Oyster diseases

Shellfish reefs

Wildlife ✓
Aquaculture✓
Human ✓

Synonyms: bonamiosis, marteiliosis, perkinsosis (dermo disease), marteiliodosis, microcell disease, hemocyte disease, winter mortality, aber disease, digestive gland disease, QX disease

KEY FACTS

What is Oyster disease?

Oysters are subject to a number of diseases which can impact the local population and reduce harvests in a commercial setup. A number of these diseases are associated with parasitic infections.

Oysters that are produced in areas contaminated with biotoxins or heavy metals could potentially cause health concerns for humans. Humans are also at risk when consuming raw oysters which contain levels of *Vibrio* (Gram-negative bacteria).

Causal agent

There are a number of causal agents recognised for oyster diseases. Examples of major oyster diseases and their causal *protozoan* agents are:

- bonamiosis (*Bonamia exitiosa, B. ostreae*)
- marteiliosis (*Marteilia refringens*)
- perkinsosis (*Perkinsus marinus, P. olseni*)

Bacteria of particular concern for human health include *Vibrio parahaemolyticus*, *V. vulnificus* and choleragenic *V. cholera.* Illness in humans is linked to the consumption of raw oysters.

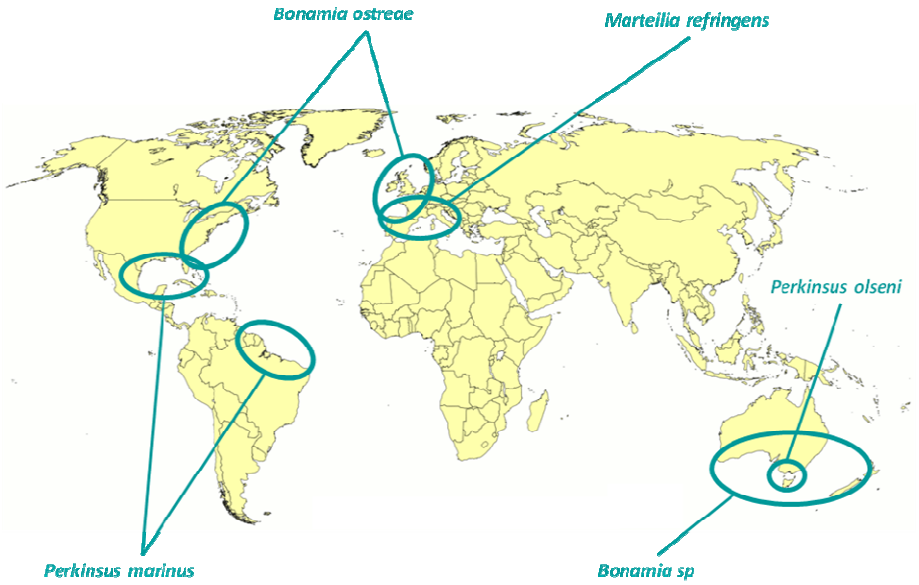
Species affected

Farmed and wild oysters worldwide are affected by diseases and those species known to be susceptible are:

Scientific name	Common name
Ostrea angasi	Australian mud oyster
O. chilensis	Chilean flat oyster
O. edulis	European flat oyster
O. puelchana	Argentinean flat oyster
O. denselammellosa	Asiatic oyster
Crassostrea gigas	Pacific oyster
C. virginica	Eastern oyster
C. ariakensis	Suminoe oyster

Geographic distribution

The above-mentioned oyster diseases (infection with *B. exitiosa*, *B. ostreae*; infection with *M. refringens*; infection with *P. marinus*, *P. olseni*) are notifiable OIE-listed diseases and now occur worldwide.



Geographic distribution of oyster diseases and their causal agents.

Environment

The causative pathogens live in aquatic environments in both tropical and temperate zones. High temperatures and salinities favour the proliferation of some of the pathogens.

TRANSMISSION AND SPREAD

Vector(s)

No data are currently available with respect to possible vectors.

How is the disease transmitted to animals?

The mode of transmission differs depending on the disease and its causal agents.

1. Bonamiosis: infection with the protozoan parasites *B. exitiosa* or *B. ostreae*

There is marked variation in susceptibility to this infection between bivalve genera. Prevalence and intensity of infection tends to increase during the warm water season. The parasite is difficult to detect prior to the proliferation stage of its development or in survivors of an epidemic. Infections may be detected in the first year of growth in areas where the disease is endemic but prevalence of infection and mortality is noticeably higher during the second year of growth.

Clean oysters living in close proximity to infected oysters (and artificial tissue homogenate/haemolymph inoculations) can precipitate infections indicating that transmission is direct (no intermediate hosts are required). There is a pre-patent period of 3-5 months between exposure and appearance of clinical signs of *B. ostreae* infection. In New Zealand, the pre-patent period for *Bonamia spp*. infection may be as little as 2.5 months and rarely exceeds 4 months.

2. Marteiliosis: infection with *M. refringens, M. sydneyi*

Marteilia refringens has a broad host range and transmission appears to be restricted to periods when water temperatures exceed 17°C. High salinities may impede *Marteilia spp*. multiplication within the host tissues. *Marteilia sydneyi* also has a seasonal period of transmission with infections occurring

generally from mid- to late-summer (January to March). Heavy mortalities and sporulation occur all year round. The parasite enters the oyster through the epithelium of the palps and gills and develops and proliferates within the digestive tract.

The route of infection and life-cycle outside the mollusc host are unknown although the life cycle within oysters has been well documented. Since it has not been possible to transmit the infection experimentally in the laboratory, an intermediate host is suspected (possibly a copepod). This is reinforced by recent observations showing spores do not survive more than 7-10 days once isolated from the oyster. Cold temperatures prolong survival (35 days at 15°C). Spore survival within fish or birds is limited to 2 hrs, suggesting they are an unlikely mode of dispersal or transmission.

3. Perkinsosis: infection with *P. marinus, P. olseni*

Proliferation of *Perkinsus spp*. correlates with warm water temperatures (>20˚C) and this coincides with increased clinical signs and mortalities. Effects appear cumulative with mortalities peaking at the end of the warm water season in each hemisphere. The infective stage is a biflagellate zoospore which transforms into the feeding trophozoite stage after entering the host's tissues where they multiply. *P. marinus* shows a wide salinity tolerance range and *P. olseni* is associated with full-strength salinity environments.

Direct transmission of *Perkinsus spp*. has been demonstrated by exposure of susceptible hosts to infected hosts, including cross-species transmission for *P. olseni*. There is currently no evidence of cross-genus transmission of *P. marinus*.

How does the disease spread between groups of animals?

Transmission of the parasite directly from host to host is possible and transmission by infective stages carried passively on currents between oyster beds is suspected. *Bonamia exitiosa* often infects wild populations of susceptible species. Transmission of marteiliosis by an intermediate host may also take place.

How is the disease transmitted to humans?

The majority of agents that cause oyster disease do not pose any human health risk. However, it is recommended not to eat oysters from areas of poor sanitation because they may be infected with *Vibrio spp*. bacteria that can cause illness in humans when ingested.

IDENTIFICATION AND RESPONSE

Field signs

Clinical signs of oyster diseases may include cessation of growth, gaping oysters and occasionally mass mortality of oysters in the wild and in farms. A decline in body condition may be seen and discolouration of the digestive glands, mantle and gills may be visible in heavily infected individuals at gross *post mortem* examination.

Recommended action if suspected

The oyster diseases mentioned within (infection with *B. exitiosa*, *B. ostreae*; with *M. refringens*; with *P. marinus*, *P. olseni*) are notifiable and a suspected outbreak must be reported immediately to local (nearest fisheries or veterinary authority) and national authorities and the OIE. Guidance concerning collection and submission of samples must be sought.

Diagnosis

Presumptive diagnosis of most of the oyster diseases can be based on clinical signs and through cytological and tissue imprints in the laboratory. A confirmative diagnosis can be obtained using histopathology and/or transmission electron microscopy. The currently accepted procedures for a conclusive diagnosis of oyster diseases are summarised in the Manual of Diagnostic Tests for Aquatic Animals 2011 (OIE, 2011).

PREVENTION AND CONTROL IN WETLANDS

Environment

No protective vaccine or effective drug/chemical treatment is available for control of the above oyster diseases in natural water bodies.

Aquaculture

There is currently no available vaccine or chemical control agent for these diseases.

Good farming practices can help reduce stress and thus the negative impact of disease. Sources of stress include exposure to extreme temperatures and salinity, starvation, handling and infection with other parasites.

Actions should be directed firstly at prevention of the disease as subsequent control can be very difficult.

A number of simple measures can minimise or prevent the spread of oyster diseases. These include:

- **Reduction in stocking densities** and/or **restocking** and **lowering of water temperatures** may suppress clinical manifestation of the disease although no eradication procedures have worked successfully to date.
- Development of **resistant stocks** of oysters.
- **Early harvesting** at 15-18 months of production and **subtidal culture** may also minimise the effects of disease on oyster production and profitability.
- **Prevention of introduction or transfer** of oysters from waters where causal agents are known to be enzootic into historically uninfected waters.
- The use of **increased salinities** which appear to suppress clinical manifestation of the disease caused by *Marteilia spp*.

Wildlife

Wild oyster beds should be monitored for signs of disease as, if infected, they may transmit disease to other beds both wild and farmed.

Humans

Humans must ensure that all biosecurity measures are followed to reduce the chance of spreading the infectious agents to previously uninfected sites.

IMPORTANCE

Effect on wildlife

Whilst most of the causal agents are naturally present in coastal water, oyster diseases do occur in wild populations. Direct impacts on wildlife are not clear, although indirect long-term effects may include threats to the environment and aquatic biodiversity through, for example, declining biomass and irreversible ecological disruption.

Effect on Aquaculture and Fisheries

High losses (up to 80-90% with bonamiosis) to oyster farmers through mortalities, and reduced growth/productivity. Increased operational cost of additional biosecurity measures.

Effect on humans

The agents causing oyster diseases do not pose any direct human health implications. However, oysters could potentially pose a health concern for humans in cases where they contain high levels of *Vibrio spp*. (*V. parahaemolyticus*, *V. vulnificus*, and choleragenic, *V. cholera*) and are consumed raw, or where the oysters are produced in an area containing biotoxin or heavy metal contamination.

Economic importance

Oyster disease has the potential to financially decimate those who run oyster farming operations. Subsequently, oyster diseases can negatively affect the community and industries depending on the oyster trade.

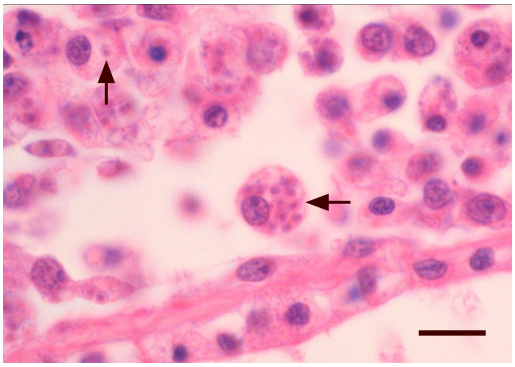
FURTHER INFORMATION

Useful publications and websites

- Australian Government Department of Agriculture Fisheries and Forestry. **Aquatic animal diseases significant to Asia-Pacific: identification field guide**. http://library.enaca.org/Health/FieldGuide/index.htm [Accessed April 2012].
- Food and Agriculture Organization (FAO) Fisheries. **Asia diagnostic guide to aquatic animal diseases**. **Technical Paper 402/2**. www.fao.org/docrep/005/y1679e/y1679e00.HTM [Accessed April 2012].
- FAO/WHO. **Risk assessment of *Vibrio vulnificus* in raw oysters: interpretative summary and technical report**. Microbiological risk assessment series No. 8. http://www.who.int/foodsafety/publications/micro/mra8.pdf [Accessed April 2012].
- OIE. **Manual of diagnostic tests for aquatic animals**. http://www.oie.int/en/international-standard-setting/aquatic-manual/access-online [Accessed April 2012].
- Levine J.F., Law M & Corsin F (2006). **Bivalves**. In: Invertebrate medicine (1st Ed.). Lewbart, G. A. (Ed.), Blackwell Publishing, (2006), pp.327.

Photos

Oysters infected with *Bonamia ostreae*, illustrating classic symptoms of *Bonamia ostreae* infection, *e.g.* gaping (*D. Alderman*).



Arrows point to *Bonamia ostreae* parasites inside haemocytes (blood cells) in the mantle of oysters (*The National Aquatic Animal Health Program (NAAHP) of Canada*).