Overview

• Anatomy
  • Basic Fish Anatomy
  • Gills

• Diagnostics
  • Basic
  • Advanced
  • State of the Art Dx
Why Anatomy & Diagnostics?

• Anatomy
  • The better you know your fish – inside and out – the better you will be at recognizing disease, managing disease, and keeping your fish healthy
  • Recommendation: Take a good look at your fish occasionally
    • Get a good sense of what “normal” looks like – inside and out

• Diagnostics
  • Some diagnostics can be done on the farm, by the producer
    • Help identify disease as early as possible
      • Best chance to manage disease early and minimize losses
  • Other diagnostics more complex
    • The more you know, the better you will be at working with your vet or diagnostic lab to manage the health of your fish
Basic Fish Anatomy
Basic Perch Anatomy - External

Nostril
Eye
Mandible
Mouth
Maxilla
Operculum
Anterior dorsal fin
Pectoral fin
Pelvic fin
Anus
Posterior dorsal fin
Caudal fin
Dorsal
Anterior
Posterol
Ventral
Perch Basic Anatomy
Perch Basic Anatomy

Diagram of a perch showing:
- Brain
- Gills
- Heart
- Liver
- Stomach
- Intestine
- Anus
- Gonad
- Pyloric caeca
- Spinal chord
- Ear
- Swim bladder
- Muscles
- Aorta

Image of a perch organ.
Fish Gills

Gill Health is Extremely Important!

- Involved in:
  - Respiration (gas exchange)
  - Metabolite excretion (e.g. ammonia)
  - Ion exchange (e.g. Na\(^+\), Cl\(^-\), etc.)
Fish Gills

- Very delicate structures
- Irritants quickly and significantly decrease function
  - Poor Water Quality
  - Ectoparasites
  - Bacteria
  - Chemicals
Disease Diagnosis
Diagnostic Goals

• If fish are sick/dying, identify the cause of that disease

• Process involves...
  • Identification of:
    • Gross morphological abnormalities
    • Histological abnormalities (at the level of tissues or cells)
    • Presence of infectious agents
  • Combine Dx results with clinical signs, history, WQ, etc.
    • Initiating factors (often poor water quality or stress)
    • Factors ultimately resulting in morbidity/mortality
Diagnostic Tools in Fish Health

• Basic
  • Gross morphology
  • Wet-mounts (skin, fin & gill)

• Advanced
  • Bacteriology
  • Virology
  • PCR
  • Histopathology

• State of the Art
  • Electron Microscopy
  • Whole Genome Sequencing
Gross Morphology

• External signs of Dz
Wet-Mounts

• To evaluate for ectoparasites, external bacterial infections, and external fungal/saprolegnina infections

• Tissues/samples typically evaluated
  • Gill clip
  • Fin clip
  • Skin scrape
Wet-Mounts: Common Pathogens

- **Trichodina**
- **Monogenean Flatworms**
- **Saprolegnia**
- **Columnaris**
Gross Morphology

- Internal signs of Dz
Bacteriology

• Typically to test for systemic bacterial infections
• Use swab to sample sites of interest → inoculate culture media → incubate
  • Ideal sites: Anterior kidney & Brain (sterile sampling)
  • Basic media: TSA, BHI, Blood agar
    • Other media required for some pathogens
Virology

• Virus Isolation is the gold standard
  • Involves inoculating cell culture with tissues of interest
  • If virus present → virus infects cells → CPE
  • Several cell culture types & temperatures used
    • Sensitivity for particular virus dependent on cell type and incubation temperature
  • If CPE, identification of virus requires additional testing

Healthy Cells

CPE
Histopathology

• Analysis of tissues on the microscopic level
  • Can be used to diagnose a number of diseases
• Involves preserving tissues in fixative → embedding in solid paraffin block → slicing in very thin sections → staining sections → microscopic analysis
PCR – Polymerase Chain Reaction

- Molecular assay that indicates the presence or absence of DNA specific to certain pathogens
  - Works by amplifying target DNA sequence if present
- Quick, specific, can be very useful (particularly for viral or bacterial pathogens)
State of the Art Diagnostics

Electron Microscopy
• Uses a beam of electrons to create an image of specimen
• Much higher magnifications than a light microscope

Whole Genome Sequencing
• Process of determining the complete DNA sequence of an organism's genome at a single time

(Photo by A. Armien, U. of Minnesota)
Questions