



**Kelly D. Goodwin, PhD**

***Environmental Microbiologist- NOAA AOML/OCD***

**NSF-NIEHS Oceans & Human Health Center Role: Investigator-  
Recreational Microbes**

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## **Education**

- Ph.D., Environmental Engineering Science, 1996,  
California Institute of Technology, Pasadena, CA  
Subject Minor, Oceanography 1993  
Scripps Institute of Oceanography, San Diego, CA
- M.S., Environmental Engineering Science 1991,  
California Institute of Technology, Pasadena, CA

## Research Interests

### ▪ **Molecular-based Assays:**

- Use molecular biological tools to detect microbial contaminants in coastal waters.
- Use Florida red-tide dinoflagellates and bacteria that indicate sewage contamination as model organisms.
- Develop assays that are quick, convenient, sensitive, and able to identify multiple species simultaneously.
- Three types of assays are under development:
  - 1) high-throughput Luminex xMAP assay
  - 2) Electrochemical assays
  - 3) colorimetric microplate assay
- These projects utilize the Rookery Bay National Estuarine Research Reserve and field sites in Biscayne and Florida Bays, and are a cooperative effort between NOAA/AOML and U. Miami/RSMAS (Jack Fell).

### ▪ **Molecular-Based Sensors:**

- Apply innovations in biotechnology to improve monitoring of coastal water quality.
- Develop an in-situ sensor to detect nucleic acid hybridization using electrochemical methods.
- Develop upstream lysis and nucleic acid amplification strategies.
- Deploy the sensor in coastal environments and relay biological and other environmental data in near real-time.
- Meeting these challenges are critical first steps toward developing the next generation of remote sensing technology. The project combines the expertise of electrochemists, biologists, and engineers from government (Kelly Goodwin, Shailer Cummings, Peter Ortner, NOAA/AOML), academic (Jack Fell, RSMAS, Mike LaGier, CIMAS, Joe Wang, NMSU), industrial (Alderon), and research laboratories (Chris Scholin, MBARI).

### ▪ **Halocarbon Biogeochemistry:**

- Explore interactions between the biosphere and the atmosphere, with focus on biodegradation of ozone-depleting halocarbons such as methyl bromide and carbon tetrachloride.
- Quantify bacterial degradation of halomethanes in coastal and open ocean systems.
- Identify and characterize novel isolates.
- Use isolates to perform mechanistic studies of bacterial processes.
- Use traditional and molecular methods to elucidate species and enzymes responsible for halocarbon degradation.

## Representative Publications

An electrochemical RNA hybridization assay for detection of the fecal indicator bacterium *Escherichia coli*. M.J. LaGier, C. Scholin, J. Wang, J.W. Fell and **K.D. Goodwin**. *Marine Pollution Bulletin*, in press (2005).

Toluene inhibits methyl bromide biodegradation in seawater and isolation of a marine toluene-oxidizer that degrades methyl bromide. **K.D. Goodwin**, R. Tokarczyk, F.C. Stephens, and E.S. Saltzman, *Applied and Environmental Microbiology*, in press, V71(7) (2005).

A DNA hybridization assay to identify toxic dinoflagellates in coastal waters: detection of *Karenia Brevis* in the Rookery Bay National Estuarine Research Reserve. **K.D. Goodwin**, S.A. Cotton, G. Scorzetti, and J.W. Fell, *Harmful Algae*, 4: 411-422 (2005).

Detection of *Karenia brevis* by a Microtiter Plate Assay. K.D. Goodwin, G. Scorzetti, S.A. Cotton, T.L. Kiesling, P.B. Ortner, and J.W. Fell. IN: *Harmful Algae 2002. Proceedings of the Xth International Conference on Harmful Algae*. Steidinger, K.A., Landsberg, J.H. Tomas, C.R., and Vargo, G.A. (Eds.). Florida Fish and Wildlife Conservation Commission and Intergovernmental Oceanographic Commission of UNESCO. (2004).

Methyl bromide and methyl chloride in the Southern Ocean. Yvon-Lewis, S.A., D.B. King, R. Tokarczyk, K.D. Goodwin, E.S. Saltzman, and J.H. Butler. *Journal of Geophysical Research*, 109, CO2008, doi:10.1029/2003JC001809 (2004).

Methyl chloride and methyl bromide degradation in the Southern Ocean. R. Tokarczyk, K.D. Goodwin, E.S. Saltzman. *Geophysical Research Letters*, 30(15): OCE 2-1-2-4, doi:10.1029/2003GL017459 (2003).

Bacterial degradation of trihalomethanes, Goodwin, K.D. In: M.S. Fram, B.A. Bergamaschi, K.D. Goodwin, R. Fujii, J.F. Clark, *Processes affecting the trihalomethane concentrations associated with the subsurface injection, storage, and recovery program in Lancaster, Antelope Valley, California, U.S. Geological Survey Water-Resources Investigations Report, 03-4062*, <http://water.usgs.gov/pubs/wri/wri034062/> (2003).

Halocarbon biogeochemistry. L.G. Miller and K.D. Goodwin (editors). *Biogeochemistry*, special issue, 60, 92 pages (2002).

Water-Quality Monitoring and Studies of the Formation and Fate of Trihalomethanes during the Third Injection, Storage, and Recovery Test at Lancaster, Antelope Valley, California, March 1998 through April 1999. Fram, M.S., J.K. Berghouse, B.A. Bergamaschi, R. Fuji, K.D. Goodwin, and, J.F. Clark.

U.S. Geological Survey Open File Report 02-102,  
<http://water.usgs.gov/pubs/of/ofr02102/> (2002).

*Leisingera methylhalidivorans* gen. nov., sp. nov., a marine methylotroph that grows on methyl bromide. J.K. Schaefer, K.D. Goodwin, I.R. McDonald, J.C. Murrell, and R.S. Oremland. *International Journal of Systematic and Evolutionary Microbiology*, 52: 851-859 (2002).

Consumption of tropospheric levels of methyl bromide by C<sub>1</sub> bacteria and comparison to saturation kinetics. K.D. Goodwin, R.K. Varner, P.M. Crill, and R.S. Oremland. *Applied and Environmental Microbiology*, 67(12): 5437-5443 (2001).

Methyl bromide loss rate constants in the North Pacific Ocean. R. Tokarczyk, K.D. Goodwin, E.S. Saltzman. *Geophysical Research Letters*, 28(23): 4429-4432 (2001).

Bacterial degradation of methyl bromide and dibromomethane in natural waters and enrichment cultures. K.D. Goodwin, J.K. Schaefer, and R.S. Oremland. *Applied and Environmental Microbiology*, 64(12): 4629-4636 (1998).

Marine bacterial degradation of brominated methanes. K.D. Goodwin, M. E. Lidstrom, and R.S. Oremland. *Environmental Science and Technology*, 31(11): 3188-3192 (1997).

Production of bromoform and dibromomethane by Giant Kelp: factors affecting release and comparison to anthropogenic bromine sources. K.D. Goodwin, M.E. Lidstrom, and W.J. North. *Limnology and Oceanography*, 42(8): 1725-1734 (1997).

Natural cycles of brominated methanes: macroalgal production and marine microbial degradation of bromoform and dibromomethane. K.D. Goodwin. Ph.D. thesis, California Institute of Technology (1996).

Laboratory production of bromoform, methylene bromide, and methyl iodide by macroalgae and distribution in near-shore southern California waters. S.L. Manley, K.D. Goodwin, and W.J. North. *Limnology and Oceanography*, 37: 1652-1659 (1992).

More Info:

<http://www.aoml.noaa.gov/ocd/people/goodwin/>