

## Disease Introduction

### Introduction:

**Disease:** A disease is a particular abnormal condition that negatively affects the structure or function of all or part of an organism.

Kinne (1980) described diseases in terms of epidemiology (epizootiology for animal diseases), as follows:

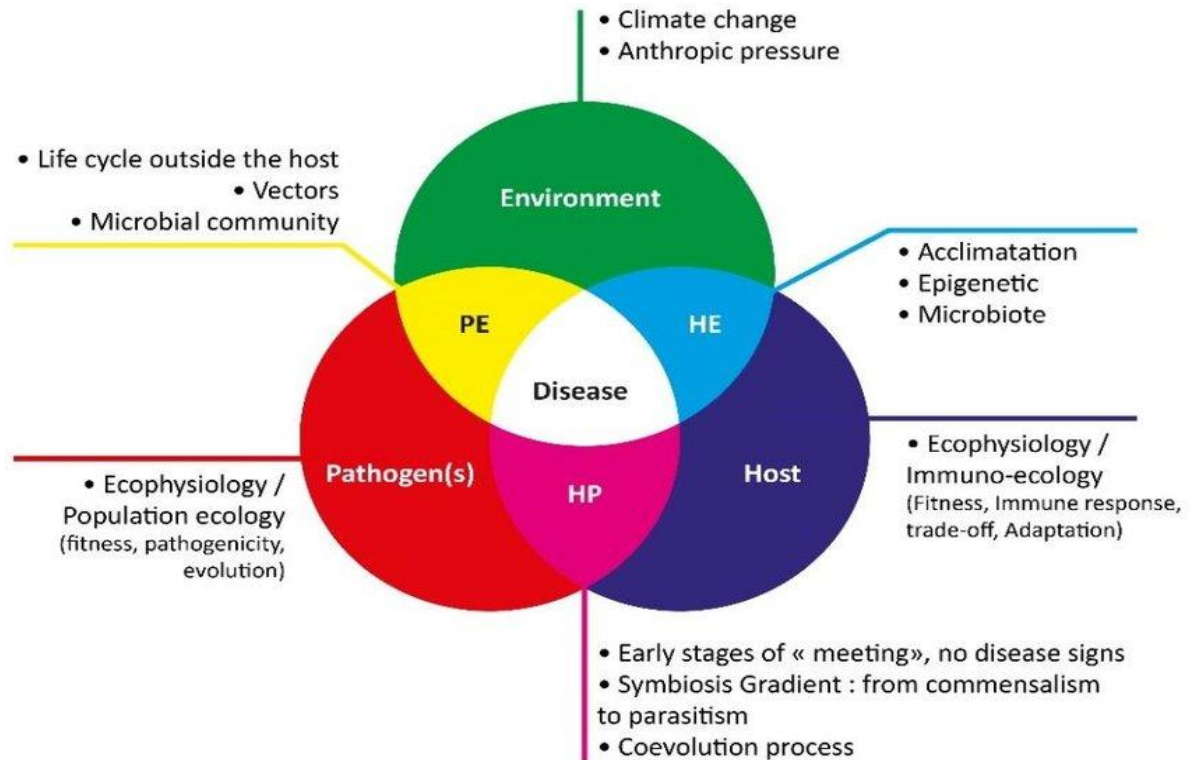
**Sporadic diseases**, which occur sporadically in comparatively small numbers of individuals in a population.

**Epidemics/Epizootics**, which are large-scale outbreaks of communicable disease occurring temporarily in limited areas.

**Pandemics/Panzootics**, which are large-scale outbreaks of communicable disease occurring over large areas.

**Endemics/Enzootics**, which are diseases persisting or reoccurring as low-level outbreaks in defined areas.

### Host, Pathogen and Environment interaction:



The host-pathogen interaction is defined as how microbes or viruses sustain themselves within host organisms on a molecular, cellular, organismal or population level. This term is most commonly used to refer to disease-causing microorganisms although they may not cause illness in all

hosts.<sup>[1]</sup> Because of this, the definition has been expanded to how known pathogens survive within their host, whether they cause disease or not.

Many effects of diseases on cultured fish are known; they are less clear in wild fish populations. Cultured fish represent captive populations that can be subjected to intense scrutiny with an increasing range of diverse and powerful tools. Disease represents a spectrum from acute mortality to rather benign or inconsequential syndromes, all sharing the common feature of a deviation from the normal structure or function of the host. Understanding these deviations among cultured and wild fish populations and balancing their implications against ecological, economic, and political concerns are challenges for both fish health scientists and fisheries managers. The severity of a given disease is dependent on the interaction of numerous variables of the host, the parasite, and the environment.

### **Types of pathogens**

Pathogens include bacteria, fungi, protozoa, helminths, and viruses.

The interest in diseases of aquatic organisms is primarily directed towards aquaculture which, to paraphrase definitions, is the rearing of aquatic species in controlled conditions. Here, disease may be of sudden onset with rapid progression to high mortalities, with an equally quick decline (acute disease). Conversely, there may be cases where the disease develops more slowly, with less severity but longer persistence (chronic disease).

It is apparent that as society moves through the twenty-first century, aquatic animals continue to suffer the vagaries of disease, especially as new diseases continue to occur, e.g. acute hepatopancreatic necrosis disease syndrome (AHPND), which is attributed to infection of the shrimp with *Vibrio parahaemolyticus*. However, the study of aquatic pathobiology is largely an aerobic affair as most laboratories do not consider the possible role of anaerobes or microaerophiles. It would be interesting to determine if this reflects a lack of expertise, interest or suitable methods rather than the absence of occurrence of anaerobic or microaerophilic pathogens/parasites. The majority of literature points to a single species of pathogen as the main cause of disease situations but there are reports of sequential viral and bacterial as well as parasitic and opportunistic bacterial combinations. Certainly, it is appreciated that there have been important developments in disease diagnosis, with progression from traditional phenotyping to the use of newly developed molecular techniques. In many modern laboratories, identification is now routinely accomplished by sequencing of the 16S rRNA gene, a move that has led to greater confidence in the outputs although this will reflect the accuracy of the data in the databases.

### **Conclusion**

- The list of parasitic, bacterial and viral pathogens continues to grow, although the significance of some organisms to pathology is difficult to ascertain – are they truly parasite/pathogens, secondary invaders or contaminants?

- There has been considerable improvement in the taxonomy and hence diagnosis (accuracy and sensitivity) of many pathogens, particularly involving the sequencing of the 16S rRNA gene.
- Disease control has progressed from therapeutic to prophylactic, and now involves a wide range of approaches including vaccines, non-specific immunostimulants, prebiotics, probiotics and plant products.