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Drugs and Chemicals Legal for Use in Aquaculture - Part 1

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While it would be nice for a fish farmer to be able to use any chemical or drug felt necessary to preserve the health of the fish, the reality is that laws restrict the use of many drugs and chemicals. Fish can only be treated with drugs and chemicals that are in accordance with current regulations of the U.S Food and Drug Administration (FDA), U.S Environmental Protection Agency (EPA), U.S Department of Agriculture (USDA), and state and local agencies. The FDA regulates drugs, and the EPA regulates most chemicals. These regulations are necessary to ensure the safety of the aquatic food products, the integrity of the environment and to prevent the potential loss of public trust. For reasons that are not the main topic of this article, the list of approved drugs and chemicals is fairly short.

Chemicals that can be used on fish fall into many categories. These include:

1) Approved drugs. Approved drugs carry national labels that describe specific legal uses in fish. (Table 1.)

2) Drugs that can be used under an Investigational New Animal Drug exemption (INAD). INAD drugs are used in a limited fashion by participants in formal studies of drug effectiveness. These participants may be farmers, but there are many legal and record keeping responsibilities. (Table 2.)

3) Drugs that are not approved but of a low regulatory priority. Low regulatory priority drugs are not formally legal, but the government has allowed their use for certain things. Although FDA is not aware of safety problems associated with the specific uses on these substances, their uses have not been shown to be safe and effective in well-controlled scientific studies. (Table 3.)

4) Extra-label use. Many drugs may be legally used on fish with a veterinarian's prescription. Extra-label use refers to the use of an approved drug in a manner that is not in accordance with the approved label directions. The key constraints are that any extra-label use must not result in dangerous or illegal residues in food-producing animals. The veterinarian must assume liability for all residue concerns and environmental impacts.

5) "Action Deferred." Copper sulfate and potassium permanganate are not officially of a low regulatory priority, but regulatory action is deferred pending the outcome of research investigating their safety and effectiveness.

6) Pesticides with national aquatic labels. These include herbicides, a chemical for free swimming stages of a parasite and snail killers.

7) Pesticides with regional/temporary labels. These include Special Local Needs (SLN or 24c) chemicals and pesticides approved under section 18 Emergency Exemptions.

8) Fish Toxicants.

9) Vaccines.

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Table 1. Drugs with approved labels for aquaculture.

Formalin (several different formulations)	Used to control protozoa, monogenic trematodes, and fungi on fish and eggs
Chorulon (Human Chorionic Gonadotropin)	Aid in improving spawning function
Oxytetracycline monoalkyl tremethyl ammonium (Terramycin)	Used to mark skeletal tissue, control ulcer disease furunculosis, bacterial hemorrhagic septicemia and pseudomonas disease
Sulfadimethoxine, ormetoprim (Romet-30)	Used to control furunculosis and enteric septicemia
Tricaine methanesulfonate	Anesthesia/sedation
Sulfamerazine	Used to control furunculosis (not currently available)

Table 2. Drugs undergoing the approval process but not currently legal.

Amoxicillin trihydrate	Oral antibacterial (INAD/NADA # 9659)
Aqui-S	Anesthetic (INAD/NADA # 9731)
Azamethiphos (Salmosan)	Sea Lice control (INAD/NADA # 10-137)
Chloramine-T	External microbicide (INAD/NADA # 8086)
Common carp pituitary	Spawning aid (INAD/NADA # 9728)
Copper sulfate	External microbicide (INAD/NADA # 10-046)
EarthTec	External microbicide (INAD/NADA # 9996)
Erythromycin	Oral antibacterial (INAD/NADA # 4333, 6430)
Fumagillin	Mxyozoan control (INAD/NADA # 10-106)
17-methytestosterone	Sex reversal aid (INAD/NADA # 10-296)
Ovaplant (S-GnRH)	Spawning aid (INAD/NADA # 10-087)
Ovaprim	Spawning aid (INAD/NADA # 10-040)
Potassium permanganate	External microbicide (INAD/NADA # 10-223)
Pyceze	External microbicide (INAD/NADA # 10-366)

The tables above and on page three list the **drugs and chemicals legal in aquaculture**. Keep in mind that regulations constantly change and that this article only serves as a guideline. In aquaculture, as in all agriculture, the label is the law. You can only use drug or chemicals if your intended use exactly matches the label. If your intended use differs, contact the UAPB Fish Diagnostic Laboratories for advice before purchasing or using the chemical. Also remember it is not legal to substitute another brand for the labeled version; for example, substituting an unapproved brand of formaldehyde for a slightly more expensive approved brand.

Part 2 of this article, covering "action deferred" to vaccines (categories 5-9), will appear in a future issue of Arkansas Aquafarming.

Direct questions to any UAPB Fisheries Extension contacts listed on page one.

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Table 3. Drugs determined to be of a low regulatory priority.

Acetic Acid	Used at 1000-2000 ppm dip for 1-10 minutes as a parasiticide.
Calcium Chloride	Used to increase water calcium concentration to ensure proper egg hardening. Dosages would be those necessary to raise calcium concentration to 10-20 ppm $CaCO_3$. Used up to 150 ppm to increase water hardness for holding and transporting fish (helps fish maintain osmotic balance)
Calcium Oxide, Calcium Hydroxide (quicklime, hydrated lime, slaked lime)	Used as a pond disinfectant. Chemical is sprinkled on the drained, wet, bottom and sides of earthen ponds at 2000 lbs/acre. Used as an external protozoacide for fingerlings to adult fish at 2000 ppm for 5 seconds.
Carbon Dioxide Gas	For anesthetic purposes.
Fuller's Earth	Used to reduce adhesiveness of fish eggs to improve hatchability.
Garlic (Whole Form)	Used to control helminths and sea lice on marine salmonids.
Hydrogen Peroxide	Used at 250-500 ppm to control fungi on all species and life stages of fish, including eggs.
Ice	Used to reduce metabolic rate of fish during transport.
Magnesium Sulfate	Used to treat external monogenic trematode infestation and external crustacean infestation in fish at all life stages. Immerse fish in 30,000 ppm $MgSO_4$ and 7000 ppm NaCl for 5-10 minutes.
Onion (Whole Form)	Used to treat external crustacean parasites and to deter sea lice from infesting external surface of salmonids at all life stages.
Papain	Used as a 0.2% solution in removing the gelatinous matrix of fish egg masses in order to improve hatchability and decrease the incidence of disease.
Potassium Chloride	Used as an aid in osmoregulation; relieves stress and prevents shock. Dosages used would be those necessary to increase chloride ion concentration to 10-2000 ppm.
Povidone Iodine	Used to disinfect eggs. Use 50 ppm for 30 minutes during water hardening, or 100 ppm for 10 minutes after water hardening.
Sodium Bicarbonate	Used at 142-642 ppm for 5 minutes as a means of introducing carbon dioxide in the water to anesthetize fish.
Sodium Chloride	Used as a 0.5% to 1.0% solution for an indefinite period as an osmoregulatory aid for the relief of stress and shock prevention. Used as a 3% solution for 10-30 minutes as a parasiticide.
Sodium Sulfite	Used as a 1.5% solution for 5-8 minutes to treat eggs in order to improve their hatchability.
Thiamine Hydrochloride	Used to prevent or treat thiamine deficiency in salmonids. Eggs immersed in a solution of up to 100 ppm for up to 4 hours during water hardening. Sac fry are immersed in a solution of up to 1000 ppm for up to one hour.
Urea and Tannic Acid	Used to denature the adhesive component of fish eggs at concentrations of 15 g urea and 20 g NaCl per 5 L of water for 6 minutes, followed by a separate solution of 0.75 g tannic acid per 5 L of water of 6 more minutes. This will treat approximately 400,000 eggs.

Upcoming Events

Second Annual Fish Olympics
9:30 a.m. - 1 p.m., September 25, 2003, UAPB's Aquaculture Research Station. Turn off highway 79 North at Oliver Road, next to the new UAPB football stadium. This day of activities will promote aquaculture and fisheries to high school students. Activities are geared toward getting them acquainted with occupations in the field. See www.uaex.edu/aquaculture/olympics/ for more information or call (870) 543-8123.

Arkansas Aquaculture 2004
January 15 - 17, 2004, Austin Hotel, Hot Springs, Arkansas. Annual educational meetings. Sponsored by the Catfish Farmers of Arkansas and the Arkansas Bait and Ornamental Fish Growers Association. For registration information contact Bo Collins at (870) 673-4059 or Ronnie Anderson at (870) 552-7506.

Fish Farming Trade Show
February 5 - 6, 2004, Washington County Convention Center, Greenville, MS. Tenth annual regional trade show and conference. Sponsored by Catfish Farmers of Arkansas, Catfish Farmers of Mississippi, Alabama Catfish Producers and Louisiana Catfish Farmers Association. Contact Mike McCall, (601) 714-5327, for more information.

Catfish Farmers of America Annual Convention
February 26 - 28, 2004, Sheraton Hotel, New Orleans. Contact (662) 887-2699.

World Aquaculture 2004
March 1 - 5, 2004, Hawaii Convention Center, Honolulu, Hawaii.
Triennal gathering of aquaculturists from all over the world. The National Aquaculture Association will sponsor this event in collaboration with the U.S. Aquaculture Suppliers Association, World Aquaculture Society, the National Shellfisheries Association and the Fish Culture Section of the American Fisheries Society. See http://www.was.org/meetings/Hawaii/Pages/RegBrochure.asp for more information or call (760) 432-4270.

Bird Depredation Permits

Micheal Kearby
USDA/APHIS/Wildlife Services
Hugh Thomforde
Extension Aquaculture Specialist

Migratory bird depredation permitting has changed considerably in recent years. Ten years ago few aquaculture facilities held depredation permits for the control of fish eating birds. However, research revealed that fish eating birds cause considerable economic loss, and therefore the process for obtaining a depredation permit was improved.

Depredation permits are a control tool issued by the U.S. Fish and Wildlife Service (USFWS) for the lethal take of fish-eating birds causing damage to commercial aquaculture facilities. They are to be used in conjuction with non-lethal methods of keeping birds away from ponds. Wildlife Services, of the U.S. Department of Agriculture, Animal Plant Health Inspection Services (USDA/APHIS/Wildlife Services), serves a vital role in facilitating applications and permits by providing technical and administrative assistance to both fish producers and USFWS regulators.

The steps for obtaining a permit are simple. The fish farmer must first contact Wildlife Services to declare that a problem exists, and that he/she needs help with controlling bird depredation on the farm. The next step is for a member of the Wildlife Services staff to investigate the problem.

During the initial site visit a biologist comes to your farm, examines the problem, and provides non-lethal harassment suggestions for the development of an intensive bird control program which may be implemented even without a depredation permit. The Wildlife Services biologist will assist with all stages of the application for a permit and will forward the paperwork to USFWS, along with specific technical recommendations. If USFWS approves the request, Wildlife Services will provide the applicant with the depredation permit. USFWS requires annual reporting of the number of birds killed under the permit. Wildlife Services personnel are available to assist producers with reporting requirements.

Commercial aquaculture production in the southeastern United States is expected to increase. Likewise, problems associated with migratory bird depredation on fishponds are expected to grow. USDA/APHIS/Wildlife Services remains committed to provide assistance to the fish farming industry.

Wildlife Services: (501) 324-5382 or (870) 673-1121

Review of AGFC Restricted Species List

George Selden - Extension Fisheries Specialist

In October 2002, the Arkansas Game and Fish Commission (AGFC) updated its Approved Aquaculture Species List. Most commercial fish producers are unaffected by this, and may go about their business as usual. However, several established species have now been placed on the Restricted Species List. This occurred due to criticism at the regional and national level. The list includes silver carp, bighead carp, diploid black carp and European rudd. AGFC requires that persons possessing or desiring to possess these species apply for a Restricted Species Possession Permit. Triploid (sterile) black carp are *not* on the list of restricted species–they are on the Approved List and can be held without a special permit.

In the permit application, producers must detail the species and numbers held, the location of the facilities and describe measures taken to prevent escape. Pond escape barriers, such as double-screening of discharge pipes, are required. Permit holders will be required to implement these and any other escape prevention precautions they have proposed in their application. If AGFC determines that the potential for fish escape is acceptably low, they will grant a no-fee Restricted Species Possession Permit, renewable on an annual basis.

The permit holder is responsible for notifying the AFGC of any escapes. While the farmer won't be held liable for escapes due to unforeseen circumstance, such as floods, lightning or sabotage, everything possible should be done to reduce the chance of escapes due to such occurrences. For example, the farmer should be very concerned about flooding. Locations in an active flood zone should not be used for the culture of restricted species. The permit holder is expected to assure that buyers of restricted species within Arkansas also possess an approved permit. Estimates of the numbers of fish to be held must be provided at the time of renewal.

UAPB aquaculture/fisheries Extension specialists have copies of the necessary paperwork. Direct specific questions to Brian Wagner, AGFC Nongame Aquatics Biologist, in Benton, at (877) 847-2690.

Channel Catfish Virus Research Proves Beneficial

Dr. Andy Goodwin - Extension Fish Pathologist

Dr Wayne Gray of the University of Arkansas College for Medical Sciences (UAMS) studies herpes viruses to learn better ways to prevent and treat diseases in humans. As part of his work, he has studied fish herpes viruses collaborating with me on koi herpes virus and with Dr. Billy Griffin (retired) of the Stuttgart National Aquaculture Research Center (SNARC), on channel catfish virus (CCV).

The CCV kills fry or fingerling catfish during the summer of their first year. The only current approach to CCV management is to avoid handling or stressing young catfish during hot weather.

Our current understanding of CCV disease is that it works a lot like chicken pox, a common herpes viral disease of humans. Almost everybody gets chicken pox as a kid. As you fight off the viral infection, your immune system forces the virus to hide in nerves. If the virus tries to escape and cause problems, the immune system quickly kills the viruses before they can do any damage. Decades after a childhood case of chicken pox, stress caused by medical problems or life circumstances may inhibit the immune system allowing the virus to safely escape from the nerves and produce a new disease called "shingles." Adults suffering from shingles can infect children giving them chicken pox. In much the same way, it appears that many, if not most, adult catfish carry CCV in their tissues. When these fish are stressed they may shed the virus into the water and pass it on to young fish.

Dr. Gray lab developed a sensitive diagnostic test (PCR) for CCV and confirmed that, just like humans with chicken pox, many adult catfish carry CCV. A group of CCV-free catfish hatched from disinfected eggs and maintained in well water was exposed to CCV. Young catfish got sick and many died, but those exposed at older ages became infected with the virus but did not get sick (but they may become carriers). Thus, the virus is only dangerous to catfish at a very young age when they typically live in fingerling production ponds.

With this information, it is now possible that CCV-free broodfish could be used to produce CCV-free fingerlings. If those fish were raised in disinfected ponds with well water they could remain CCV-free until they were stocked out in foodfish production ponds. This approach has not been practical in the past because of two concerns, 1) there was no test that could easily detect carriers of CCV so there was no way to identify CCV-free broodfish, and 2) if humans are not exposed to chicken pox until they are adults, they suffer a more serious form of the disease than do children. If CCV behaved the same way, CCV-free fingerlings might have been killed when they were put into production ponds where CCV virus is undoubtedly present. Dr Gray's work shows that this is not a problem because the virus does not produce disease in the one-year-old fingerlings that would be stocked into those ponds. Thus, CCV fingerlings could now be produced and should not suffer CCV when stocked out.

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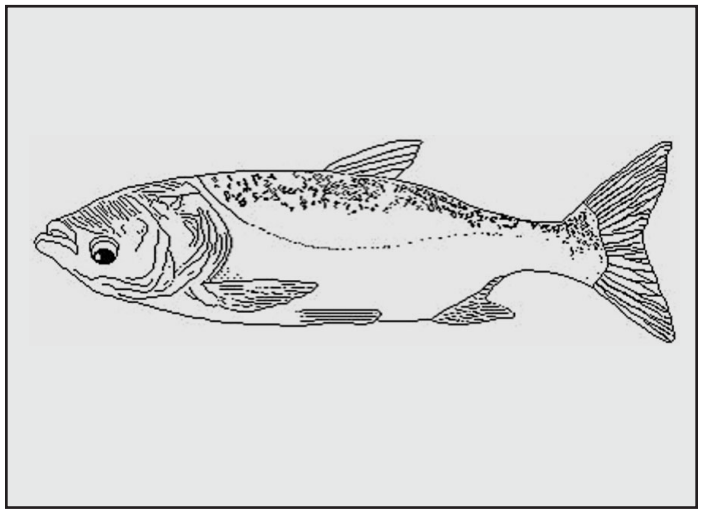
Does your fish farm need a permit for bird depredation?
See story on page 4.



New rules for bighead carp farming in Arkansas.
See story on page 5.

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