

# What could possibly go wrong??!!

## Or

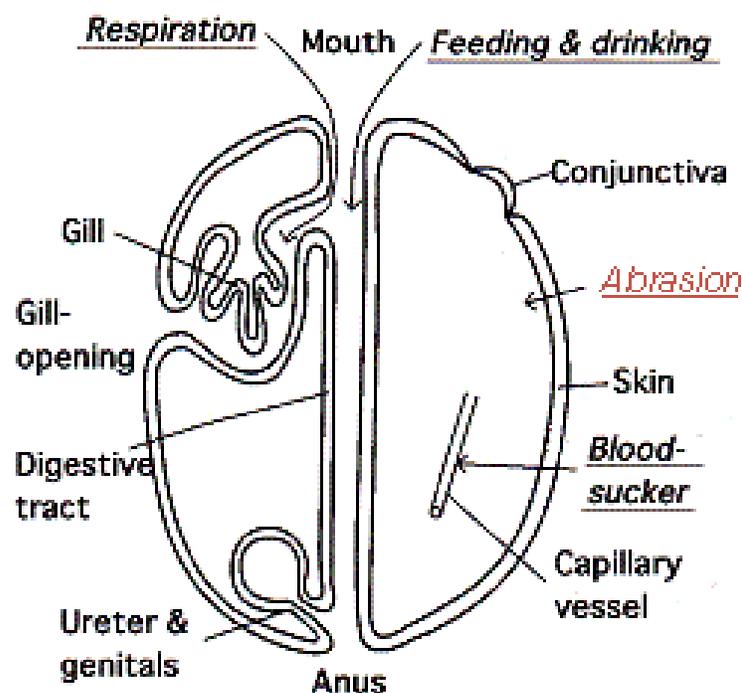
### Getting to know how your fish tick when they're sick

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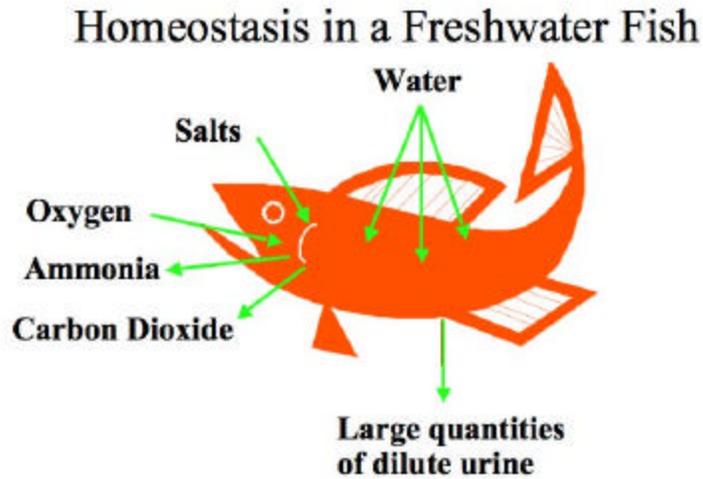
#### PREVENTION = THE KEY TO KEEPING YOUR FISH HEALTHY

- Knowledge of your animals, their biology and their husbandry requirements
- Excellent husbandry
- System design
- Environment
- Water quality
- Nutrition
- Quarantine
- An ability to recognize and respond to disease

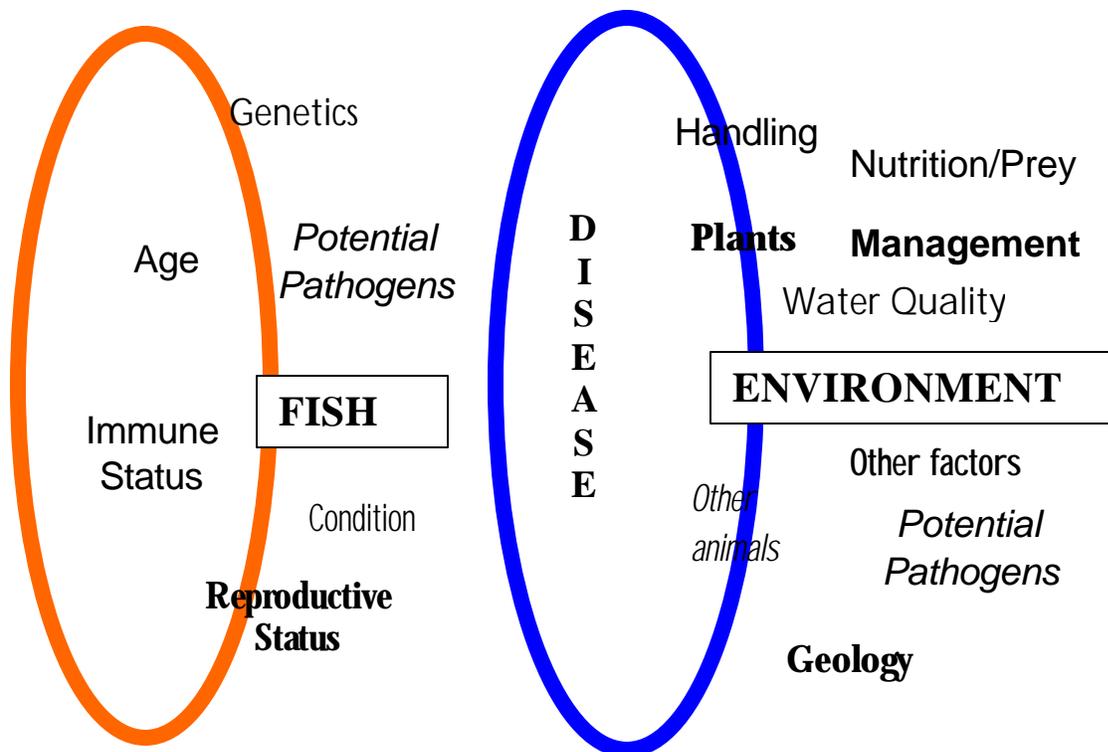
#### HOW DO MY FISH BECOME DISEASED?



## HOMEOSTASIS (MANTAINING AN INTERNAL BALANCE)



## THE EPIDEMIOLOGIC DIAD



## **FISH SKIN**

- Epidermis - living and only a few cell layers in thickness
  - First line of defense
  - Mucous/cuticle - reduces drag, waterproofing, immune function
  - Limited blood supply
  - Irritation - increased mucous, hyperplasia (cloudy)
- Dermis - scales originate from the dermis
  - Loss of scale = micro-ulcer
- Ulcers - parasite, bacterial invasion, site of water gain
- Wound Healing - epithelial cells move in from the margins to cover the wound
  - Thinning of the adjacent epithelium
  - Dermis regenerates from below
  - Healing ulcer is fragile

## **FISH GILL**

- Healthy gills - bright red, clear
- Diseased - pale, mottled, increased mucous (cloudy), necrotic areas (black, gray, white), eroded
- Structure:
  - Primary and secondary lamellae
  - Secondary lamellae - where oxygen and salts taken in and ammonia and carbon dioxide released
  - 1 cell layer between water and blood
- Irritated gills respond in 3 ways:
  - Hyperplasia - increase in cell numbers
  - Hypertrophy - increase in cell size
  - Increase mucous production
  - Each of these responses can impede oxygen and salt uptake, ammonia and carbon dioxide release
- Continued irritation can lead to gill erosion and/or necrosis

## **WHAT IS STRESS?**

- A condition in which a fish is unable to maintain a normal physiologic balance because of various factors adversely affecting its well-being.

- Stress is caused by placing a fish in a situation beyond its normal level of tolerance.

**Stressors: Husbandry Practices**

- Chasing, as with a net
- Confinement in a small space that restricts movement
- Prolonged chasing prior to capture
- Prolonged struggling in a net after capture
- Removal from the water (air exposure)
- Excessive equipment noise

**Stressors: Biological Factors**

- Intraspecific Aggression
- Interspecific Aggression
- Crowding
- Insufficient Number of shelter spaces
- Poor diet
- Microorganisms-bacteria, viruses, fungi
- Macroorganisms- parasites

**Stressors: Environmental Factors**

- Exposure to low dissolved oxygen
- Abrupt transfer to higher or lower temperatures
- Abrupt transfer from higher to lower pH
- Abrupt transfer to higher or lower salinity
- Exposure to ammonia, nitrite, copper, formalin, chlorine, ozone, elevated water bacterial loads, elevated microalgae levels, pesticides, herbicides
- Exposure to low pH
- Inadequate water flow or current
- Improper filter system design
- Improper maintenance of filtration systems
- Inadequate and/or irregular cleaning of tanks/ponds

## **THE PHYSIOLOGICAL STRESS RESPONSE**



What happens when a fish is under stress?

- Increased use of stored sugar reserves
- Freshwater fish tend to take on water
  - Increased energy requirements to osmoregulate
- Increased respiration, blood pressure, red blood cells
- Inhibition of the immune response
- Decrease in the effectiveness and/or amount of mucous.
- **INCREASED ENERGY REQUIREMENTS WHICH CAN LEAD TO AN ENERGY DEFICIT**

## **SIGNS OF STRESS AND/OR DISEASE IN FISH**

- Off feed
- Lethargy
- Increased respiratory rate
- Isolation
- Opercular flaring
- Excess mucus production
- Gasping at surface
- Clamped fins
- Reddened/ulcerated areas on fins/body
- Changes in color
- Scale Loss
- Improper buoyancy

## **RECOGNITION AND RESPONSE TO DISEASE**

- Watch the fish closely
- Look signs of disease
- Respond early and quickly
- Try to constantly learn about your fish
- The more the you know about what is normal and abnormal the earlier they may be able to recognize problems

*But if you tame me we shall need each other.  
To me, you shall be unique in all the world.  
To you, I shall be unique in all the world.  
You become responsible, forever, for what you have tamed*

**--Antoine de Saint-Exupery (1900-1944)**

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