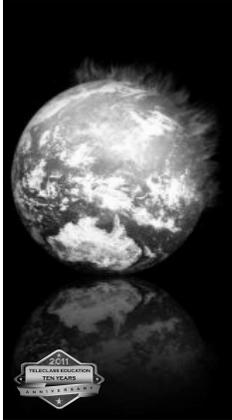


**Climate Change and Communicable Disease: What Are the Risks?**  
**Prof. Andrew Nichols, University of Plymouth**  
**A Webber Training Teleclass**



**CLIMATE CHANGE AND  
COMMUNICABLE  
DISEASE:  
WHAT ARE THE RISKS?**

Andy Nichols  
University of Plymouth

Hosted by Maria Bernallick  
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July 14, 2011

**Aims and objectives**

- Discuss a review of the literature
- Present examples from practice
- Consider future actions and risk

**Potential health impacts of climate change**

- Heat waves
- Storms
- Floods
- Fires
- Droughts
- Infectious diseases

**Potential health impacts of climate change**

- Agriculture and fisheries
- Ecosystems and economies
- Impact on health and wellbeing

**Natural events, environmental change and health**

- Examples:
- Flash flooding
- Outbreaks of *Escherichia coli* O157 in the United Kingdom (UK)
- Increased incidence of tick borne infections in Europe

**Historical perspective**

- Changes in the climate
- Changes in the environment
- Changes in patterns of disease
- Hippocrates - Airs, Waters, Places

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Healthcare practitioners responsibility?

- Promoting the health of the public
- Protect the environment
- Work to prevent, mitigate and adapt to climate change and its impacts

Focus on three main areas

- Water
- Vector
- Food borne disease

Waterborne disease

- Increased risk of infection due to flooding more likely to impact poorer countries
- Unlikely to impact upon the UK/developed nations unless water sources themselves are breached

Waterborne disease

- Evidence suggesting that climate change and consequent heavy rainfall events may have a role in changing patterns of infection in temperate regions
- Outbreaks of infection associated with drinking water associated with heavy rainfall events immediately preceding the onset of the outbreak

Waterborne disease

- Rainfall events are likely to increase the prevalence of organisms such as *Cryptosporidia* and *Giardia* within streams, rivers or other recreational waters

Waterborne disease

- Rising temperatures may aid the development of toxic algal blooms that are detrimental to health within both fresh watercourses and sea waters
- Increased incidence of cholera associated with such blooms
- Cholera is unlikely to present a major future risk in the UK

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**Waterborne disease**

- Increased incidence of cholera associated with such blooms
- Cholera is unlikely to present a major future risk in the UK
- <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Cholera>

**Waterborne disease**

- Impact of a warmer climate on water borne disease in countries like the UK is more likely to be via its detrimental effect on chemical coagulation used in the treatment of drinking water supplies
- Potentially leading to a reduced elimination of microorganisms from treated water

**Waterborne disease**

- UK DOH/HPA advice advocates the use of enhanced monitoring and risk management measures as a means of safeguarding water supplies during extreme weather events such as droughts or unusually heavy rainfall

**Vector borne disease**

- Increasing in ambient temperatures
- Flooding associated with climate change
- Likely to result in an increase in the spread of vectors e.g. mosquitoes
- With a resultant increase in incidence of diseases such as malaria

**Vector borne disease**

- Likely to present a particular problem only in developing countries
- Unlikely that countries with adequate public health and medical infrastructures would see a significant spread of malaria

**Vector borne disease**

- Need for vigilance throughout Europe
- Possibility of the arrival of new species that could act as an effective vector

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### Vector borne disease

- Climate change may be a significant factor responsible for precipitating changes in the prevalence of arthropod borne diseases in the UK

### Vector borne disease

- Alterations in land usage and leisure activity due to warmer temperatures in the UK
- Associated changes in human behaviour
- Changes are likely to have an impact on the transmission of vector-borne diseases such as those spread by insects e.g. flies, ticks and mosquitoes

### Vector borne disease

- Suggestion that as a result of the warming climate, the sand fly which may carry *Leishmania*, could spread into northern areas previously unpopulated by this species of fly
- <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/TravelHealth/EpidemiologicalData/ArthropodBorneInfections/travLeishmaniasis>

### Vector borne disease

- Reports of vector species responding to climate change in Europe, with latitudinal shifts in the population of ticks due to rising temperatures
- Resulting in changes in the incidence, distribution and transmission of tick-borne encephalitis

### Vector borne disease

- Unlikely that tick-borne encephalitis would become a major problem in the UK

### Vector borne disease

- Multiple factors –
- Temperature, humidity, levels of precipitation, soil moisture and sea level rise can all have an impact on the transmission of vector-borne infectious diseases

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### Vector borne disease

- The UK Department of Health (DOH) and the UK Health Protection Agency
- It is unlikely there will be outbreaks of malaria within the UK in the immediate future and any such outbreaks are likely to be uncommon and involve few people

### Vector borne disease

- Lyme disease
- Agricultural workers or those involved in rural leisure activities during warmer weather are more likely to be exposed to disease causing ticks
- Uncertainty over whether the numbers of disease causing ticks are likely to increase
- <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/LymeDisease>

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- Agricultural workers or those involved in rural leisure activities during warmer weather are more likely to be exposed to disease causing ticks
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### Food borne disease

- Reported increasing risk of death and disease from food poisoning associated with climate change and the effects of flooding
- Effects of higher temperatures on food storage and food hygiene

### Food borne disease

- Rising temperatures and increased risk of flooding are likely to affect the distribution and incidence of diarrhoeal disease, with associated increased risk of food contamination

### Food borne disease

- Greatest risk of diarrhoea will occur in populations in developing countries
- Western/developed countries may suffer little additional risk

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### Food borne disease

- Food contamination may also result from flooding and the remobilisation of chemicals and pesticides on the land

### Food borne disease

- DOH/HPA indicate temperature is a significant factor in diarrhoeal disease such as salmonellosis, finding that a higher incidence in summer months suggests a role for climate in the causation of food borne disease

### Food borne disease

- DOH/HPA indicate temperature is a significant factor in diarrhoeal disease such as salmonellosis, finding that a higher incidence in summer months suggests a role for climate in the causation of food borne disease
- <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Salmonella>

### Adaptation and Mitigation

- Climate change may well have some future impact upon the incidence and prevalence of water, vector and food borne communicable disease in the UK

### Adaptation and Mitigation

- Mitigation and adaption to the effects of climate change on health are risk management issues and provide a framework for the identification and prioritisation of adaptation policies

### Adaptation and Mitigation

- Communicable disease control focus on -
- Surveillance and response
- Early warning systems
- Policy responses
- Risk assessment
- Feasibility of options
- Involvement of stakeholders

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**Adaptation and Mitigation**

- Strategies to ensure that future land-use developments do not worsen current levels of risk
- Health Impact Assessments

**Adaptation and Mitigation**

- Adaptation and mitigation approaches for differing areas of communicable disease risk will require the engagement of different multi-agency stakeholders
- Forestry Commission
- Tourist Advice
- Waste Management

**Adaptation and Mitigation**

- Evidence available of changes in the transmission of communicable disease associated with extreme weather events in the UK

**Cornish beach outbreak**



**Rainfall and flooding**



**Rainfall and flooding**

- More frequent extreme rainfall events could lead to increased surface water turbidity and higher numbers of bacteria and pathogens in surface water

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**Beach outbreak**

- In August 2004 seven cases of Escherichia coli O157 infection were identified in children on holiday in Cornwall
- All seven had stayed at different sites in the area

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- In August 2004 seven cases of Escherichia coli O157 infection were identified in children on holiday in Cornwall
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- <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/EscherichiaColiO157>

**A Cornish beach with a stream**



**Beach outbreak**

- Increased numbers of coliforms were found in the stream. Cattle were grazing upstream
- Evidence suggested that the source of the outbreak of acute gastrointestinal illness caused by *E. coli* O157 was a contaminated stream flowing across the beach

**Beach outbreak**

- Heavy rainfall in the days preceding the outbreak might have lead to faeces from the cattle contaminated by *E. coli* O157 contaminating the stream

**Beach outbreak**

- Increased rainfall over short periods could lead to increased bacteria in surface water
- Heavy rainfall could provide a bolus of contamination to water courses and bathing areas

# Climate Change and Communicable Disease: What Are the Risks?

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#### Behaviour and Public Health

- Public Health Messages:
- Don't smoke
- Drink less
- Eat healthily
- Exercise more
- Take care in the sun

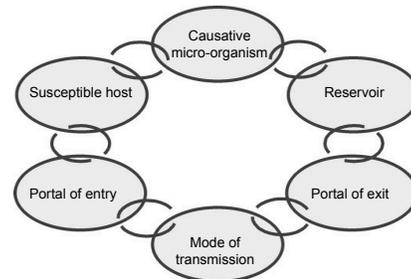
#### Behaviour and Public Health

- Potential climate change related scenario:
- Warmer, dryer summers
- Increased outdoor recreational activities
- Increased exposure to potential pathogens
- Public health advice – avoid exposure to risk
- How successful might this advice be?

#### Behaviour and Public Health

- Chain of infection
- Two organisms involved
- Causative/infectious organism
- Susceptible host organism
- Consider changes in the behaviour of both organisms in response to climate change
- Impact on communicable disease control

#### Chain of Infection



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#### 2011 BRITISH TELECLASS TOPICS

**FEBRUARY 22 ...**

Writing for Publication and Conference Presentation  
– First Steps to Dissemination (Heather Loveday)

**MARCH 16 ...**

Moving Closer to Nirvana – The Importance of  
Nurse Empowerment (Julie Storr)

**APRIL 12 ... (Free Teleclass)**

Voices of the IPS (Infection Prevention Society Board)

**APRIL 28 ... (Free Teleclass ... A.D. Russell Memorial Teleclass)**

The Spaulding Classification, Disinfection and Sterilization: Is it Time  
to Reconsider (Gerry McDonnell)

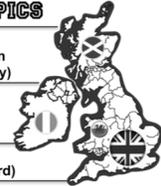
**JULY 14 ... (Free Teleclass)**

Climate Change and Infectious Disease (Andrew Nichols)

**Free WHO Teleclasses (Europe) ...**

- **APRIL 8 ...** Hand Hygiene Education and Monitoring
- **MAY 6 ...** Importance of Worldwide Hand Hygiene Events & Activities
- **JULY 20 ...** Highlights and Results from May 5 Activities
- **AUGUST 24 ...** Latest Update on *Clostridium difficile* Control
- **OCTOBER 4 ...** MRSA Control – Is Search & Destroy the Way to Go?

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