Climate Change and Vector-Borne Diseases: How much of a threat to Malta?

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Overview

- Climate change and Vector-borne disease
- How could climate change affect VBDs already present in Malta?
- Could climate change increase the range of VBDs in Malta?
- Current work

Climate change predictions (2100)

- Taken from First report to UNFCC
- Temperature rise by 3°C
- Precipitation:
  - Total decrease (17%)
  - Decrease in autumn
  - Increase in spring
- Increase in severe weather events

Impact of changing climate on VBDs

- Difficult to predict
- Different impacts on each vector
- Consider whole life cycle and impact on habitat:
  - Larval development
  - Adult survival
  - Pathogen infection
  - Breeding sites
- Impact on reservoir and humans

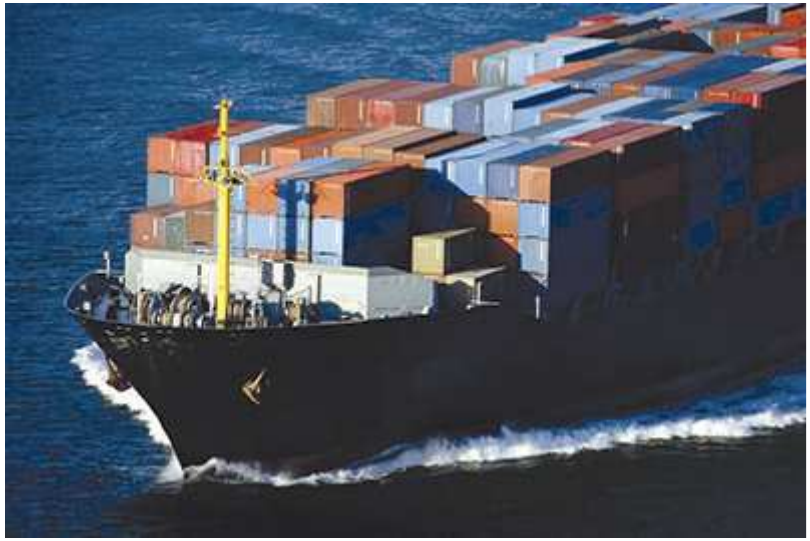
Human behaviour

- Associated to climate change
- Increased temperature will mean:
  - More time outside?
  - Longer BBQ season
  - More mosquito and tick bites?
- Also – more use of water containers
  - Ideal breeding ground for Aedes albopictus
  - Increased risk of establishment?
- Combination of increased vector density and season = more cases?

Human behaviour

- Not associated to climate change
- Increased travel: increased risk of coming back with illness
  - Between 2001 and 2006 travel from Malta to Chik countries increased by >200%
  - In 2006, >2000 persons came to Malta from Chik countries

  (source NSO)
- Trade in used tyres and other items
  - Increased risk of introduction of new vectors



Vectors present in Malta

- Culex spp - West Nile Fever
- *Aedes detritus - Competence for Chikungunya in laboratory*
- *Aedes aegyptii*
  - *Reported in Malta in early 20th century*
  - *Vector for Dengue, Chikungunya*
- Anopheles
  - Vector for Malaria
  - Reported until 1940's
- Ticks – *Ixoides ricinus*, probably others – typhus, other diseases?

Current VBDs

- Leishmaniasis
- Typhus
- West Nile Fever?

Leishmaniasis

- Visceral form known locally since early 20th century
- Cutaneous leishmaniasis described locally in early 1980s
- Vector: sandfly, common (*Phlebotomous perniciosus, P. papatasii*)
- In 2008: 14 cutaneous cases, 2 visceral cases reported
- Cutaneous cases mainly linked with Gozo

Leishmaniasis and climate change

- Vector:
  - Increased duration of sandfly season
  - More generations per year
  - Changing humidity levels?
- Human impact
  - Increased human exposure?
  - Increasing immigration (higher HIV prevalence)

Typhus

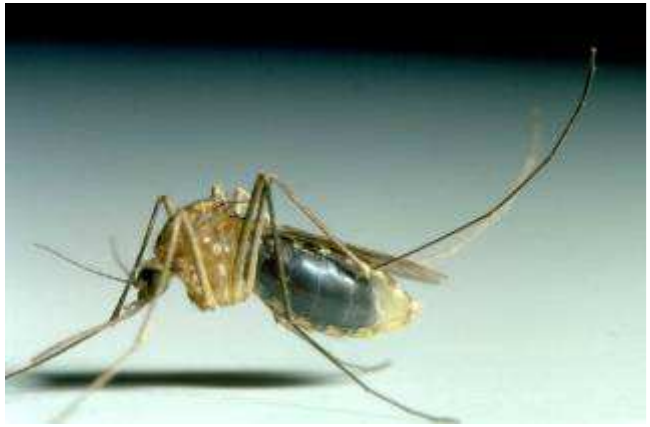
- Mediterranean Spotted Fever and other types
- Vector is tick (*Rhipicephalus sanguineus*, *Ixodes ricinus*) or fleas
- Reservoir locally not knows, probably rats/other mammals
- Number of cases have decreased in recent years
  - Peak of 65 cases in 1998
  - 12 cases in 2007

Climate and typhus

- Evidence that increase in Summer temperature leads to increase in MSF in following year (1 deg = 32% increase) - Sardinia
- May lead to prolongation of season
- Climate change implicated in increase in:
  - MSF in Spain
  - Rocky Mountain Spotted Fever in US
  - TBE in Sweden

West Nile Fever

- Life cycle involving birds, mosquitoes
- Mammals (humans, horses) infected incidentally
- Outbreaks reported from North Africa, Italy, France
- Vector (*Culex pipiens*) present in Malta
- Anecdotal report of local case
- Diagnostics not routinely available



WNF and climate change

- Need further work to ensure WNF is not currently endemic
- Increased temperature, may lead to increased vector density (particularly in Spring)
- Effect on C. *pipiens* of decreased rainfall?

Future risks?

- Malaria
- Chikungunya/Dengue

Malaria

- No endemic cases for decades
- In 2008: 3 imported cases
- No reports of airport malaria or other local transmission
- Vector not currently present
- Previous foci of malaria:
  - Salini
  - Gozo
- Anopheles not reported since 1943 following last “epidemic” of malaria

Climate change and malaria

- Climate in past was suitable for malaria
- Decrease in rainfall might be limiting factor
- Number of factors resulted in eradication:
  - Nutrition
  - Housing
  - Drainage of swamps
- Unlikely to reappear if current predictions true
- Also need supply of parasite

Chikungunya/Dengue

- Not reported locally
- Vector is usually *Aedes albopictus* or *Aedes aegyptii*
- *A Aegyptii* possibly was present in past
- Climate suitable for *A albopictus*, eggs can withstand dessication
- *A detritus* can be a potential vector of Chik
- Risk of introduction of virus through travel and trade
  - Example of Italy (2007) - Chik

Climate change?

- Conditions are already suitable for Chik
- Increased temperature might lead to increased vector densities
- Increase risk of exposure to vector
- Importation of virus in specific circumstances could lead to outbreak
- Introduction of A aegypti or A albopictus increases risks – but is it climate change or global travel/trade?

Current work

- Risk assessment on vector borne diseases led by European Centre for Disease Control
- Entomologists and Public health experts looking at mosquitoes in Malta and current risks
- Will enable us to have starting point for surveillance
- Serve as foundation for assessing risk of climate change

Surveillance

- Hope to have improved surveillance for vectors over Summer 2009
- Working to enhance diagnostics (WNV)
- ECDC developing network working on climate change
- Linking environmental and epidemiological data

Conclusion

- Climate change could have an impact on vector borne diseases
- Impact different for each vector
- Climate change is *one* of the determinants of vector-borne disease spread
  - Consider effect of global travel and trade

Conclusion

- Increase surveillance:
  - Vectors (mosquitoes and basic research on ticks)
  - Humans
- Improve response:
  - Planning
    - Early identification of imported illness
    - Contingency plans for new vectors and outbreaks
  - Further assessment of impact of climate change on individual vectors

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Thank you

Increasing temperature

- Increases development rate of vectors but may shorten life cycle
- Could result in increased in density of sandflies
- Prolongation of sandfly season
- Effect on ticks?

Decreased precipitation

- Less favourable natural breeding grounds?
- Decreased activity of ticks?
- Decreased rainfall might favour some vectors but not others