One Health perspectives on zoonotic and vector-borne diseases

REGIONAL WORKSHOP ON THE LINKAGES BETWEEN BIODIVERSITY AND HEALTH IN THE EUROPEAN REGION

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Lets get real!
Human health...

Household air pollution
4.3 million deaths every year as a result of exposure to indoor smoke from cooking fuels
3 million deaths every year as a result of exposure to fine particulate matter

Chemicals
2004 at least 4.9 million deaths (8.3% of all deaths) were due to environmental exposure to selected chemicals

Non Communicable Diseases
40 million of the 56 million global deaths in 2015 were due to NCDs

Suicide
800 000 die from suicide globally each year (one death every 40 seconds)
Perceptions Flawed?

60.3% EIDs zoonoses & 71.8% of these wildlife origin Jones et al 2008 but where else would the genetic material for evolution come from…what is much more worrying is….

Tompkins et al 2015
Zoonotic Threat

Global animal biomass is now domestic
Patterns of disease emergence and decline

Wolfe 2007

Funk et al 2013
Disease is Ecosystemic

In <month in 2015 210,000 or 90% of a globally endangered species died from a bacterial disease most likely triggered by environmental conditions generated by a rapidly changing climate (Kock et al 2017 in review).
...with anthropogenic interfaces
Economic proportionality...
...produces the very cascade of disease events
‘Hot spots’ confound geography for causality

Morse et al. 2012
Causality’s direction reversed

Guangdong to Hong Kong

Utilized FDI of Guangdong (US$ million)

Source: Guangdong Statistical Yearbook, 2011
Intercontinental reassortment accelerates selection

Gene Segments, Hosts, and Years of Introduction

- PB2, PA
  - ~1998
- PB1
  - ~1968
  - ~1996
- HA, NP, NS
  - ~1918
- NA, M
  - ~1979

Triple Reassortant
- PB2
- PB1
- PA
- HA
- NP
- NA
- M
- NS

Classical Swine

Eurasian Swine

2009 A(H1N1)

Garten et al. 2009
Perhaps the greatest health risk of arboviral emergence comes from extensive tropical urbanization and habitat fragmentation….

Domestication of vectors is a critical factor in emergent diseases e.g. *Ae. aegypti* is a monophyletic group (*Brown et al. 2013*) & all populations outside Africa are descended from a single lineage *Powell and Tabachnick 2013*. indicating a one-off event. The colonization of urban expanding habitat by this highly anthropophilic mosquito led to the emergence of permanent endemic cycles of urban DENV and chikungunya virus (CHIKV), as well as seasonal interhuman transmission of yellow fever and Zika viruses. *Weaver and Reisen 2010*
Political ecology underpins disease emergence

Social development within neoliberal agendas are strong undercurrents that promote structural changes and epidemiological instabilities in ecosystems, supportive of disease emergence very often most experienced at the margins of society. *Wallace et al 2017 (in review)*

One mistake centuries of disease

**Ebov in West Africa** (*Wallace, Gilbert, Wallace, Kock 2014*)

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**Figure 1**: Figure 1. Exports-imports of a) palm oil and b) palm oil kernels for Guinea and Liberia, 1995-2011. Data from FAOSTat.

**Figure 2**: Figure 2. Landscape mosaic forest, fruit plantations and villages across Melandou and Gueckedou, Guinea.
For a Structural One Health

Health sector Invests <3% on zoonoses and preventive medicine – this must change

Biodiversity underpins health

Wallace et al. 2014
Acknowledgements
Organisers of the WHO CBD conference especially Cristina Romanelli and colleagues……

Robyn Alders, Rob Wallace, Rodrick Wallace, Lenny Hogerwerf, Luke Bergman, Katie Atkins, Alison Galvani, Julie Garnier-Cox, Barbara Haesler, Mollie Holmberg, Billy Karesh, Catherine Machalaba, Mike Kock, Vincent Martin, Steve Osofsky, Joachim Otte, Peter Rabinowitz, Jonathan Rushton, Jan Slingenbergh, Jeff Waage, Marius Gilbert, Kevin Queenan and many others…..
Many institutions...