules round or oval shape and its number varied from 2 to 4 cysts. These nodules contents milky fluid filled with mature spores present study results the occurrence of the three myxosporidians and the health risks to their hosts and revealed the myxosporidians encountered from various organs of the host fish. Skeletal deformation in matured major fish by myxobolus infection cause damage to its hosts through attachment of Triactinomyxon spores and migrations of various stages through tissues along nervous as well as by digesting cartilage. Other symptoms include skeletal deformaties and “whirling behaviour” in young fish which thought to have been caused by a loss of equilibrium caused by damage to the spinal cord and lower brain stem. © 2016 Universal Research Publications. All rights reserved

Keywords- Myxosporidian, Myxobolus sps, Ceratomyxa sps, Catla catla, Parasitic disease.

INTRODUCTION
Members of the Myxozoa are microscopic metazoan parasites with an extremely reduced body. The dimensions of the myxospore, the typical myxozoan stage in fish hosts, range usually between one hundredth and two hundredth of a millimetre. Myxospores consist of several cells, which are transformed to shell valves, nematocyst-like polar capsules with coiled extrudible polar filaments and amoeboid infective germs. Myxospores develop in plasmodia (trophozoites), which can be very large and polysporic (generally histozoic in host tissue) or small and mono- or disporic (coelozoic in organ cavities). Myxozoans are parasites of fish, worms (oligochaetes and polychaetes) and bryozoans. Few representatives were found as parasites of amphibians and reptiles, and recent findings confirmed the ability of myxozoans to infect mammals (Prunescu et al., 2007, Dyková et al., 2007) and birds (Bartholomew et al., 2011). Humans as potential hosts for myxosporea were also reported (Boreham et al., 1998, Moncada et al., 2001), however, myxospores were detected in faecal samples and probably just passed through the digestive tract.

Myxozoaa Grassé, 1970 contains two classes: Malacosporea Canning, Curry, Feist, Longshaw Okamura et al., 2000 and Myxosporea Bütschli, 1881. Malacosporea includes only two genera (Tetracapsuloides and Buddenbrockia) with a total of three described species. Myxosporea includes about 2200 species in 60 genera. Wolf and Markiw (1984) discovered myxosporean life cycles altering between two host species – fish and annelid worm. The myxospore is ingested by annelids and then the myxosporidian undergoes a schizogony and a gametogony. Finally, the parasite develops into an actinospore, a triradiate myxosporean spore, which infects the vertebrate host. Here, the sporoplasm released from the actinospore divides by endogony, and then presporogenic multiplication of the myxosporean occurs. The life cycle is completed with the development of mature myxospores in sporogenic plasmodia. The anidians are definitive hosts whereas vertebrates are intermediate hosts for Myxosporea. The rediscovery of Buddenbrockia plumatellae, a worm-like animal, as a myxozoan species was an important clue to the origin of Myxozoa (Monteiro et al., 2002). SSU rDNA of this enigmatic worm showed its close relationship to Tetracapsuloides bryosalmonae, and B. plumatellae was assigned to Malacosporea, the sister group to Myxosporea. Consequently Myxozoa were considered to be bilaterians, or their close relatives (Monteiro et al., 2002). However, phylogenetic analysis based on sequences of numerous
protein-coding genes (Jimenez-Guri et al., 2007) excluded a bilaterian origin of B. plumatellae and suggested Cnidaria as the most closely related taxon to Myxozoa.

MATERIALS AND METHODS

The material for the present study was obtained from the culture Ponds and natural breeding grounds around Krishna District. The fishes were maintained in aquaria tanks in the laboratory and were subjected to regular examination. In juveniles the clinical signs of infection were evident with certain conformity of Diagnostic significance. The procedure followed to observe for the incidence of infection was to remove the muscle, slowly strip the muscle contents on to a clean glass slide using the edge of a cover slip or a fine needle and forceps. The muscle contents were spread out and a wet smear was prepared. The wet mount was examined directly by a reduced bright field microscope with 10X and 20X objectives for Cysts and spores. In case of Infections, smears were prepared from the fish tissue on an albuminated slide, fixed in Schaudinn’s fluid and stained with Delafield haematoxylin or Heidenhains iron haematoxylin which facilitated studying structures of sores and, developmental stages. Cysts were collected from the muscle and maintained in 25% potassium dichromate for observations on gametogony and sporogony. All measurements were taken with an ocular micrometer and drawings made to scale with the help of a camera lucida. Microphotographs were obtained with DMLS Lucida microscope fitted with image analyser.

OBSERVATIONS AND DESCRIPTION OF SPECIES Myxobolus sps

Myxobolus is a myxosporean parasite of catla catla that causes whirling disease in farmed salmon and trout and also in wild fish population. It spread and it has appeared in most of Europe (including Russia), the United States, South Africa and other countries. In the 1980s, it was discovered that myxobolus needs to infect a Tubificidae oligochaete to complete its life-cycle. The parasite infects its hosts with its cell after piercing them with polar filaments ejected from nemocyte-like capsules.

Morphology:

Diagram of the structure of a triactinomyxon stage spore of Myxobolus has many diverse stages ranging from single cells to relatively large spores, not all of which have been studied in detail.

Myxosporean stage:

Myxospores, which develop from sporogonic stages cell stages inside fish hosts, are lenticular. They have a diameter about 10 micrometers and are made of six cells. Two of these cells from polar capsules, two merge to form binucleate sporoplasm, and two from protective valves. Myxospores are infective to oligochaetes, and found among the remains of fish cartilage. They are often difficult to distinguish from related species because of morphological similarities across genera. Though myxobolous is the only myxosporean ever found in Catla cartilag, other visually similar species may be present in the skin, nervous system or muscle.

Pathology:

Skeletal deformation in a mature major carp (catla catla) by Myxobolus infection. Myxobolus causes damage to its fish hosts through attachment of triactinomyxon spores and the migrations of various stages through tissues and along nerves, as well as by digesting cartilage. The fish tail may darken, but aside from lesions on cartilage, internal organs generally appear healthy. Other symptoms include skeletal deformities and “whirling” behaviour (tail-chasing) in young fish, which was thought to have been caused by a loss of equilibrium, but is actually caused by damage to the spinal cord and lower brain stem. Experiments have shown that fish can kill Myxobolus in their skin (possibly using antibodies), but that the fish do not attack the parasites once they have migrated to the central nervous system. This response varies from species to species.

Prevention and control:

Some biologists have attempted to disarm triactinomyxon spores by making them fire prematurely. In the laboratory, only extreme acidity or basicty, moderate to high concentrations of salts, or electrical current caused premature filament discharge; neurochemicals, Cnidarian chemosensitizers, and trout mucous were ineffective, as were anaesthetized or dead fish. If spores could be disarmed, they would be unable to infect fish, but it is unclear whether any of the methods that worked in the laboratory could be employed in the wild.

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Ceratomyxa sps.:

The routine observation of the carp fish catla catla for the occurrence of parasitic protozoans was done coelozoic Myxozoan was observed in the gallbladder. The examination of the stained smears, showed the pansporeoblasts and spores. The pansporeoblasts were disporous, along with filiform projections like with blunt rounded lateral ends. Shell valves were smooth and equal. The sutural line was straight and distinct. Spores measured...
3.2 – 3.4 μm in length and 15.2 – 16.0 μm width. The polar capsules were 2.0 – 2 μm in length. Polar capsules were two in number, large sub spherical, and terminal. The polar filament showed 5-6 coils while inside the capsule. The sporoplasm stained blue in colour extremely into the two values. There was a single deeply stained nuclear in the sporoplasm.

Life History:

Intermediate host is a freshwater polychaete (first identified from periphyton samples attached to fresh water mussel – no direct link to the freshwater mussel or the periphyton has been determined (Bartholomew et al., 1977). Infection through contact with infectious stage (actinospore) found in water column Neither horizontal (fish to fish), or vertical (fish to egg) transmissions have been documented in laboratory testing Spore size 14-23 μm wide Spores released back into freshwater system following Catla mortality Complete life cycle, host and vector interaction, non fully understood (especially the ecology of the polychaete host) (Bartholomew pers com. 2002).

Infection:

Clinical indications of infection include lethargy, loss of body mass, darkening, ascites, exophthalmia, kidney pustules (vary by Catla species and life stage) Internally affects entire digestive tract, liver, gall bladder, spleen, gonads, kidney, heart, gills, and muscle Adult Catla sps mortality caused by intestinal perforations and co-occurring bacterial infections. Research indicates infection potential is enhanced when water temperatures are high, high flow are low, and number of infectious Catla sps are relatively high infection rates appear to be higher in below reservoir environments than culture ponds. (Variable).

Diagnosis/Treatment:

Detection of infection is achieved either microscopically, by visual detection of parasite spores in intestinal scrapings, by detection of parasite DNA using a specific polymerase chain reaction assay, or by examination of histological sections using monoclonal antibodies and fluoresce in or enzyme conjugated secondary antibodies (Palenzuela et al.,1999; Bartholomew 2010). Treatment of incoming hatchery water supplies using a combination, has been successful in decreasing infections in these facilities.

Disease Resistance:

Catla catla stocks exhibit varied resistance to Ceratomyxa (co-evolutionary resistance) (reviewed by Bartholomew 1998). Resistance is variable and may be compromised by high levels of exposure to Ceratomyxa and increased water temperatures catla stocks resistant to Ceratomyxa not necessarily myxosporean resistant & capable of infection by myxobolus (whirling disease).

Conclusion:

The Myxosporean parasites of fish hosts are known to cause major health risk to their hosts. These protists occur as histozoic parasites in tissues or as coelozoic parasites in lumen of ducts of glands. In the present study these Myxosporeans have been encountered from varies organs of the host’s fish Catla catla. The coelozoic myxosporean is reported from the skeletal muscles and gall bladder is ceratomyxa sps. The being large in size in the spore in the spore stage in known to mechanically occlude the free passage of bile. This results in improper digestion producing certain digestive disorders leading to stunted growth. Among the opaque white cysts on the gill rachi. The outer more exposed gill filaments is unknown. In case of heavy infections the number of cysts being more there is massive respiratory experiment resulting in stunted growth of the host leading to mortality. The second histozoic parasite occurring the visceral muscles and other vital organs of the abdomen in myxobolus sps. This parasite produces cysts of small size in its place of infeccluvity. Whenever the parasite settles down on the tissue it brings about localized tissue deformation only. However much of pathogenicity was not noticed in Myxobolus infection in host fish.

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