Winter School on

'RECENT ADVANCES IN DIAGNOSIS AND MANAGEMENT OF DISEASES IN MARICULTURE'

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Course Manual

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ANTIBIOTIC RESIDUES IN FARMED SHRIMP – A MAJOR HAZARD

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Antibiotics in aquaculture

Even though use of antibiotics in aquaculture practice is unscientific, unwanted and harmful, antibiotics are being used for (i) therapeutic (ii) prophylactic and/or growth promoting purposes. Also, some manufactures are incorporating certain antibiotics in shrimp feed as a preservative. The devastating shrimp diseases like white spot syndrome disease and yellow head disease are caused by viruses. Antibiotics have no therapeutic value against viruses at all. Still many of our aquaculture farmers are dumping antibiotic formulations in their farms against viral diseases. Further, even bacterial diseases cannot be treated with antibiotics, since in the aquaculture environment, effectiveness of antibiotic therapy is not at all proved. The world over, use of antibiotics in aquaculture is banned. Still clandestine efforts are being made to practice its use.

The table I gives the antibiotic formulations/antibiotics which are being clandestinely promoted for aquacultural practice in India.

Table I

Trade name of Group	Ingredient	Action
1. DART	Sulphonamide and chlorine	Anti bacterial
2. VANKOL	Sulphonamide	"
3. Tetra cyclines	Chlortetra cycline Oxytetra cycline Tetra cycline Doxy cycline	"
4. Penicillins	Ampicillin Amoxycillin	"
5. Nitro furans	Furazolidone	
6. Gentamycin	Gentamycine	
7. PIZOMEX	Quinoline based antibiotic (fluoroquinolone)	
8. Chloramphenicol	Chloramphenicol	"

Why antibiotics should not be used in aquaculture ?

i) Effect on environmental microflora

The aquaculture environment is a very dynamic system. The chemical / biochemical / gaseous equilibrium, in the farm, i.e. the water quality is maintained by the mineralisation process caused by microflora, mainly bacteria. In the shrimp farms, on an average, 60 mg/m^2 of waste is resulted for every kilogram of shrimp produced. These organic wastes are mineralized and farm environment kept clean and healthy by the farm/soil microorganisms.

When we use antibiotics/antibacterial chemicals in the farm either as therapeutical, prophylactic or growth promoters, they destroy the environmental microflora. The scavenging action by microflora is destroyed. So waste accumulate in the farm, resulting in favourable environment for disease.

ii) Development of drug resistant bacteria, including pathogens.

Use of antibiotics results in the emergence of drug resistant bacteria, some of which are human pathogens.

4. **Retention of drug residue in farmed shrimps**

The antibiotics used in aquaculture will accumulate in the shrimp tissue and exoskeleton. The drug withdrawal period before harvesting, usually 2-3 weeks will not eliminate the accumulated residues from the tissues, and particularly from exoskeleton. The European Union, US FDA and Japan have notified that residues of the following antibiotic should not be present in the imported shrimp.

1. Chloramphenicol
2. Furazolidine
3. Nalidixic acid
4. Neomycine
5. Oxolinic acid (quinoline compound)
6. Oxy tetra cycline
7. Tetra cycline
8. Sulphamethaxazole/Trinethoprim (Sulphonamide)

The Government of India has recently notified the maximum permitted residual level of antibiotics in fish & fishery products (Table II).

Table II: ANTIBIOTIC RESIDUES

Permitted Maximum Residual Level (MRL) of antibiotics in fish/fishery products

1. **European Union Standards**

(Annexure-III to the EEC Regulation No.2377/90)

Anti-infection agents, Antibiotics and quinolones **SHOULD NOT BE .PRESENT** in fish/meat products imported to the EU Countries except (1) Sarafloxacin upto 0.03 ppm in Salmonid fishes, (2) Nafcillin in borine products (0.3 ppm in meat and 0.03 ppm in milk).

2. **US FDA**

(Fish & Fisheries Product Hazards & Controls
Guidance : 3rd Edn, June 2001)

1	Oxytetracycline	2 ppm	In Salmonids, Cat fish & lobster only
2	Sulfamerazine	Nil	All fishes
3	Sulphadimethoxine/ Ormetoprim combination	0.1 ppm	In Salmonids and Cat fish only

No other antibiotics permitted in fish/fishery products

3. **Government of India**

(Order New Delhi dated 17th August 2001, The Gazette of India (Extra ordinary), Part II – Section 3, Sub Section (ii) No.582).

S.No.	Antibiotics	Max. Residual level in ppm *
1	Chloramphenicol	Nil
2	Furazolidone	Nil
3	Neomycin	Nil
4	Tetracycline	0.1
5	Oxytetracycline	0.1
6	Oxolinic acid	0.3
7	Trimethoprim	0.05
8	Nalidixic acid	Nil
9	Sulphamethazole	Nil

- **For export to EU, USA & Japan, the MRL fixed by individual countries are to be complied with.**

4. **Japan**

No antibiotic residue is permitted except tetracyclines, to a maximum of 0.1 ppm.

The Present Scenario in India

Antibiotics and antibacterial substances are indiscriminately being used in India in shrimp farms in Andhra Pradesh, Tamil Nadu, Kerala & Karnataka. Maximum – in Andhra Pradesh. A recent study in Central Institute of Fisheries Technology, Cochin showed that out of the 2086 samples of farmed shrimp (Tiger prawn, White prawn and Freshwater scampi) Tetracyclines were detected in 434 samples and Chloramphenicol in 58 samples.

Recently, Chloramphenicol and Nitrofurans were detected in Indian farmed shrimp exported to Spain, Netherlands and UK in ppb levels. All the consignments were confiscated and destroyed. Indian Exporters lost nearly Rs.100 crores.

Note: Farmed shrimps from China, Vietnam & Philippines are banned in EU countries for the presence of Chloramphenicol.

The Government of India, Ministry of Agriculture vide notification No. 33035/4/2002-Fy(T_2) dated July 5, 2002 has banned the use of 24 antibiotics and pharmacologically active substances in aquaculture.

Antibiotics and other Pharmacologically Active Substances*

Sl.No.	Antibiotics and other Pharmacologically Active Substances
1.	Chloramphenicol
2.	Nitrofurans including: Furaltadone, Furazolidone, Furylfuramide, Nifuratel, Nifuroxime, Nifurprazine, Nitrofurantoin, Nitrofurazone
3.	Neomycin
4.	Tetracycline
5.	Oxytetracycline
6.	Trimethoprin
7.	Oxolinic acid
8.	Nalidixic acid
9.	Sulphamethoxazole
10.	Aristolochia spp and preparations thereof
11.	Chloroform
12.	Chlorpromazine
13.	Colchicine
14.	Dapsone
15.	Dimetridazole

Sl.No.	Antibiotics and other Pharmacologically Active Substances
16.	Metronidazole
17.	Ronidazole
18.	Ipronidazole
19.	Other nitroimidazoles
20.	Clenbuterol
21.	Diethylstilbestrol (DES)
22.	Sulfonamide drugs (except approved Sulfadimethoxine, Sulfabromomethazine and Sulfaethoxypyridazine)
23.	Fluroquinolones
24.	Glycopeptides

* *The list is proposed to be included in the amendment to the Notification SO 792 (E) dated August 17, 2001 of the Ministry of Commerce and Industries.*

The EU has issued Council Regulation 2377/90, updated upto 1-12-2000 enlisting nearly 300 pharmacologically active substances/antibiotics/sulphonamides, which are either declared zero tolerant or for which maximum residue limits (MRL) have been fixed. But, the MRLs are less than 50 ppb in most of the cases.

The EU perception of the Residues problem in Seafood

Vide EU legislation 96/23/EC & EEC n^{0}2377/90, the following Antibiotics are banned in seafood (all foods)

1. Chloramphenicol (CAP)
2. Nitrofurans: Nitrofurazone
   Nitrofurantoine
   Furazolidone
   Furaltadone and their Metabolites

3. Further, Maximum Residue Limits (MRL) have been fixed for the following:

i) Trimethoprim	-	50 ppb*
ii) Beta lactams (Penicillins)	-	4 to 300 ppb
iii) Cephalosporins	-	20 to 1000 ppb
iv) Quinolins	-	50 to 1500 ppb
v) Macrolids (Tylosin group)	-	50 to 200 ppb
vi) Tetracyclines	-	100 to 600 ppb
vii) Aminoglycosides (Streptomycins)	-	100 to 1000 ppb

*** 1 ppb = 1 nanogram/gram = 0.001 ppm**