Emerging Diseases of Important Mollusks

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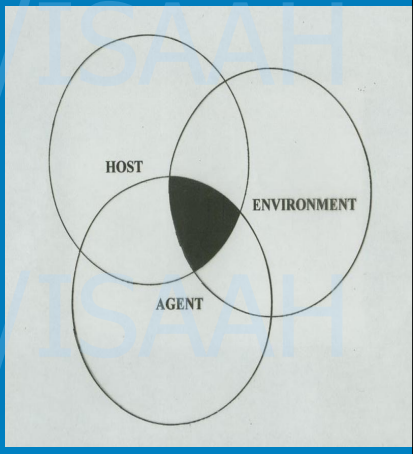
All disease is the result of the interaction of 3 factors:

- Host susceptibility
  - Poorly conditioned animal
  - Genetic lack of disease resistance (susceptibility)
- Agent virulence
  - Changed Virulence or New agent in the environment
  - Change in abundance of agents (density of agent)
  - Direct vs. Indirect infections
- Environmental conditions
  - Density of host
  - Decreased water quality
  - Temperature
  - Salinity Changes



•The elimination or modulation of any one of these factors can decrease or eliminate the occurrence of disease.

Some Emerging Diseases of Mollusks

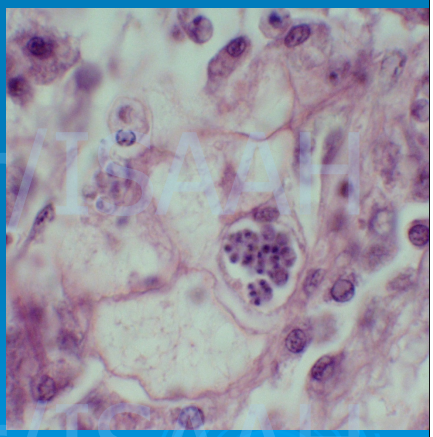
- Agents
  - *Perkinsus marinus*
    - Eastern and Pacific oysters
  - *Perkinsus olseni*
    - *Tridacna sp. (ornamental clams)*
    - *And many others*
  - Oyster Herpes Virus
    - *C. gigas*
  - Ganglioneuritis virus (Herpes) of Abalone

Perkinsus marinus (Dermo) infections

HOST: *Crassostrea virginica* (EASTERN OYSTER)

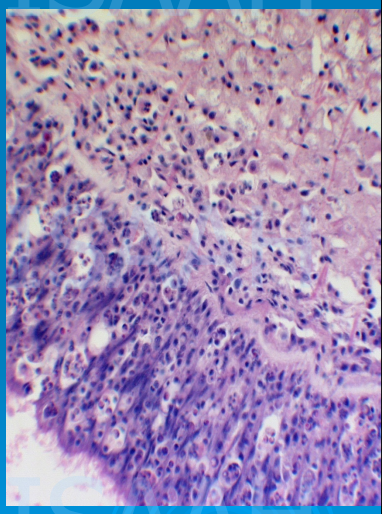
DERMO DISEASE

- **AGENT**
  - ***PERKINSUS marinus, a dinoflagellate***
  - **FORMS IN TISSUE**
    - **IMMATURE MERONTS**
    - **SIGNET RING**
    - **SCHIZONT/SPORANGIUM**
  - **FORMS IN SEAWATER**
    - **ZOOSPORANGIA/ ZOOSPORES**
- **DISEASE**
  - **HEMOCYTIC ANEMIA**
  - **HIGH MORTALITY**

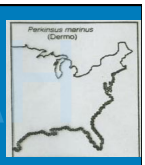


DERMO DISEASE

- **EPIDEMOLOGY**
  - **DIRECTLY INFECTIVE!**
- **CHARACTERISTICS OF INFECTION**
  - **>18° C**
  - **DERMO CAN TOLERATE LOW SALINITIES (3PPT)**



DERMO DISEASE
GEOGRAPHICAL LOCATION



- 1940 – CAUSED MORTALITY IN GULF OF MEXICO
- 1950 – FOUND IN CHESAPEAKE
- 1957 – HIGH MORTALITY ON CHESAPEAKE SIDE OF VIRGINIA (LOWER SALINITY)
- 1980 – HIGH MORTALITY ON THE ATLANTIC SIDE OF VA
- 1990 – HIGH MORTALITY IN DELAWARE BAY
- 1992 – FOUND IN MA/CT/RI
- 2010 – MAJOR CAUSE OF MORTALITY FROM MASSACHUSETTS TO THE GULF OF MEXICO

EFFECTS OF CHANGING ENVIROMENT ON THE OCCURRENCE AND SEVERITY OF DERMO

- INCREASED TEMPERATURE (GLOBAL WARMING?)
- 1997 - INCREASED OCCURRENCE AND SEVERITY OF DERMO HAS BEEN IDENTIFIED IN MA AND IS CASUALLY ASSOCIATED WITH WARMER TEMPERATURES AND EXTENDED MILD FALL TIME PERIODS
  - FORD AND SMOLOWITZ

WHERE DID IT COME FROM?

- With movement of *C. gigas* (the pacific oyster) from California many years ago?
- Molecular identification and relationship maps will help.
- Experimentally disease could be produced in *C. gigas*, but diseased C. gigas had not seen along the west coast of the U.S.

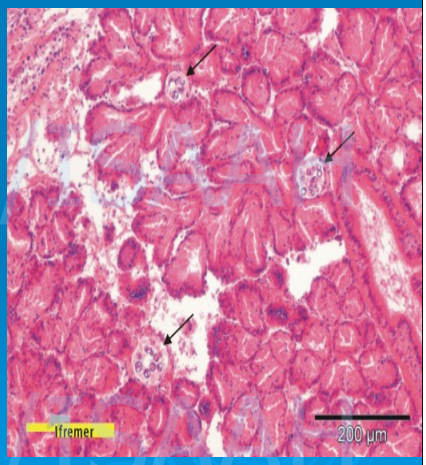
http://northislandexplorer.com/molluscs/giantpacificoyster.htm

An Emerging Disease

- *But,*
- *1990s*
  - *C. gigas* aquaculture
  - Gulf of California (Baja coast)
    - Morbidity and mortality from *P. marinus*
    - *Spring and fall time periods*
- An Emerging Disease?
  - Temperature exacerbation of a pre-existing disease?
  - Importation of the agent to Baja
  - More pathogenic agent?
  - Susceptible oyster?

Other Species of *Perkinsus*

- *P. olseni*
  - **P. olseni is an OIE disease of concern!**
  - **Infects many species of bivalves around the world (esp. in Pacific rim countries**
  - Not in the U.S. (as far as we know)
  - But…….



Perkinsus olseni infections of *Tridacna crocea* (*and maxima and gigas*)

Sheppard, B.J. and A. C. Phillips, 2008. Dis Aquat Org 79: 229-235.

- Ornamental reef clams imported to the U.S. from a Vietnam culture facility (and wild caught) were positive

PERKINSUS olseni

- What effect do diseases of ornamental shellfish/fish have on the establishment of diseases in U.S. stocks or aquacultured stocks in other countries?
- What, if anything, should be done?

Herpes Viruses

- **OYSTER HERPES VIRUS (OsHV) in *C. gigas* (Pacific Oysters)**
  - **Tomales Bay, California, 2005**
  - **Temperatures >24˚C**
  - **Larval and Juvenile**
    - **High Mortality**
    - **Causes necrosis of several tissues**
  - **Adults are carriers**
  - **Appears to be somewhat self limiting because of the temperature needed for disease expression.**
  - **Where from?**

Herpes Viruses

- **OYSTER HERPES VIRUS (OsHV)**
  - Severe epizootics of OsHV in France in 2008
  - now in England (and Scottland)
    - *C. gigas* (not the local oyster)
    - Juveniles
    - High mortality (20 to 80%)
  - Why?
    - Temperature increase (>16° C)
    - Transport of infected seed, water or other tissues?
    - New, more pathogenic strain of virus (T. Renault)
    - Susceptible Oysters

Ganglioneuritis in Abalone, Another Herpes Virus-Another mollusc

- Infects neural tissue
  - Lethargy
  - Death
- Different strains have been identified in some Pacific Rim countries
- Recently caused mortality in Tasmania, Australia
  - 2005
  - Blacklip and Greenlip Abalone
- Now present in cultured and wild animals there but appears to be contained.
- Why
  - Hybrid Herpes virus
  - Susceptible stock
  - Transport from areas with disease

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Emerging Disease

- Many are not due to a new disease but rather one that infects a new host or has changed in virulence.
- How to regulate if the potential for agent interspecies transfer and virulence modulation is unknown?
- International collaboration and communication needed!