



Oceans and Human Health: New Area of Interdisciplinary Science

Professor Lora E Fleming MD PhD MPH MSC



European Centre for
Environment & Human Health



EUROPEAN UNION
Investing in Your Future
European Regional
Development Fund 2007-13



European Union
European Social Fund
Investing in jobs and skills



convergence
for economic
transformation

Outline

Oceans & Human Health

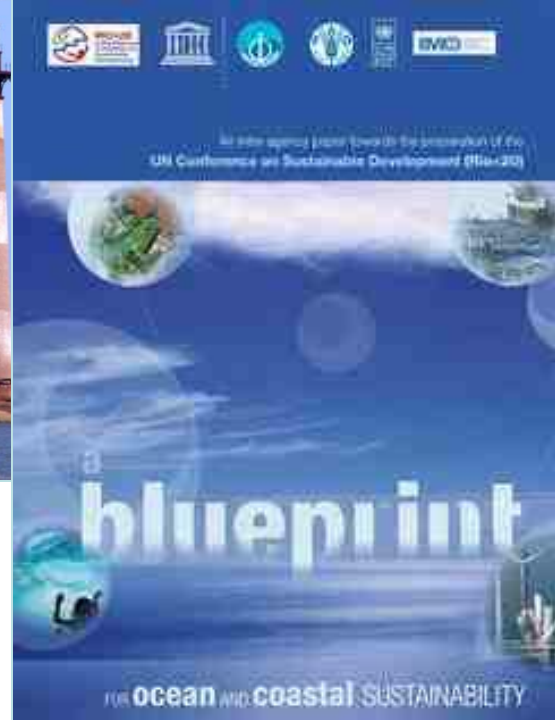
- **Context**
 - New “Metadiscipline”
- **Issues Overview**
 - Risks & Benefits/Opportunities
 - Interspersed with Fleming et al research
- **Future directions**



2005

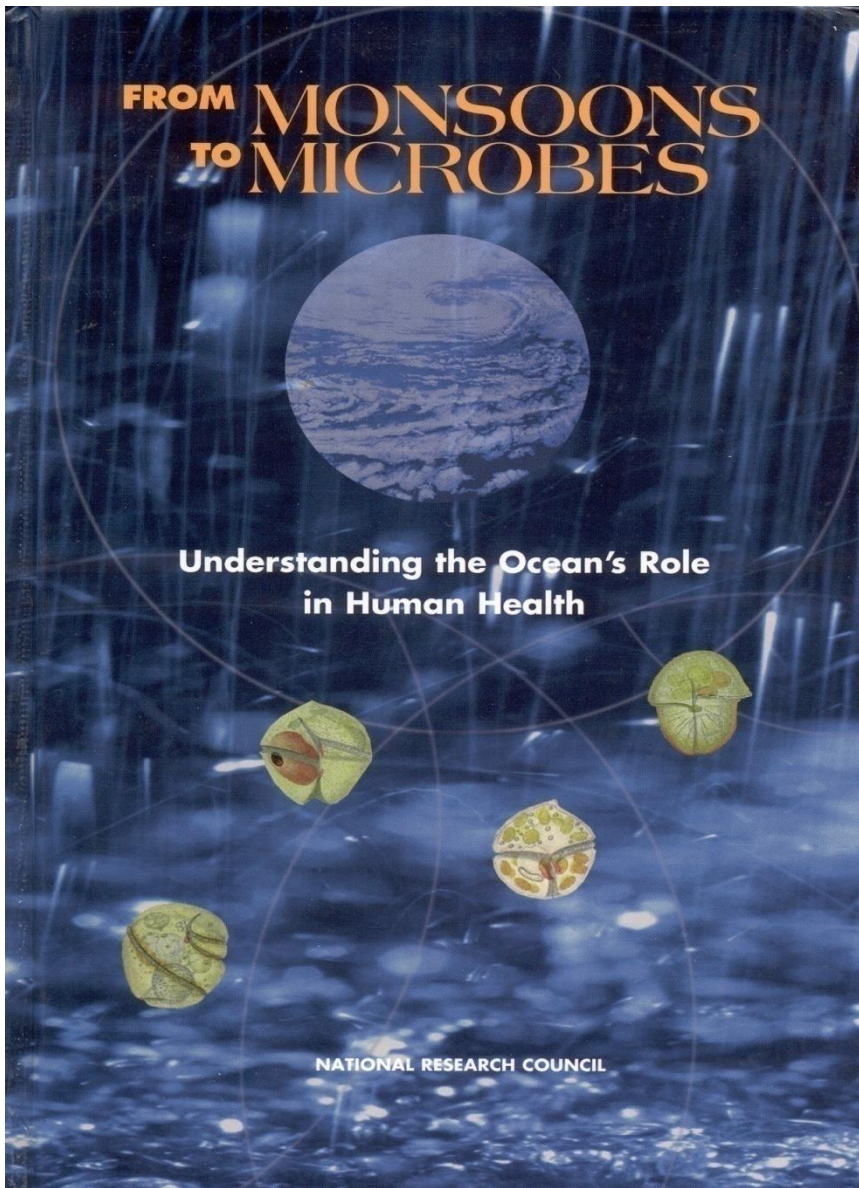


2006



2007

1999



2012

European MARINE BOARD

Advancing Seas & Oceans Science



Linking Oceans & Human Health:

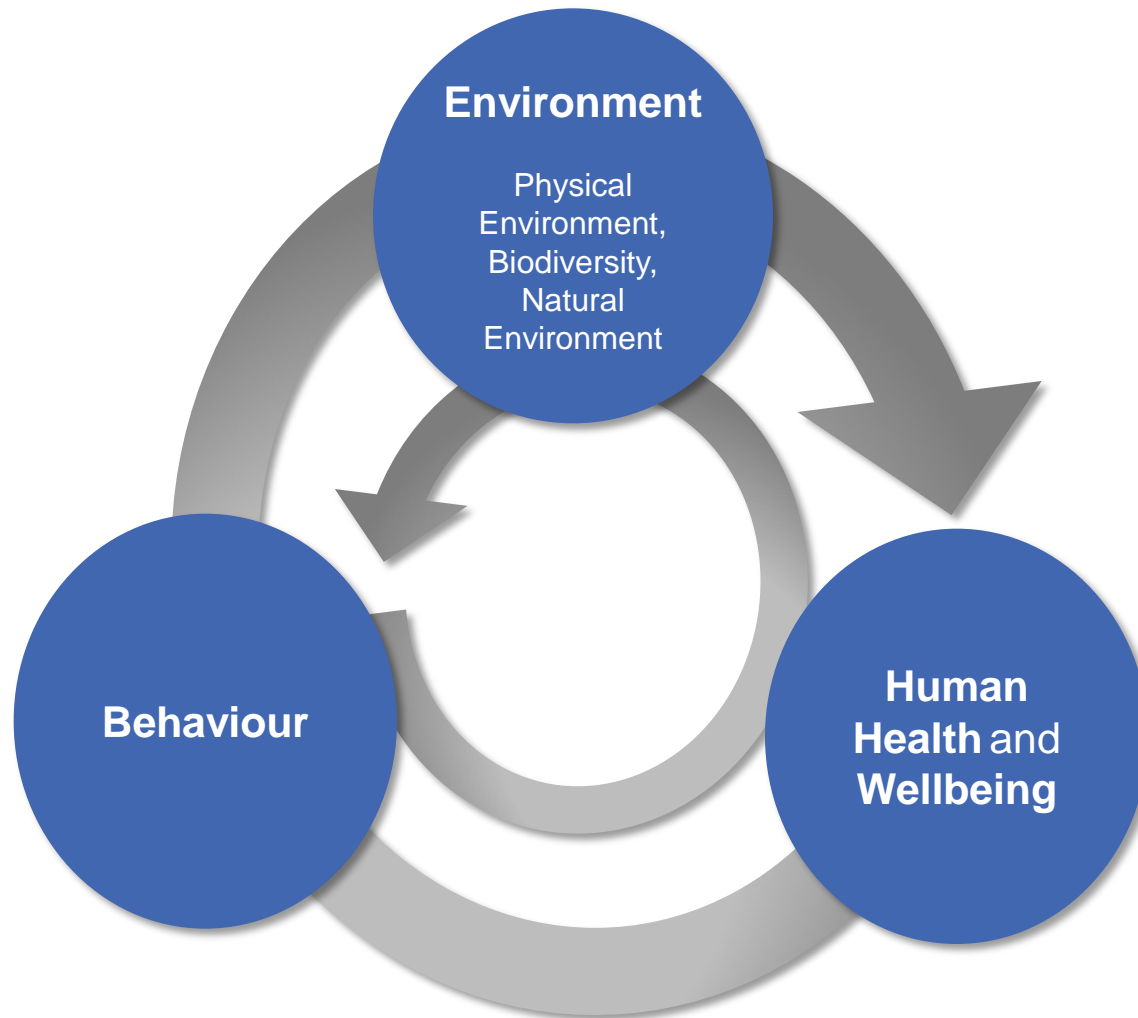
A Strategic Research Priority for Europe
Position Paper 19

2014



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Interconnections: Environment ↔ Human Health



Oceans & Human Populations: Coastal Migration

- **40-60% of the World's population lives near coastal areas**
 - **53% US population in Coastal Counties with 75% by 2025**
- **90% future world population growth in Sub/Tropical areas**
 - **6 billion to 8.3 billion (2025)**
- **Increased use of coastal/marine resources**



US Ocean Policy Commission Report

US Ocean **Commercial**:

- Ports: \$700 Billion
- Commercial Fishing: \$28 Billion
- Off shore Gas/Oil: \$25-40 Billion

US Ocean **Recreational**:

- Saltwater Fishing: \$20 Billion
- Cruise Industry: \$11 Billion
- Coastal Tourism: > 1.5 Million Jobs



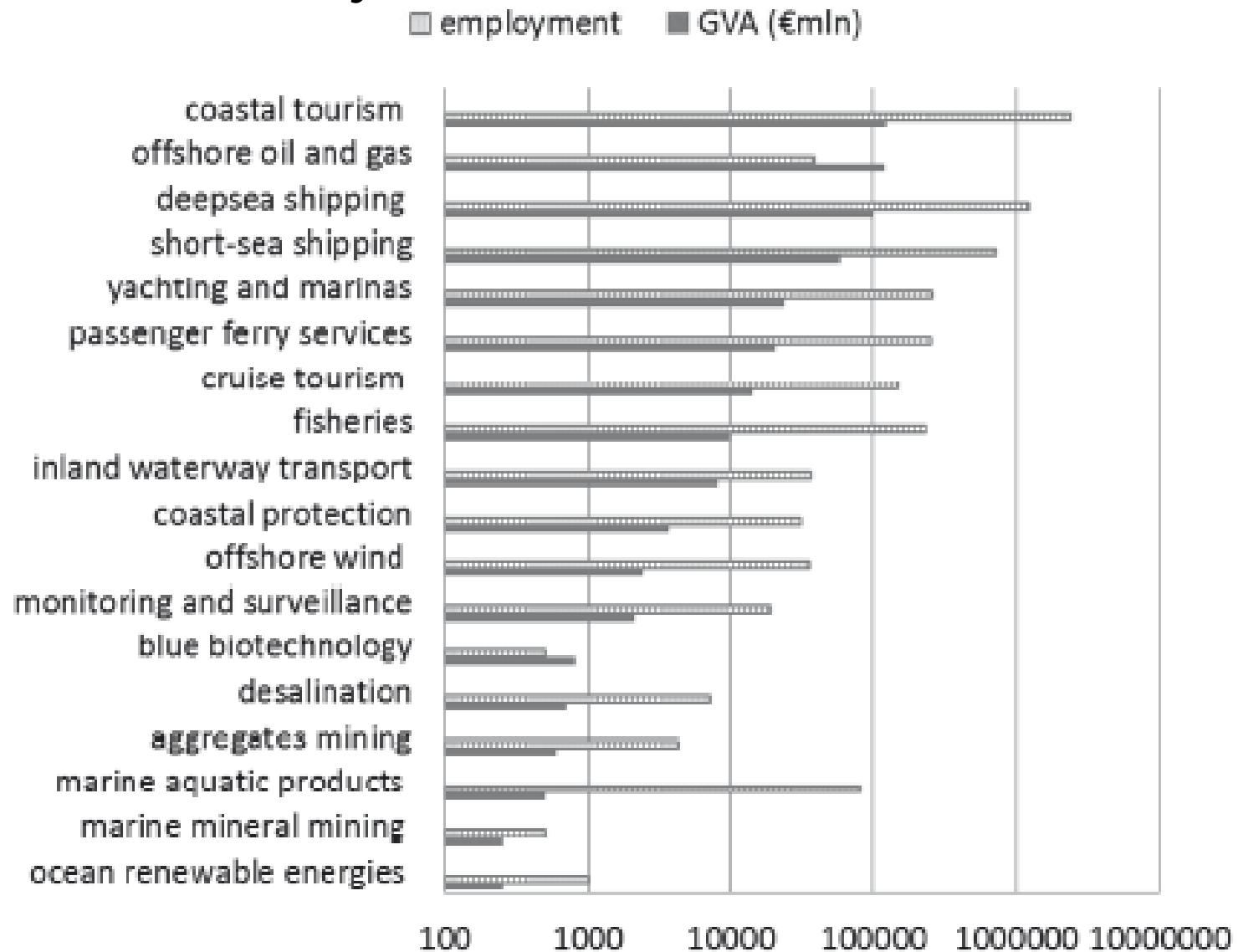
Europe – a maritime continent

- 4 seas & 2 oceans
- 91,000km coastline (EU + Norway)
 - **50% EU population lives within 50km of coastline**
 - 50% EU territory underwater
- Trade: **90% external, 40% internal**
 - 40% World's Merchant Fleet
- **5.4 M jobs**
- **GVA = €500 Billion/year**



EU Blue Growth Strategy

Economic value by sector



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RISKS & BENEFITS/OPPORTUNITIES FROM SEAS/OCEANS

International Need:

- To Increase Understanding of Human and Ecosystem Interactions with the Seas and Oceans
- Both risks AND benefits/opportunities

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RISKS:

- **Storms, Climate Events**
- **Harmful Algal Blooms (HABs) & Other Toxins**
- **Infectious Diseases**
- **Anthropogenic Chemicals**
- **Fisheries Destruction**



Natural Events/Global Climate Change

- **Hurricane Andrew** (1992) \$25 BILLION
- **Hurricane Mitch** (1998) > 9000 deaths with > 9200 people missing in Honduras, Nicaragua, Guatemala
- **Papua, New Guinea** (1998) Tsunami > 2000 deaths
- **Florida** 4 Hurricanes (2004) & 3 Hurricanes (2005)
- **Tsunami** (2004) >150,000 people dead; millions homeless from Indonesia to Africa
- **Hurricane Katrina** (2005) >3000 dead; \$Billions GOM
- **Burmese Cyclone** (2008) > ?300,000 deaths; ?damage
- **Hurricane Ike** (2008) >194 deaths; \$ Billions
- **Japan Tsunami** (2011) >17,000 deaths; \$Billions
- **Hurricane Sandy** (2012) > 70 deaths; >\$50 Billion NYC



Natural Events/Global Climate Change

Increased CO₂ and Sea Surface Temperature (SST)

- Sea Level Rise & Increased Temperatures & Acidification
- Extreme Weather
- **Human Health Impacts?**
 - Drowning, trauma, migration
 - ?Infectious Diseases
 - Threat to Fisheries & Agriculture, Food Security
 - Marine Microbial
 - Harmful Algal Blooms (HABs)
 - Other Microbes
 - ?Depression
- **Most Vulnerable are the Developing Nations!**



Natural Events/Global Climate Change



- **Climate change in the vineyards: The taste of global warming!**
 - Climate change affecting Italy's Chianti wine!
 - Climate shifts will change the future of vintages!
- **The World's First Conference on Wine and Global Warming in Barcelona!**



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Harmful Algal Blooms (HABs)





Florida Red Tide

Karenia brevis

(formerly *Gymnodinium breve*, *Ptychodiscus brevis*)

Whole (live) Cell



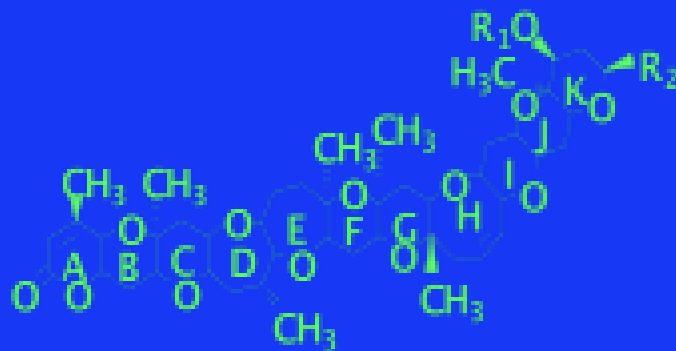
Intra-cellular Toxins

Lysed (ruptured) Cell

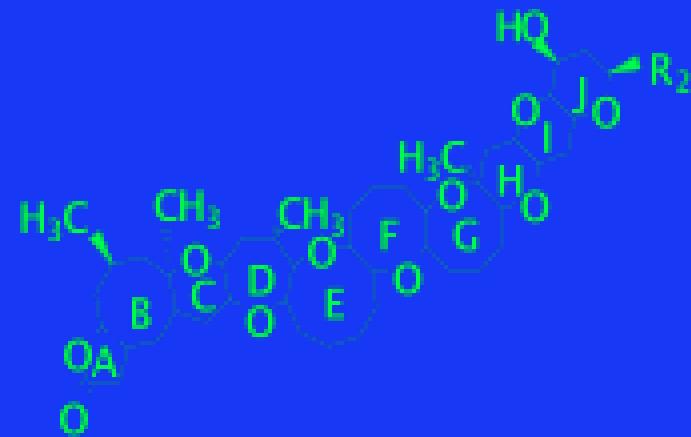


Extra-cellular Toxins

Brevetoxins



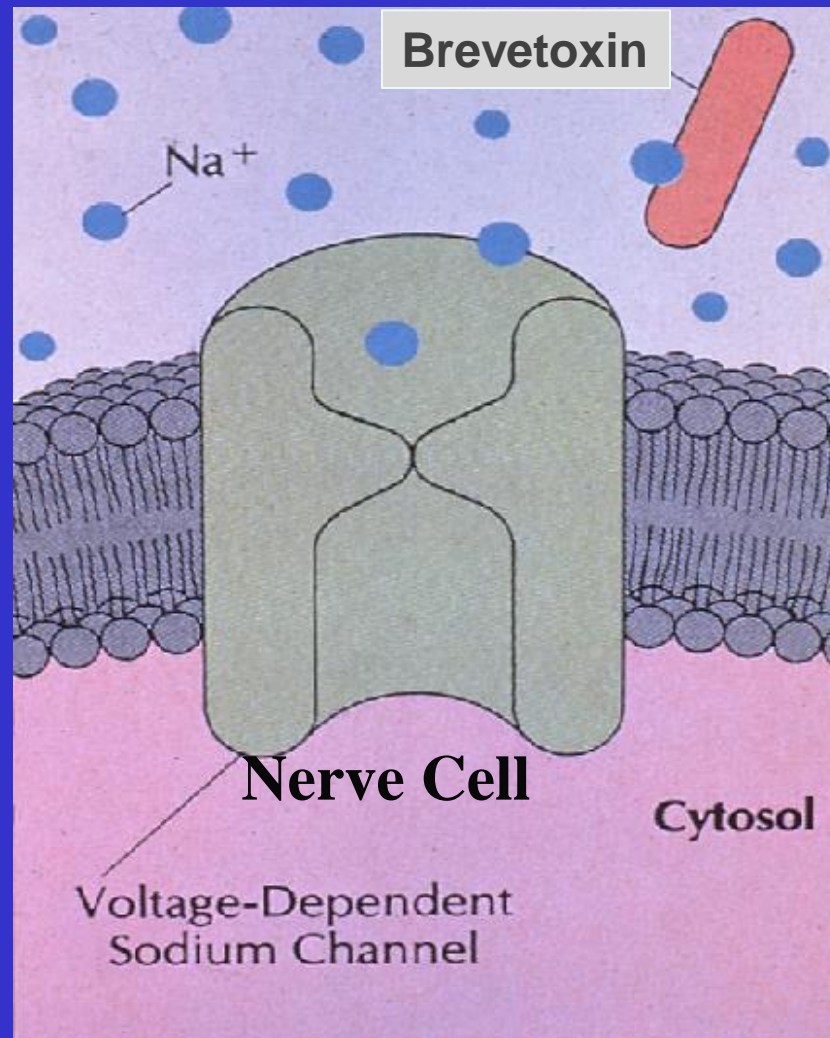
PbTx Type-2



PbTx Type-1

	<u>R1</u>	<u>R2</u>		<u>R1</u>	<u>R2</u>
PbTx-2:	H	$\text{CH}_2\text{C}(\text{=CH}_2)\text{CHO}$	PbTx-1:	H	$\text{CH}_2\text{CH}(\text{CH=CH}_2)\text{CHO}$
PbTx-3:	H	$\text{CH}_2\text{C}(\text{=CH}_2)\text{CH}_2\text{OH}$	PbTx-7:	H	$\text{CH}_2\text{CH}(\text{CH=CH}_2)\text{CH}_2\text{OH}$
PbTx-5:	CH_3CO	$\text{CH}_2\text{C}(\text{=CH}_2)\text{CHO}$			
PbTx-6:	H	$\text{CH}_2\text{C}(\text{=CH}_2)\text{CHO}$			
	27,28 peroxide				
PbTx-8:	H	$\text{CH}_2\text{C}(\text{=CH}_2)\text{COCH}_2\text{Cl}$			
PbTx-9:	H	$\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$	PbTx-10:	H	$\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$

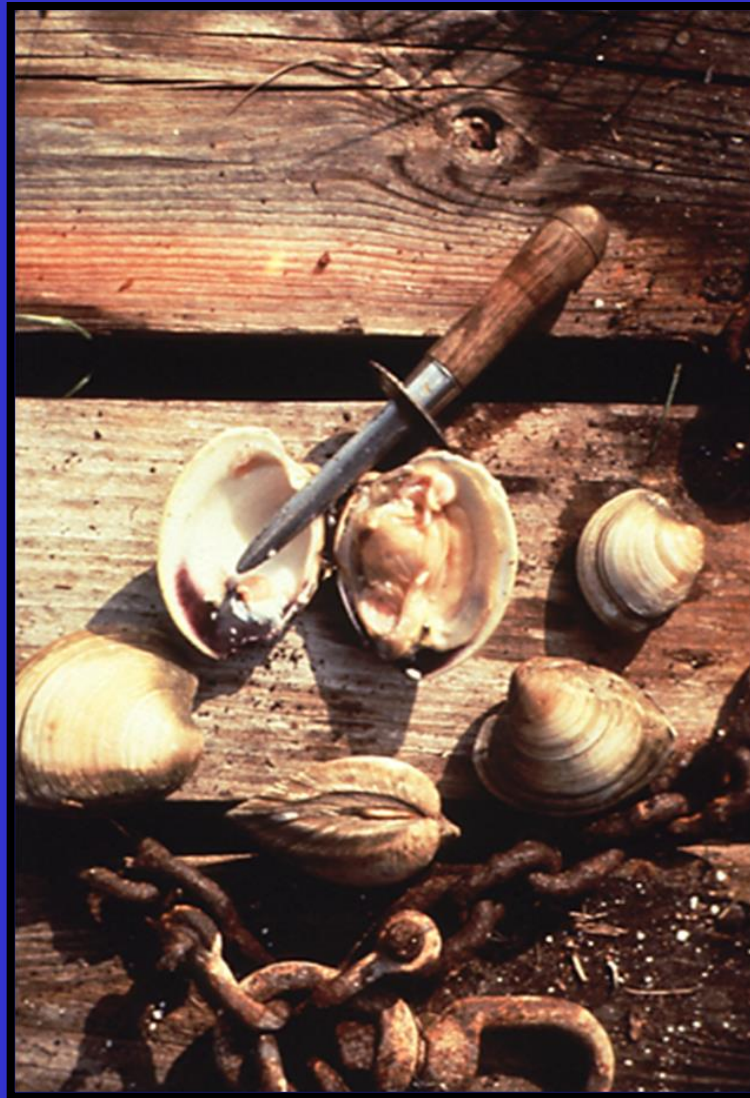
Brevetoxin Effects on the Sodium Channel in Nerve Cells



**Florida Red
Tide
One Health**



Neurotoxic Shellfish Poisoning (NSP)

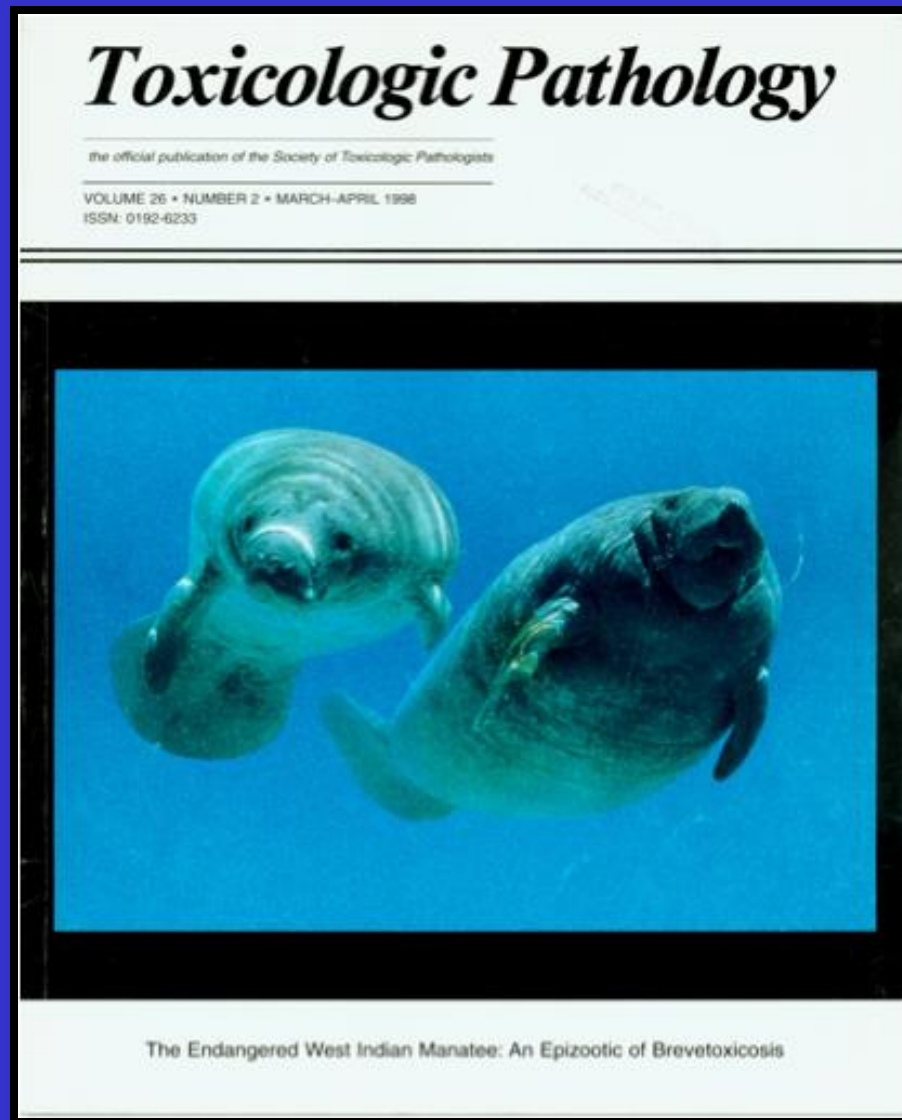




Red Tides & Fish Kills

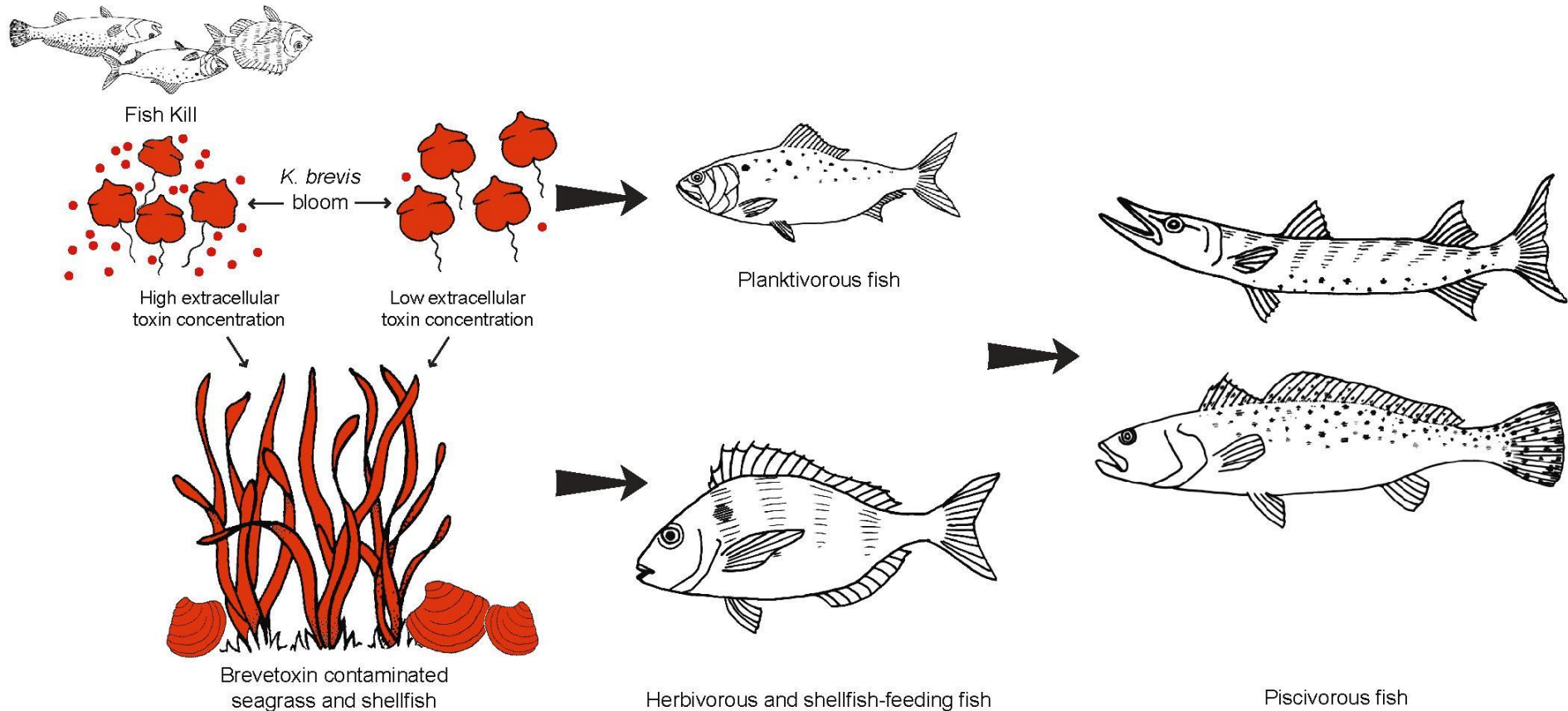


Brevetoxicosis = Zoonosis



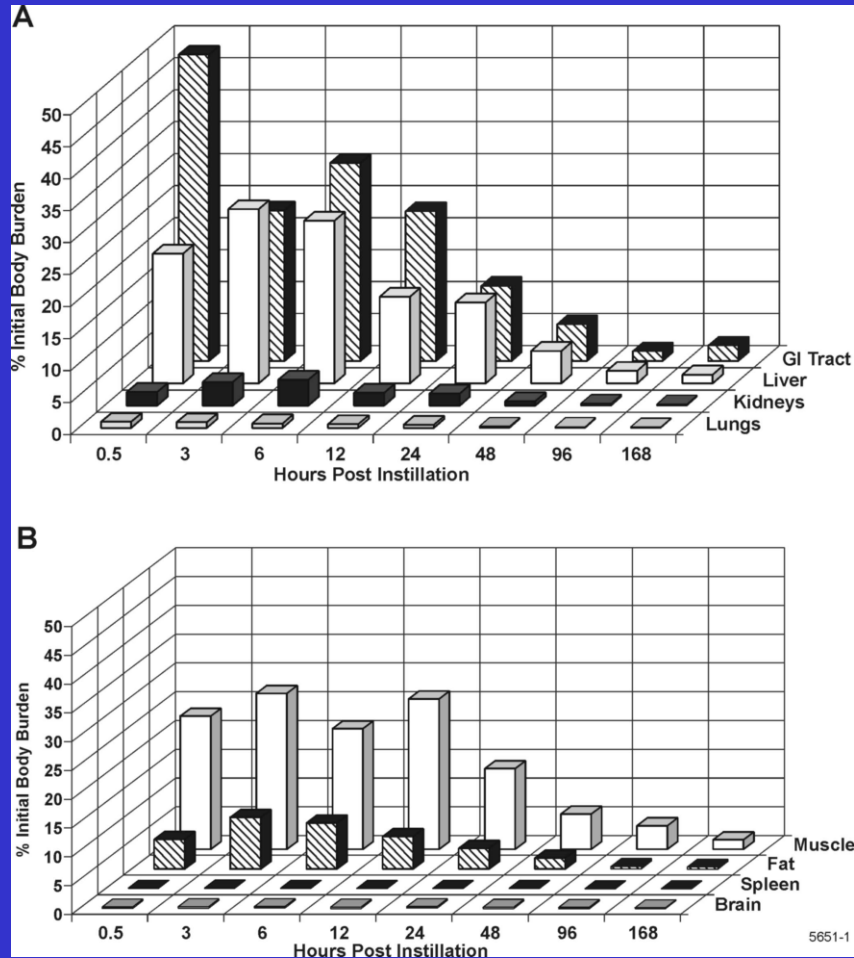
Bossart, Baden et al

?Brevetoxin Fish Poisoning New Pathway!



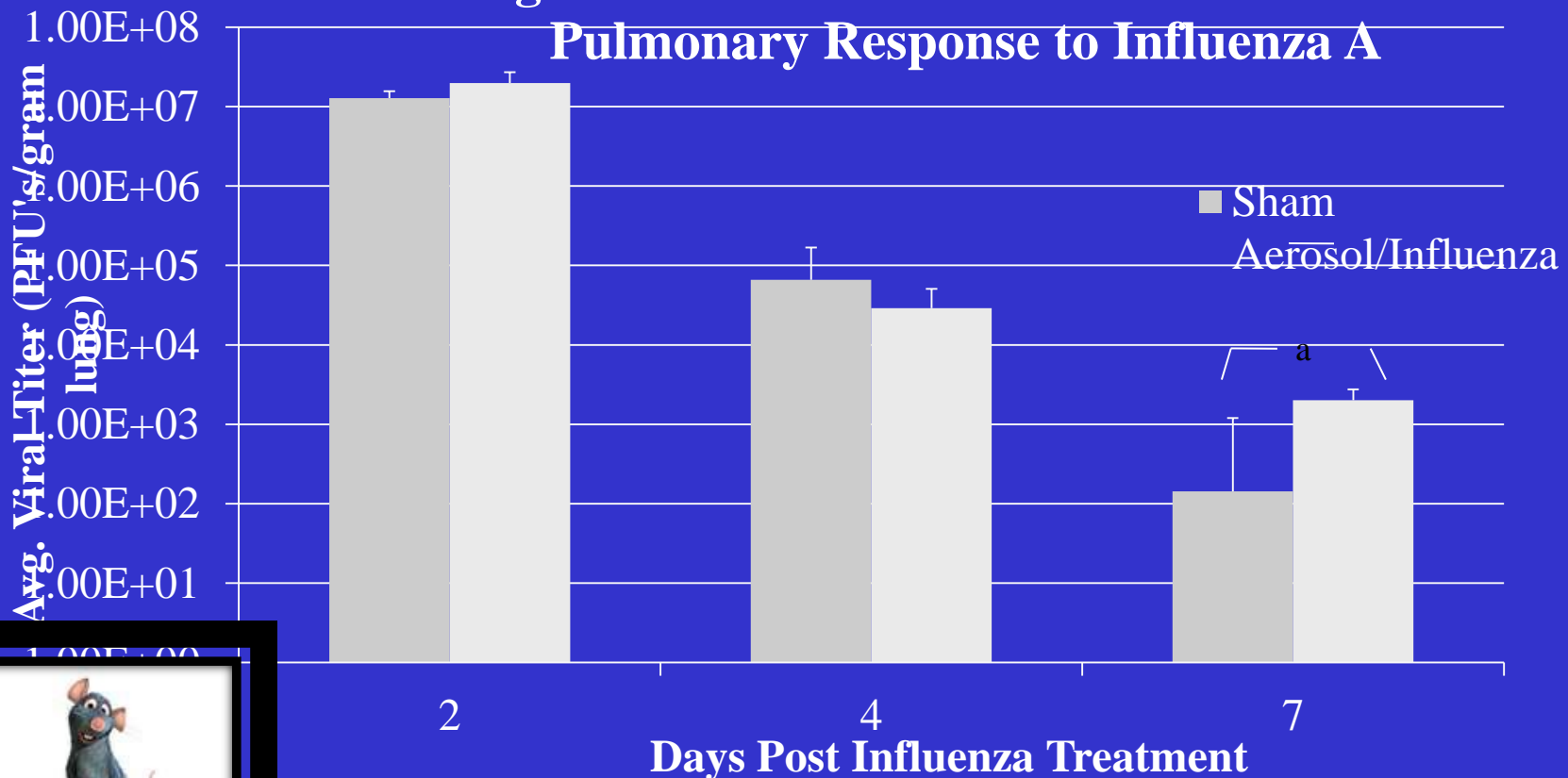
Naar, Flewelling, et al

Distribution of Brevetoxins



Brevetoxin Inhalation alters Pulmonary Response to Influenza A in F344 Rats

Lung Viral Load Clearance- Brevetoxin Affects Pulmonary Response to Influenza A

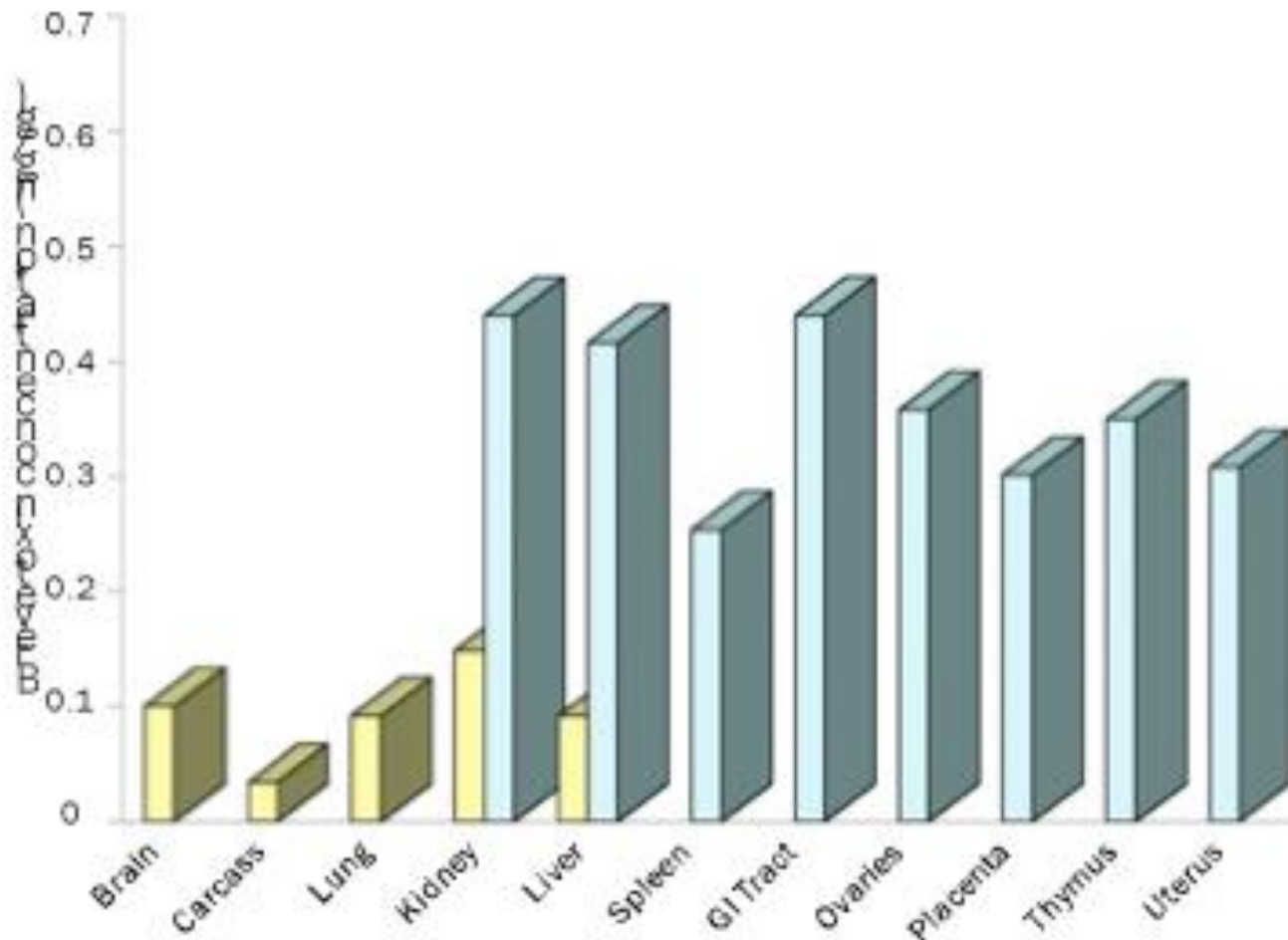


Benson et al





Brevetoxin Exposures during Pregnancy

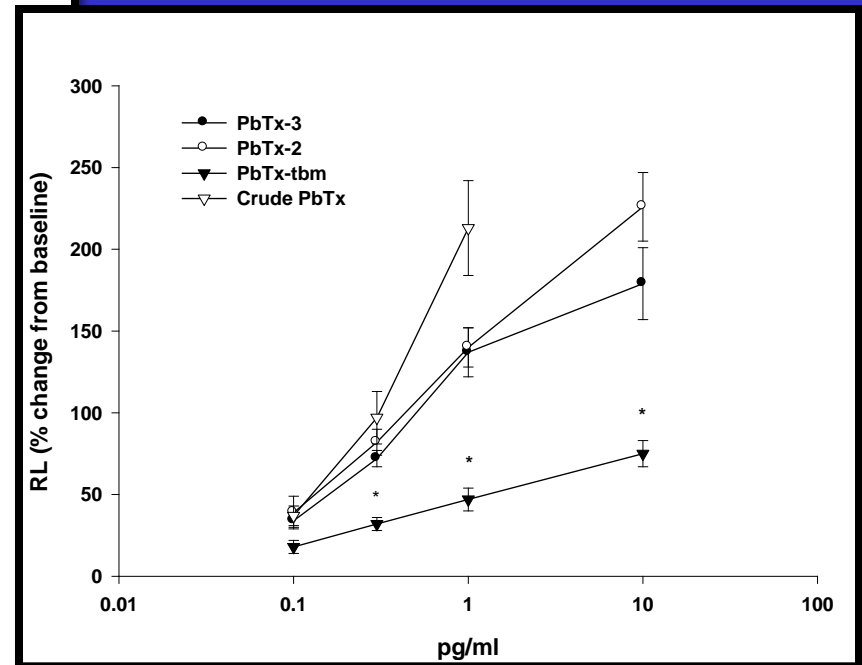
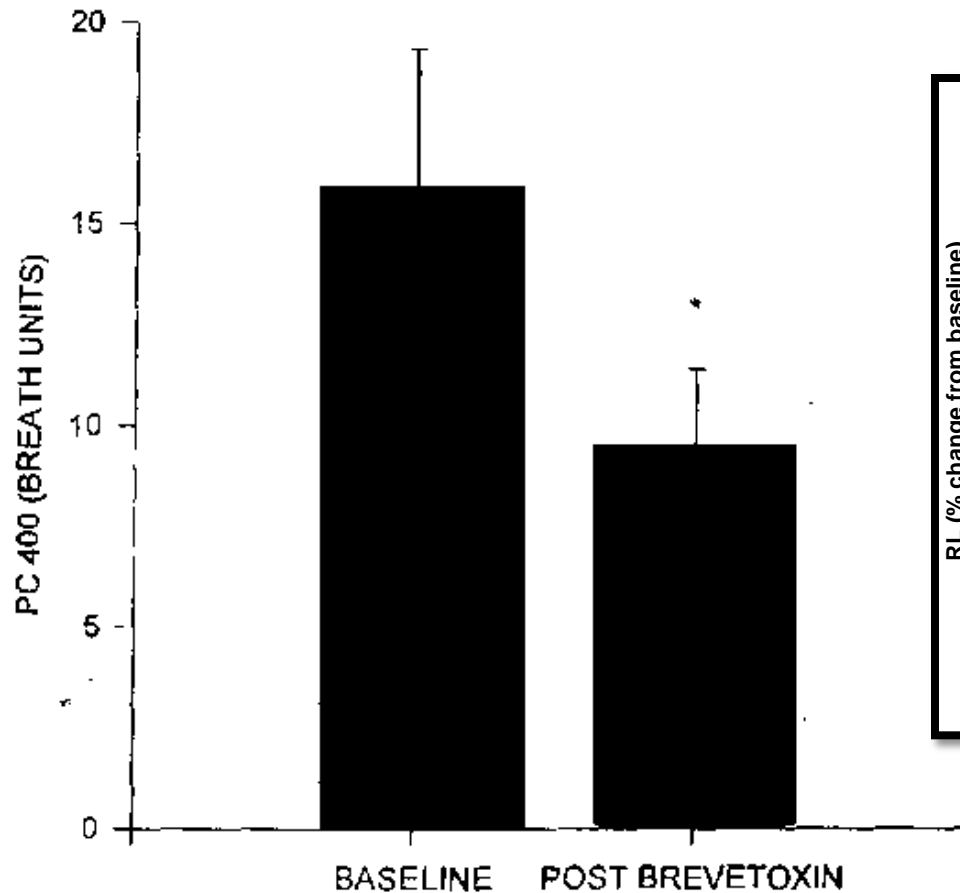


Benson et al



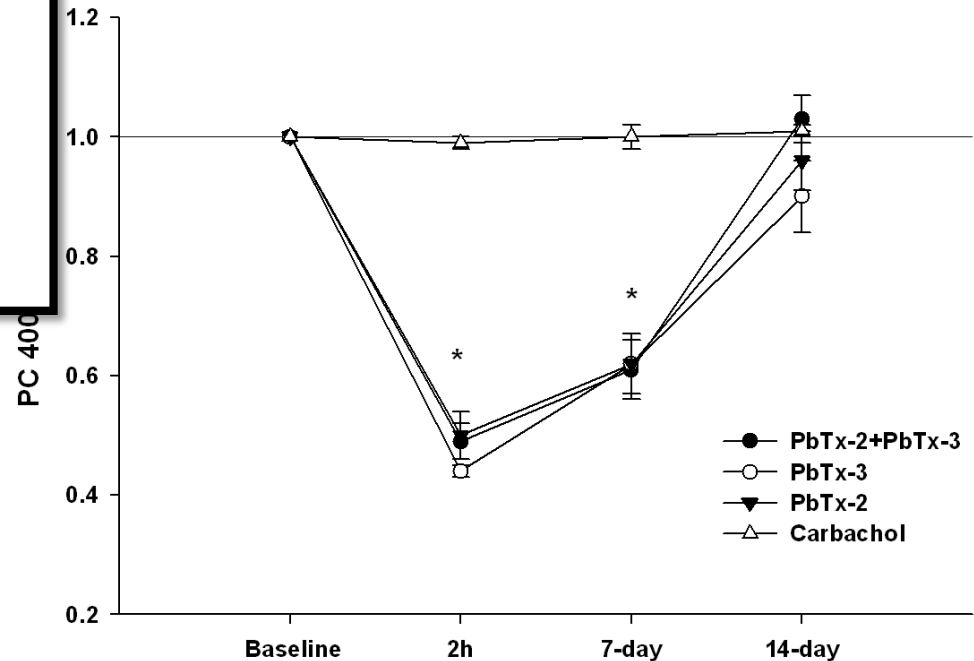
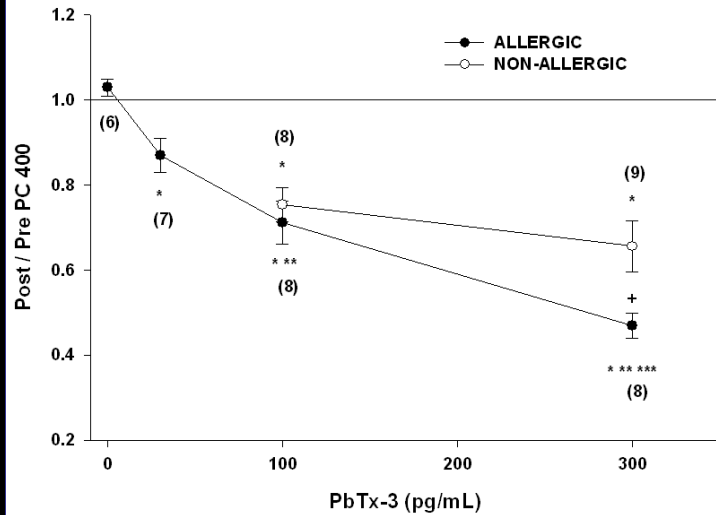
Sheep as Model Systems

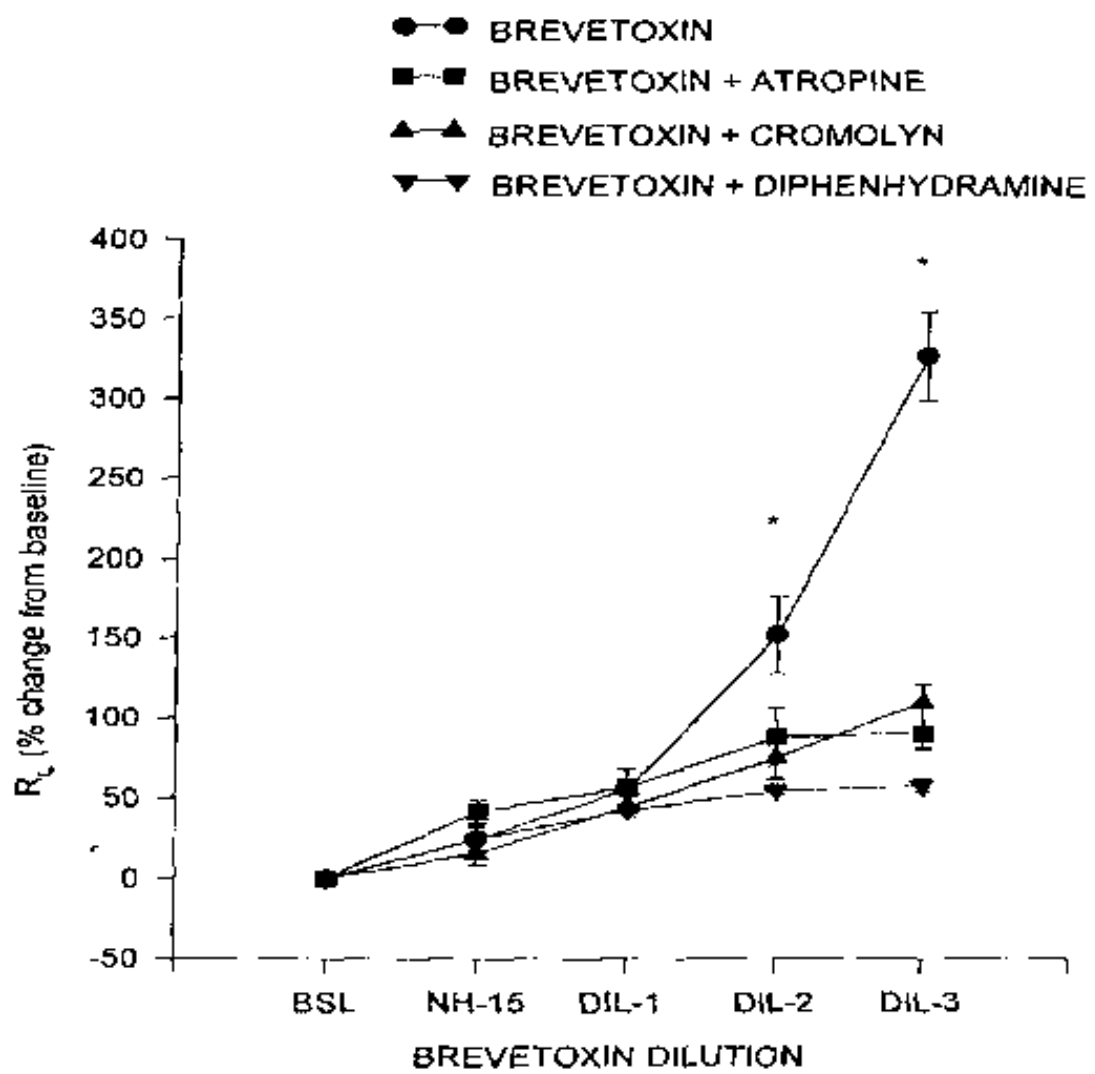
Abraham, Zaias et al



1 and 4 -Consecutive Day Challenges produce Prolonged Airway Hyper-responsiveness

1 Day Post Exposure

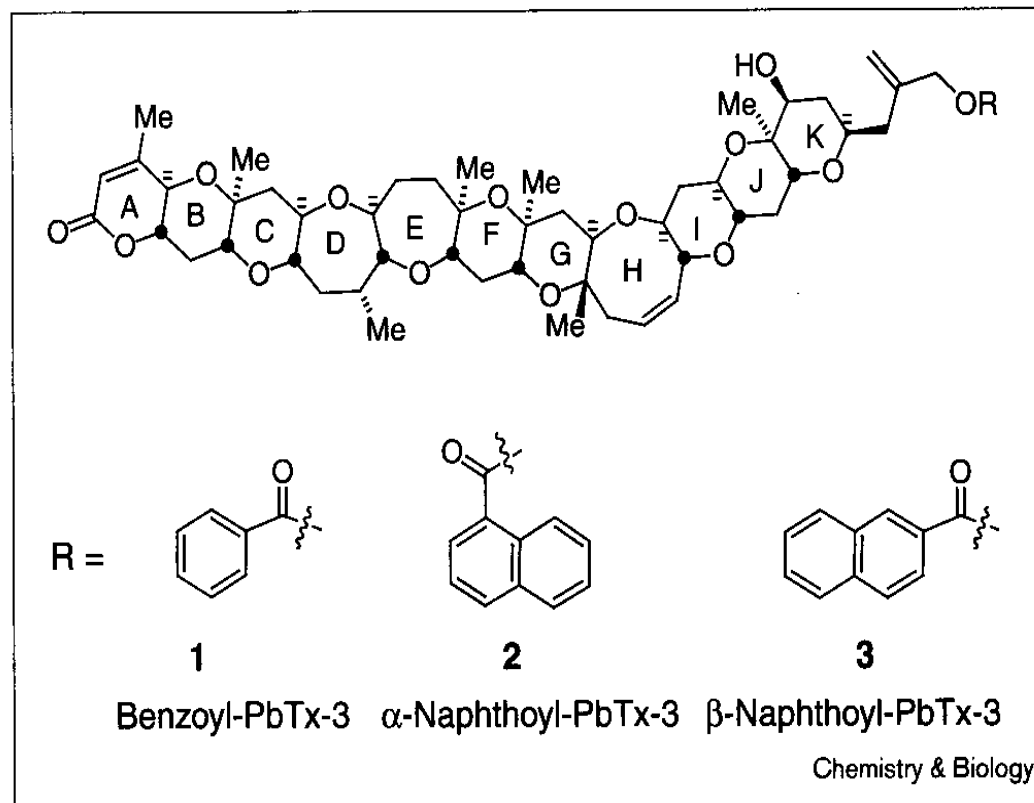




Treatment & Prevention of Brevetoxin Aerosol Effects

Abraham, Zaias et al

Synthetic & Natural Toxin Derivatives: Brevenal & Cystic Fibrosis



Structure of the brevetoxin derivatives evaluated in this study.

Aerosolized (Brevetoxin) Florida Red Tide



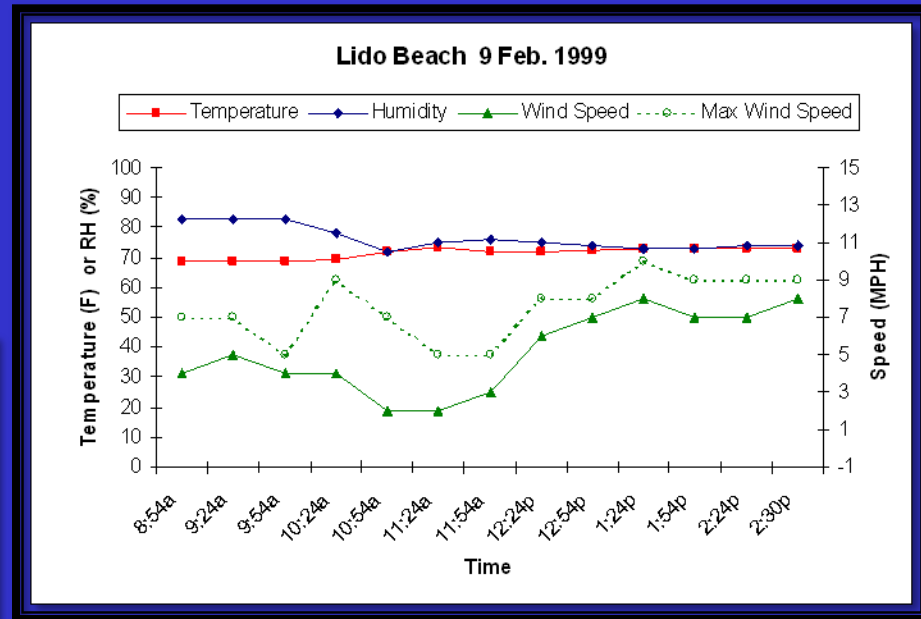


100 km
50 mi

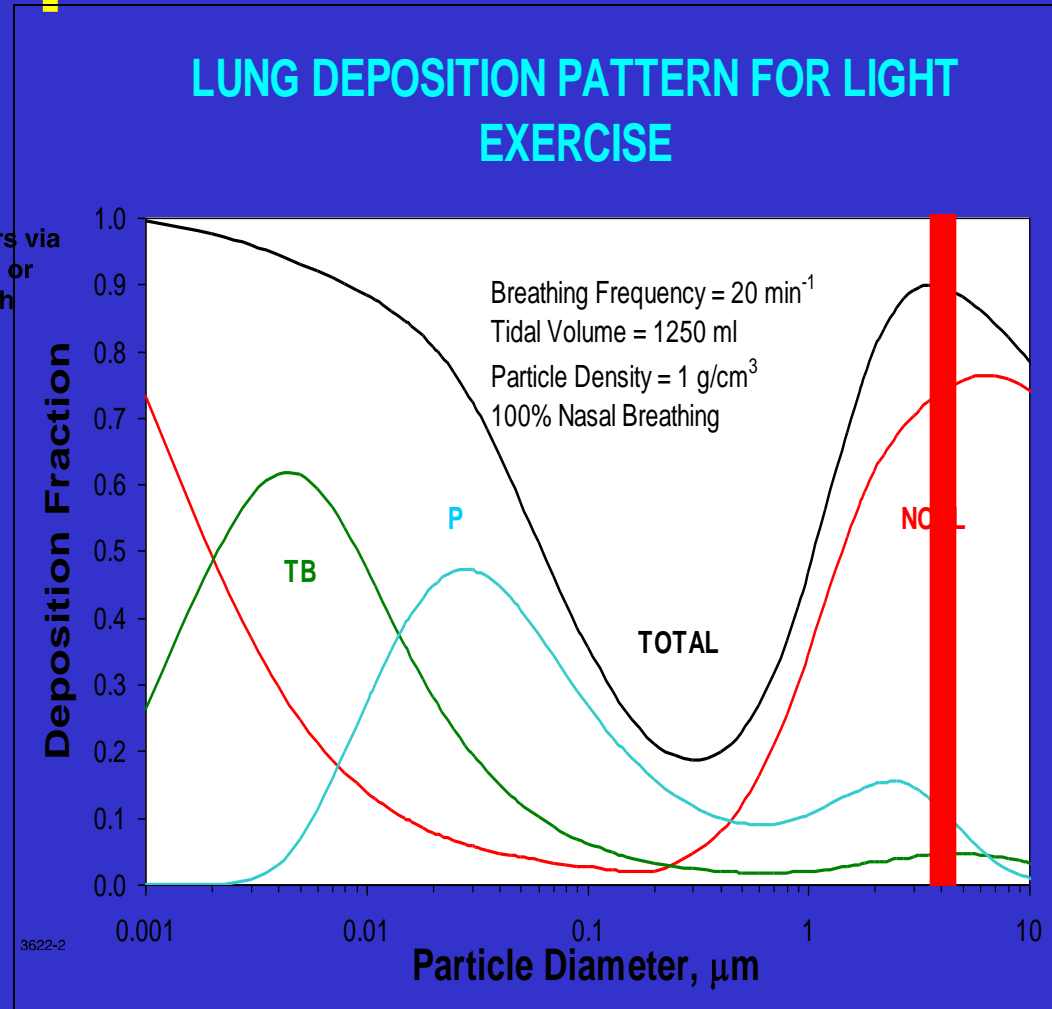
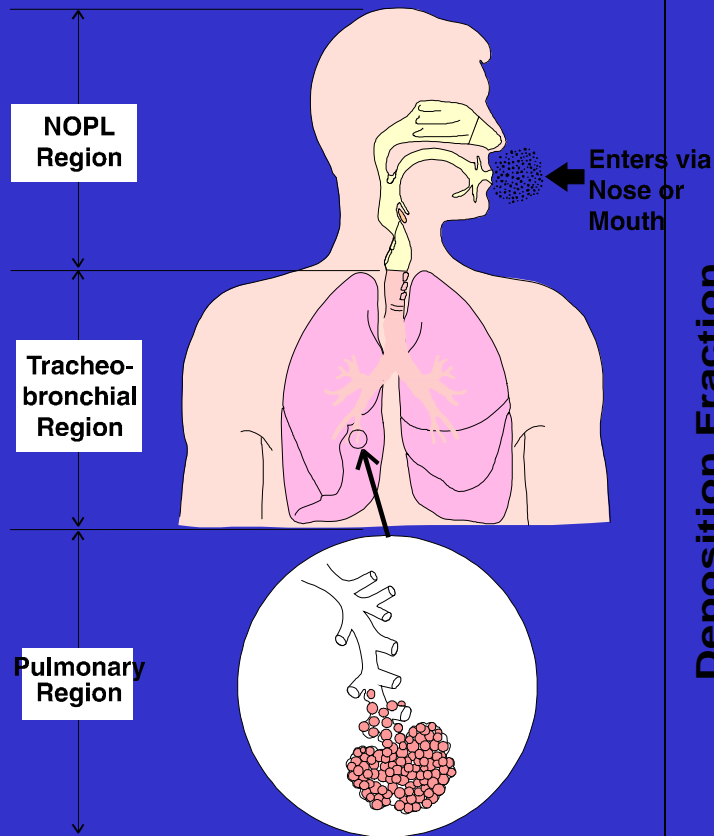
Florida Red Tide (Brevetoxin) & Organism & Toxin Monitoring



Florida Red Tide (Brevetoxin) Air Monitoring & Environmental Conditions



Respiratory Particulate Deposition



Florida Red Tide Populations & Baseline and Pre/Post Exposure Interviews

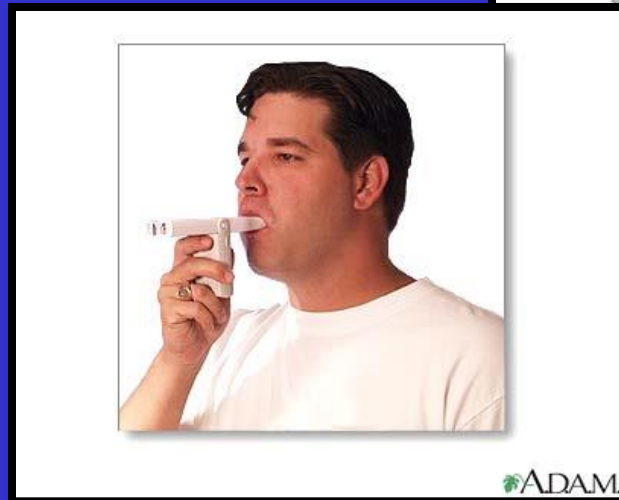
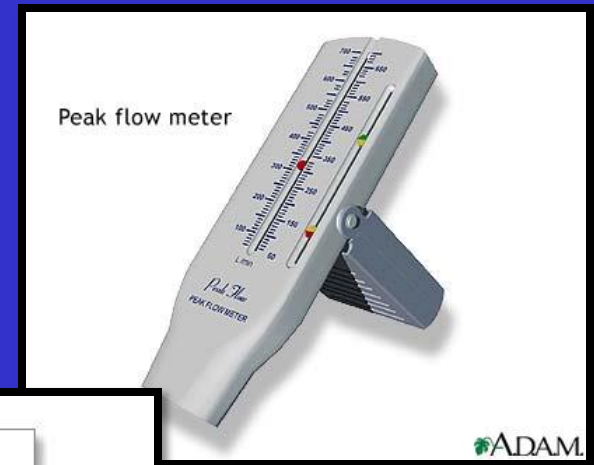


Florida Red Tide (Brevetoxins) & Baseline & Pre/Post Exposure Spirometry



Fleming, Backer,
Kirkpatrick, et al

Exhaled Breath Condensates, Peak Flow, Follow up & Longitudinal Studies



Fleming, Backer,
Kirkpatrick, et al

Emergency Room Admissions: Respiratory, GI



Kirkpatrick, Fleming, Hoagland, et al



Conclusions:

Animals & Environment

- **Animals in the wild**
 - Fish mortality
 - Brevetoxicosis
 - ?Brevetoxin fish poisoning
- **Evaluation in Animal Models**
 - Possible acute & chronic immune effects
 - No effects pregnant/fetus
 - Acute & Subacute pulmonary effects in asthmatic sheep
 - Possible Mitigation & Treatment
 - New Compound with Therapeutic Potential
- **Documented Environmental Aerosolized Exposures**
 - Cells & Toxins in water & air
 - Wind and Wind Direction Important
 - Detect brevetoxin > 1 mile inland
 - Particulate Size (10-20% respirable)



Conclusions: Humans

- **Emergency room visits GI & Respiratory**
- **Acute Respiratory Effects**
 - Symptoms in Asthmatics & Occupational
 - PFTs in Asthmatics
- **Sub Acute Respiratory Effects**
 - Symptoms & PFTs Asthmatics
 - Increased ER Respiratory Admissions
- **Chronic Respiratory Effects**
 - ?None in stable asthmatics; ?Unstable
 - ?Pneumonia, Bronchitis increased risk

Visit our website at:
www.mote.org/niehsredtidestudy



Inter-disciplinary/Agency Collaborators

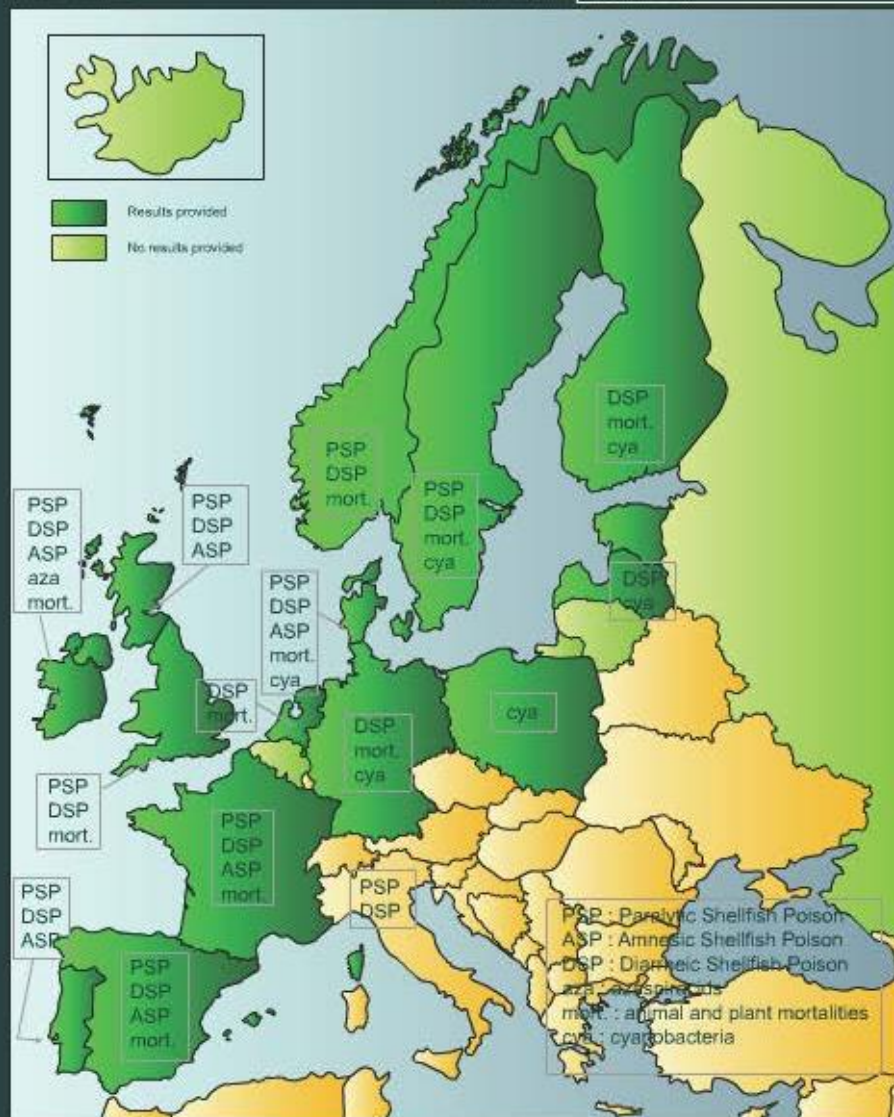
- CDC
- Florida Department of Health
- Florida Department of Environmental Protection
- Florida Marine Research Institute
- Harbor Branch
- Lovelace Institute
- Mote Marine Lab
- NIEHS
- S. Florida Poison Information
- Univ Miami School of Medicine & RSMAS
- Univ North Carolina (Wilmington)



Presence of toxins in Europe
1993 - 2002

ICES countries

DISCLAIMER - WARNING
HAEDAT maps should be interpreted with caution
regarding risk of intoxication by seafood products
from the respective areas/regions/countries.
The IOC and ICES are not liable for possible misuse
of this information.






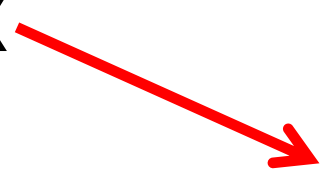
ICES
CIEM



Ifremer

Shellfish Safety – Algal toxins

EU working group on emerging toxins (May 2012)

- | | | |
|-------------------------|---|---|
| 1. Ciguatoxins |  | Emerging in
southern
European waters |
| 2. Ovatoxins |  | Emerging in
Mediterranean |
| 3. Cyclic Imines |  | Spirolides
everywhere,
others sporadic |
| 4. TTX |  | Gasteropod (PT) & fish in Mediterranean |

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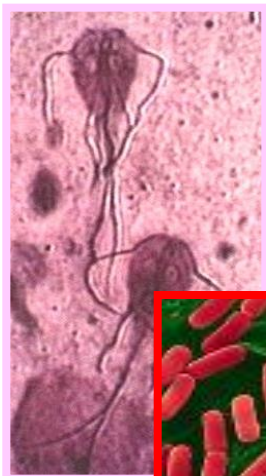
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RISKS:

- Storms, Climate Events
- Harmful Algal Blooms (HABs) & Other Toxins
- **Infectious Diseases**
- Anthropogenic Chemicals
- Fisheries Destruction

Microbes & Infectious Diseases

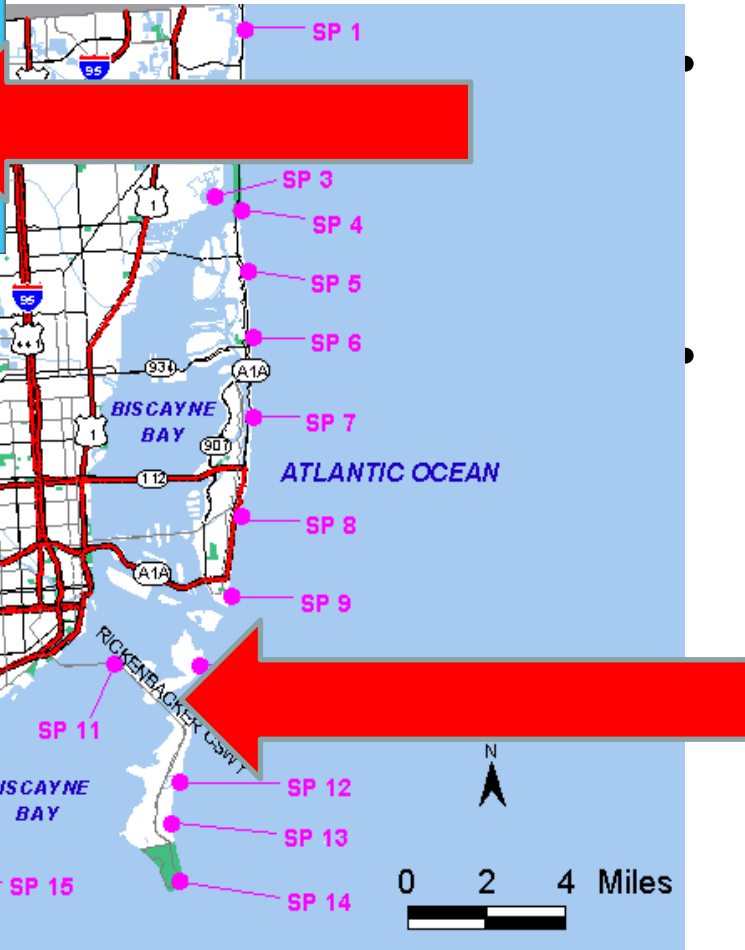


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Environment & Human Health

Microbial Pollution



Background



Florida Healthy Beaches Initiative starting in 2000

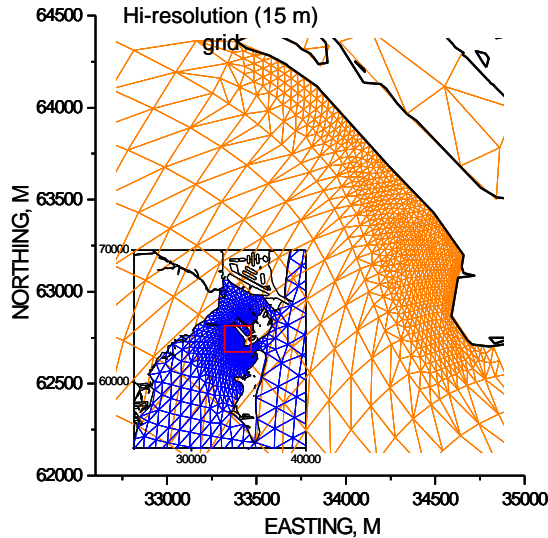
Miami (Florida, USA) Study Site has been in program since beginning

Primary Goal:

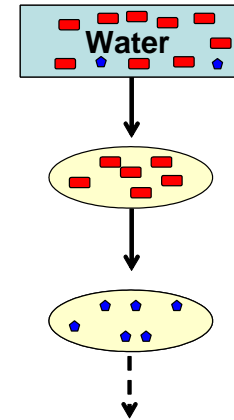
**Evaluate relationship between
human health
and
physical & microbial characteristics
of
non point source sub/tropical
recreational marine waters**

Project Goals

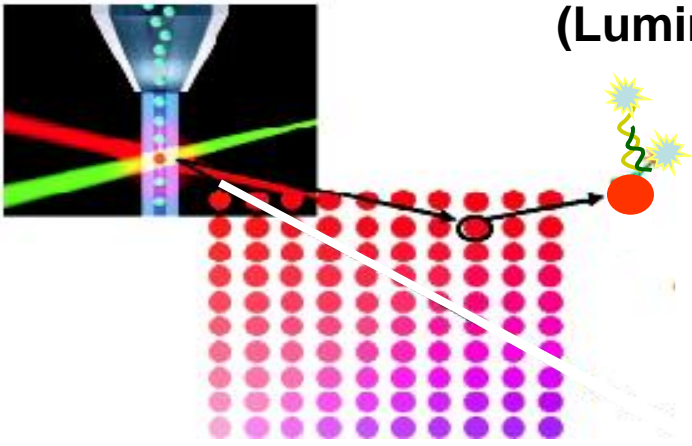
Develop a Microbial Fate and Transport Model



Measure indicators/pathogens and human health outcomes



Explore new innovative technology (Luminex)



Train scientists concerning health issues related to coastal water quality



Sampled potential sources of organisms

- Bathers, dogs, birds, shrimp, water, sand, runoff



Wright 2009; Abdelzaher 2013

Adult Bather Shedding Studies



Large Pool Study

Elmir 2007;
Plano 2011

Elmir 2009; Plano 2013

Toddler Shedding Study



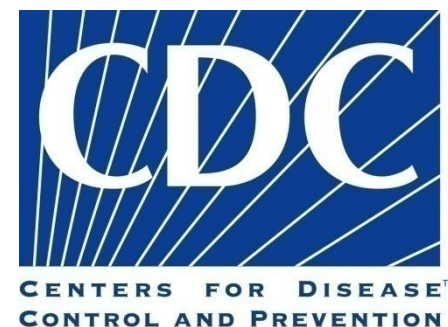
OCEANS AND HUMAN HEALTH CENTER
UNIVERSITY OF MIAMI • ROSENSTIEL SCHOOL



NATIONAL SCIENCE FOUNDATION • NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES

B.E.A.C.H.E.S

Beach Environmental Assessment and Characterization Human Exposure Study



BEACHES STUDY



Randomization



Conclusions

Non Point Source Subtropical Marine Waters

- **+Increased reported illness**
 - Gastrointestinal
 - Skin
 - Respiratory
- **Associated with Indicator Organism (MF)**
 - No Threshold: Skin only
- **Associated with Environmental Measures**
 - Rain (Skin) & Temperature (AFI)
- **No Association other FIB or Env Measures**
 - Enterococcus QPCR, Source Tracking, Staph

Acknowledgeme



National Science Foundation
WHERE DISCOVERIES BEGIN



Miami-Dade County
HEALTH DEPARTMENT





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Anthropogenic Pollution

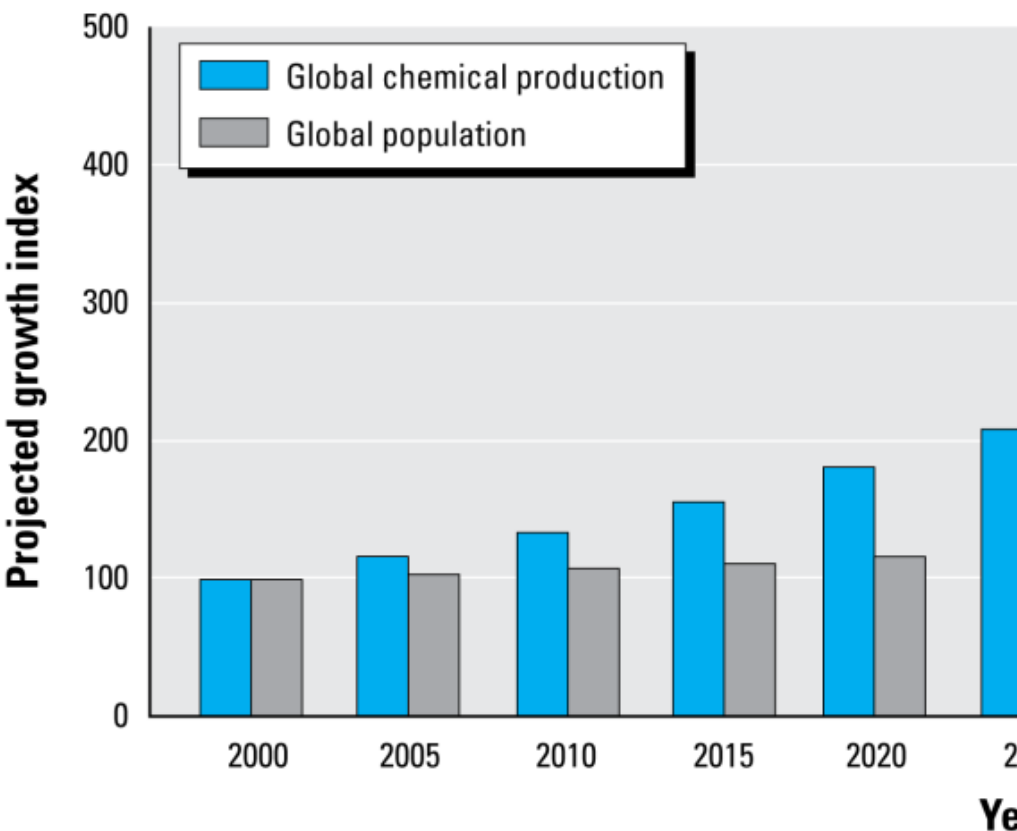


Mixtures!!!

Chemicals, HABs, Microbial Pollution, Climate Change, Acidification, Ocean Currents, Demographic Change, etc



Marine Chemical Pollution



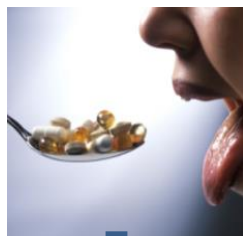
Global chemical production growth 2000-2050
(Wilson and Schwarzman, 2009). N McDonough ESF Marine Board





Research Questions

Is it **bioactive/toxic**?
Is it **bioavailable**?



Which pharmaceuticals should we research?

How much is **excreted**?

What are the **metabolites**?

Degradation in the sewage treatment works?

Partition into sludge or biosolids?

Can we use **models** to predict this?

Does the **biosolid form** matter?

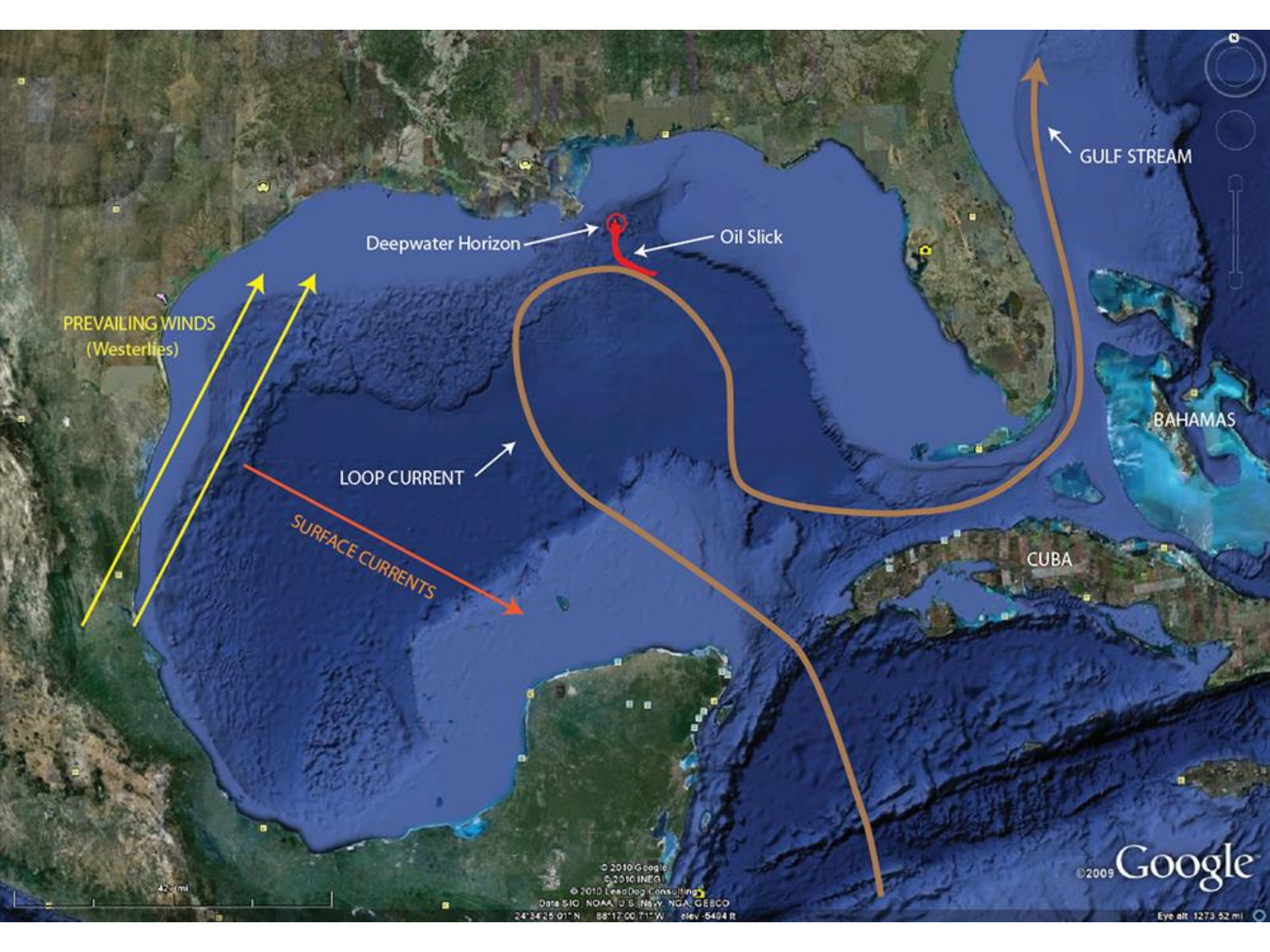
Does the **soil type** matter?

Does it **degrade**?

Do crop plants **uptake**?

Does the **crop** matter?

Can we **predict** uptake?



Coastal Populations & Food Chain



Eric Dewailly MD PhD photos



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RISKS:

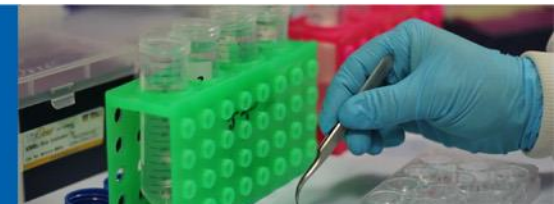
- **Storms, Climate Events**
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Seafood Depletion



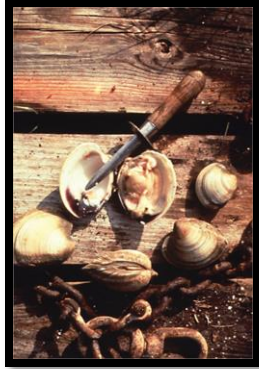
“**Seafood** (fish and shellfish harvested from capture fisheries and aquaculture production in marine and freshwater environments) contributes at least **15% of average animal protein consumption** to 2.9 billion people” (Smith 2010)



Communicating Mixed Messages: Example of Seafood

Benefits

- Health
 - Protein
 - Omega 2 fatty acids
 - Other essential nutrients
 - ?Decreased chronic diseases
 - Cardiovascular diseases
 - Cancer
 - Dementia
- Historic/Cultural/Local
- ?Aquaculture



Risks

- HAB toxins
- Microbial pathogens
- Chemicals/Contaminants
 - Heavy metals
 - POPS
- Fisheries destruction
- Historic/Cultural/Local
 - Occupational
- ?Aquaculture



eDPSEEA = Ecosystem Services & Ecological Public Health

- Theoretical Framework
- Stakeholder Engagement

Reis et al 2013

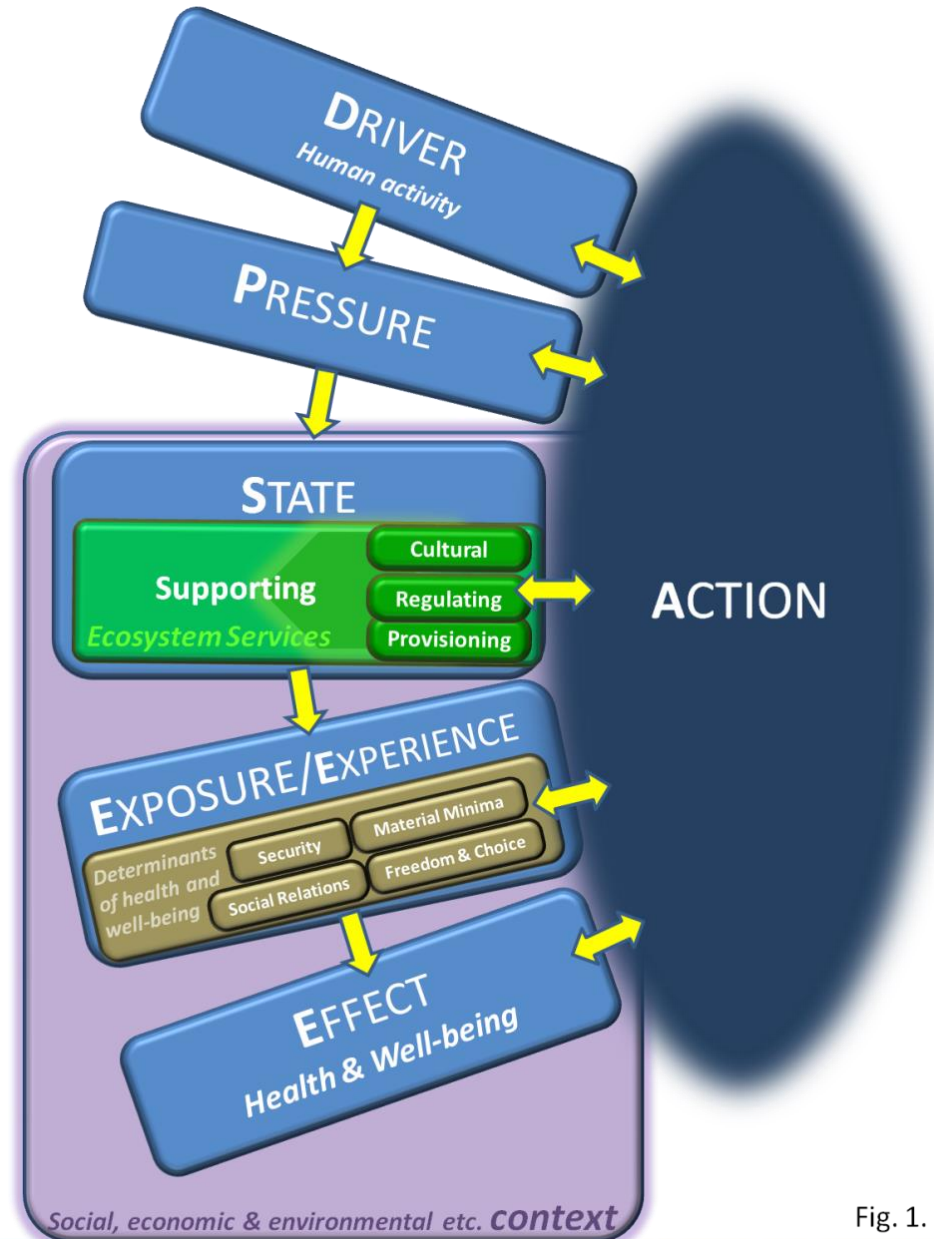


Fig. 1.



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RISKS:

- Ocean Acidification
- Invasive Species
- Other?

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***!! OVERFISHING!**
!?!#! WATER POLLUTION!!
!?!#! GLOBAL WARMING!!!!
***!@*! REEF DESTRUCTION!**



'NOT SO FUN LISTENING TO THE OCEAN, THESE DAYS...'

Linking Oceans & Human Health:

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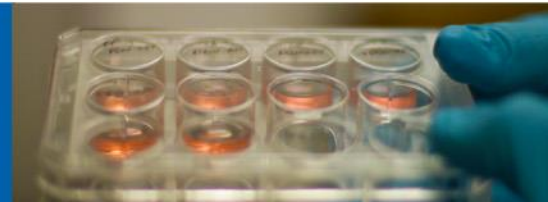
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BENEFITS & OPPORTUNITIES FROM THE SEA

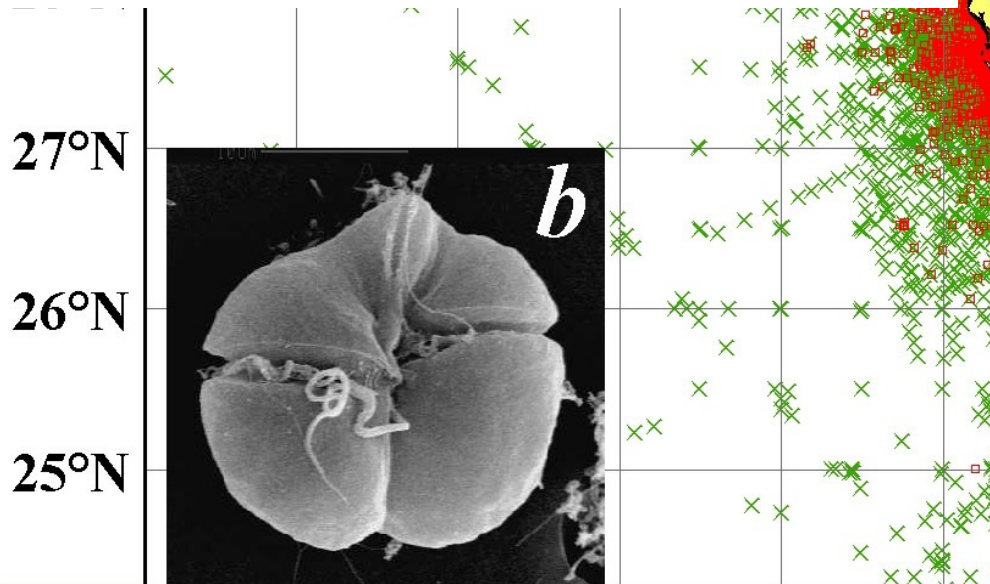
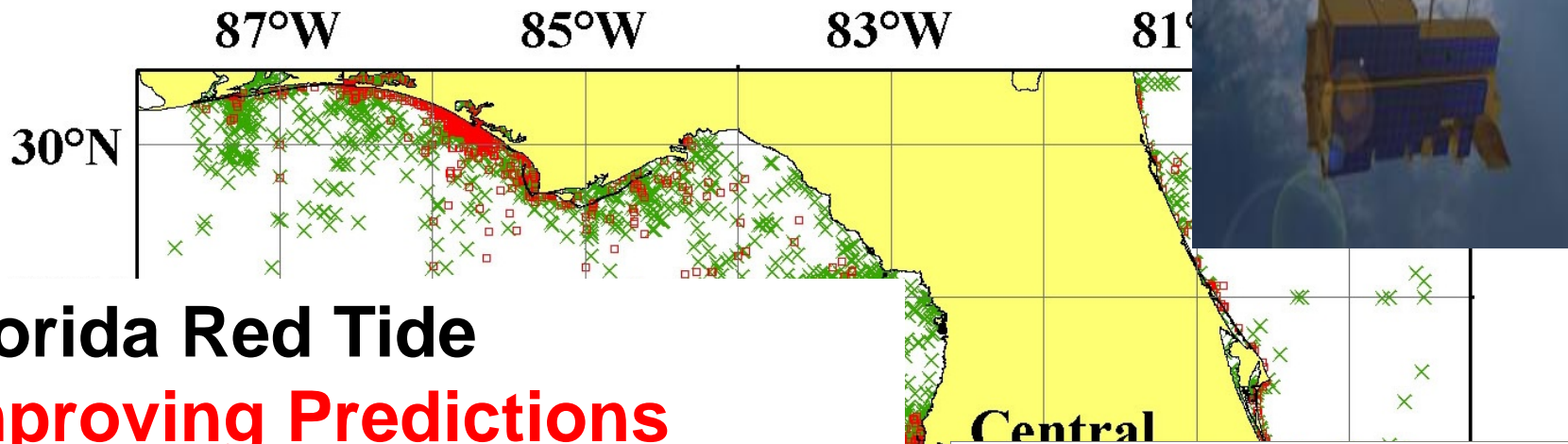
- **Modelling/Forecasting**
- **Pharmaceuticals & Other Bioactive Compounds & Biotechnology**
- **Marine Organisms as Biomedical Models**
- **Coastal Living/Blue Gym**




Florida



Florida Red Tide Improving Predictions



 **Gulf of Mexico Harmful Algal Bloom Bulletin**
5 January 2006
NOAA Ocean Service
NOAA Satellites and Information Service
Last bulletin: January 3, 2006

Conditions Report

A harmful algal bloom has been identified in Monroe County. Patchy low impacts are possible for the gulfside Lower Keys today and Sunday, with low to moderate impacts possible Friday and Saturday. No impacts are expected elsewhere in SW Florida through Sunday. Dead fish have been reported between Key West and Marathon in the past few days. Dead fish smell, while unpleasant, does not produce the same respiratory irritation as red tide.

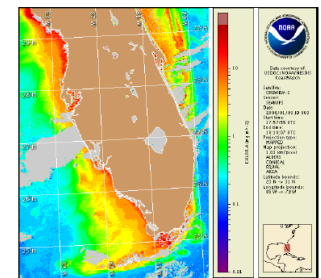
Analysis

The bloom near the Lower Keys remains present. Chlorophyll levels are continually elevated north and south of the Lower Keys, with levels highest north and southeast of Big Mullett Key (24°35'N, 81°54'W and 24°34'N, 81°53'W), inside the Marquesas Keys, and northeast of the Horseshoe Keys (24°48'N, 81°16'W). Elevated chlorophyll extends along the ocean side of the Lower Keys, out to approximately 7 miles from shore. No recent samples are available for this area. A fish kill was reported on 1/3 at Egret Lane west of Marathon. Sampling is highly recommended throughout this area. Continued transport around the Lower Keys is possible throughout the weekend. Also, a slight possibility exists for the transport of additional *K. brevis* through the Lower Keys' larger passages on Friday and Saturday with the appearance of strong north to northwesterly winds.

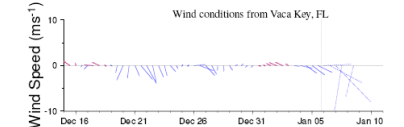
Sampling results indicate the bloom is no longer present at the SW Florida coast, although background levels remain patchy in bay and sound areas of Sarasota and Pinellas County (FWRI, 1/3). Elevated chlorophyll features remain offshore Collier and Monroe Counties near 25°36'N, 82°13'W, and offshore Lee and Collier Counties at 26°16'N, 82°27'W. Sampling, if possible, is recommended. Overall movement has been minimal; the features will likely remain offshore and continue southward migration. Fisher, Broder

Please use the following restrictions as all SeaWiFS imagery derived from CoastWatch.

1. Data are restricted to civil marine applications only. i.e. federal, state, and local government use/distribution is permitted.
2. Image products may be published in newspapers. Any other publishing arrangements must receive OnImage approval via the CoastWatch Program.



Satellite chlorophyll image with possible HAB areas shown by red polygons.



SW Florida: Westerly winds (5-10kts, 3-5m/s) today will shift northwesterly, strengthening to 20kts (10m/s) after midnight through Friday. Continued northwesterlies on Saturday will weaken to 15kts (8m/s) and turn northeasterly Saturday night at 10kts (5m/s). Mild easterlies expected Sunday and Monday (5-10kts, 3-5m/s).

FL Keys: Northwest to north winds (10kts, 5m/s) today, becoming westerly this afternoon into tonight at 15kts (8m/s). Strong northwesterlies on Friday (up to 25kts, 13m/s) and gusty will shift northerly Friday night into Saturday, weakening to 15kts (8m/s). North to northeast winds near 15kts (8m/s) on Sunday. Northeast to east winds expected Monday.

Linking Oceans & Human Health:

A Strategic Research Priority for Europe

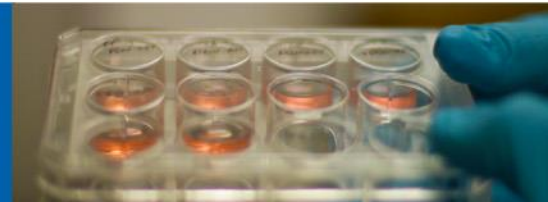
Position Paper 19

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BENEFITS & OPPORTUNITIES FROM THE SEA

- Modelling/Forecasting
- **Pharmaceuticals & Other Bioactive Compounds & Biotechnology**
- Marine Organisms as Biomedical Models
- Coastal Living/Blue Gym



Remedies from the Seas

Current successful examples:

- **Bryostatin 1** (potent anticancer agent from marine invertebrate);
- **Ecteinascidin 743** (potent anti cancer drug from the Caribbean sea squirt);
- **Discodermolide** (potential anti cancer drug from a marine sponge)
- **Brevenal** (possible cystic fibrosis agent from Florida Red Tide brevetoxin natural derivative)

Bourdelaïs, Baden, Abraham et al



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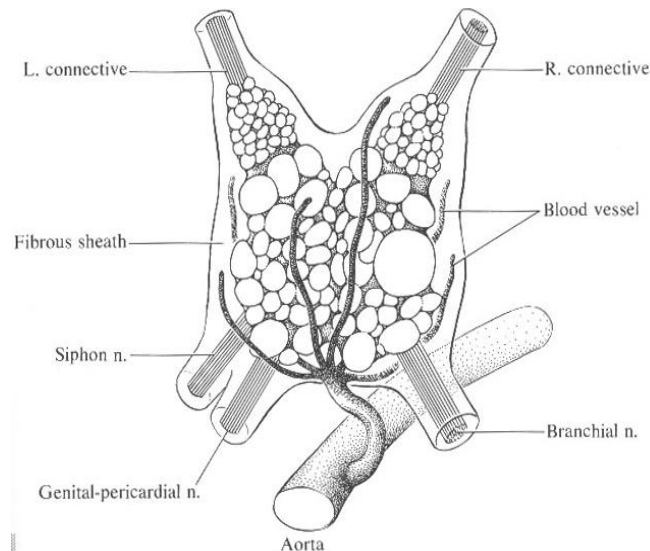
Sentinel Species



Example: Aquatic Animal Model

Aplysia (Sea Hare)

Simple Brains Enabled
Nobel Award Winning
Studies of Memory &
Learning



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BENEFITS & OPPORTUNITIES FROM THE SEA

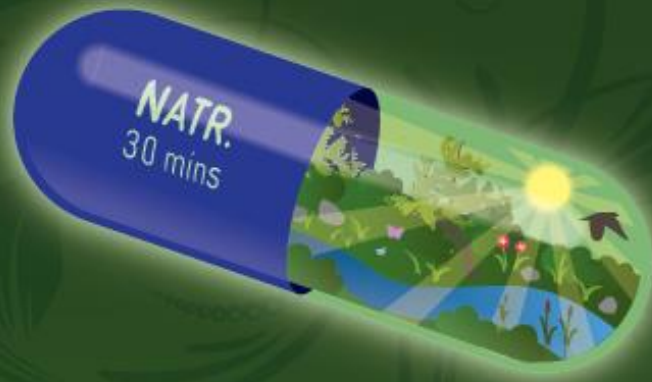
- **Modelling/Forecasting**
- **Pharmaceuticals & Other Bioactive Compounds & Biotechnology**
- **Marine Organisms as Biomedical Models**
- **Coastal Living/Blue Gym**



A relationship between environmental degradation and mental health in rural Western Australia (Speldewinde 2009)



- An association was detected between **dryland salinity** and **depression**, indicating that **environmental processes may be driving the degree of psychological ill-health** in these populations.



Salutogen[©]

- Lowers blood pressure
- Lowers heart rate
- Promotes wellbeing

Available from all parks, seashores,
forests or countryside near you.

Dr Will Stahl-Timmins
Prof Michael Depledge

Blue Gym = Campaign + Research



Rockpool rambles



Sailing



Rigorous scientific studies (Secondary Data, Intervention & Mechanistic studies)

Coastal walks

Kayaking



Swimming



Diving

Mike Depledge PhD et al

Health & Wellbeing in the Natural Environment Across the Life Course

Transitions into Retirement

Young Adults & Outdoor Physical Activity (ESRC/National Trust)

**“Stories of the Sea”:
Exploring *Embedment* in Deprived Coastal Communities**

Choosing a hotel room.....



European Centre for
Environment & Human Health

All 3 rooms are identical (2-3 star, size, furniture, ensuite, price) except view from the balcony

A



£60.81

B



£72.85

C



£47.96

Mean Willingness to Pay (per night)

White *et al.*, 2010, J Environ Psych



Self-reported Health Census Data (England, n = 48 million)

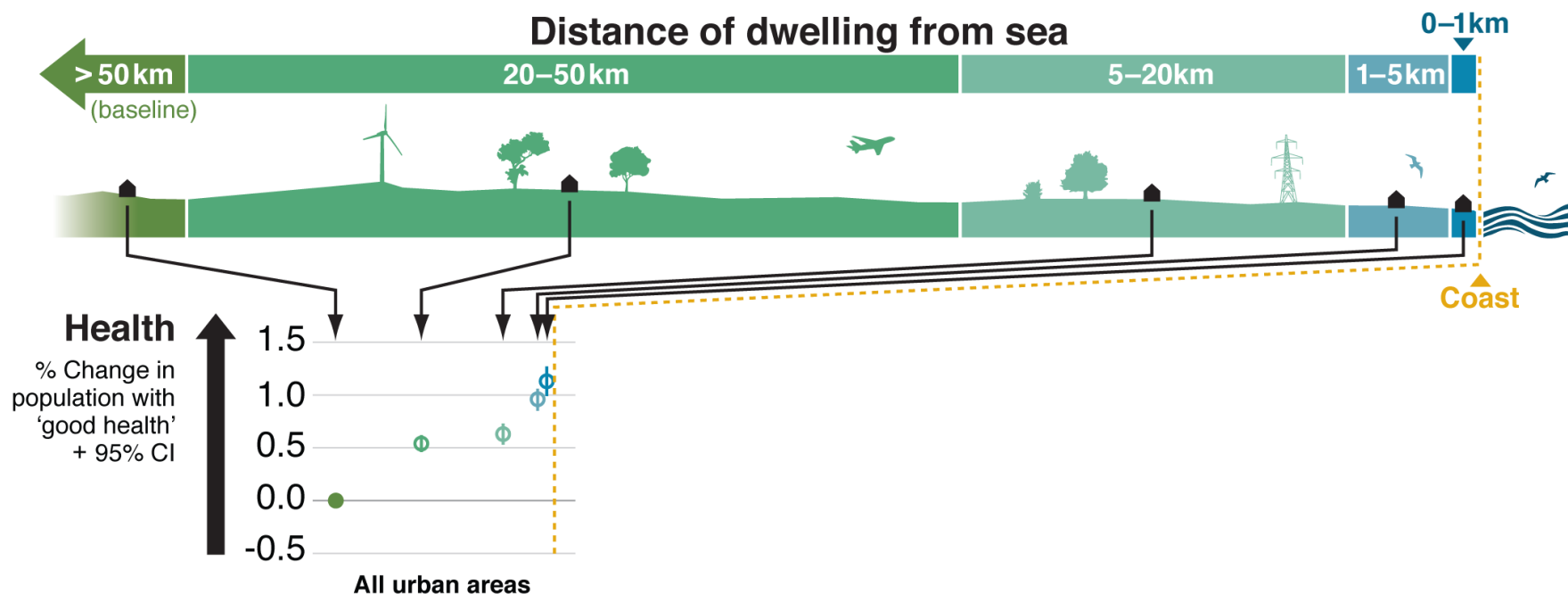
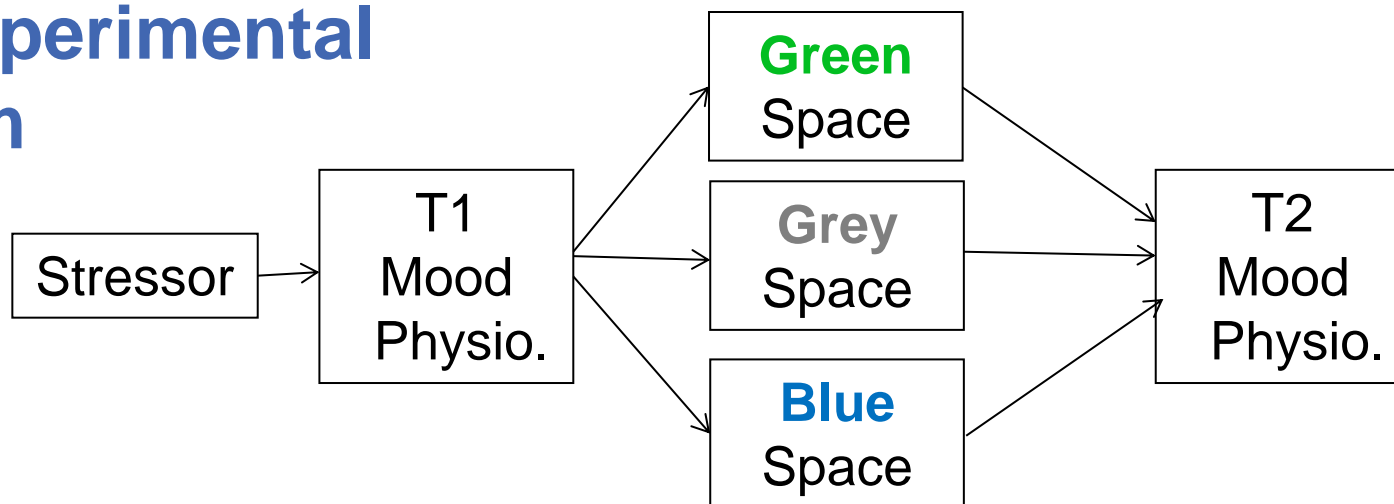


Fig 1. The coast and good health in urban areas. Age standardised % of population stating 'good health' relative to those in areas furthest from the coast (>50km) - adjusted regression coefficients with 95% confidence intervals; total and by income deprivation quintile.



Basic Experimental Paradigm

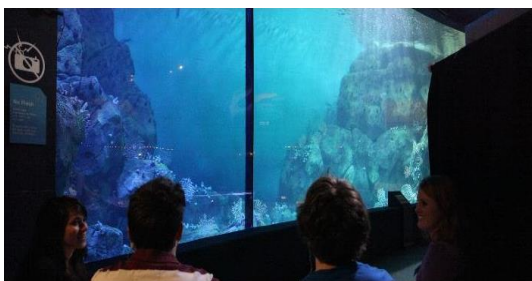


Lab work:

(Films, Sounds, +
During Exercise)



Applied Settings & Different Populations



Dental surgeries (+ VR)



White et al



Randomised Control Trial



Dental room



Iced water

Virtual beach

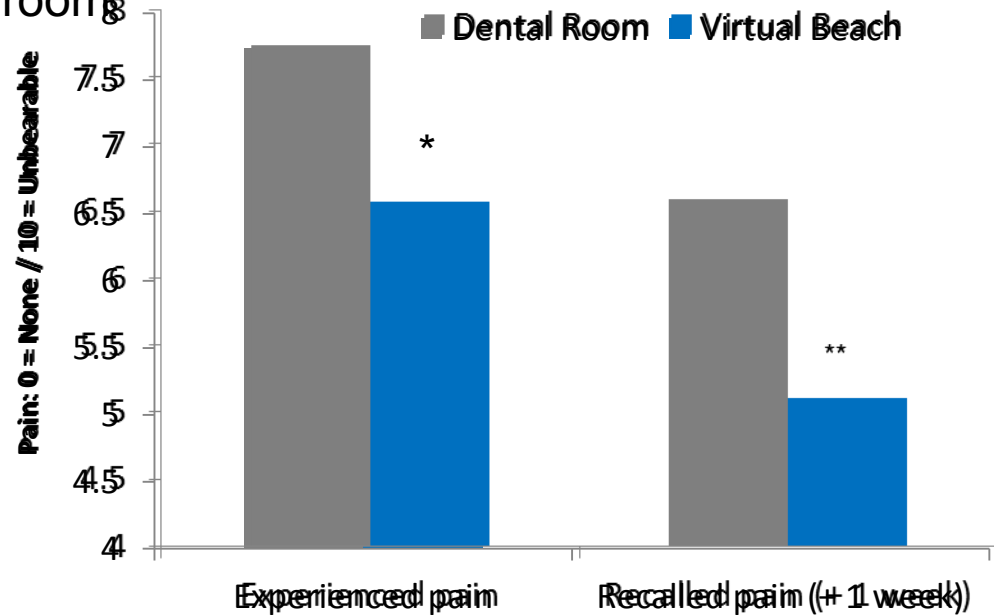


Outcomes

Pain

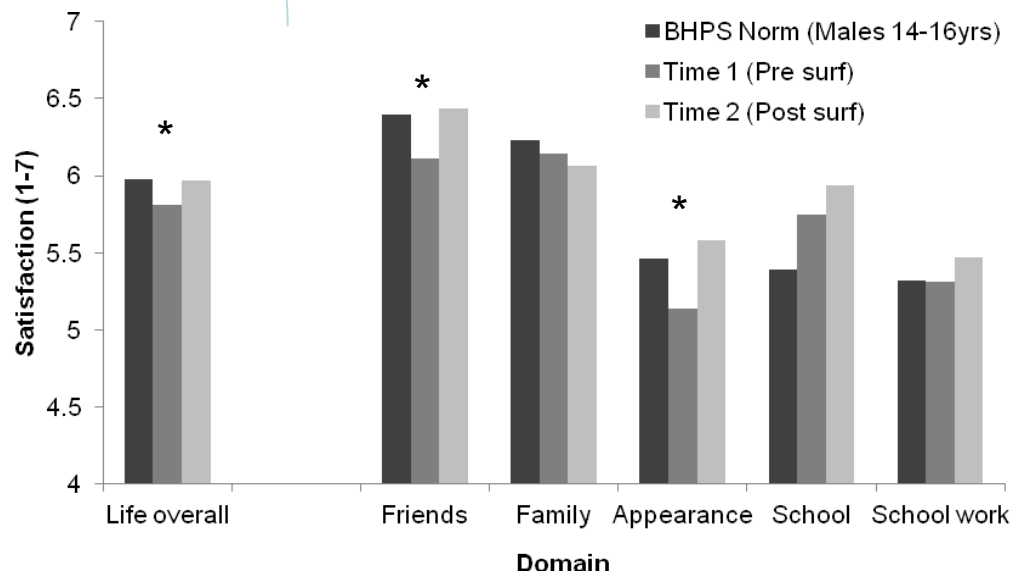
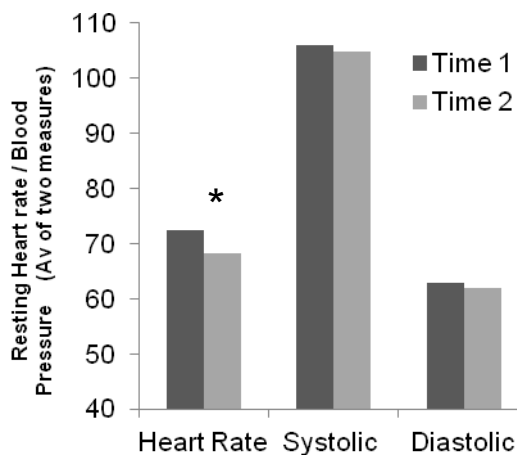
Ease of treatment

Keep appointments





Vulnerable Communities



Next steps

- 1) Other countries?
- 2) What is the optimal dose?
- 3) How long do effects last?
- 4) What about children?
- 5) Environmental impact?
- 6) Comparisons to drugs (e.g. depression)?





Health & Well-Being from Coastal Environments

ECEHH & Plymouth University Team: Ian Alcock, Kat Ashbullby, Debbie Cracknell, Michael Depledge, Karin Dijkstra, Josey Field, Amanda Hignett, Rebecca Jenkin, Sabine Pahl, Cassie Phoenix, Jo Ross, Chloe Thomas, Ben Wheeler, Mat White, Kayleigh Wyles

For further details please contact: **mathew.white@exeter.ac.uk**



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Home » Research » Research Projects » Psycho-physiological responses to indoor cycling in different environments

PROJECT DETAILS



Psycho-physiological responses to different environments

Physical activity can have a host of benefits for this study we are trying to understand more about exercising in different environments.

Listen to Dr White explaining the study to BBC

We are doing this in a controlled setting by asking 15 minutes whilst viewing images and sounds of

1. Coast
2. Countryside
3. Town
4. Blank wall (this acts as our control condition)

Over a period of 4 weeks participants will cycle. We are monitoring participant's mood, arousal & before, during and after cycling.

Explore Images:



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Home » Research » Research Projects » The beach as a setting for families' health promotion

PROJECT DETAILS



The beach as a setting for families' health promotion

This multi method project involving in-depth interviews with 15 families aged 8-11 years living in Cornwall and Devon is exploring the following:

- how families spend their time at the beach
- children and parents perceptions of the risks and benefits of the beach
- children and parents perceptions of the barriers and enablers to beach and children active free play in coastal settings

Natural outdoor environments are increasingly being considered as health promotion and for the role they can play in increasing human wellbeing. This is in light of evidence that engagement with nature can provide physical activity, reduce stress, restore cognitive ability, social interaction and facilitate pro-environmental attitudes and behaviour.

For children in particular, natural environments can offer multiple benefits for physical activity through active play, the nature, creative play, social interaction and the development of confidence in being outdoors. Of course, in addition to offering such benefits for children and adults, natural environments also can provide

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Home » Research » Research Projects » Blue space and health: Secondary data analysis

PROJECT DETAILS



Blue space and health: Secondary data analysis

As part of the Centre's programme of research on how aquatic environments (blue space) are related to health and wellbeing, we are conducting secondary data analyses.

Secondary data are those that have already been collected, and by using these alongside data we collect ourselves (primary data), we can set out to address our research questions in a powerful, highly efficient and cost-effective manner.

These secondary data can be used within Geographic Information Systems (GIS) in order to map environmental, socio-economic and health data together. GIS allows us to visualise how, for example, rates of disease vary spatially, and to carry out geographical analysis to determine how environmental conditions are related to health outcomes.

We are currently working with health/socio-economic datasets derived from the UK Census and other large scale surveys, and environmental datasets from landuse surveys, satellite imagery and so on.

These data permit us to address questions such as to what extent access to 'blue space' (coasts, inland waterways and urban waters) might have positive effects on public health and wellbeing.

Explore Images:



ALTHOUGH



European Regional
Development Fund
Investing in your Future



convergence
for economic
transformation



RESEARCH
WITH
PLYMOUTH
UNIVERSITY

Linking Oceans & Human Health:

A Strategic Research Priority for Europe

Position Paper 19

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BENEFITS & OPPORTUNITIES FROM THE SEA

- Blue Energy
- Blue Carbon
- Other?



Linking Oceans & Human Health:

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Oceans & Human Health

- **Research & Training**



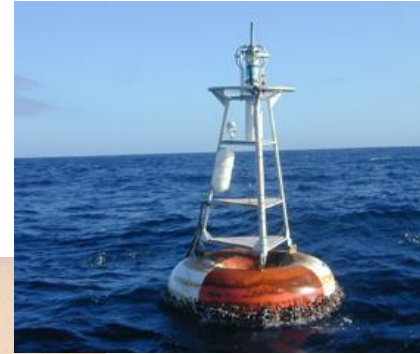
2004

4 NSF NIEHS OHH Centers

3 NOAA OHH Centers

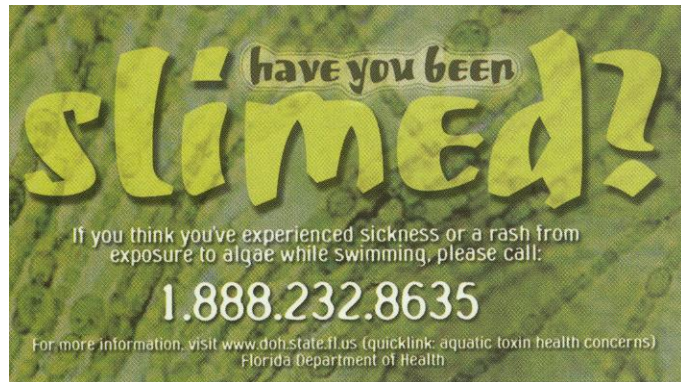


Oceans & Human Health Centers: **Inter-disciplinary** Research, Training, Pilot Projects, Facilities Cores, Shiptime



Outreach & Dissemination Programmes

www.rsmas.miami.edu/groups/niehs/AMBIENT



**Poison
Information
Aquatic Hotline
888 232 8635**

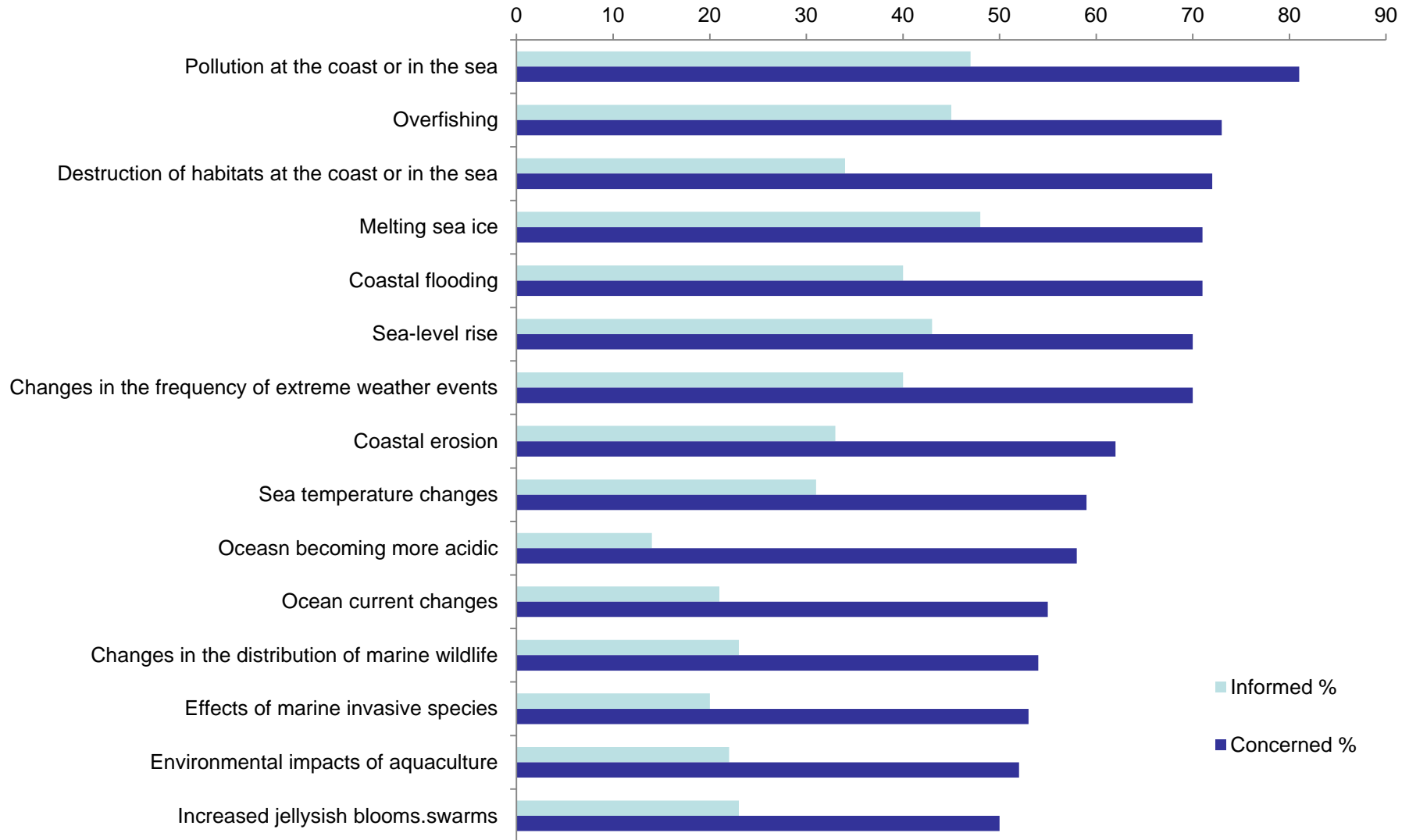


www.mote.org/niehsredtidestudy/

10,000 citizens from 10 EU countries (Clamer Survey)

1. How well informed?

2. Concern about 15 key marine environmental issues?



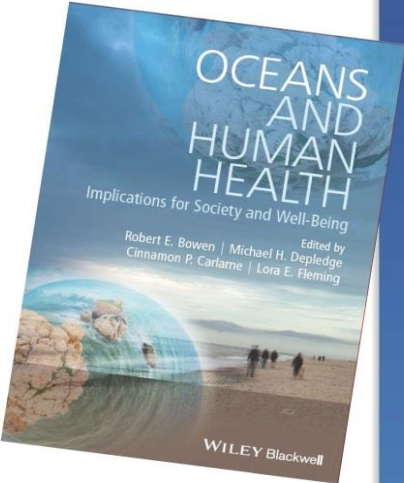
OHH New S

 Gordon Research

Gordon Conference **OCEANS & HUMAN**

- June 2008
- June 2010
- June 2012
- **June 2014**
- **June 2016 ?Europe**

New Book: Seas, S
(Bowen et al, Wylie



Oceans and Human Health
Implications for Society and Well-Being
Robert E. Bowen, Cinnamon P. Carlarne, Michael H. Depledge, Lora E. Fleming

This remarkable volume brings experts from diverse disciplines and builds a workable understanding of breadth and depth of the processes – both social and environmental – that will help us to limit future costs and enhance the benefits of sustainable marine systems. In particular, the authors have developed a shared view that the global coastal environment is under threat through intensified natural resource utilization, as well as changes to global climate and other environmental systems. All these changes contribute individually, but more importantly cumulatively, to higher risks for public health and to the global burden of disease.

This pioneering book will be of value to advanced undergraduate and postgraduate students taking courses in public health, environmental, economic, and policy fields. Additionally, the treatment of these complex systems is of essential value to the policy community responsible for these questions and to the broader audience for whom these issues are more directly connected to their own health and well-being.

"The following pages in this volume are written in a lucid and very readable style, and provide a wealth of knowledge and insightful analysis, which is a rare amalgam of multi-disciplinary perspectives and unique lines of intellectual inquiry. It is valuable to get a volume such as this, which appeals as much to a non-specialist reader as it does to those who are specialists in the diverse but interconnected subjects covered in this volume." From the "Forward" written by, R K Pachauri, Director General, TERI and Chairman, IPCC

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USD \$80.00 / £50.00 / €65.90

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Message from Bedruthan

Unanimous call for a coordinated, transnational and



“....Unanimous call for a coordinated trans-national and interdisciplinary oceans and human health research programme in Europe..”

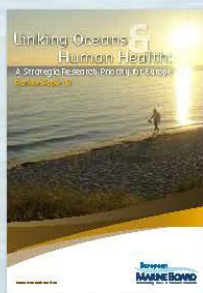
- managing effective knowledge transfer and science policy interfaces.

The Bedruthan workshop unanimously called for a coordinated, transnational and interdisciplinary Oceans and Human Health research programme in Europe. Research should be solutions-oriented, supporting health and wellbeing promotion and disease treatment, and informing maritime, environment, public health and innovation policy.

European Marine Board (EMB) position paper

The Message from Bedruthan follows publication of EMB position paper 19, “**Linking Oceans & Human Health: A Strategic Research Priority for Europe**”. The EMB is a partnership of 36 major national research institutes and funding agencies from 19 European countries. The paper represents a compelling endorsement from this large European research network of the societal importance for Europe of supporting coordinated interdisciplinary OHH research.

Download at www.marineboard.eu



3. Strategic Analysis

Analyse the current OHH research effort and state-of-the-art in Europe, including research capacities and infrastructures, and identify research gaps and needs. Identify mechanisms to collate existing evidence and data currently dispersed across many different fields.

4. Human Capacities

Improve training and researcher mobility, and promote interdisciplinary expertise in OHH.

5. Policy Assessment and Support

Analyse the current EU policy framework, identifying policy gaps and making recommendations in support of evidence-based policy which takes account of maritime environment and human health interactions.

6. Stakeholder Engagement

Improve the pathways for knowledge transfer and uptake across key OHH areas, linking with current ocean literacy developments in Europe, to achieve stakeholder and community engagement.

For more information, contact:

Professor Lora Fleming, Director, European Centre for Environment & Human Health, University of Exeter: l.e.fleming@exeter.ac.uk
Dr. Niall McDonough, Executive Scientific Secretary, European Marine Board: nmcdonough@esf.org
Reference: Fleming et al., 2014. Message from Bedruthan. A statement from the participants of the Oceans & Human Health workshop. A rising tide of challenges and opportunities in Europe, Bedruthan, Cornwall, UK, 20-21 March 2014.
Further information at: www.ecehh.org/events/oceans-human-health & www.marineboard.eu/oHH

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6 Essential Areas to Build OHH Capacity

1. Community building
2. International cooperation
3. Strategic analyses
4. Human capacities
5. Policy assessment
6. Stakeholder engagement and knowledge transfer
 - **Knowledge Gap: Interconnections**

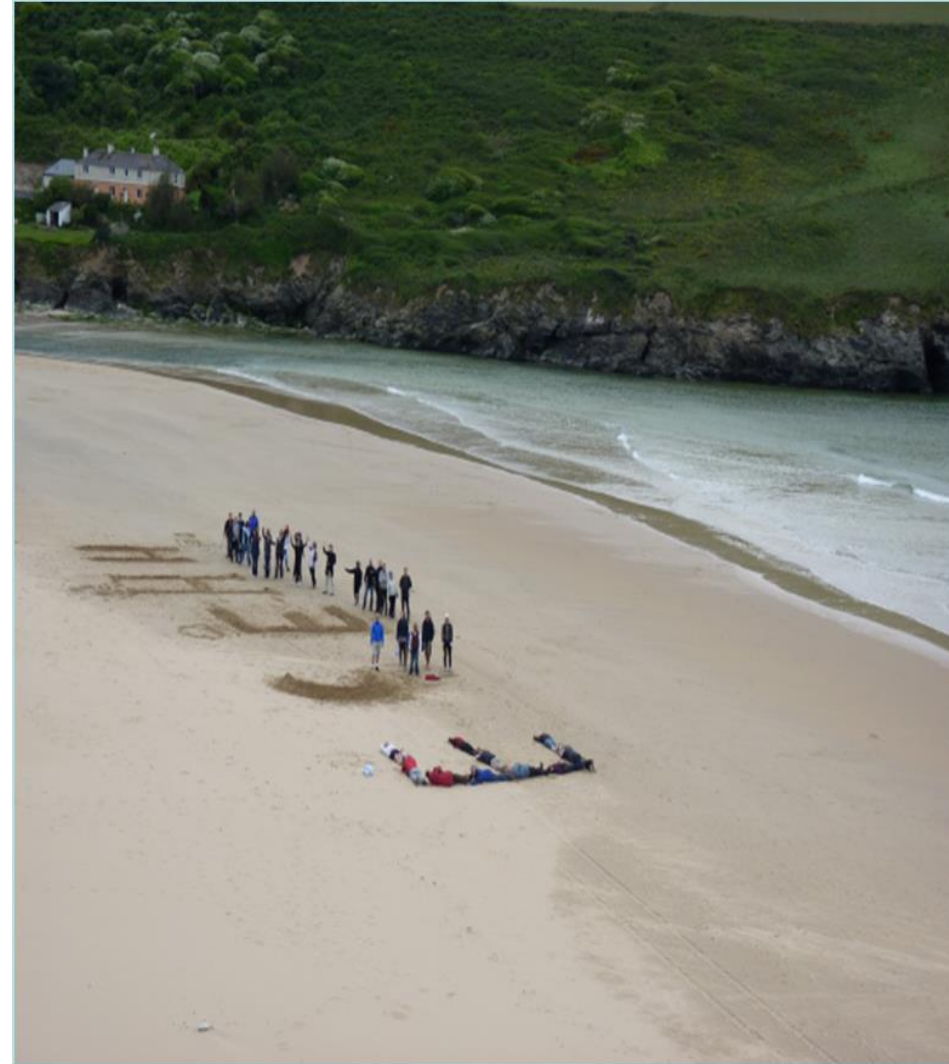




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Environment & Human Health

Interconnections between the Environment & Human Health

www.ecehh.org



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