



# Physical, Environmental and Chemical Methods of Marine Disease Prevention and Control

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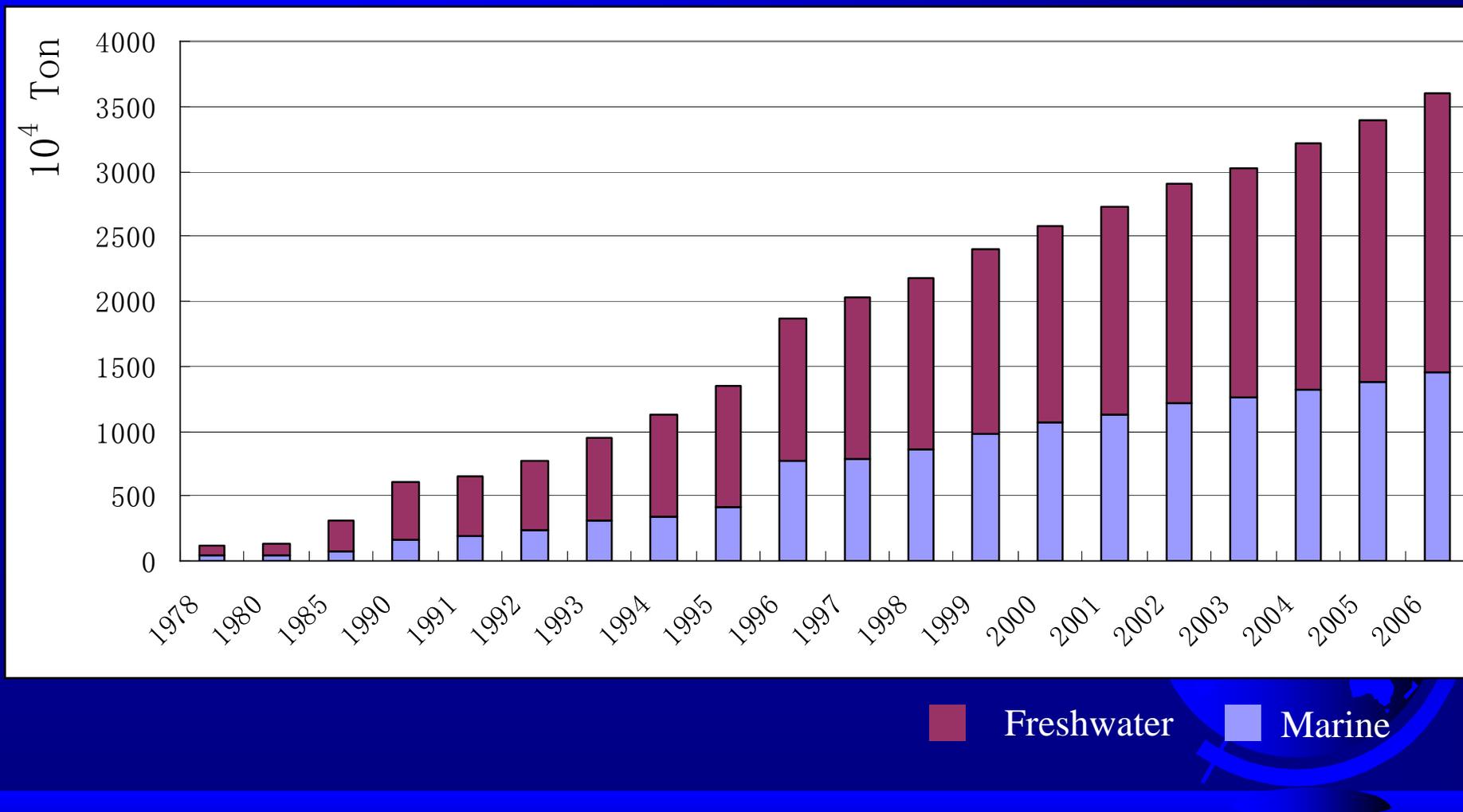
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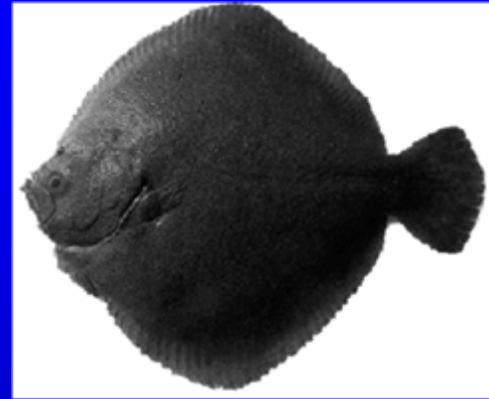
# Part 1. Background



# 1. Gross production of Chinese aquaculture (1978~2006)



## 2.The Major Cultured Marine Species in Yellow Sea



Fish : flounders, sea bass,  
fugu, dark perch

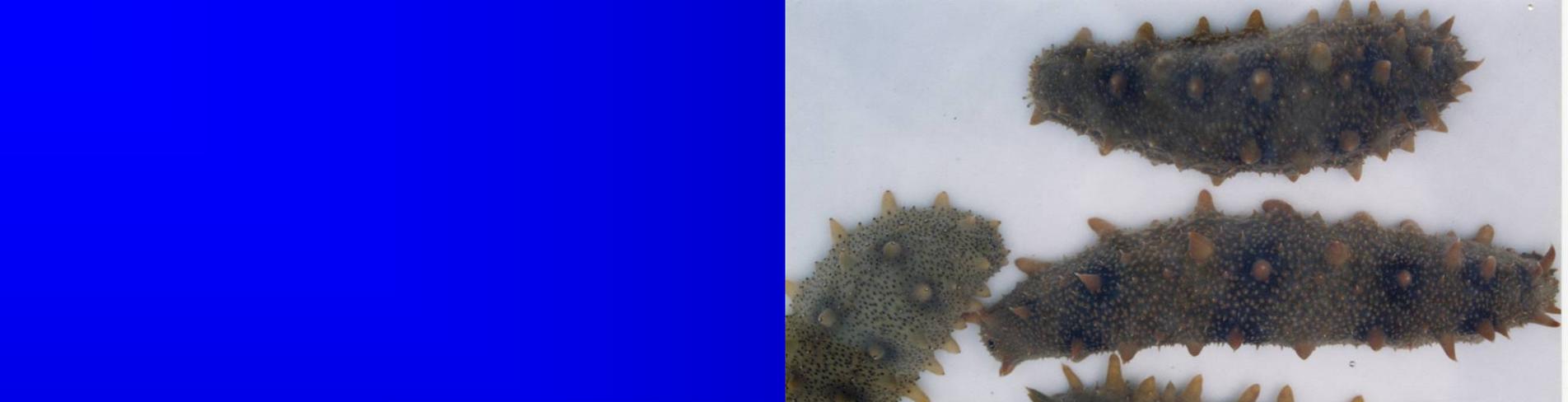




**Shrimps**

# Shellfish and Sea cucumber





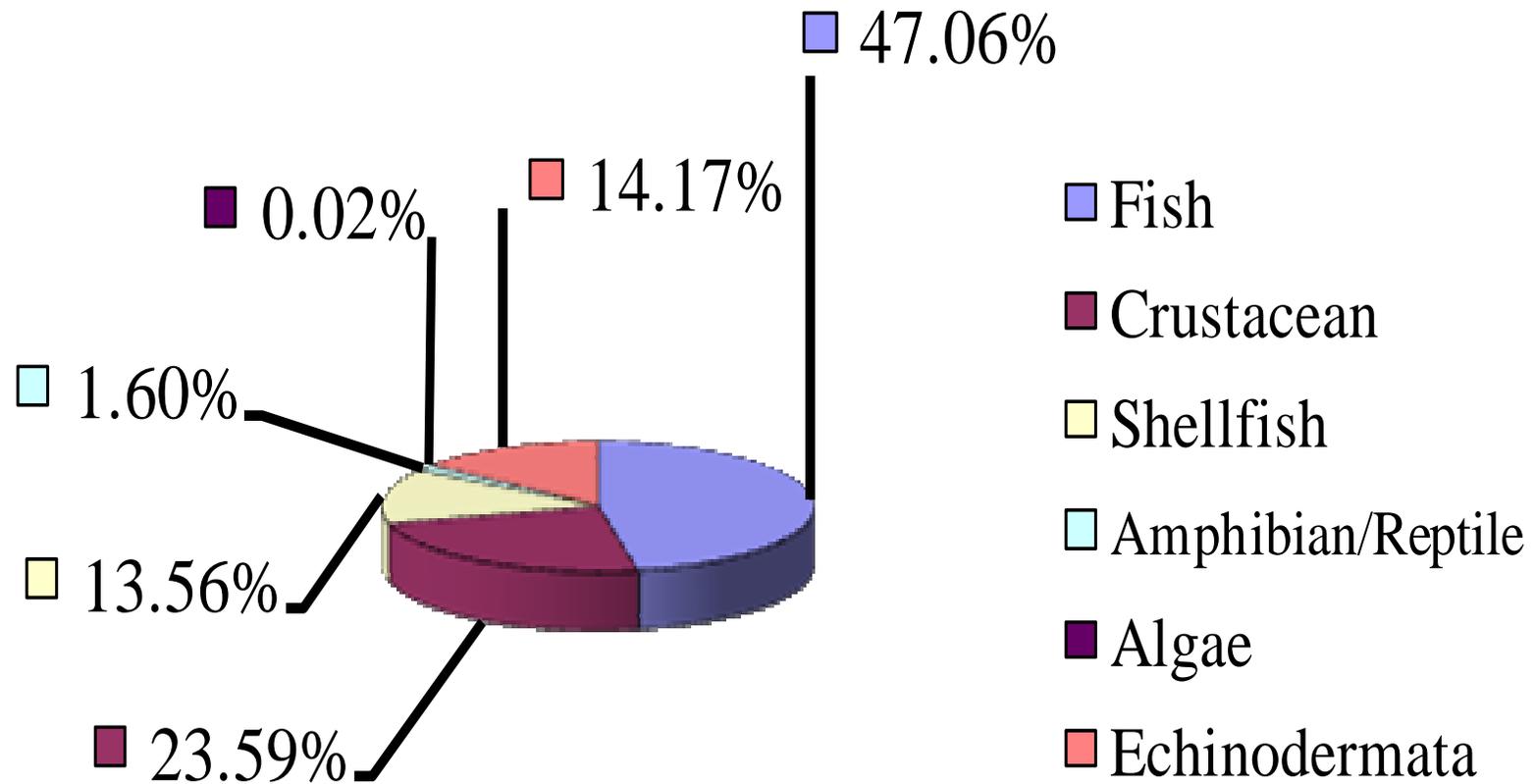
### 3.The Disease problems

Great expansion and intensification induced the occurrence of diseases since early 1990's

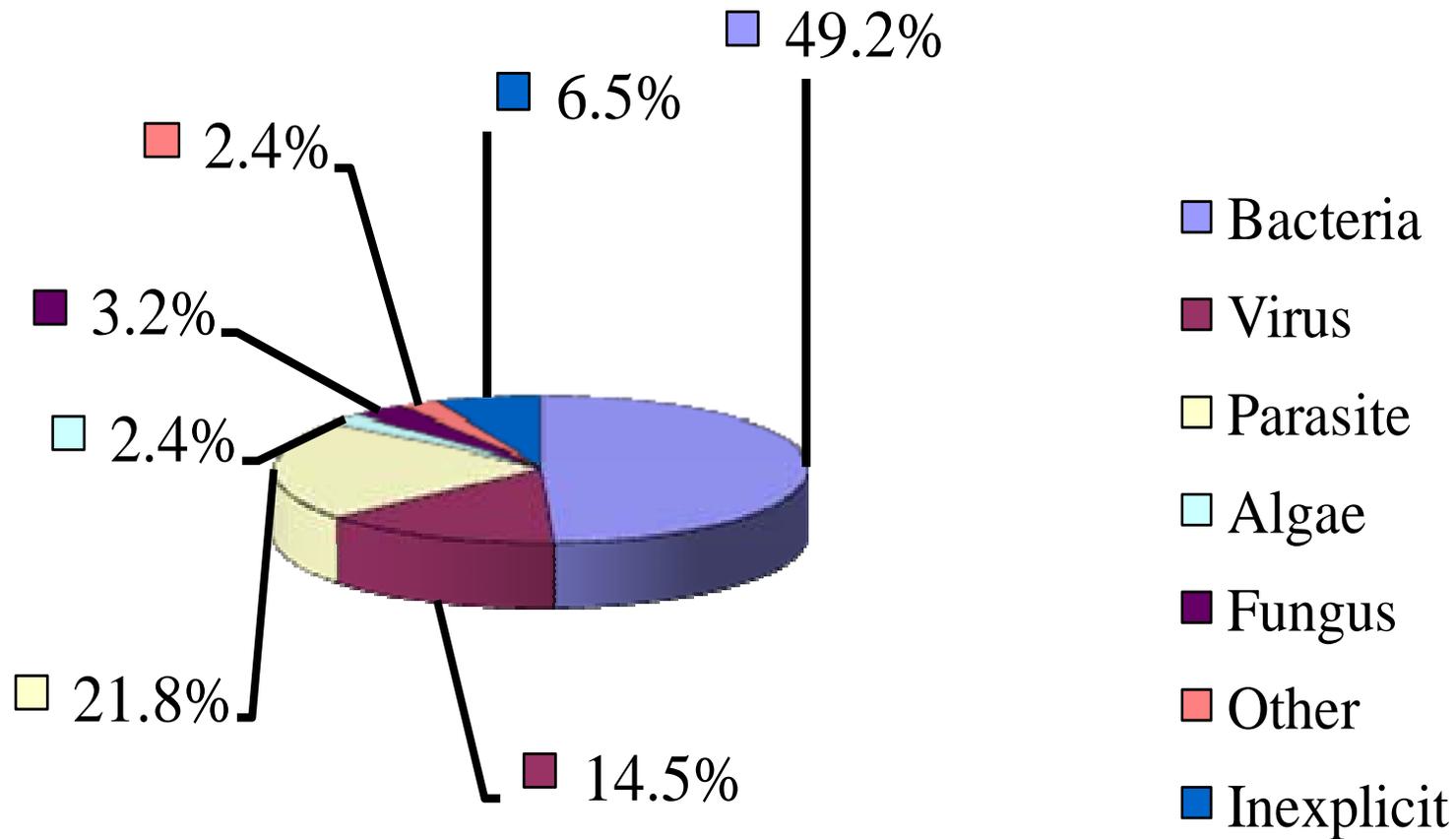
- white spot syndrome (WSSV) causing big losses of cultured shrimp in 1993 ( 1 billion USD per year)
- massive mortality of cultured scallop in 1998 ( lost 0.5 billion USD from scallop acute viral necrotic disease (SAVND)
- severe diseases occurred in cultured sea cucumber since 2002
- totally lose 2.8 billion USD per year for Chinese aquaculture

Diseases have been the major limiting factor in the development of the industry!





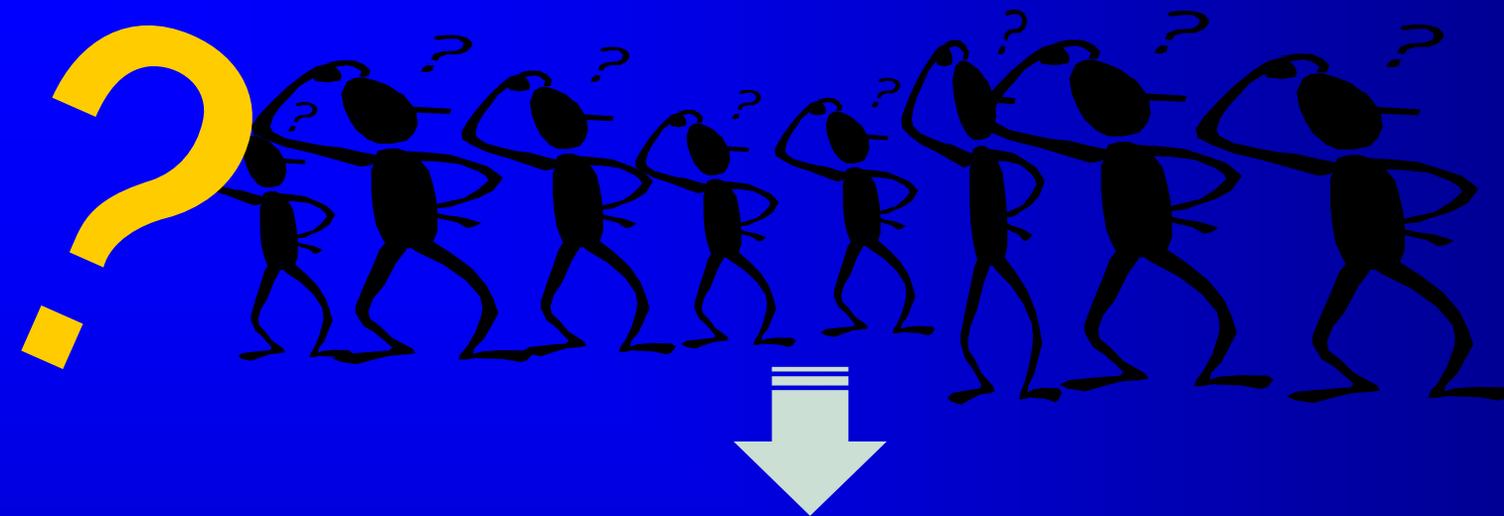
**Ratio of the losses for different species**



**Occurrence of diseases caused by different agent**

# How to prevent and control diseases?





Diagnosis

Analyse

Physical, Environmental and Chemical Methods.....



# Part II. Physical Methods



Physical method is usually applied in hatcheries and farms, to remove organic matters or kill the bed



Filters



UV light



Ozone(O<sub>3</sub>)



# Water Recycle System

- ☸ Screener
- ☸ Protein Skimmer
- ☸ Biofilter
- ☸ .....



# Part III. Environmental Methods

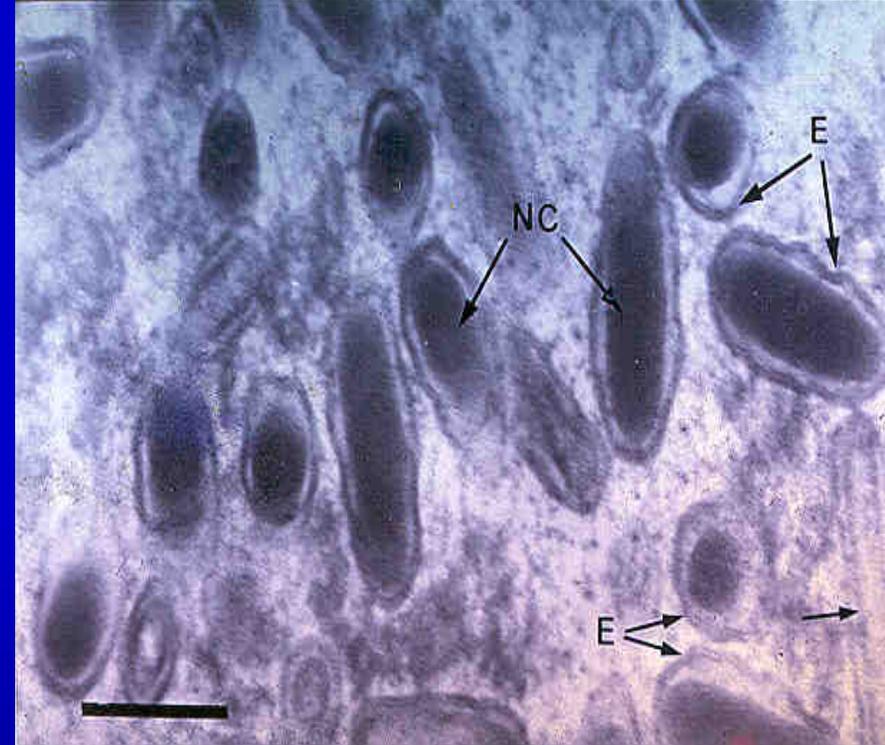
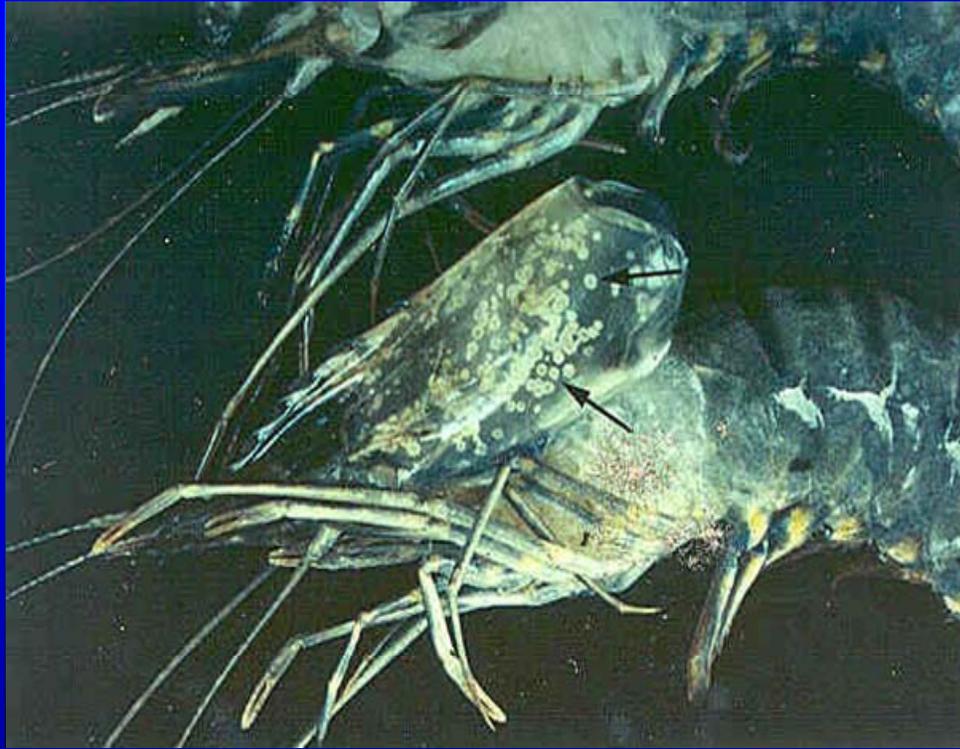


# Environmental factors

## Prevention

- ★ Keeping good water environment
  - ★ Increase or decrease salinity and temperature
  - ★ Suitable stocking density
  - ★ Establish detection and warning system
  - ★ Cut off infection route f. water source & feedstuff
- 

★ Increase or decrease salinity and temperature



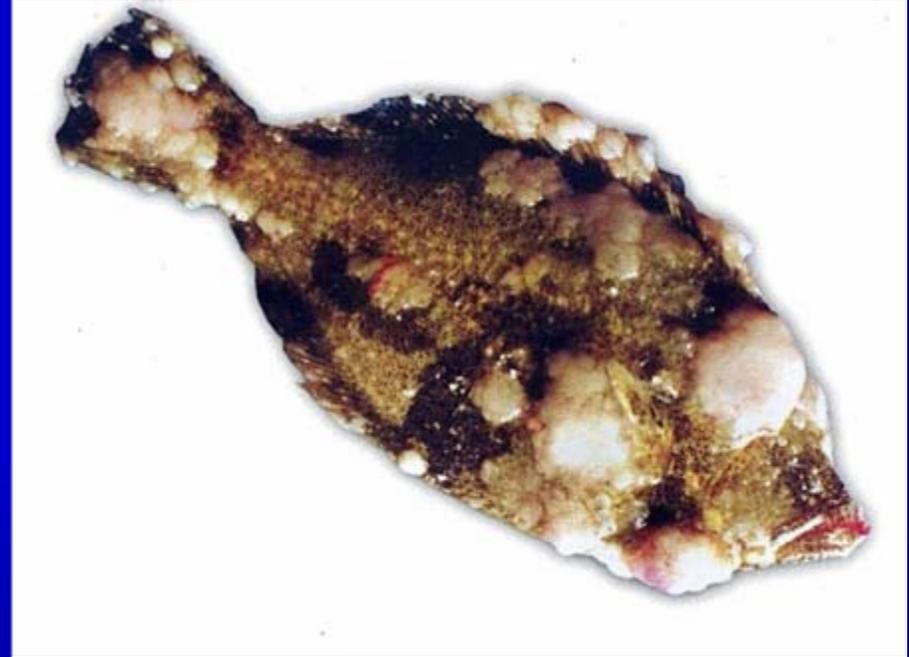
## White spot syndrome(WSS):

- WSS will occur after temperature shock down after heavy rain
- Shrimp culture in freshwater (or low down salinity) could against WSS
- The reason why the Chinese shrimp production increased after WSS outbreaks

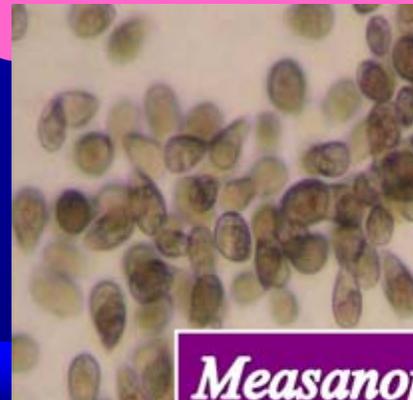
# Scuticociliatosis



# Lymphocystis disease

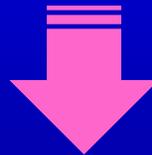


Temperature increased 3-4 °C could be useful in the treatment of above disease



*Measanoophrys carcini*

# Bacterial ulceration syndrome of Sea Cucumber



Treatment :

Increasing temperature up to 15°C, could against BUS during winter nursery.



Marine fishes are shortly immersed in freshwater will be a useful treatment for parasitic infections

Fresh water  
and fish

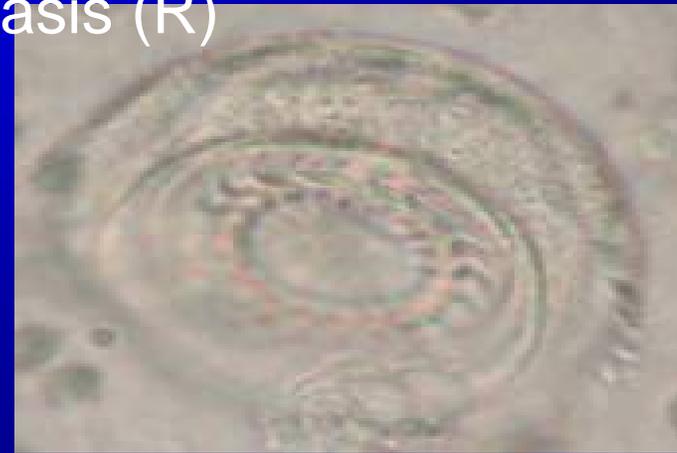


Take out  
fish after  
5-10 min

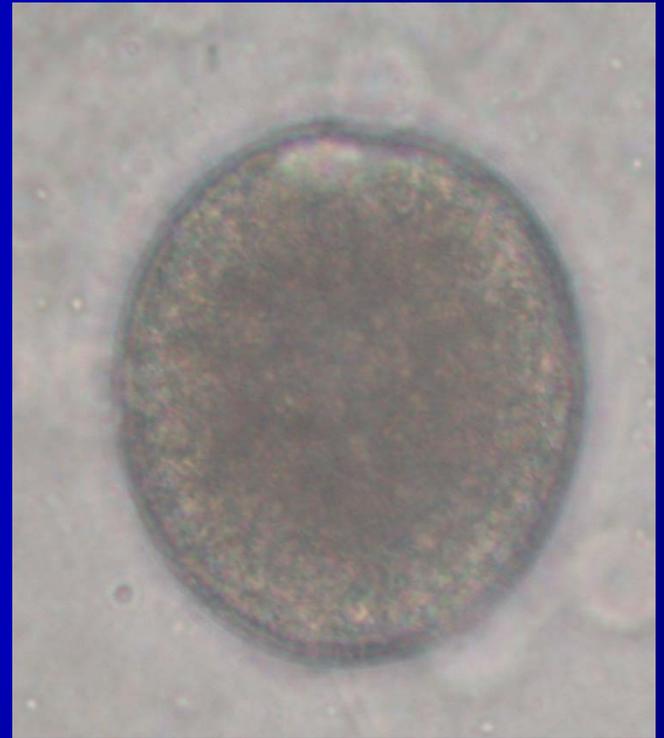




Diseased turbot infected by *Ichthyobodo necatrix* (L) & trichodiniasis (R)



Photography of *Ichthyobodo necatrix* (left) and trichodiniasis (right)



Ichthyophthiriasis locate on fish gills and its  
photography of parasite *Ichthyophthirius marinus*



# Part IV. Chemical Methods



Biological products  
immunostimulant, vaccine,  
microecological modulator,  
diagnostic reagent etc.

Antibiotics

Disinfectants

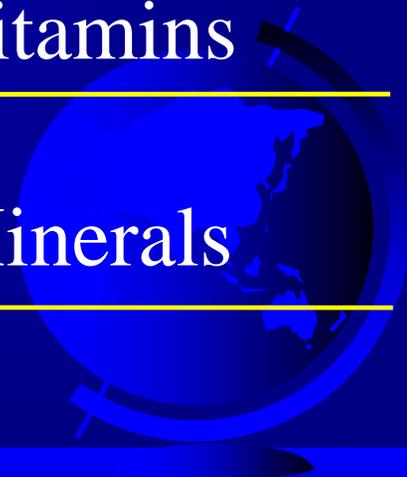
Pesticides

Vitamins

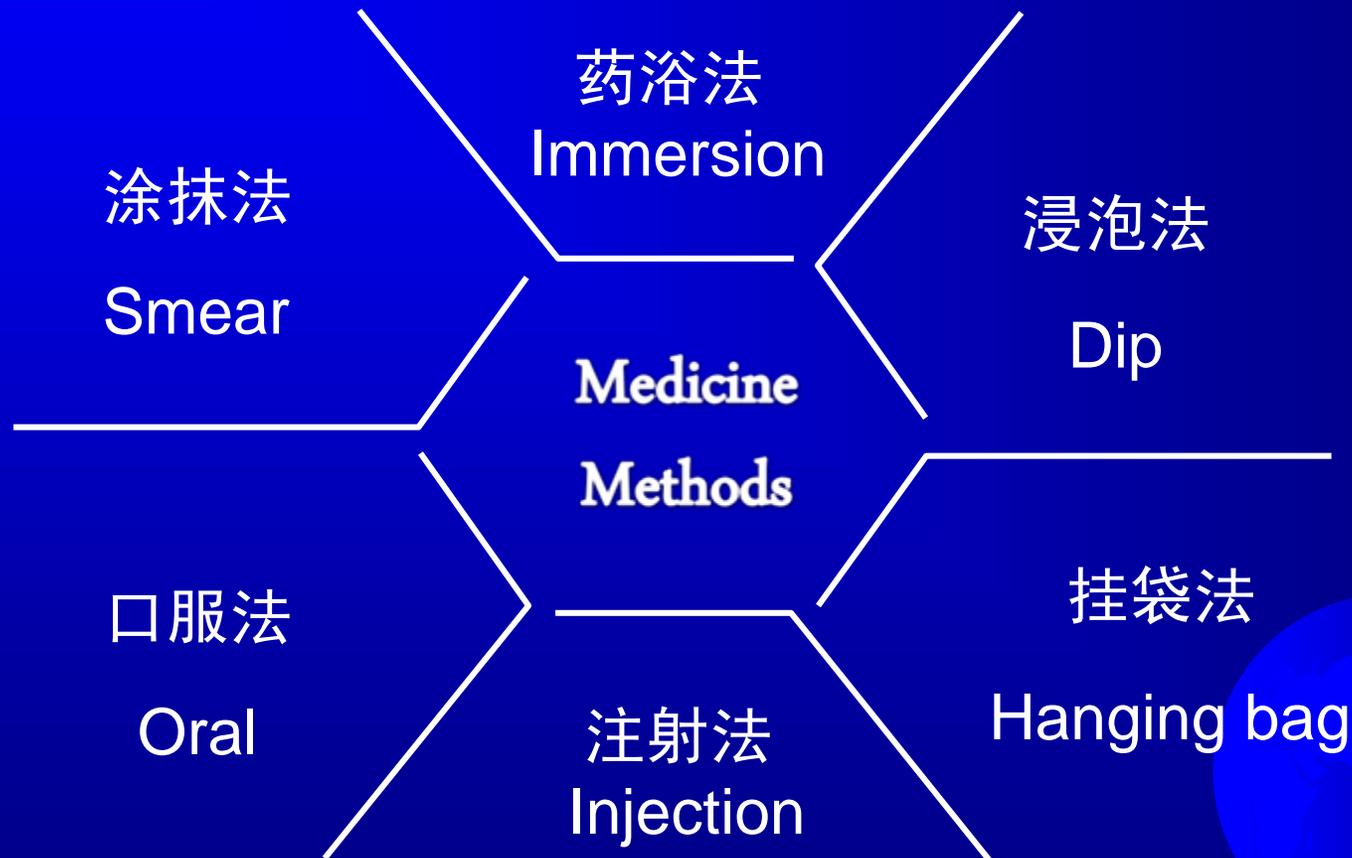
Herbals

Minerals

**Chemical**



# Aquatic medication



# Disinfectants

e.g. NaClO , Iodine, CaO etc.

**Liming with  
CaO**



# Antibiotics

Use of high efficiency, but no harm, no residues, non prohibited approved drugs



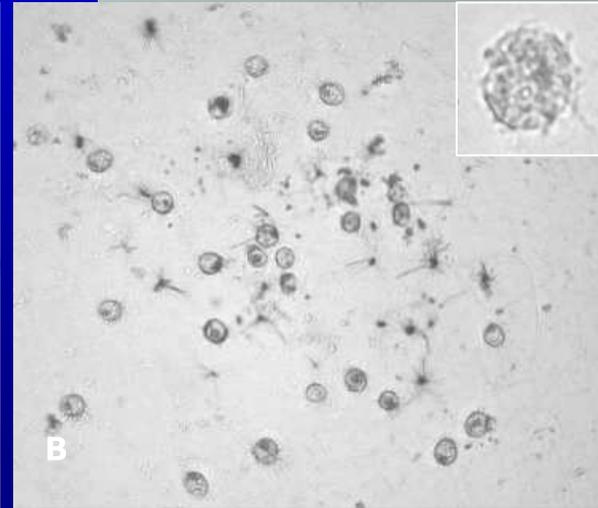
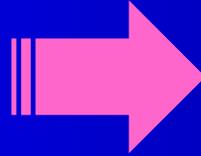
Antibiotic  
Sensitivity  
Test

ATB细菌分析检测仪



# Herbals

Oral: powder or extraction

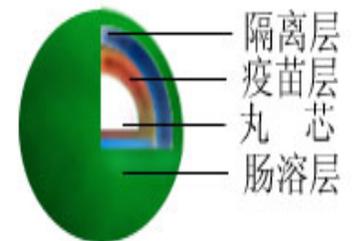


# Biological products

immunostimulant, vaccine, microecological modulator, diagnostic reagent etc.

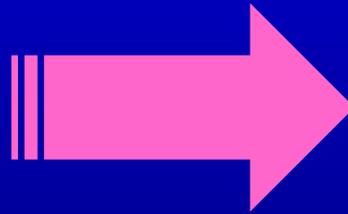


## Oral Vaccine-Enteric-coated Capsule



肠溶包衣疫苗结构示意图

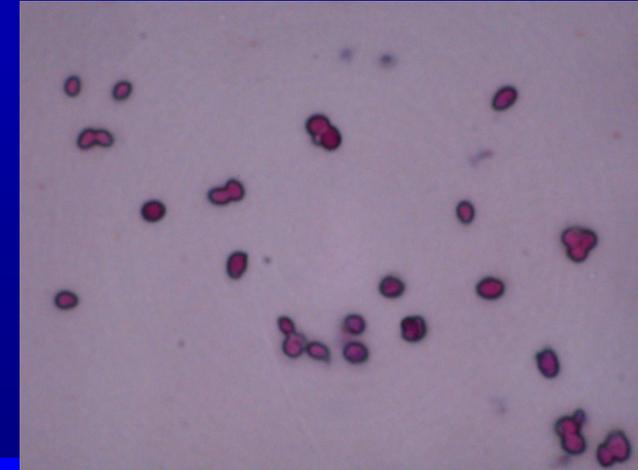
# Environment improvement



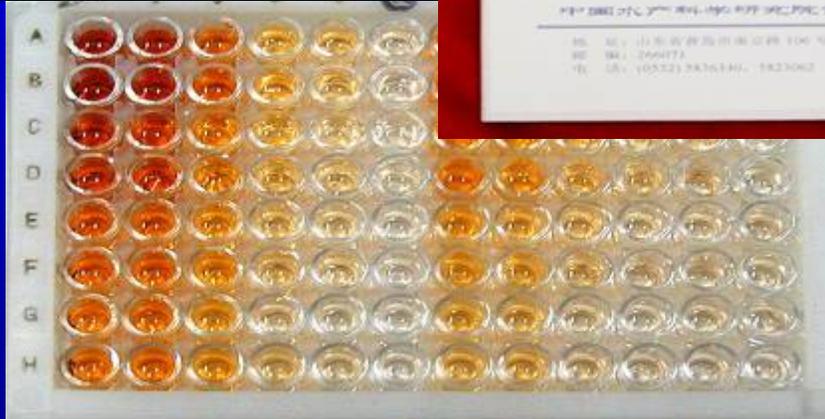
*Subtilis* sp.



*Rhodococcus phenolicus*



# Diagnostic reagent



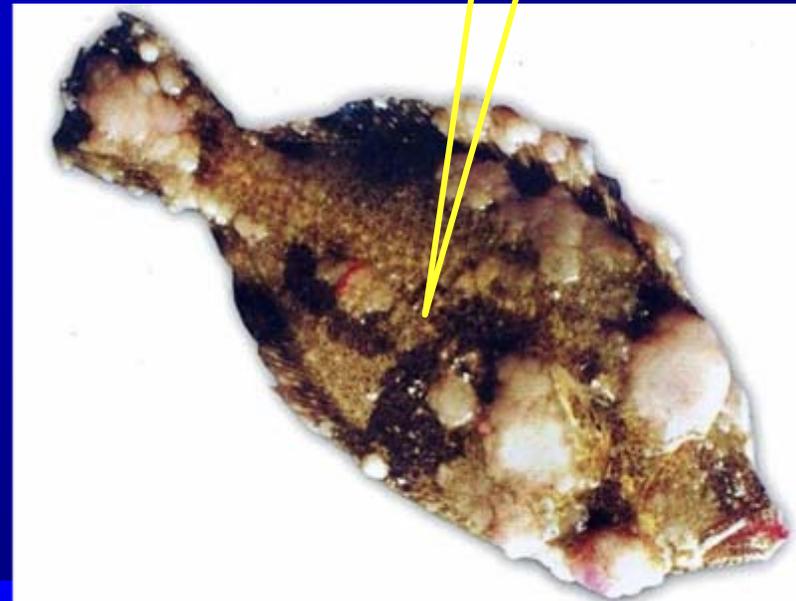
# Polyinosinic-polycytidylic Acid (poly I:C) treatment

□ Poly(I:C) is a synthetic analog of double-stranded RNA(dsRNA), a molecular pattern associated with viral infection. dsRNA is known to induce interferons (IFN) and other cytokines production.

□ IFN induction is mediated by two different pathways. The first pathway leading to NF- $\kappa$ B activation depends on the dsRNA-responsive protein kinase (PKR)1, whereas the second pathway is PKR-independent and involves TLR3.

□ Transfection of 293 T cells with

TLR3 (TLR1/2, TLR4)





Food  
Safety

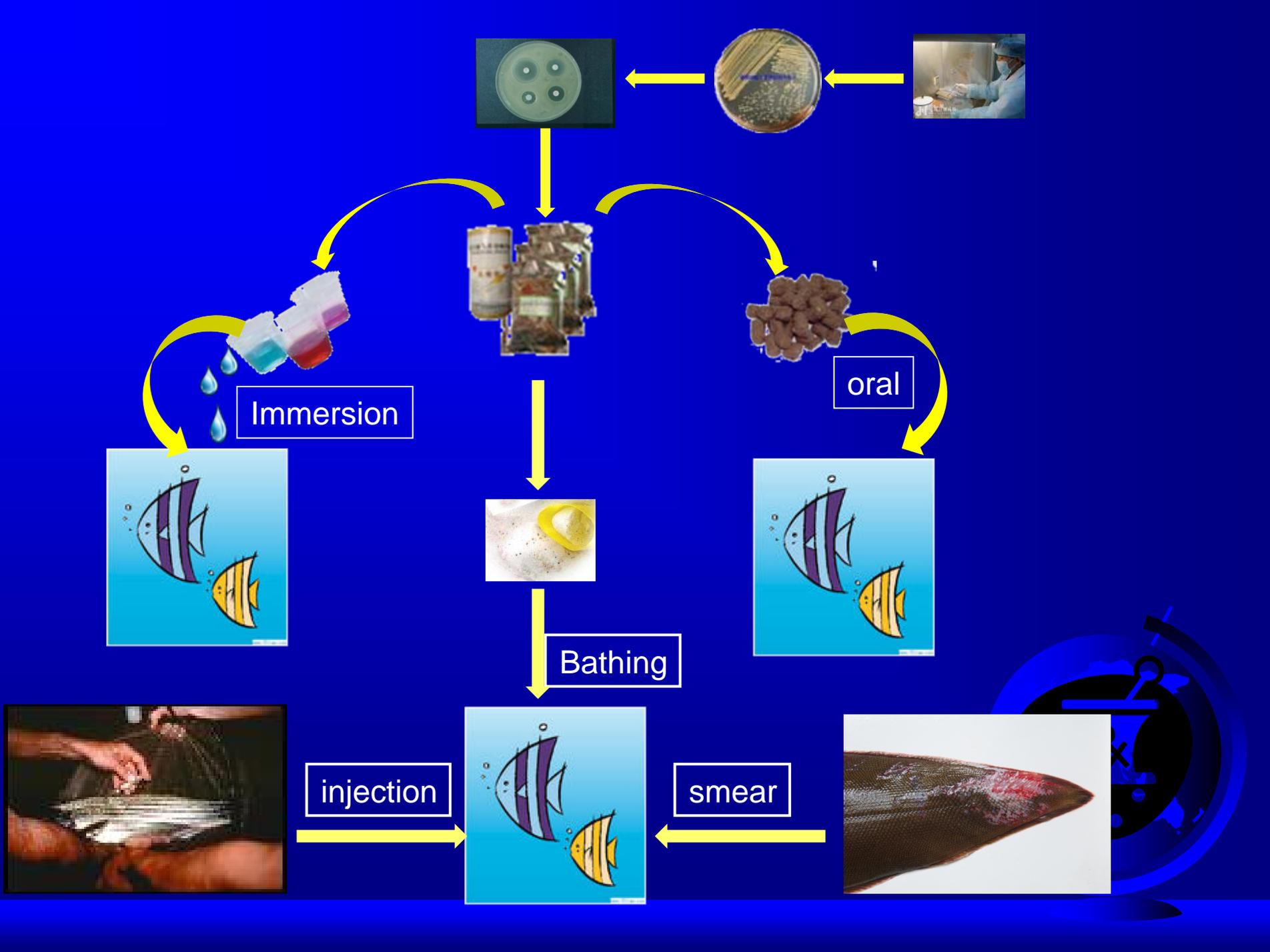


Efficiency



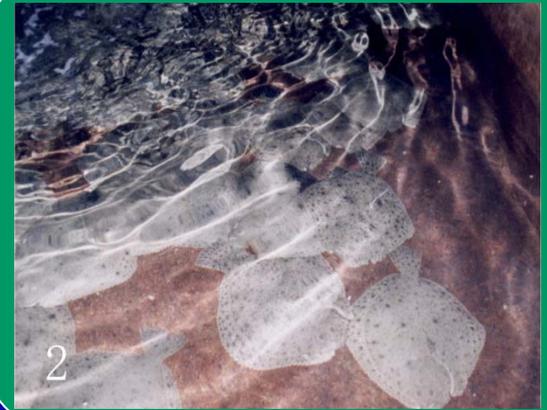
No  
Residue







*Happy Fish!*





**Thank you**

**for your attention**



# Aquatic medicament

★ disinfectants

★ antibiotics

★ herbal

★ bactericidal

★ parasitocidal

★ antivirotic

★ antifungal

★ nutritional additives

★ Immunoenhancer

★ environment improvement



# **Viral disease prevention and control**

- **Pond clean and disinfected**
- **Closed water supply system**
- **Decrease salinity**
- **SPF or SPR fry**
- **Suitable stocking density**
- **Poly-culture**
- **Cut the infect route**
- **Monitor the virus quantity termly**
- **Administration of herbs and immunopotentiator**
- **Feed with virus receptor inhibitor**



# **Bacterial disease prevention and control**

- **Pond clean and disinfected**
- **Closed water supply system**
- **Monitor water quality ( $< 10^4$ CFU/ ml)**
- **Water disinfection (UV or  $O^3$ )**
- **Tools disinfection**
- **Suitable stocking density**
- **Avoid overfeeding**
- **Administration of herbs and immunopotentiator**
- **Apply special antibiotics**



# Parasitic disease prevention and control

- Keep ponds and tools clean and disinfected
- Closed water supply system
- Decrease salinity
- Increase water exchange
- Cut the infect route and isolate infected fish
- Suitable stocking density
- Apply pesticide

Herb



Infusorian

