

New technologies and old ideas for biosurveillance

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Overview

1. The precarious road ahead
2. The questions
3. The challenges
4. New technologies
5. Old ideas
6. The way forward

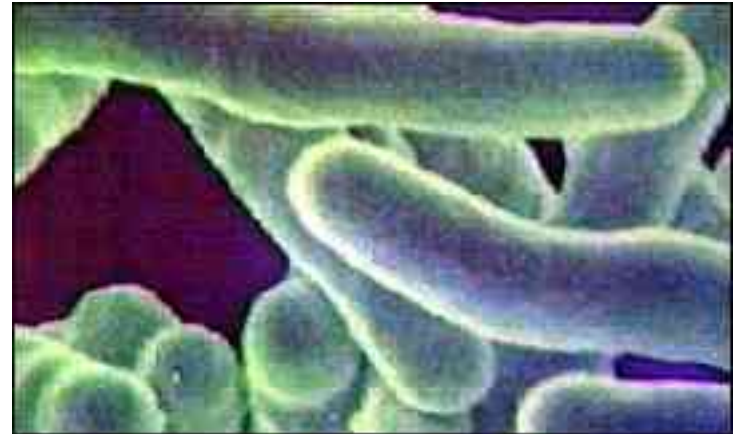


The need:

- The likelihood of a disease outbreaks is growing
- Potential impact is getting greater
- We have systems in place for those threats we have been faced with before
- We are more vulnerable to those we know about, but have not faced on a major scale
 - Use of biological weapons
 - Leakage from old biowarfare stocks
 - Bioterrorism
- Even more vulnerable to those that we don't know about

Re-emerging threats:

- E.g. TB
 - Spreading rapidly in vulnerable groups
 - Multi-drug resistant strains putting a huge burden on healthcare systems
 - No cost effective diagnostic available
 - Limited drugs



Man made threats:

- Biowarfare
 - Use of biological weapons
 - Leakage from old biowarfare stocks
 - Bioterrorism
- Risk of chemical and/or radiation incidents
- Precautions are often similar to those necessary for dealing with naturally occurring outbreaks



Emerging diseases - unknown:

- 30 infectious diseases identified since 1973
- Impact on health, economies & security
- Capable of spreading faster than ever before



Our track record

- HIV pandemic
- Rift valley fever
- FMD pandemic
- West Nile Virus in the US
- SARS
- Monkeypox

No room for complacency

Hurdles to be overcome

- Diagnostics – limited availability
- Data collection – limited capacity
- Partial coverage – the black holes are getting larger
- Inconsistent definitions and quality of data
- Incompatible reporting systems and stove piping of information
- Political filters

Important questions:

- How do we define the level of risk?



- How robust are our existing bio-surveillance systems?
- To what extent can technology provide a solution?
- What should we be seeking to do?

Role of risk analysis

- Probabilistic Risk Assessment can provide a framework for:
 - Analysis of past cases
 - Scenario planning
 - Prioritisation of preventive measures
- Key elements are factors affecting:
 - Initiating event
 - Subsequent spread and impact
 - Control measures
- Lessons to be learnt from the nuclear industry

Enabling technologies for analysis

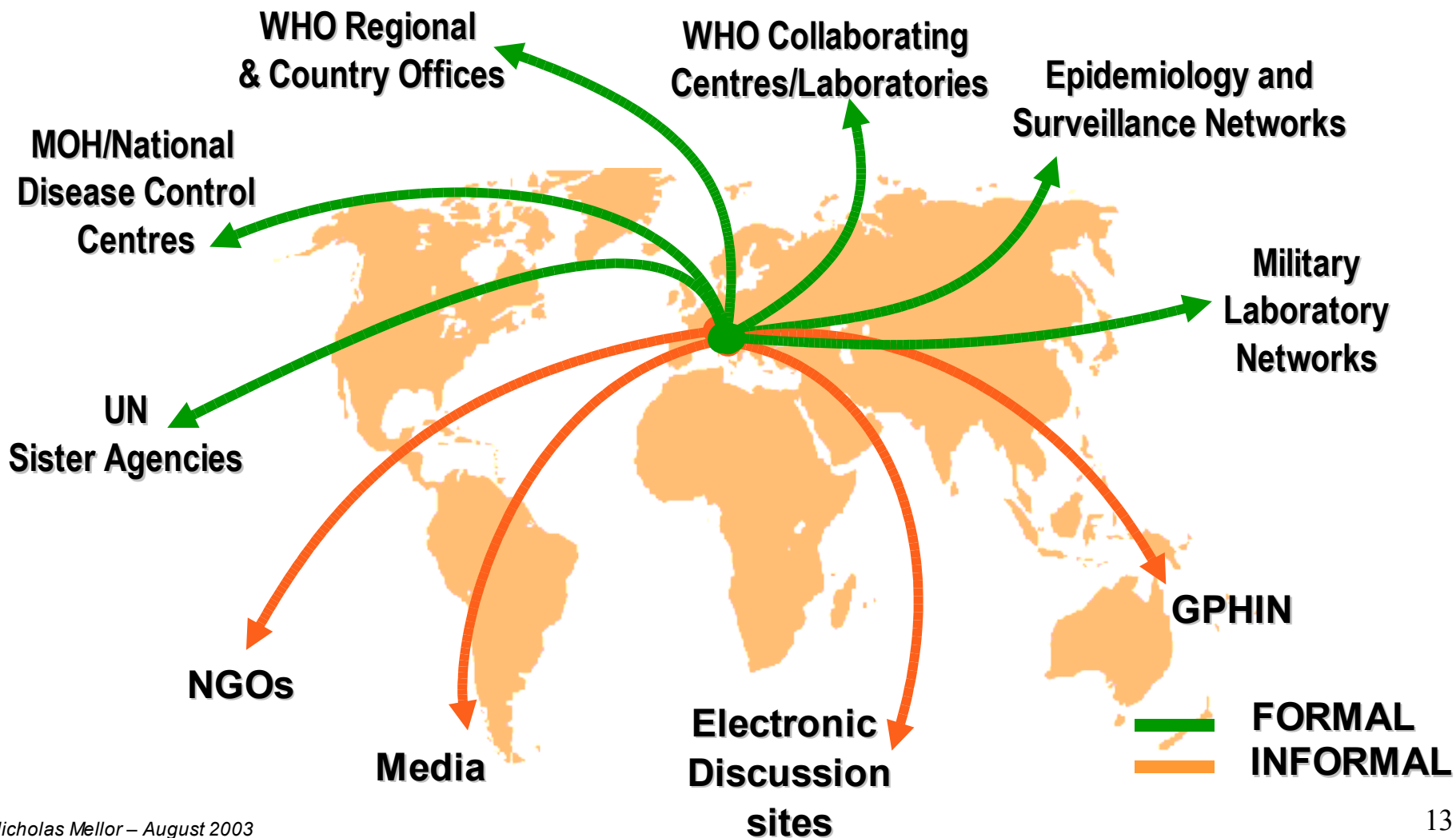
- Data warehousing and management
- Data mining
- Multivariate analysis
- Visualisation and Modelling

Improving surveillance

- Traditional
 - Reinforce existing systems
 - Build a network of networks
- Combine with new, independent data sources
- Analysis to create better intelligence
- Create a real-time feedback loop for real time outbreak control

Leveraging resources through network of networks

Detect and respond to the unexpected



New data sources

- News...
- Analysis of media reports, eg MiTAP
 - Collection of data streams: online news, chat rooms
 - Document classification
 - Information extracted
 - Intelligence presented
- The next step: multimedia capability



Satellites

- Algal blooms can be used to monitor the threat of cholera



Algal blooms in the Southern Baltic Sea, 23.7.2001

Thinking outside the box



- Early detection of disease outbreaks is the holy grail of public health, and has now also become a crucial issue for governments facing the threat of bioterrorism.
- Statisticians at Carnegie-Mellon University in Pittsburgh, Pennsylvania have devised a way of detecting outbreaks by monitoring sales of non-prescription drugs such as cough medicine.

Old ideas

- Crows recognised for divination in Roman times
- A crucial component of the US West Nile Virus control programme



The way forward

- Bring multiple disciplines together
- Open source informational platform eg RODS
 - Syndromic monitoring
 - Standardised temporal spatial integration
 - Archiving
 - Real time data exchange

