DOWNLOAD PDF PATHOLOGY OF FISHES

Chapter 1 : Fish, crustacean and mollusc pathology | IZSVe

Research workers, instructors, and students have long expressed the need for a comprehensive reference book dealing with fish pathology. Now, with these published proceedings of the first international conference ever held on comparative pathology, all in the fieldâ€"fisheries biologists, comparative microbiologists, veterinary scientists, hygienists, parasitologists, toxicologists, and.

Project Methods Wild and captive fish will be examined for disease. Fish will include those submitted to the Fish Disease Diagnostic Laboratory at Auburn University and fish collected for other projects. Fish will be examined for diseases of any kind; their sex, age, and weight determined; and the data recorded for correlation with results from assays for pathogens. Pathogens will be isolated in culture. Initial work on development of improved laboratory tests and basic pathology will focus on columnaris disease and on largemouth bass virus. The number of external protozoan parasites was also significantly different with a Impinged freshwater drum, also had significantly higher prevalence of pathogenic bacteria compared to reference fish difference of No differences in pathogens or in length-weight frequencies were observed in the threadfin shad. An additional observation that noted from the gizzard shad was the prevalence of melanomic tumors. Gizzard shad were examined from the Black Warrior River at Plant Gorgas 10 cases out of fish observed. Tumors were raised and pigmented, varying in size as weell as location on the body. These tumors were cutaneous spindle cell melanomas that have only been previously reported in Oklahoma. No etiology has been determined. Current methods of detecting channel catfish virus CCV are lethal and require relatively high titer of active virus which is only present during an outbreak of susceptible fish. Barbel samples were taken from channel catfish brood stock during spawning. Tissue samples were collected from individual brood fish in and eighty-five of those fish were PIT tagged for future identification and re-sampling in Twenty-five fish were found positive for CCV in Tissue samples were collected from brood fish in , and 80 samples have been screened. Four of those 80 individuals were found positive for CCV. Utilizing this method may allow us to monitor the "carrier" status of brood fish over several spawning periods and could be beneficial in maintaining virus-free brood stocks. Two novel bacteriophages that infect E. The phages are double-stranded DNA viruses with approximate genome sizes of 39 and 45 kb, respectively. The latent period for phage infection was 70 min, with an estimated burst size of These phages have not been observed to produce plaques on any other bacterial species. The specificity and lytic activity of these bacteriophages for E. Impacts Fish diseases are important in both wild fish populations and aquaculture. Improved diagnostic methods, including methods for detecting pathogens in subclinical infections, will enable better management of affected fish populations. Knowledge of factors affecting the spread, prevalence, and pathogenesis of fish diseases is important for control of the disease and will enable managers to make appropriate provisions in population management. First report of Yersinia ruckeri biotype 2 in the USA. Journal of Aquatic Animal Health Host-specific association between Flavobacterium columnare genomovars and fish species. Journal of Systematic and Applied Microbiology To test this hypothesis, virulence and adhesion of F. Virulence of three isolates of F. In the adhesion assay, each well received the same F. After a 1-h exposure to the bacteria, adhesion of the bacteria to fish in the adhesion assay corresponded to the virulence of the isolates. These results indicated that simultaneous measurement of adhesion and virulence provided better comparison of these variables than when the experiments were done at different times. Detection of largemouth bass virus LMBV was compared for two types of samples: Based on the results from both the viscera and gill, 23 of the 70 largemouth bass tested were infected with LMBV. This level of sensitivity for gill samples was not satisfactory for detection of LMBV in a fish populations. The health of fish impinged on the cooling-water intake screens at Plant Barry, a coal-fired steam generating plant located on the Mobile River, Mobile County, AL, was compared with the health condition of reference fish collected from the river population. Fish species sampled were threadfin shad, blue catfish, channel catfish, and freshwater drum with sampling occurring in the spring and fall of Lesions observed included, necrotic gills, eroded fins and fin bases, ulcers, skin depigmentation, and hemorrhaging. Liver, trunk kidney, and the periphery of lesions on gills and skin were sampled for bacteria.

These data suggest that water intake structures may be selecting diseased fish from the population and could provide a method for detecting diseases present in a low proportion of the population. Impacts Fish diseases, such as columnaris disease and largemouth bass virus disease, are important in both wild fish populations and aquaculture. Knowledge of factors affecting the spread and pathogenesis of fish diseases is important for control of the disease and will enable managers to include the effects of diseases in population management. Virus distribution and signs of disease after immersion exposure to largemouth bass virus. The relation of largemouth bass virus to largemouth bass population metrics in five Alabama reservoirs. Transactions of the American Fisheries Society Effects of live-well conditions on mortality and largemouth bass virus prevalence in largemouth bass caught during summer tournaments. North American Journal of Fisheries Management The optimal inoculation procedure tested was to remove the culture medium from the culture well before the addition of the inoculum, and the optimal adsorption procedure tested was to allow the virus to adsorb for 40 min while the plates were on an orbital shaker. Following inoculation, incubation at 30C resulted in a higher number of viral plaques than incubation at 25C or 32C. Similar percentages of LMBV positive samples were detected in BF-2 and FHM cell cultures inoculated with homogenized organ samples from largemouth bass; however, the use of two cell lines increased the number of infected samples discovered. A blind passage also increased the number of positive samples detected in cell culture. Subcultivation to confirm virus positive samples was useful for reducing false-positive results. Largemouth bass virus was also studied in a laboratory challenge experiment. Largemouth bass were immersed for 1 h in water containing LMBV and then fish were necropsied daily for 27 d. Cell culture was used to detect LMBV, and the following organs were tested: Of the fish exposed to LMBV, 2 dead and 5 moribund fish were collected during the 27 d after immersion. Largemouth bass virus was detected systemically at the end of the 1-h exposure period and for up to 24 d postexposure. Fish collected during days 0 through 8 postexposure had a greater number of LMBV infected organs than fish collected on days 9 through Impacts Largemouth bass virus disease is a recently discovered problem in wild fish. Improved diagnostic methods, including methods for detecting this virus, will enable better management of affected fish populations. Knowledge of factors affecting the spread of this pathogen will be important for control of the disease and will enable managers to include the effects of LMBV disease in population management. Exposure to feed-borne mycotoxins T-2 toxin or ochratoxin A causes increased mortality of channel catfish challenged with Edwardsiella ictaluri. Evaluation of cell culture methods for detection of largemouth bass virus. Evaluation of unpurified cell culture supernatant as template for the polymerase chain reaction PCR with largemouth bass virus. For the gill assay, gills were dissected from channel catfish, bluegill, and common carp. There was a significant difference among F. Only two isolates were tested with normal channel catfish gills; however, there was a significant increase in the number of bacteria adherent to gill of channel catfish with proliferative gill disease or with Aeromonas infection. For the assay with larval zebrafish, there were significant differences in adhesiveness of 11 isolates of F. For the assay with cultured cells, 7 isolates of F. Four isolates were tested in saline, and one isolated had a significantly reduced adhesiveness. The assay with cultured cells was not satisfactory because the high concentration of sodium chloride in saline reduces the adhesiveness of F. The use of fresh water during the incubation of cells with F. The variation in adhesiveness among the F. The plastic plate assay and the larval fish assay appear most promising for future studies. To simplify this procedure, we centrifuged the fathead minnow or bluegill fry cell culture fluid to remove cellular debris and then used the supernatant directly in the PCR without DNA extraction. For supernatants from cell cultures inoculated with 1: Unpurified cell culture fluid supernatant from blind passage samples cells inoculated with supernatant from CPE negative cultures was PCR positive for Impacts Results of these experiments will enable fish farmers to reduce losses caused by disease. An improved understanding of fish diseases will result in better management of wild fish populations. First report of koi herpesvirus in wild common carp in the Western Hemisphere. Fish Health Newsletter 32 3:

Chapter 2 : The Physiology of Fishes - CRC Press Book

William E. Ribelin was professor in the Department of Veterinary Science at the University of Wisconsin--Madison. He was coeditor of books and articles, including The Pathology of Laboratory Animals.

Heart Structure of Fishes: Structure, Pathology and Innervation Article shared by: In this article we will discuss about Cardiovascular System in Fish e. Structure of Heart 2. Pathology of Heart 3. The heart of fishes is known as branchial heart, because its main function is to pump venous blood to ventral aorta into gills branchial and then to somatic vasculature. Thus branchial and systemic vascular beds are arranged in series with heart. Apart from heart, heart-like organs are present only in Agnatha Myxine and Petromyzon. The heart of fishes consists of four chambers, a sinus venosus, an atrium, a ventricle and a conus or a bulbus arteriosus Fig. Some authors considered atrium and ventricles as the chambers of heart while some considered sinus venosus and conus arteriosus also as the chambers of the heart. There is some confusion in bulbus and conus arteriosus in fishes. In elasmobranchs the fourth chamber is designated as conus arteriosus whereas it is known as bulbus arteriosus in teleost, a specialized ventral aorta in teleosts. The distinction between the two is that the conus consists of cardiac musculature similar to the ventricle and is generally provided by a large number of valves arranged in successive rows Fig. According to Torrey , the heart of Cyprinus carpio a teleostean fish, contains both conus and bulbus arteriosus. However, later workers held that in teleosts only bulbus arteriosus is present. Elasmobranch and aganthan have conus arteriosus instead of bulbus arteriosus. Heart Rate and Stroke Volume: The heart performance basically depends on two factors; the heart rate and the stroke volume. At each heartbeat, the ventricle pumps out blood. The volume is termed stroke volume and the time of the heart beat is known as heart rate. These are controlled both by aneural factors such as extent of cardiac filling Starlings law of the heart or circulatory substances hormones and by the innervation of the cardiac pacemaker and muscle. The fish atrium is filled by suction created by the rigidity of the pericardium and surrounding tissue. Venous blood return to the atrium is aided by ventricular contraction in systole which causes a fall in intra-pericardial pressure that is transmitted through the thin wall of the atrium to create an aspiratory or via a fonte effect. It is contrary to the situation in mammals where the central venous pressure determines the atrial filling during diastole vis a tergo, driving force from behind. The sinus venosus is not an active part of the heart although pacemaker properly starts in this chamber Fig. It is actually a continuation of the venosus vessels and its main function is to receive blood and to pass it on to the atrium. Sinus venosus receives blood through two duct Cuvieri, hepatic veins pour the blood from liver. The ventral ductus Cuvieri receives blood from anterior and posterior cardinal veins. The sinus venosus is distinguished histologically into tunica intima, tunica media and tunica adventitia. Normally the sinus venosus is purely amuscular in some fishes. The matrix of this chamber is made up of elastic and collagen fibres. The muscles are restricted around the sinuatrial opening in circular fashion forming sinuatrial ring. The sinus venosus opens into atrium by a sinuatrial ostium, which is provided by two sinuatrial valves. Farrel and Jones reported single atrioventricular valve in teleost fishes. The atrium is a large muscular contractile chamber. It is situated dorsal to the ventricle in almost all fishes Fig. In fishes, the atrium is also known as auricle, but actually the appendages of the atria are called as auricles. The atrium is undivided single chamber in elasmobranch and teleosts but in dipnoi, the atrium is partially divided by an incomplete interatrial septum Fig. Pulmonary blood drains directly into the left side of the atrium, whereas the systemic venous blood is collected in the sinus venosus through ducti Cuvieri. The blood from the sinus venosus goes to the right side of the atrium. Internally, the atrium is divisible into two parts, a sinuatrial canal and atrium proper. The former is rather thick-walled semi-cylindrical rigid tube and the latter is a thin-walled distensible spongy cavity. The significance and functional importance of this funnel is due to the pressure of blood in the sinus venosus and atrial filling. The spongy portion of the atrium contains pectinate muscles Fig. The trabeculae at the atrioventricular ostium form mesh-like network. When they contract, they pull the roof and sides of the atrium towards atrioventricular ostium. The atrial mass constitutes 0. The endocardium is the innermost layer, lining the lumen of the atrium. The endothelial cells are flat with spheroid or more often elongated nuclei. The atrium communicates with the ventricle through a tubular

structure referred to as canalis auricularis or atrioventricular funnel. The atrioventricular opening is round and guarded by atrioventricular valves. Regarding the disposition and number of AV valves in the heart of fishes in general and teleosts in particular are still much disputed. Generally, in teleosts two atrioventricular valves are present but Farrel and Jones described a single atrioventricular valve. The atrioventricular valves in all the three genera of dipnoans, lungfish, i. The atrioventricular plug which guards the horseshoe-shaped atrioventricular opening, the functions is similar to atrioventricular valve. It is in the form of inverted cone with its apex pointing into the atrial lumen. It is projected dorsally with the atrial lumen and reaches up to pulmonalis fold and due to this, there is partial septation of the atrium. It is made up of hyaline cartilage encircled by fibrous connective tissue. In Neoceratodus, the hyaline cartilage is absent and the plug is made up of fibrous connective tissue. The teleost ventricle is either tubular, pyramidal or sac-like in appearance Fig. It is relatively large muscular chamber. It is undivided in elasmobranch and teleost, but it is partially divided into left and right chambers by a muscular septum in Dipnoi. The muscular septum is posterior to the atrioventricular plug in all the three genera but extends anteriorly along the ventral surface in Lepidosiren. Its anterior and dorsal margins are free. In majority of Indian teleost fishes the ventricle is sac-like. The layers constituting the ventricle wall are fairly well differentiated in epicardium, myocardium and endocardium Fig. These layers are essentially similar to the atrium except that the myocardium is substantially thicker than that of the atrium. The ventricular myocardial architecture is different in different fishes. The arrangement may be compact, mixed, i. In compact myocardium, layers of muscle bundles are arranged orderly within ventricular wall. In elasmobranchs, the compact myocardium, at the level of the atrioventricular orifice is continuous with the trabeculated myocardium. In teleosts, the compact myocardium is independent of the trabeculated myocardium and a large number of fibres insert into the bulbo-ventricular fibre ring. No such detailed description had been given regarding myocardial arrangement in the ventricle of any Indian fish, but in majority of Indian teleosts both compact and trabeculated situation occur. The ventricular myocardium is entirely trabecular in lungfishes. There are two routes for oxygen supply and they are utilized to different degrees among fishes. Since the heart pumps venous blood, oxygen is available from the relatively oxygen poor venous blood that bathe the endocardial lining of the chamber. In addition, an arterial supply of oxygen rich blood may be provided by the coronary circulation to the myocardium. All elasmobranchs and most active teleosts use both the venous and coronary oxygen supply to varying degrees. Development of coronary circulation is generally associated with the relatively larger ventricle. In rainbow trout, Onchorhynchus mykiss, acetylcholine helps in the contraction of coronary arteries and there is predominantly relaxation with isoproterenol, epinephrine, nor-epinephrine and serotonin. Coronary vascular resistance increases exponentially as coronary flow rate decreases. Coronary resistance was also influenced by cardiac metabolism and acclimatization. Farrel experimentally produced vaso-constriction of the coronary vessels by injection of adrenaline into the coronary circulation. He held it as temperature dependent. The available evidence suggests that properties of the contractile proteins from lower vertebrate are broadly similar to those found in the skeletal and cardiac muscle of mammalian species. However, adult cardiac muscles contain isotypes of myosin, tropomyosin and troponin which have distinct chemical structures and somewhat different properties from those found in skeletal muscle. The complex orientation of fibres and the presence of a large proportion of non-muscle cells in cardiac tissues make it difficult to obtain multicellular preparations for the study of their contractile properties. The myosin isolated from fish and amphibians skeletal muscles are of unstable type which readily lose their ATPase activity of storage. The fish actomyosin preparations are orders of magnitude more stable than corresponding myosin preparations. It is now of common belief that in common with myosin there have been selective modifications in the sequence of tropomyosin and troponin to permit efficient regulation of contraction at different body temperatures. The heart muscles are infected with bacteria and viruses. The bacterial infection is due to aero-monas and vibrios. They form colonies in the myocardium resulting that the endocardium becomes swollen and their nuclei become pycnotic. The viral infection commonly affecting the heart muscle are rhabdo-virus. The infection causes myocardial necrosis resulting in inflammation in all the three layers, i. The inflammation of cardiac muscle is known as myocarditis. A few reports deal with atrioventricular valve diseases. Like the higher vertebrates, the regeneration ability of cardiac

muscle is nil and any injury or myocardial infarction develops into fibrous connective tissue. The cardiac conducting system of homoiothermal vertebrates is responsible for the initiation and conduction of electrical impulse at right place and at right time.

Chapter 3 : Pathology of tumors in fish associated with retroviruses: a review.

10/12/ 1 Pathology of Laboratory Fishes Jeffrey C. Wolf, DVM, DACVP Experimental Pathology Laboratories (EPL Â®), Inc. Sterling, VA What are Laboratory Fishes?

Cleaner fish Some fish take advantage of cleaner fish for the removal of external parasites. The best known of these are the Bluestreak cleaner wrasses of the genus Labroides found on coral reefs in the Indian Ocean and Pacific Ocean. These small fish maintain so-called "cleaning stations" where other fish, known as hosts, will congregate and perform specific movements to attract the attention of the cleaner fish. In the tropics, the mola will solicit cleaner help from reef fishes. By basking on its side at the surface, the sunfish also allows seabirds to feed on parasites from their skin. Sunfish have been reported to breach more than ten feet above the surface, possibly as another effort to dislodge parasites on the body. Fish kill , Red tide , and Harmful algal bloom Some diseases result in mass die offs. It is caused by the ambush predator dinoflagellate Pfiesteria piscicida. When large numbers of fish, like shoaling forage fish , are in confined situations such as shallow bays, the excretions from the fish encourage this dinoflagellate, which is not normally toxic, to produce free-swimming zoospores. If the fish remain in the area, continuing to provide nourishment, then the zoospores start secreting a neurotoxin. This toxin results in the fish developing bleeding lesions, and their skin flakes off in the water. The dinoflagellates then eat the blood and flakes of tissue while the affected fish die. The rate at which the kills occur increases as organically polluted land runoff increases. Diseases and parasites in salmon Henneguya salminicola , a parasite commonly found in the flesh of salmonids on the West Coast of Canada. Coho salmon According to Canadian biologist Dorothy Kieser, protozoan parasite Henneguya salminicola is commonly found in the flesh of salmonids. It has been recorded in the field samples of salmon returning to the Queen Charlotte Islands. The fish responds by walling off the parasitic infection into a number of cysts that contain milky fluid. This fluid is an accumulation of a large number of parasites. Henneguya and other parasites in the myxosporean group have a complex lifecycle where the salmon is one of two hosts. The fish releases the spores after spawning. In the Henneguya case, the spores enter a second host, most likely an invertebrate, in the spawning stream. When juvenile salmon out-migrate to the Pacific Ocean, the second host releases a stage infective to salmon. The parasite is then carried in the salmon until the next spawning cycle. The myxosporean parasite that causes whirling disease in trout, has a similar lifecycle. Kieser, a lot of work on Henneguya salminicola was done by scientists at the Pacific Biological Station in Nanaimo in the mids, in particular, an overview report [35] which states that "the fish that have the longest fresh water residence time as juveniles have the most noticeable infections. Hence in order of prevalence coho are most infected followed by sockeye, chinook, chum and pink. It is strictly a fish parasite that cannot live in or affect warm blooded animals, including man". I have previously examined smoked chum salmon sides that were riddled with cysts and some sockeye runs in Barkley Sound southern B.

Chapter 4 : Fluorescence in situ hybridization - Wikipedia

Many research workers are going to appreciate this book, though it is not quite the normal textbook on fish pathology. It is the Proceedings of the first ever international conference on the contributions of fish pathology to comparative pathology.

In addition, the laboratory for epidemiological studies of aquatic organisms was set up in to integrate and support the three reference laboratories for fish, crustaceans and molluscs. An experimental aquarium authorized by the Ministry of Health has been established at the NRL, formed by independent tanks of various sizes for conducting experimental infection trials in both freshwater and seawater fish. The staff is formed by experts from a variety of diagnostic sectors: The department is currently taking part in several national and EU research projects. Activities and servicesProjects and collaborationsContacts Activities and services The department has years of experience in diagnosing aquatic animal pathologies, most notably salmonid diseases. The department has been involved in the development of experimental vaccines for different bacterial fish diseases for many years, and an adjuvanted bacterin was recently successfully employed in field trials and later authorized by the Italian Ministry of Health to control Lactococcosis caused by Lactococcus garvieae, which is a major bacterial problem in the Italian trout industry. The department is also actively involved in the development of an efficacious vaccine against viral retino-encephalopathy, a disease causing a severe neuropathological condition in marine fish, as sea bass. The department cooperates with the laboratory for the control of crustacean and mollusc hygiene, which is involved in developing new techniques for identifying fish species, evaluating shelf-life and detecting viral foodborne diseases HAV, Norovirus, enterovirus. It has extensive experience in the control of microbiological parameters of sea water for the classification of bivalve harvesting areas, according to national and EU legislation. The main activities are: In addition, species can be diagnosed rapidly and accurately using the above molecular biology techniques. Projects and collaborations Research is an another important departmental activity, involving several national and international research projects, the most important of which are: Since being imported into Spain from the United States in , it has invaded the whole of Europe. In the species was reported in Piedmont, after which it spread to Tuscany and many other regions of Italy. After acclimatizing to Friuli Venezia Giulia, probably in , Louisiana crayfish have become a serious problem due particularly to the risks associated with: The aim of the intense, highly structured work programme is to: Improving European mollusc aquaculture: The health of the bivalve molluscs was monitored for three years by histological, bacteriological and virological examination. The mytilids tested negative at all times for notifiable diseases and were only rarely infested with trematodes. No distress or abnormal mortality was observed. The oysters tested positive for ostreid herpesvirus 1, diagnosed by PCR or confirmed by sequencing. Mortality was recorded, but in combination with anoxic phenomena in the lagoon. The project consists of six workpackages: Project co-ordination and consortium management; WP 2: Collection of virus sequences and epidemiological data; WP 3: Phylogeny and evolution of viruses; WP 4: Investigation of the effect of temperature on gene expression patterns; WP 5: Scenario simulation models for control options; WP 6: Dissemination and exploitation for developing the website. Targeted disease prophylaxis in European fish farming. The project was awarded a 6-million euro grant under the 7th Framework Programme of the European Commission and will run for five years. The project consortium is formed by research institutes and private veterinary and biotechnology companies. Network for technological innovation in aquaculture This project is funded by the Programme for Cross-Border Cooperation Italy-Slovenia , under the umbrella of the European Regional Development Fund and national funding. Research and innovation work will be focused on the most commercially viable species in aquaculture, exploring systems for controlling fish health and environmental farming conditions. Contacts Director of National reference laboratory for fish, crustacean and mollusc pathology Giuseppe Arcangeli.

Chapter 5 : The pathology of fishes.

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FISH is used by examining the cellular reproduction cycle, specifically interphase of the nuclei for any chromosomal abnormalities. Urothelial cells marked with four different probes Probes are often derived from fragments of DNA that were isolated, purified, and amplified for use in the Human Genome Project. The size of the human genome is so large, compared to the length that could be sequenced directly, that it was necessary to divide the genome into fragments. In the eventual analysis, these fragments were put into order by digesting a copy of each fragment into still smaller fragments using sequence-specific endonucleases, measuring the size of each small fragment using size-exclusion chromatography , and using that information to determine where the large fragments overlapped one another. To preserve the fragments with their individual DNA sequences, the fragments were added into a system of continually replicating bacteria populations. Clonal populations of bacteria, each population maintaining a single artificial chromosome, are stored in various laboratories around the world. The artificial chromosomes BAC can be grown, extracted, and labeled, in any lab containing a library. Genomic libraries are often named after the institution in which they were developed. These fragments are on the order of thousand base-pairs, and are the basis for most FISH probes. Preparation and hybridization process â€" RNA[edit] Cells, circulating tumor cells CTCs , or formalin-fixed paraffin-embedded FFPE or frozen tissue sections are fixed, then permeabilized to allow target accessibility. FISH has also been successfully done on unfixed cells. Separate but compatible signal amplification systems enable the multiplex assay up to two targets per assay. Signal amplification is achieved via series of sequential hybridization steps. At the end of the assay the tissue samples are visualized under a fluorescence microscope. First, a probe is constructed. The probe must be large enough to hybridize specifically with its target but not so large as to impede the hybridization process. The probe is tagged directly with fluorophores , with targets for antibodies or with biotin. Tagging can be done in various ways, such as nick translation , or PCR using tagged nucleotides. Then, an interphase or metaphase chromosome preparation is produced. The chromosomes are firmly attached to a substrate , usually glass. The probe is then applied to the chromosome DNA and incubated for approximately 12 hours while hybridizing. Several wash steps remove all unhybridized or partially hybridized probes. The results are then visualized and quantified using a microscope that is capable of exciting the dye and recording images. If the fluorescent signal is weak, amplification of the signal may be necessary in order to exceed the detection threshold of the microscope. Fluorescent signal strength depends on many factors such as probe labeling efficiency, the type of probe, and the type of dye. Fluorescently tagged antibodies or streptavidin are bound to the dye molecule. These secondary components are selected so that they have a strong signal. Variations on probes and analysis[edit] FISH is a very general technique. The differences between the various FISH techniques are usually due to variations in the sequence and labeling of the probes; and how they are used in combination. Probes are divided into two generic categories: In fluorescent "in situ" hybridization refers to the cellular placement of the probe Probe size is important because longer probes hybridize less specifically than shorter probes, so that short strands of DNA or RNA often 10â€"25 nucleotides which are complementary to a given target sequence are often used to locate a target. The overlap defines the resolution of detectable features. For example, if the goal of an experiment is to detect the breakpoint of a translocation , then the overlap of the probes â€" the degree to which one DNA sequence is contained in the adjacent probes â€" defines the minimum window in which the breakpoint may be detected. The mixture of probe sequences determines the type of feature the probe can detect. Probes that hybridize along an entire chromosome are used to count the number of a certain chromosome, show translocations, or identify extra-chromosomal fragments of chromatin. This is often called "whole-chromosome painting. However, it is possible to create a mixture of smaller probes that are specific to a particular region locus of DNA; these mixtures are used to detect deletion mutations. When combined with a

specific color, a locus-specific probe mixture is used to detect very specific translocations. Special locus-specific probe mixtures are often used to count chromosomes, by binding to the centromeric regions of chromosomes, which are distinctive enough to identify each chromosome with the exception of Chromosome 13 , 14 , 21 , A variety of other techniques uses mixtures of differently colored probes. A range of colors in mixtures of fluorescent dyes can be detected, so each human chromosome can be identified by a characteristic color using whole-chromosome probe mixtures and a variety of ratios of colors. Although there are more chromosomes than easily distinguishable fluorescent dye colors, ratios of probe mixtures can be used to create secondary colors. Similar to comparative genomic hybridization , the probe mixture for the secondary colors is created by mixing the correct ratio of two sets of differently colored probes for the same chromosome. The same physics that make a variety of colors possible for M-FISH can be used for the detection of translocations. That is, colors that are adjacent appear to overlap; a secondary color is observed. Some assays are designed so that the secondary color will be present or absent in cases of interest. In the opposite situationâ€”where the absence of the secondary color is pathologicalâ€”is illustrated by an assay used to investigate translocations where only one of the breakpoints is known or constant. Locus-specific probes are made for one side of the breakpoint and the other intact chromosome. In normal cells, the secondary color is observed, but only the primary colors are observed when the translocation occurs. This technique is sometimes called "break-apart FISH". Targets can be reliably imaged through the application of multiple short singly labeled oligonucleotide probes. Probes not binding to the intended sequence do not achieve sufficient localized fluorescence to be distinguished from background. The technology has potential applications in cancer diagnosis , [14] neuroscience , gene expression analysis, [15] and companion diagnostics. Fiber FISH[edit] In an alternative technique to interphase or metaphase preparations, fiber FISH, interphase chromosomes are attached to a slide in such a way that they are stretched out in a straight line, rather than being tightly coiled, as in conventional FISH, or adopting a chromosome territory conformation, as in interphase FISH. This is accomplished by applying mechanical shear along the length of the slide, either to cells that have been fixed to the slide and then lysed , or to a solution of purified DNA. A technique known as chromosome combing is increasingly used for this purpose. The extended conformation of the chromosomes allows dramatically higher resolution â€” even down to a few kilobases. The preparation of fiber FISH samples, although conceptually simple, is a rather skilled art, and only specialized laboratories use the technique routinely. This technique is used routinely in telomere length research.

Chapter 6 : Pathology of Alabama Fish - AUBURN UNIVERSITY

Pathology of Heart 3. Innervation. Structure of Heart: The heart of fishes is known as branchial heart, because its main function is to pump venous blood to ventral aorta into gills (branchial) and then to somatic vasculature.

Chapter 7 : Muscular Melanosis â€“ Gross Pathology â€“ Fish Pathology

The term melanosis is used to describe the presence of melanin in abnormal areas. Melanin is a pigment synthesized in melanosomes, an organelle present in melanocytes, located in the dermis.

Chapter 8 : The Pathology of Fishes: Proceedings of a Symposium - Google Books

6/12/ 1 Gross Pathology of Fish CL Davis Foundation Dalen W. Agnew, DVM, PhD, Dipl ACVP Michigan State University College of Veterinary Medicine.

Chapter 9 : Pathology Outlines - FISH general

What is known about fish disease often relates to aquaria fish, and more recently, to farmed fish. Disease is a prime agent affecting fish mortality, especially when fish are young. Fish can limit the impacts of pathogens and parasites with

behavioural or biochemical means, and such fish have reproductive advantages.