

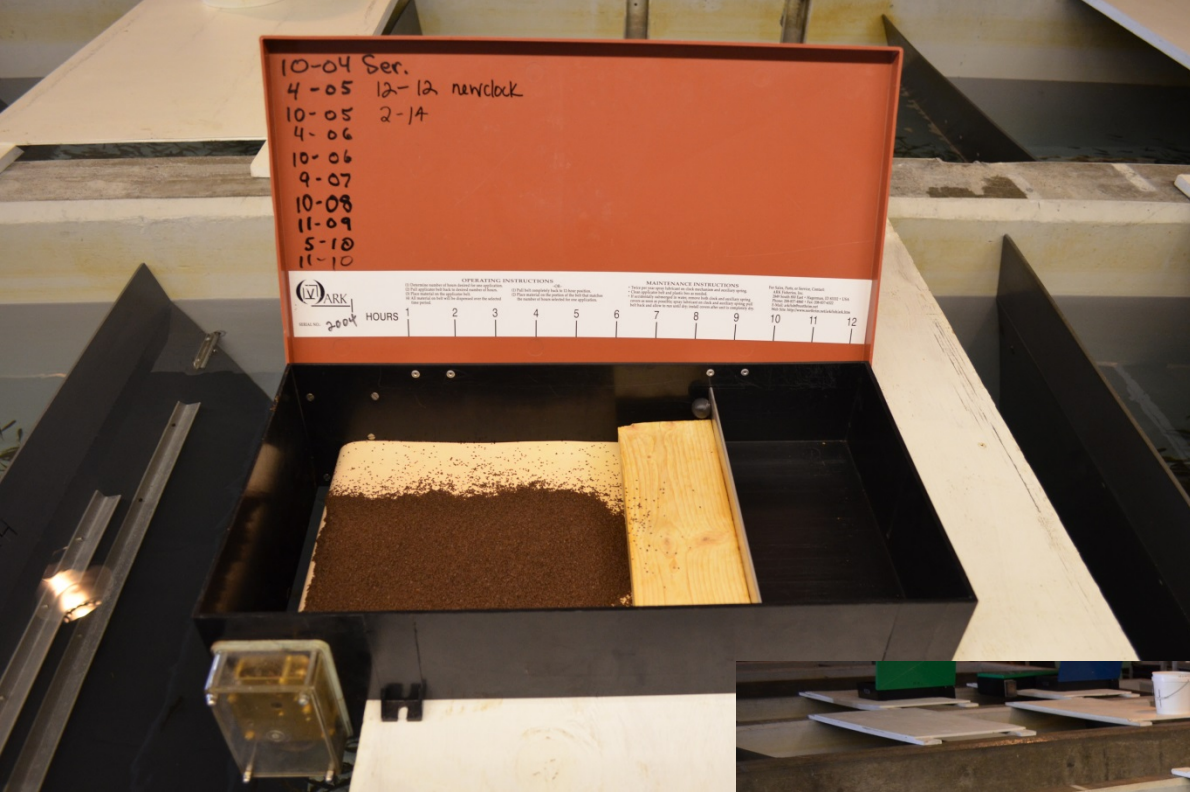
INTRODUCTION TO FISH HEALTH MANAGEMENT



Skin hemorrhaging in infected Pacific herring often caused by VHSV



Pacific herring with typical VHS lesion



Fish culturists can be fashionable too.....



Lifesta
Maine
207 591 7077
1-877 211 2429
207 591 7078
lifesta-bio-oregon.com

2013 Fish Health Workshop



The First Line of Defense – observant and well-informed fish culturists

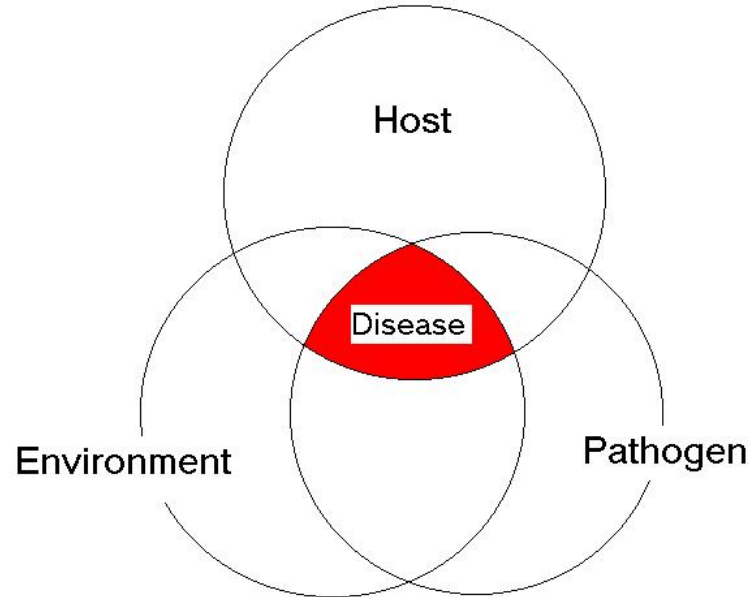
- Most facilities are geographically isolated
- Early detection!
- Eyes and ears for pathologists

Some definitions

- ❑ Symptom – a subjective change or finding (pain or other “feeling”)
- ❑ Sign – observable change
- ❑ Syndrome – all symptoms + signs
- ❑ Clinical disease – abnormal condition or function of the body manifested by characteristic symptoms and signs
- ❑ Subclinical disease – disease which does not produce signs or symptoms
- ❑ Pathology – study of abnormal structural or functional changes and their causes
- ❑ Lesion – an abnormal change within a cell, tissue, or organ
- ❑ Etiology – the cause of the disease

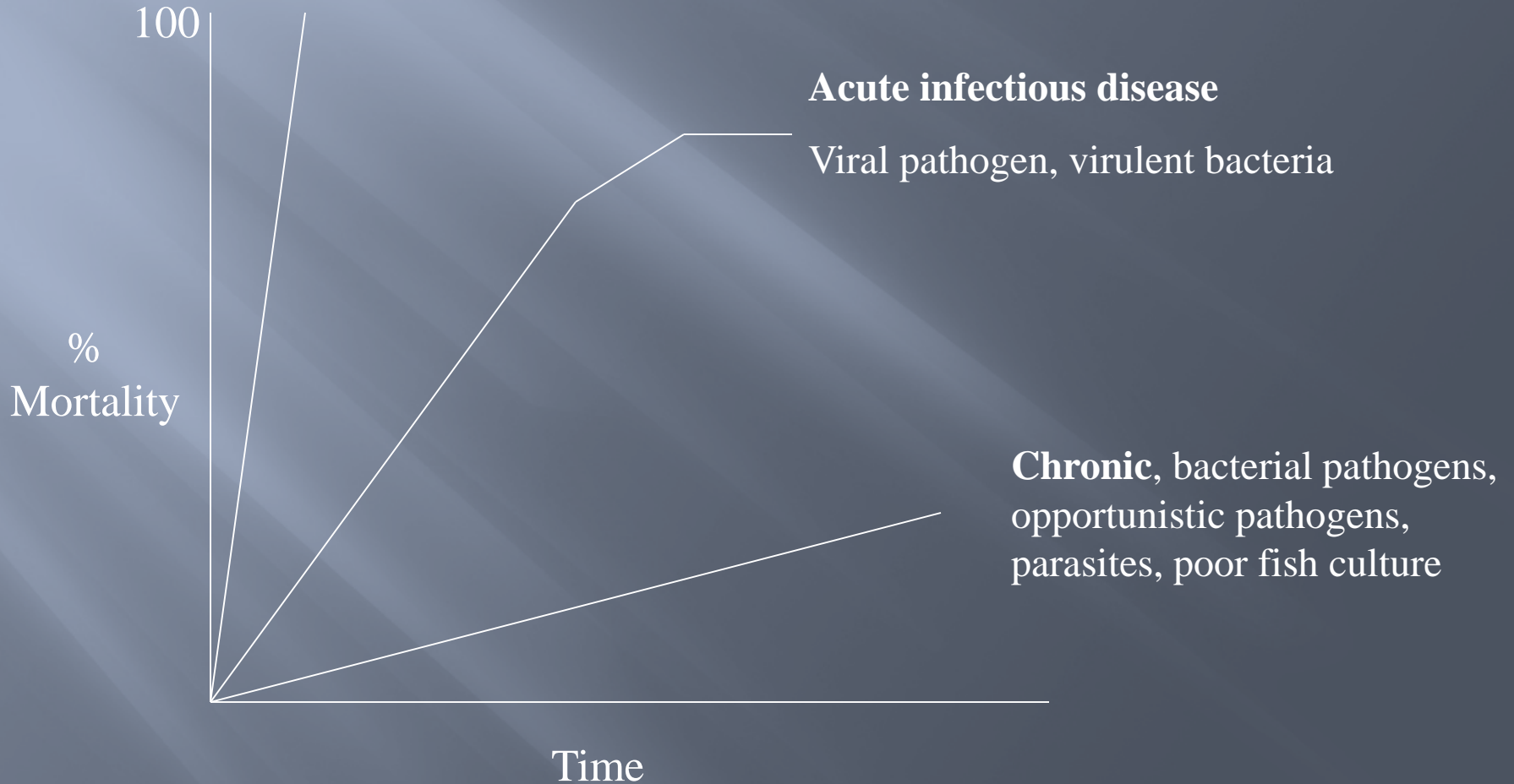
Relationship of environment, host and pathogens

A fish must interact with a pathogen in a stressful environment for a disease outbreak to occur.



Mortality over time for some disease outbreaks

Acute environmental failure



Signs of Disease

- ▣ Behavioral Changes
 - Flashing
 - Abnormal swimming
 - ▣ Corkscrewing
 - ▣ Side swimmers
 - Congregating at the tail screens and bottom of raceway
 - Increased daily mortality
 - Loss of appetite
 - Listless
 - Increased respiration
 - Flared opercula

Signs of Disease

▣ External

- Discolored body
- Exophthalmia (popeye)
- Hemorrhages, usually at the base of the fins
- Darkened peduncle
- Fungus
- Swelling, potbelly
- Visible sores
- Whitened areas on fins
- Deformities
- Fecal Casts
- Pale gills



Deep, scooping ulcers characteristic of bacterial coldwater disease in coho salmon fingerlings

Signs of Disease

- ▣ Internal
 - Color change of organs
 - Hemorrhaging in tissues
 - Boils or swollen lesions
 - Change in texture of organs
 - Fluid in body cavity
 - Visible parasites



Actions when clinical signs are present

- ▣ Isolate sick populations
- ▣ Note the clinical signs
- ▣ Note environmental history
- ▣ External examination
- ▣ Internal examination
- ▣ Contact ADFG Pathology with information
- ▣ Be prepared to answer a lot of questions!

ADFG sample submission form

FISH PATHOLOGY LAB SAMPLE SUBMISSION FORM CASE DATA SHEET

DATE RECEIVED: _____

Accession # (to be assigned by Fish Pathology Lab) _____

DATE COLLECTED: _____

FACILITY/CONTACT PERSON & ADDRESS: _____

LOT (BROOD/YEAR/STOCK/SPECIES): _____

NUMBER IN SAMPLE: _____

LIFE STAGE: _____ SEX (if applicable): _____ WILD? _____

DATE OUTBREAK NOTICED: _____

PROBLEM HISTORY: _____

RECENT MEDICATIONS: _____

Are these samples an FTP requirement? _____ YES _____ NO

If yes, what is the FTP number? _____

Alaska Dept. of Fish & Game - Fish Pathology Lab, 333 Raspberry Road, Anchorage AK 99518-1089, (907) 267-2244
Pathology Forms, Labels and PDQs/Forms/Sampleboxes.doc

Common Diseases

- ▣ Bacterial
 - Bacterial Gill Disease
 - Bacterial Kidney Disease
 - Enteric Redmouth Disease (ERM)
 - Furunculosis
 - Motile Aeromonas and Pseudomonas
 - Vibriosis
 - Bacterial Coldwater Disease



Severe internal hemorrhaging typically seen in bacterial septicemias like enteric redmouth disease

Common Diseases

- ▣ Fungal Protozoa
 - Phoma Herbarum
 - Saprolegnia
- ▣ External Protozoa
 - Costia (flagellate)
 - Trichodina (ciliate)
- ▣ Internal Protozoa
 - Hexamita
- ▣ Copepods



Coho salmon with swollen prolapsed vent due to infection with *Ceratomyxa shasta* (Photo: R. Holt, Oregon Dept. of Fish and Wildlife)



Bloating due to ascites in fish infected with *Ceratomyxa shasta* (Photo: R. Holt, Oregon Dept. of Fish and Wildlife)

Common Diseases

- ▣ Viral
 - IHN
 - VHS
- ▣ Non Infectious
 - White Spot (Coagulated Yolk)
 - Gas Bubble Disease
 - Pinhead Drop Out
 - Gill Hyperplasia



Skin hemorrhaging in infected Pacific herring often caused by VHSV



Pacific herring with typical VHS lesion

Bacterial Gill



http://www.michigan.gov/dnr/0,1607,7-153-10364_10950-26967--,00.html

<http://www.fishdoc.co.uk/index.htm>

Bacterial Gill Disease

- ▣ Causative Agent = Flavobacterium
- ▣ Affects: all cultured salmonids
- ▣ Clinical signs
 - Loss of appetite
 - Gill abnormalities – swollen lamellae
 - Labored breathing – opercular movement
- ▣ Some causes
 - Compromised water quality
 - Feeding of very small feed sizes
- ▣ Control
 - Take off feed
 - Hydrogen peroxide
 - Do NOT use formalin for this!
- ▣ Prevention
 - Reduce stress
 - Address water quality
 - Chemical treatment if necessary

BKD Bacterial Kidney Disease



Subcutaneous BKD lesion on a sockeye salmon



Bacterial Kidney Disease

- ▣ Causative Agent = *Renibacterium salmoninarum*
- ▣ External signs: exop., skin petechiation, abdominal distention, darkened body color
- ▣ Internal signs: swollen kidney, white spots on kidney, fluid in body cavity
- ▣ Slow, progressive mortality
- ▣ Some causes:
 - Xmit fish to fish and lifestage to lifestage
 - Soft water (hardness <13ppm CaCO₃)
 - Above 11C – generally speaking
 - Diet: seems to be less prevalent with semi-moist diets
- ▣ Control
 - Erythromycin @ 100mg/kg fish x 28 days (INAD required)
- ▣ Prevention
 - Rs -free water supply and broodstock
 - Family tracking
 - Disinfect green eggs
 - Prophylactic treatment of fry
 - Good fish culture practices – reduce stress

Furunculosis



Chronic furunculosis
taken from "Fish Disease" E. J. Noga, Mosby Publishing 1996

Furunculosis

- ▣ Causative agent: *Aeromonas salmonicida*
- ▣ External signs:
 - Acute infection may show none
 - Chronic infection: darkening body, lethargy, loss of appetite
 - Focal necrosis
 - Hemorrhaging at base of fins
 - Exophthalmia, distended abdomen, bleeding from vent
- ▣ Internal signs:
 - Internal hemorrhaging, major organs necrotic or swollen
 - Posterior intestine congested with bloody material
- ▣ Some causes:
 - Infected fish or contaminated water supply
 - Species of fish other than salmonids
 - Surface contamination of eggs
 - Contaminated surfaces (can survive up to 6 days outside of host)
 - As water temp increases, so does intensity and incidence
 - Nutritional status and stress
- ▣ Prevention
 - Avoidance!
 - Pathogen free water
 - Disinfect eggs
 - Good fish culture practices
- ▣ Control
 - Oxytetracycline, Romet (sulfa drugs)
 - Vaccines?

Motile Aeromonas and Pseudomonas

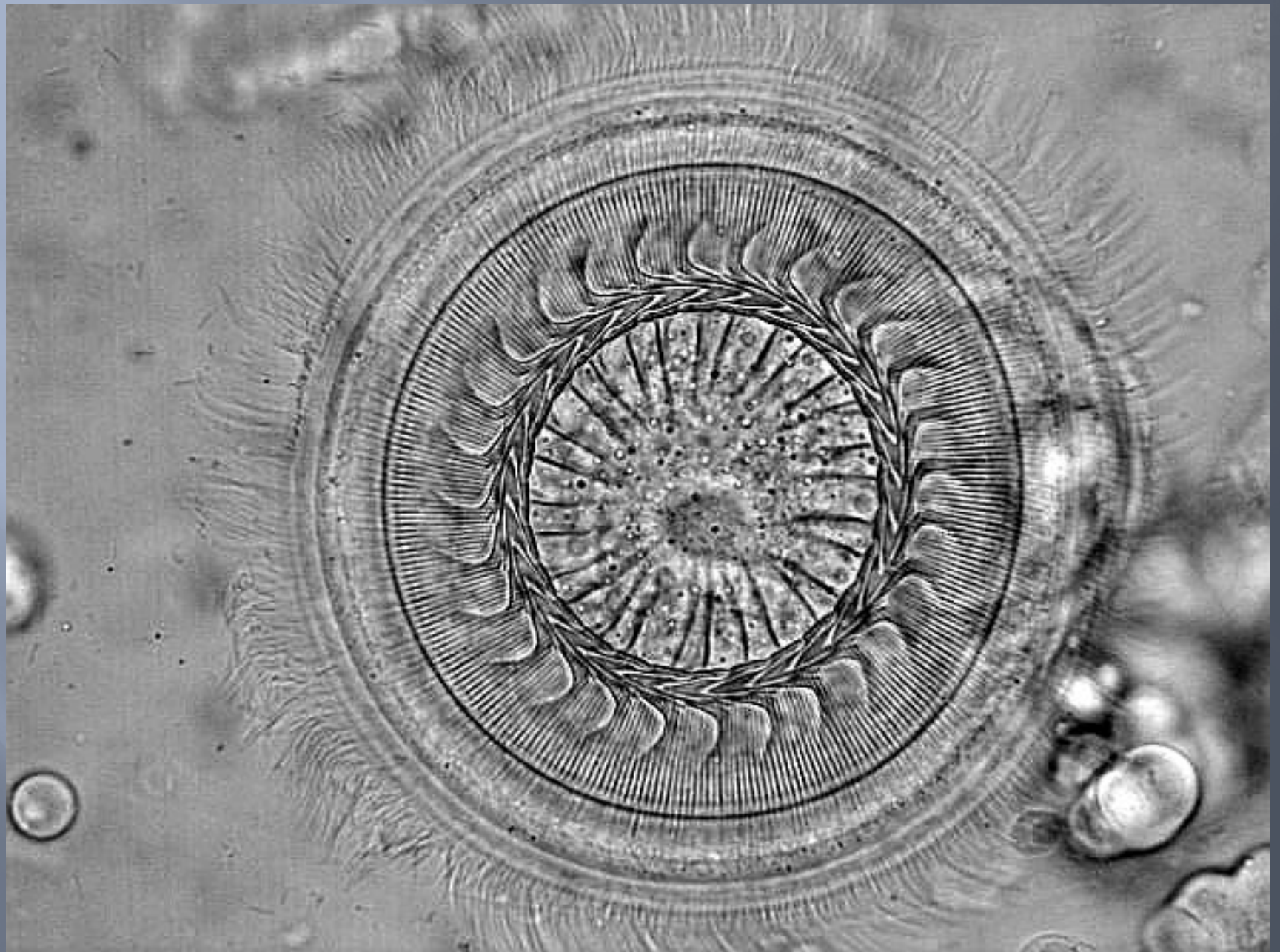


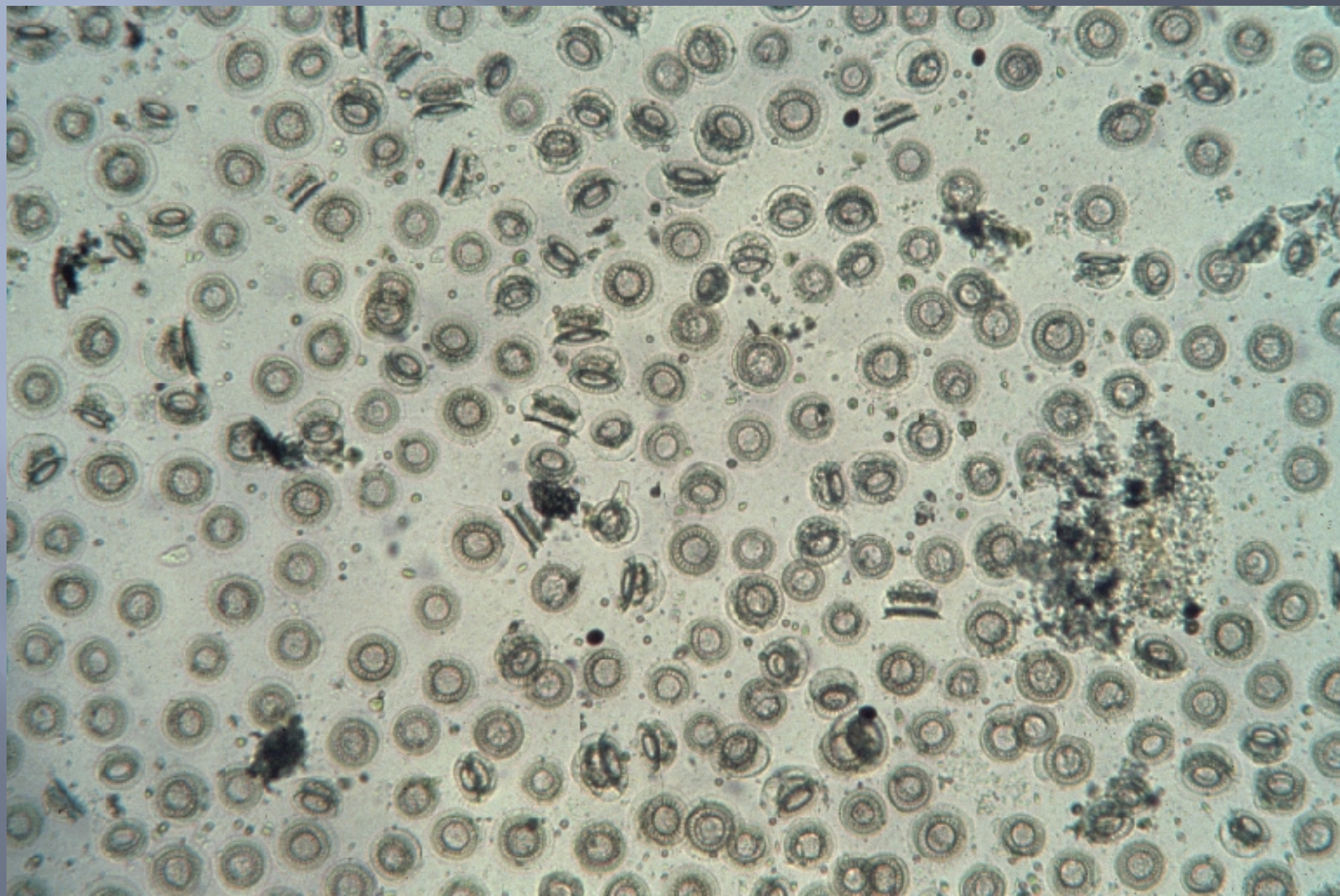
Motile Aeromonas and Pseudomonas

- ▣ Causative agent: *A. hydrophila* and *P. fluorescens*
- ▣ External signs are typical bacterial: exop, hemorrhaging, bloating, lethargy, mortality
- ▣ Internal signs:
 - Kidney, spleen enlarged
 - Hemorrhaging
 - Lower intestine inflamed
- ▣ Some causes
 - Various vectors: other fish, parasites, contaminated water supply
 - Very common bacteria in water
- ▣ Control
 - Oxytetracycline
- ▣ Prevention
 - Good fish culture practices. This is stress-related

Trichodina







Trichodina

- ▣ Causative agent: Trichodina! – many species
- ▣ External signs:
 - Flashing
 - Excessive mucous
 - Labored gill movements
 - White patches on skin/ fins
- ▣ Internal signs – none usually
- ▣ Causes
 - Always present in water
 - Stress and/or mechanical damage to skin or gills
- ▣ Control
 - Formalin bath (1:6000 x 1hour x 2 days) – repeat as necessary
 - Saltwater flush for one hour
- ▣ Prevention
 - Good fish culture practices
 - Address water quality issues
 - Reduce density if possible
 - Reduce feeding

Copepods



More parasites!

Salmincola spp.



Costia

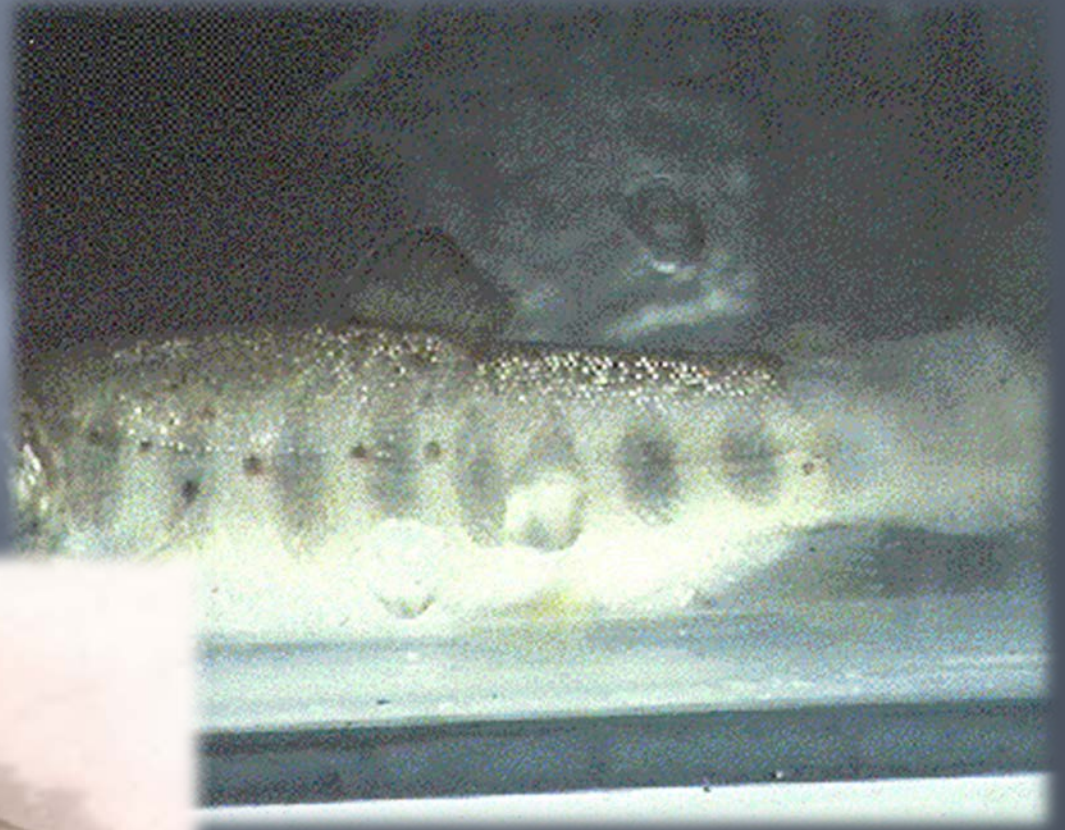


Severe *Salmincola* infestation of rainbow trout gills; note necrotic areas at tips of gill lamellae

Exophthalmia – a common sign that something's gone haywire....



Saprolegnia (our old friend)



Tail rot due to infestation with *Saprolegnia* fungus

Review -Major Diseases of Concern

- ▣ Bacterial Gill Disease
- ▣ Bacterial Kidney Disease
- ▣ Furunculosis
- ▣ Trichodina
- ▣ Cold Water Disease
- ▣ IHNV
- ▣ Vibrio

Medications!

Bio-Pacs

Supplementary nutrient packs for tough rearing conditions

Extra Vitamins

Vitamins are essential for normal fish growth, health, and reproduction. Use Bio-Oregon's Extra Vitamin pack for enhanced nutrition especially when feeding a restricted ration.

Extra Vitamin C

Vitamin C has been shown to assist in wound healing, disease resistance, and in the formation of collagen, cartilage & bones. Extra Vitamin C can be ordered in levels of 500 ppm or 1000 ppm.

Pigments

Besides imparting color to fish flesh, research has shown that carotenoids (pigments) play a role in health and immunity, reproduction, fertilization and egg quality. Many Bio-Oregon diets contain natural pigments or astaxanthin.

Medications

Several FDA approved medications are available. Please contact your nearest Bio-Oregon representative for more information.

Bio-Pacs are available in selected Bio-Oregon feeds. Minimum order quantities will apply when product is not in stock. Please contact your Bio-Oregon representative for more information.



Woman is 53 But Looks 27

Fairbanks: Mom publishes free facelift secret that has angered doctors...



U.S. Fish & Wildlife Service
AQUATIC ANIMAL DRUG APPROVAL PARTNERSHIP (AADAP) PROGRAM

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AADAP

Aquatic Animal Drug Approval
Partnership Program

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Double click to select button

- Links
- Drug-use Guidance
- Contact AADAP Staff
- AFWA-DAWG
- Aquaculture Production Database
- AFS-FCS's Working Group on Aquaculture Drugs, Chemicals & Biologics

INAD INFORMATION

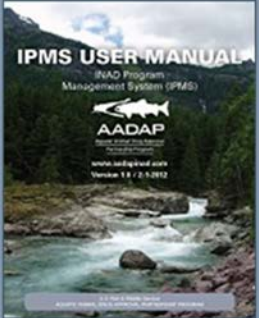
- Oxytetracycline Med. Feed
- Oxytel for Shrimp
- Chloramine-T
- Florfenicol
- Florfenicol for Lobsters

WHAT'S SHAKIN'

GENERAL NEWS

last updated:
8 March 2012

New IPMS User Manual Now Available: A new, greatly



improved User Manual for AADAP's INAD Program Management System (IPMS) is now available. To view or download, click on the front cover above or [click here](#).

Newest issue of "Eddies," a periodic publication of the

MISSION STATEMENT

The Aquatic Animal Drug Approval Partnership (AADAP) Program is a broad, partnership-based program of national scope located in Bozeman, Montana. The mission of the AADAP Program is:

"Working with our partners to conserve, protect, and enhance the Nation's fish resources by coordinating activities to obtain U.S. Food and Drug Administration (FDA) approval for drugs, chemicals, and therapeutants needed for aquaculture and fisheries management programs."

Public and private aquaculture in the United States has struggled for many years because of a severe shortage of FDA

HOT TOPICS

MARK YOUR CALENDARS
31 July 2012

The 2012 U.S. Fish & Wildlife Service's Aquaculture Drug Approval Coordination Workshop is scheduled to take place in La Crosse, Wisconsin.

This year's Workshop will be held at the Radisson Hotel, and is being hosted by the U.S. Geological Survey's Upper Midwest Environment

For non-approved FDA medications

Investigational New Animal Drugs
INAD 101

What are they?

- Allow the legal use of unapproved drugs under limited and experimental conditions
- Strictly controlled by FDA's Center for Veterinary Medicine (CVM)....and AADAP
- Are granted by CVM with the expectation that meaningful data will be generated and used to support a NADA
- What they are not?
 - A "use permit"



A QUICK REFERENCE GUIDE TO:

Approved Drugs for Use in Aquaculture



FLORFENICOL				
Product name & supplier	Species	Indication	Dosing	Limitations & comments
AQUAFLO [®] Intervet/Schering-Plough Animal Health Corp. 1-800-521-6767	Cattfish	Control of mortality due to enteric septicemia associated with <i>Edwardsiella ictaluri</i>	• 10 mg florfenicol per kg fish per day for 10 days	• Veterinary Feed Directive (VFD) drug • 12-day withdrawal time
		Control of mortality due to columnaris disease associated with <i>Flavobacterium columnare</i> (Conditional Approval)		• VFD drug • 12-day withdrawal time • Must use AQUAFLO [®] -CA1 product
	Freshwater-reared calmonids	Control of mortality due to furunculosis associated with <i>Aeromonas salmonicida</i> Control of mortality due to ooldwater disease associated with <i>F. psychrophilum</i>	• 10 mg florfenicol per kg fish per day for 10 days	• VFD drug • 15-day withdrawal time

HYDROGEN PEROXIDE				
Product name & supplier	Species	Indication	Dosing	Limitations & comments
35% PEROX-AID [®] Western Chemical, Inc. 1-800-283-5292	Freshwater-reared finfish eggs	Control of mortality due to saprolegniac	• Coldwater and coolwater: 500 - 1,000 mg per L for 15 min in a continuous flow system once per day on consecutive or alternate days until hatch • Warmwater: 750 - 1,000 mg per L for 15 min in a continuous flow system once per day on consecutive or alternate days until hatch	• Initial bioassay on a small number of fish is recommended before treating the entire group • 0-day withdrawal time
	Freshwater-reared calmonids	Control of mortality due to bacterial gill disease associated with <i>Flavobacterium branchiophilum</i>	• 100 mg per L for 30 min or 50 - 100 mg per L for 60 min once per day on alternate days for 3 treatments	• Initial bioassay on a small number of fish is recommended before treating the entire group • 0-day withdrawal time
	Freshwater-reared	Control of mortality due to external columnaris	• Fingerlings and adults: 50 - 75 mg per L for 80 min once per day on alternate days for 3 treatments	• Initial bioassay on a small number of fish is recommended before treating the entire group • Should not be used to treat northern pike or

FORMALIN				
Product name & supplier	Species	Indication	Dosing	Limitations & comments
PARASITE-S Western Chemical, Inc. 1-800-283-5292	All finfish	Control of external protozoa (species of the genera <i>Chilodonella</i> , <i>Costia</i> , <i>Epicystis</i> , <i>Ichthyophthirius</i> , <i>Syngnathis</i> , and <i>Trichodina</i>)	• Salmon & trout in tanks and raceways: • Above 50°F: up to 170 µL per L for up to 1 hr • Below 50°F: up to 250 µL per L for up to 1 hr	• Drug must not be subjected to temperatures below 40°F • Do not apply to ponds when (1) water is warmer than 80°F, (2) there is a heavy phytoplankton bloom, or (3) dissolved oxygen is less than 5 mg per L • Ponds may be retreated in 5 to 10 days if needed • Do not treat ponds containing striped bass • Test on a small number of fish from each lot to check for any unusual sensitivity to formalin before proceeding • 0-day withdrawal time
		and monogenetic trematodes (species of the genera <i>Cleudococcus</i> , <i>Dactylogyrus</i> , and <i>Gyrodactylus</i>)	• All other finfish up to 250 µL per L for up to 1 hr • Earthen ponds: 15 - 25 µL per L indefinitely	
	PARASITE-S Western Chemical, Inc. 1-800-283-5292	All finfish eggs	Control of fungi of the family Saprolegniaceae	• All finfish eggs: 1,000 - 2,000 µL per L for 15 min • Species of the order Ascosporeales: up to 1,500 µL per L for 15 min
FORMALIN-F Natchez Animal Supply Co. 1-800-847-8780	All finfish eggs	Control of protozoan parasites (species of the genera <i>Bodo</i> , <i>Epicystis</i> , and <i>Zootamnium</i>)	• Tanks and raceways: 50 - 100 µL per L for up to 4 hrs daily • Earthen ponds: 25 µL per L as single treatment	• Drug must not be subjected to temperatures below 40°F • Do not apply to ponds when (1) water is warmer than 80°F, (2) there is a heavy phytoplankton bloom, or (3) dissolved oxygen is less than 5 mg per L • Ponds may be retreated in 5 to 10 days if needed • 0-day withdrawal time
FORMACIDE-B B.L. Mitchell, Inc. 1-800-917-5808	Pensaid shrimp	Control external protozoa (species of the genera <i>Chilodonella</i> , <i>Costia</i> , <i>Epicystis</i> , <i>Ichthyophthirius</i> , <i>Syngnathis</i> , and <i>Trichodina</i>)	• Salmon & trout in tanks and raceways: • Above 50°F: up to 170 µL per L for up to 1 hr • Below 50°F: up to 250 µL per L for up to 1 hr	• Drug must not be subjected to temperatures below 40°F • Do not apply to ponds when (1) water is warmer than 80°F, (2) there is a heavy phytoplankton bloom, or (3) dissolved oxygen is less than 5 mg per L • Ponds may be retreated in 5 to 10 days if needed • Do not treat ponds containing striped bass • Test on a small number of fish from each lot to check for any unusual sensitivity to formalin before proceeding • 0-day withdrawal time
PARACIDE-F Argent Laboratories 1-800-428-8258	Salmon, trout, oattfish, largemouth bass, and bluegill	and monogenetic trematodes (species of the genera <i>Cleudococcus</i> , <i>Dactylogyrus</i> , and <i>Gyrodactylus</i>)	• Catfish, largemouth bass, and bluegill: up to 250 µL per L for up to 1 hr • Earthen ponds: 15 - 25 µL per L indefinitely	• Preliminary bioassay should be conducted on a small
PARACIDE-F Argent Laboratories 1-800-428-8258	All freshwater-reared Oncorhynchus mykiss	Control of external protozoa (species of the genera <i>Chilodonella</i> , <i>Costia</i> , <i>Epicystis</i> , <i>Ichthyophthirius</i> , <i>Syngnathis</i> , and <i>Trichodina</i>)	• Salmon & trout in tanks and raceways: • Above 50°F: up to 170 µL per L for up to 1 hr • Below 50°F: up to 250 µL per L for up to 1 hr	• Preliminary bioassay should be conducted on a small

OXYTETRACYCLINE HYDROCHLORIDE				
Product name & supplier	Species	Indication	Dosing	Limitations & comments
Oxytetracycline HCl Soluble Powder-343 IXX Animal Health 1-800-750-3664	Finfish fry and fingerlings	Mark skeletal tissues	• 200 - 700 mg oxytetracycline hydrochloride (buffered) per L of water for 2 - 6 hrs	• None
TERRAMYCIN-343 Aquatic Health Resources 1-877-280-2858				
TETROXY [®] Aquatic Soluble Powder Bimeda 1-888-524-8332				

OXYTETRACYCLINE DIHYDRATE				
Product name & supplier	Species	Indication	Dosing	Limitations & comments
TERRAMYCIN [®] 200 for Fish Phibro Animal Health 1-888-475-7355	Pacific salmon	Mark skeletal tissue	• 250 mg per kg fish per day for 4 days	• Salmon <30 g size • In feed as sole ration • 7-day withdrawal time
	Salmonids	Control of ulcer disease (<i>Hemophysium plicatum</i>), furunculosis (<i>Aeromonas salmonicida</i>), bacterial hemorrhagic septicemia (<i>A. liquefaciens</i>), and pseudomonas disease (<i>Pseudomonas</i> spp.)	• 2.5 - 3.75 g per 100 lbs fish per day for 10 days	• In mixed ration • 21-day withdrawal time • No temperature restrictions on use
	Freshwater-reared calmonids	Control of mortality due to ooldwater disease caused by <i>Flavobacterium psychrophilum</i>	• 3.75 g per 100 lbs fish per day for 10 days	• In mixed ration • 21-day withdrawal time • No temperature restrictions on use
TERRAMYCIN [®] 200 for Fish Phibro Animal Health 1-888-475-7355	All freshwater-reared Oncorhynchus mykiss	Control of mortality due to columnaris disease (<i>F. columnare</i>)	• 3.75 g per 100 lbs fish per day for 10 days	• In mixed ration • 21-day withdrawal time • No temperature restrictions on use
	Cattfish	Control of bacterial hemorrhagic septicemia (<i>A. liquefaciens</i>) and	• 2.5 - 3.75 g per 100 lbs fish per day for 10 days	• In mixed ration • Water temperature not below 82°F (18.7°C)

Treatment Methods & Calculations

Raceways need to be cleaned prior to treatment for maximum efficacy!

- ▣ Drugs introduced directly into the water
 - ▣ Flow through
 - ▣ Static Bath (if possible lower water level)
- ▣ Immersion
 - Medicated Feed
 - ▣ Top Coating
- ▣ Vaccines
 - ▣ Injectable
 - ▣ Oral
 - ▣ Immersion
 - ▣ Spray
- ▣ Injections
 - ▣ Adults

Drugs Introduced into the Water

- ▣ Most Commonly Formalin
 - Static bath
 - ▣ Example trichodina 1:6000 @ 1hr RV = 150m³
 - ▣ Can you figure out this one?
 - Flow through
 - ▣ Drip or metering pump
 - ▣ Example trichodina 1:6000 @ 3,750 lpm x 1hr

Does everyone remember how to calculate these?

Drugs added to the Feed

- ▣ Oxytetracycline OTC (TM200)
- ▣ Romet
- ▣ Furox 50
- ▣ Sulfamerazine
- ▣ Feed manufacturers can add drugs to the feed.
 - Hatchery personnel need to do the calculations though – need biomass and feed rate
- ▣ Hatchery personnel can add drugs by top coating.
 - Proper mixing is important – avoid hot spots
- ▣ Most medications will have dosage levels on labels. Be sure to check them!
 - Amount of drug/biomass

Vaccines

▣ Vaccine

- stimulates the development of antibodies for a specific disease

▣ Antigen

- A preparation that contains an infectious agent or its components which is administered to stimulate an immune response.
 - A therapeutic (treatment) vaccine is given after infection and is intended to reduce or arrest disease progression.
 - A preventive (prophylactic) vaccine is intended to prevent initial infection.
- Agents used in vaccines may be whole-killed (inactive), live-attenuated (weakened) or artificially manufactured.
- Delivery methods: injection, immersion, orally (in feed)

Species
[Salmonid Products](#)
[Marine Fish Products](#)
[Warm Water Fish Products](#)

Salmonid Products

Merck Animal Health offers the following products for salmonids.

Anti-infectives

Name	Description
AQUAFEN®-L	Broad spectrum, in-feed antibiotic for the reduction of mortality in bacterial diseases caused by florfenicol susceptible bacteria
AQUAFLO® 50% PREMIX	Broad spectrum, in-feed antibiotic for the treatment of bacterial diseases of fish caused by bacteria susceptible to florfenicol. (Available in Europe, Latin America, Asia Pacific)
AQUAFLO® Type A Medicated Article	A broad-spectrum in-feed antibiotic approved in the United States for use in all freshwater-reared finfish. (Available in US only)
TRIBRISSEN™	Broad spectrum antibiotic for the treatment of infections caused by organisms susceptible to trimethoprim/sulfadiazine.

Parasiticides

Name	Description
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Vaccines and Related Products

Name	Description
AQUAVAC® Ergosan™	A complementary feed stuff for fish made from sea weed, used to optimise the nutritional status of fish prior to vaccination and in anticipation of high stress events (grading, temperature changes etc).
AQUAVAC® ERM	Vaccine against enteric redmouth disease caused by <i>Yersinia ruckeri</i> (Hagerman type 1 strain) in trout.
AQUAVAC® ERM Oral	Vaccine against enteric redmouth disease caused by <i>Yersinia ruckeri</i> (Hagerman type 1 strain) in trout.
AQUAVAC® FNM	Vaccine against furunculosis caused by <i>Aeromonas salmonicida</i> in Atlantic salmon.
AQUAVAC® IPN Oral	Vaccine against Infectious Pancreatic Necrosis virus (IPNV) in salmonids
AQUAVAC® RELERA™	Vaccine against enteric redmouth disease caused by <i>Yersinia ruckeri</i> (Hagerman type 1 and EX5 biogroup) in trout.
AQUAVAC® Vibrio	Inactivated vaccine against vibriosis caused by <i>Vibrio anguillarum</i> serotype 01 and O2α (<i>V. ordalii</i>) in rainbow trout (<i>Oncorhynchus mykiss</i>) and European sea bass (<i>Dicentrarchus labrax</i>).
AQUAVAC® Vibrio Oral	Vaccine against vibriosis caused by <i>Vibrio anguillarum</i> serotype 01 and O2α (<i>V. ordalii</i>) in rainbow trout (<i>Oncorhynchus mykiss</i>) and European sea bass (<i>Dicentrarchus labrax</i>).
NORVAX® COMPACT PD	Vaccine against Salmonid Alpha virus in Atlantic salmon
NORVAX® MINOVA 6	Vaccine against Furunculosis caused by <i>Aeromonas salmonicida</i> , vibriosis caused by <i>Vibrio anguillarum</i> serotype 1 and O2α, cold water vibriosis caused by <i>Vibrio salmonicida</i> , wound disease caused by <i>Moritella viscosa</i> and Infectious Pancreatic Necrosis (IPNV) in Atlantic salmon.

<http://aqua.merck-animal-health.com/species/salmonids.aspx>

Many manufacturers with new products being developed all the time.

Example of one source of vaccine.....note delivery instructions



Schering-Plough Animal Health
Aquaculture

Disease Management

Salmon - Furunculosis

Dosage and Administration:

Injection - Vaccination Method

Intraperitoneal injection of 0.1ml per fish of minimum size 20 g.

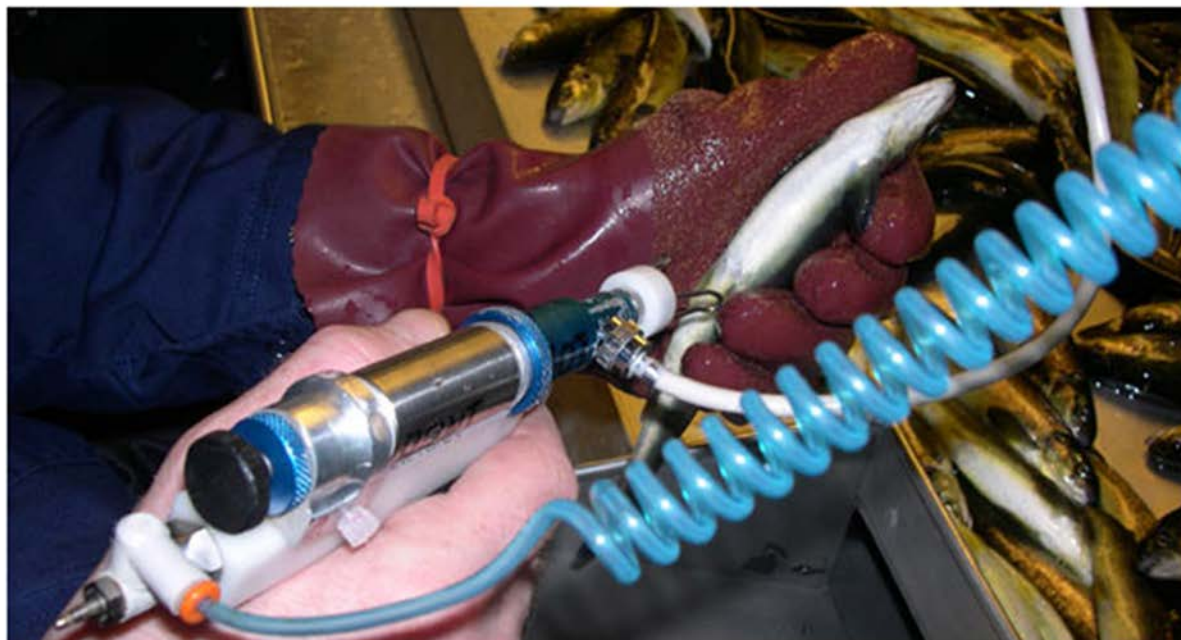
Immersion - Vaccination Method

Immersion for 60 seconds. Minimum fish size = 1g.

1 liter treats 100 kg of fish

1. Dilute 1 liter of vaccine with 9 liters of clean hatchery water.
2. Drain and weigh a netful of fish and dip fish in the diluted vaccine for 60 seconds ensuring that fish are totally immersed in the vaccine.
3. After 60 seconds exposure, lift net, allow to drain and return fish to holding tank.
4. Repeat until 100 kg of fish have been dipped into 10 liters of diluted vaccine.

When convenient more than 1 liter of vaccine may be diluted in a single bath. In such cases the weight of fish which may be dipped will be 100kg x the number of liters of vaccine used.



Birnagen Forte As

Birnagen Forte As is a vaccine designed to provide protection against IPN and Furunculosis in Salmon.

[Read more...](#)

Ermogen

Ermogen is a vaccine designed to reduce mortality and clinical signs of Enteric Redmouth Disease (Yersinia Ruckeri Serotype 1) in Trout.

[Read more...](#)

Immersion vaccination

- More effective than spray
- Watch d.o. levels!
- Have to watch biomass being vaccinated – replenish w/new vaccine





Spray vaccination for *Vibrio*



3/31/15

Due: 4/6/15 by 5pm

Show all of your work when performing calculations. Points will be deducted if work is not shown.

1. Read the article: <http://pentairaes.com/learn-about-aquaculture/technical-talks/hauling-tanks-tt22> which can be found under Course Contents/Resources and answer the following about fish transport:

- a) What impact does temperature have on fish during transport? Address both warm and cold situations.
- b) How does the addition of salt impact fish during transport?
- c) List the 3 types of oxygen replenishment methods and a basic description for each.
- d) Do NOT copy and paste your answers – use your own words. **20pts**

2. Well, the boss has gone off to Istanbul this time. Right during ponding time for your Chinook fry – of course you are left to figure things out. Since she's not around to tell you what to do, you get to call the shots.

Set up a feeding program for the little guys by detailing the following:

- what manufacturer, type and size of feed would you be ordering initially (to grow them from .40 to 4 grams)? It's your choice remember!
- what types of feeders would you use (hand, automatic, something new)? State why you prefer one method over the other.
- the water is pretty cold (<6C) and it's February so what steps might you take to insure a good, initial feed response? What might you change once the water warms up a bit?
- what instructions would you give the fish culturist who will be in charge of feeding the fish? Imagine you are leaving this person with a "list of things to do" for the weekend and perhaps this person is not the brightest light bulb in the box. **15pts**

3. Your friend down the street is telling you he has a bunch of old salmon carcasses and is going into the fish feed business to try and recover some of the money he lost in the stock market. Hopefully you know it's a bit more complicated than this. Providing your pal with a list of potential raw ingredients (try to be specific) and their basic function will go a long way toward convincing him you won't be involved. And, by the way: is there something wrong with using old salmon carcasses? **10pts**

4. As fish culturist of a large saltwater net pen system, you notice some fish health issues in a few of the pens. Mortality increases rapidly and you must react to the situation. Ultimately, ADFG Pathology diagnoses the problem as bacterial kidney disease.

Answer the following questions about this situation:

1. what would the early symptoms have been?
2. what would you, as fish culturist, have done in the first days of finding this situation?
3. as the problem progressed and mortality rapidly increased, what would you do?

4. list steps to submit your samples to ADFG Pathology
5. what is the recommended treatment for this situation and how would you administer it?
6. In retrospect, is there something you might have done to prevent this outbreak?

15pts

5. Although none of us enjoys treating fish for parasites/diseases, sometimes it has to be done in spite of how much care we put into prevention. Answer each of the following scenarios regarding the issue of fish treatments and be sure to show your work.

1. The boss was eating a sandwich by the round pond that you were in charge of and noticed a lot of “flashing” going on. Looks like you missed an infestation of Trichodina – nice work! With head in hands, you are “asked” to treat the fish with a formalin bath at 1:6000 for one hour. The pond is 5 meters in diameter and water depth is 1.5 meters. How much formalin will you need?
2. Tough week for you – in addition to missing the infestation in the round ponds, your aluminum raceways are also infected! Because the boss is trying to teach you a lesson, she wants you to do a flow through treatment on this container. Treatment is the same, 1:6000. Flow into this raceway is 600LPM and the treatment is for one hour. How many liters of formalin will you need? Again, show how you came up with the answer.

15pts

6. Using both Woods' *Diseases of Pacific Salmon* and the ADFG publication *Common Diseases of Wild and Cultured Fishes of Alaska* answer the following questions regarding Bacterial Coldwater Disease:

1. Woods' has a different name for the disease – what is it?
2. What is the current scientific name for this bacterium? What did it used to be called?
3. What salmonid species are susceptible?
4. What are the external symptoms? Internal?
5. One text mentions this disease may become “systemic” – what does this mean? **10pts**

7. Using the USFWS article listed under Resources, find the following:

1. How much active Oxytetracycline is in TM200?
2. Your freshwater fish have been diagnosed with coldwater disease. What dosage of TM200 would you use?
3. If you have 1400kg of fish, how much TM200 would you need to feed daily?
4. You are feeding your fish at 2% of their body weight per day. What percentage of TM200 is in their feed using the information listed above? **15pts**