

## OHH Research Projects

Members of the PNW Consortium have a track record of successful collaboration in a number of areas including harmful algal blooms (HABs), pathogens, molecular mechanisms of toxicology in sentinel species (fish, mammals) and climate change impacts. Building on the PNW Consortium's established scientific relationships, OHH Trainees will be provided with research opportunities in three general areas for which collaborations already exist:

1. Understanding underlying mechanisms that influence the impacts of harmful algal blooms (HABs), pathogens and chemical toxicants on shellfish safety and links to management strategies;
2. Development of novel warning systems for detection and prediction of HABs and pathogens;
3. Use of model organisms to understand toxicant impacts.

Specific examples of the types of research carried out by PNW Consortium members include the following:

1. Mechanisms underlying the impacts of harmful algal blooms (HABs), pathogens and chemical toxicants on shellfish safety and links to management strategies (UW: Meschke, Di Giacomo, Faustman, Rocap, Hickey, Lessard, Armbrust, Leschine; NOAA: Strom, Trainer)

- Modeling the relationship between physical oceanographic processes and the delivery of HABs or pathogens to shellfish beds.
- Genomics of HABs (e.g., *Pseudo-nitzschia* spp.) and pathogens (e.g., *Vibrio* spp.) to gain insights into potential physiological constraints
- Determining and modeling the influence of HABs, pathogens or chemical toxicants on food web dynamics and ecosystem function
- Determining the influence of mortality/loss factors (e.g., grazers, viruses, flocculation) on the population dynamics of HABs and pathogens
- Determining the influence of climate change on the frequency or intensity of HAB- or pathogen-related events
- Determining shellfish consumption patterns in at-risk populations
- Integrating discoveries in HABs research into effective management plans

2. Development of novel warning systems for detection of HAB- or pathogen-related events (UW: Rocap, Hickey, Armbrust, Meschke, Di Giacomo, Furlong, Lessard; NOAA: Strom, Trainer)

- Development of high-throughput molecular techniques for detection of HAB species and pathogens
- Use of genomics to identify potential molecular markers that can be employed as components of early-warning systems
- Expansion of the types of analytes that can be detected via a hand-held surface plasmon resonance (SPR) system developed at UW
- Transfer of the SPR system to moorings located within local waters

- Development of in situ imaging and optical instruments as components of early-warning systems
- Development of models to forecast HAB occurrences

3. Use of model systems to understand toxicant impacts (UW: Faustman, Costa, Burbacher, Gallagher; NOAA: Dickhoff, Varanasi, Stein, Collier, Trainer)

- Impacts of toxicants on neurodevelopment in fish and mammalian models
- Impacts of toxicants on gene expression patterns in model fish species including well-established genetic models (e.g., zebrafish), as well as ecologically relevant species (e.g., salmon). These studies will include a causal linkage between modulation of gene expression and susceptibility to cell injury
- Use of zebrafish as a genetic model for understanding the impacts of organic chemicals and trace metals on organogenesis and neurobehavioral toxicity
- Development of risk assessment models based on results from model organisms, including a better understanding of the effects of consumption of contaminated seafood on potential *in utero* human effects