

Stress in Aquaculture and Its role in disease Development

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- **Stress**-Stress is a condition in which fish is unable to maintain a normal physiologic state because of various factors adversely affecting its well-being.
- Stress is caused by placing a fish in a situation that is beyond its normal level of tolerance.
- **Stressors**- the things that can cause stress is called stressor.

Types of stressors-4 types

1. Physical stressors
2. Chemical stressors
3. Biological stressors
4. Procedural stressors

Physical stressors

1. Temperature: This is one of the most important influences on the immune system of fish.

2. Light

3. Sounds

4. Dissolved Gases

Chemical stressors

1. Poor Water Quality—low dissolved oxygen, improper pH
2. Pollution—intentional pollution: chemical treatments— accidental pollution: insect spray, spills
3. Diet composition—type of protein, amino acids, carbohydrates and fatty acids
4. Nitrogenous and other metabolic wastes—accumulation of ammonia, nitrite, or nitrate

Biological stressors

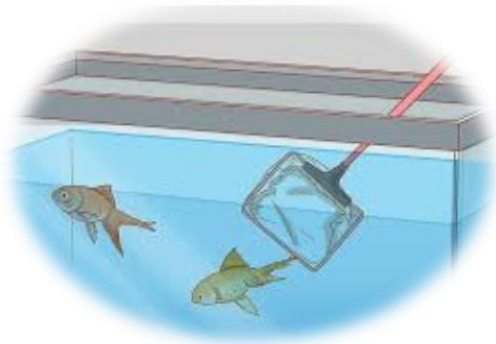
1. Population density—crowding.
2. Other species of fish—aggression, territoriality, lateral swimming space requirements.
3. Microorganisms—pathogenic and non-pathogenic.
4. Macroorganisms—internal and external parasites.

Procedural stressors

1. Handling

2. Shipping

3. Disease Treatments



Changes in body physiology under stress conditions

1. Alarm Reaction or “Fight or Flight” :

- The fight-or-flight response, also known as the **acute stress** response,
- **Acute stress** is experienced as an immediate perceived threat, either physical, emotional or psychological.
- The response is triggered by the release of hormones that prepare your body to either stay and deal with a threat or to run away to safety.
- **Chronic stress** is a prolonged and constant feeling of stress that can negatively affect your health if it goes untreated.

Hormone release during stress

1. Cortisol hormone:

- It is a hormone that works as a key player in the body's stress response and is often measured in research as an **indicator of stress**.
- Cortisol plays a vital role in the body's functioning; it's secreted by the adrenal glands and involved in the following functions and more:
 - **Proper glucose metabolism**
 - **Immune function**
 - **Inflammatory response**
 - Regulation of blood pressure
 - Insulin release for blood sugar maintenance.

2. Adrenaline hormone:

Function-

- Adrenaline is secreted by the adrenal glands.
- increases rates of blood circulation.
- Increase breathing rate.
- carbohydrate metabolism.
- prepares muscles for exertion.

Alarm Reaction events

1. Increases in blood sugar are caused by a secretion of hormones from the adrenal gland.
 - ✓ Stored sugars, such as glycogen in the liver, are metabolized.
 - ✓ This creates an energy reserve that prepares the animal for an emergency action.

2. Osmoregulation is disrupted because of changes in mineral metabolism.

Under these circumstances, a freshwater fish tends to absorb excess water from the environment (over-hydrate).

A saltwater fish will tend to lose too much water to the environment (dehydrate).

This disruption requires that extra energy be used to maintain osmoregulation.

- **Osmoregulation:** the maintenance of constant osmotic pressure in the fluids of an organism by the control of water and salt concentrations.