

FAO/OIE/WHO joint scientific consultation on influenza and other emerging zoonotic diseases at human-animal interface: final remarks



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Highly Infectious Diseases

Acknowledgments

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- FAO/OIE/WHO
- Wonderful persons and very good food and wine!
- Very nice venue
- Excellent organization
- Our tireless facilitator

.....Conclusions

It is possible to predict

-that infectious disease emergencies will continue to occur with regularity,

It is possible, with appropriate planning

- to be prepared to meet emergencies in a way that ensures that they cause as little social disruption as possible.

Foreword

- Hundreds of excellent papers published in the issue of EIDs testify to the vast expansion in knowledge of emerging viruses biology that has been achieved over that time, ranging from the elucidation of viral replication mechanisms to the development of new vaccines
- the burden of EIDs in western and developing countries is growing
- Not only did the emergence of EIDs surprise the research community because in some cases agent shows unexpectedly high lethality and/or a novel epidemiologic pattern.
- Sequencing of EIDs revealed significant differences among viruses isolated from individual patients, indicating that repeated introductions of the viruses had taken place

**Emerging Infections in
western countries:
a rare and unusual event in
the XXI century!**

Are we ready?

Le Monde

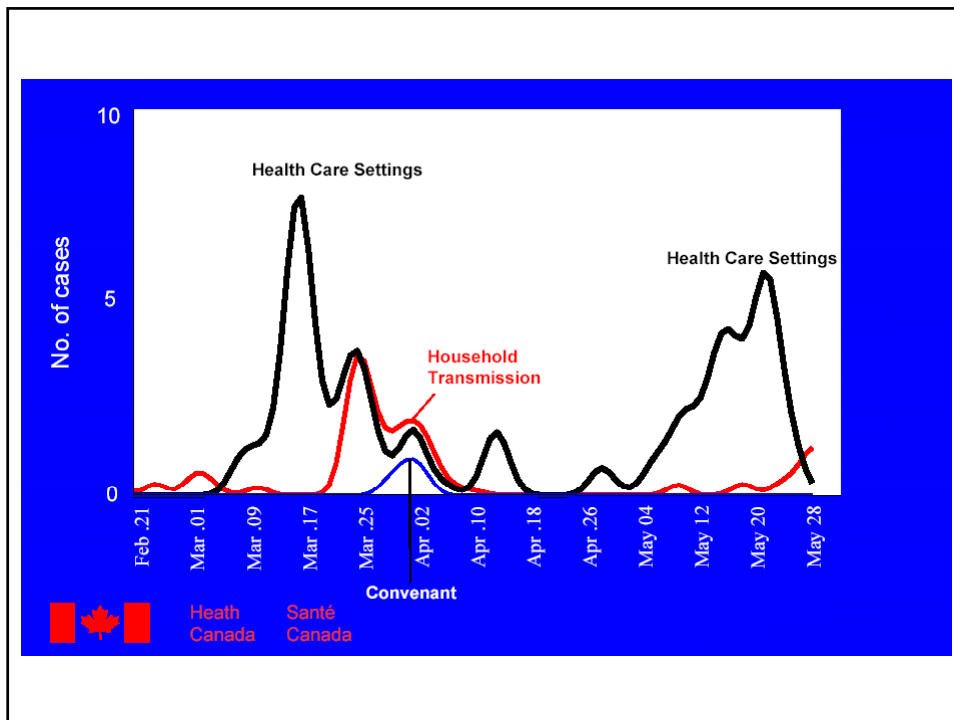
SAMEDI 19 AVRIL 2003 FONDATEUR: HUBERT

Enquête aux origines de l'épidémie de SRAS

Les silences chinois, la mise au point d'un test de dépistage, les incertitudes sur le traitement



**Lack of awareness,
communication, integration
between scientists, clinicians and
public health officers**



Response to Imported Case of Marburg Hemorrhagic Fever, the Netherlands

Aura Timen, Marion P.G. Koopmans, Ann C.T.M. Vossen, Gerard J.J. van Doornum, Stephan Günther, Franchette van den Berkmortel, Kees M. Verduin, Sabine Dittrich, Petra Emmerich, Albert D.M.E. Osterhaus, Jaap T. van Dissel, and Roel A. Coutinho¹

Rapid communications

A FATAL CASE OF LASSA FEVER IN LONDON, JANUARY 2009

A Kitching (Aileen.Kitching@hpa.org.uk)^{1,2}, S Addiman³, S Cathcart³, L Btshop⁴, D Krahe⁴, M Nicholas⁴, J Coakley⁴, G Lloyd⁵, T Brooks⁵, D Morgan⁵, D Turbitt⁶

1. European Programme for Intervention Epidemiology Training, European Centre for Disease Prevention and Control, Stockholm
2. Health Protection Agency, London Region Epidemiology Unit, London, United Kingdom
3. Health Protection Agency, North East and North Central London Health Protection Unit, London, United Kingdom
4. Homerton University Hospital NHS Foundation Trust, London, United Kingdom
5. Health Protection Agency, Novel and Dangerous Pathogens (NaDP) Laboratory, Centre for Emergency Preparedness and Response (CEPR), Porton Down, United Kingdom
6. Health Protection Agency, Gastrointestinal, Emerging and Zoonotic Infections (GEZI) Department, Centre for Infections, Colindale, United Kingdom

Rapid communications

THE FIRST CASE OF LASSA FEVER IMPORTED FROM MALI TO THE UNITED KINGDOM, FEBRUARY 2009

S Atkin (Sara.Atkin@hpa.org.uk)¹, S Anarak¹, P Gothard², A Walsh³, D Brown⁴, R Gopal⁴, J Hand⁴, D Morgan³

1. Health Protection Agency, North East and North Central London Health Protection Unit, London, United Kingdom
2. Hospital for Tropical Diseases, University College London Hospitals NHS Foundation Trust, London, United Kingdom
3. Health Protection Agency, Gastrointestinal, Emerging and Zoonotic Infections (GEZI) Department, Centre for Infections, Colindale, United Kingdom
4. Virus Reference Dept (V.R.D), Centre for Infections, Colindale, United Kingdom

Corsica, August 2006

-59 year old man from southeast France who had stayed in Porto, a département of South Corsica, from early to mid summer 2006.



-at the beginning of August fever and gastrointestinal symptoms, and after several days of illness was admitted to the hospital.

Thrombocytopaenia (40 000 platelets/mm³).

Diagnosis?

Possible Autochthonous Malaria from Marseille to Minneapolis

Barbara Doudier,*† Hervé Bogreau,†
Aaron DeVries,‡ Nicolas Ponçon,§
William M Stauffer III,‡ Didier Fontenille,§
Christophe Rogier,† and Philippe Parola*†

We report 2 cases of *Plasmodium falciparum* malaria in southern France in a French woman and an American man of Togolese origin who reported no recent travel to malaria endemic countries. Both infections occurred after a lay near Marseille, which raises the possibility of autochthonous transmission. Entomologic and genotypic investigations are described.

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 13, No. 8, August 2007

Are physicians ready?

Some features that should be carefully kept in mind:

- **Clinical presentation of emerging diseases (key-symptoms)**
- **Geographical provenience of patient**
- **Outbreak currently occurring worldwide**

Problems in the therapy for imported malaria in the USA

Errors in drug treatment occurred in 25% of patients

While the clinical symptoms and signs do not help distinguish the infecting *Plasmodium* species, the travel history is extremely helpful in guiding drug selection.

Non-infectious diseases specialists are more likely to make errors in therapy than are infectious diseases specialists.

Singh K. Arch Intern Med. 2003;163(17):2027-30.

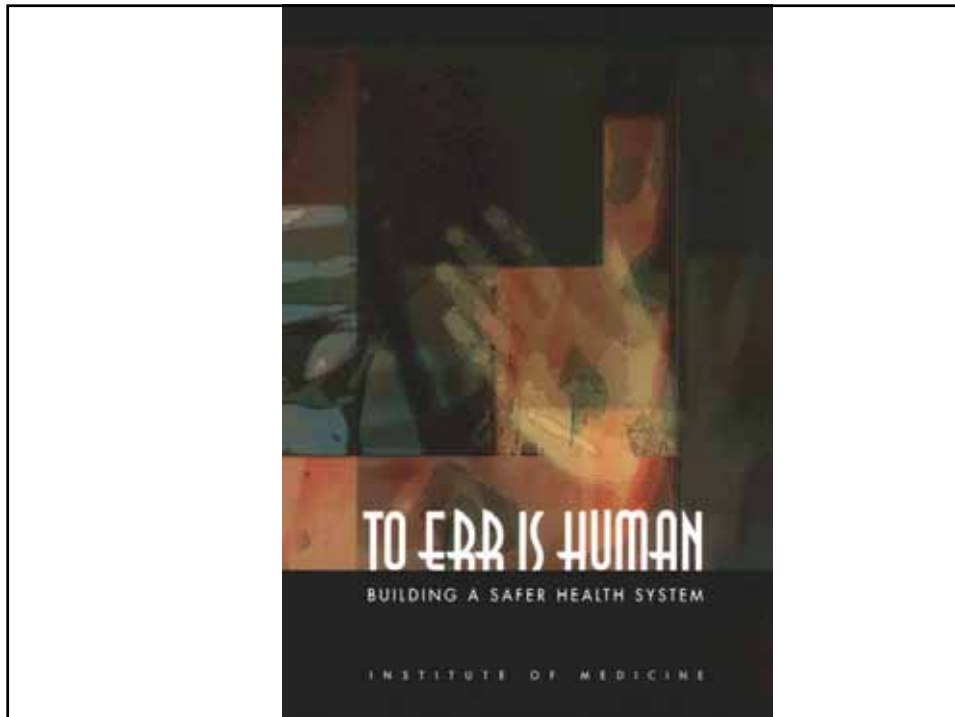
Imported malaria in Canada: inappropriate therapy rate

patients treated:

at community hospitals 48%

at the Tropical Diseases Unit 8%

Kain KC. *Clin Infect Dis.* 1998;27:142-149.



Detection & Intervention

Global Re-Emergence of Infectious Diseases

- **PROTECT**
 - Early Detection
 - Rapid Response
- **PREVENT**
 - Research -Vaccines, Drugs, Diagnostics
- **PREPARE**
 - Readiness

Syndromic Surveillance in Emerging
Infectious Diseases

Early Detection

The FASTER
We Know What It Is



Rapid Response

The FASTER We Can Take Appropriate
Action

Early warning systems based on Syndromic Surveillance: a lesson learned from real life – Chikungunya in Italy

- July 2007: reports of febrile illnesses;
- Second week of August: implementation of surveillance systems through a standardized questionnaire;
- Late August: outbreak investigation and diagnosis;
- **About two months from warning to diagnosis.** Probably too long time...

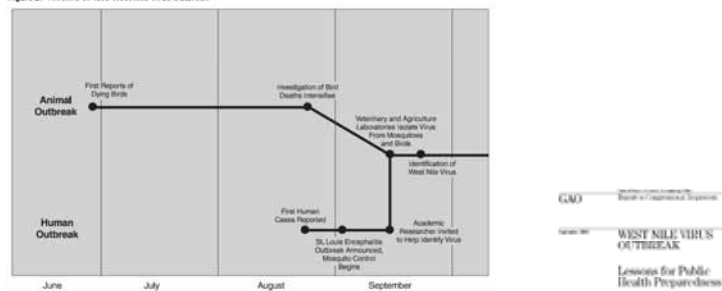


ECDC Mission Report – Chikungunya in Italy

Lessons learned from past experiences about the potential utility of a good use of early warning systems – WNV in USA, 1999

- Deaths reported in birds in June, initial human cases in August;
- The two “lines of investigations” were linked one month after (initially St. Louis encephalitis suspected in humans);
- Dead birds would have been considered as a driving clue

Figure 2: Timeline of 1999 West Nile Virus Outbreak



Another valuable approach for early warning: investigating factors influencing EID occurrence

- Some events could be predicted on the basis of the factors that may determine their occurrence:
 - Climatic factors;
 - Migration routes;
 - Changes in land use;
 - Many others...

Models for answer

Main points to be addressed to face EID

- **Surveillance and prevention:**
 - Early warning systems (prompt detecting, investigating and monitoring of EID events),
 - Systems monitoring the factors influencing EIDs;

Surveillance

Surveillance Systems



Active System



Passive System



Sentinel System



Syndromic System

Sentinel Surveillance



- Key report sources are selected to participate in an enhanced disease surveillance system

- e.g., reporting systems for Influenza



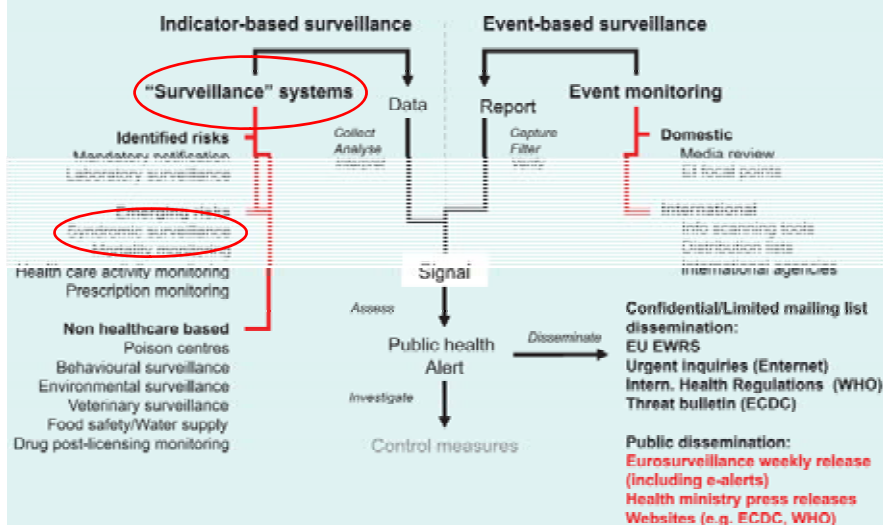
Syndromic Surveillance Systems

- Syndromic surveillance systems:
 - Electronic transfer of data fields describing symptoms or presenting complaints (e.g. ED visit)
 - Periodic analysis to detect temporal or spatial clusters
 - If pre-determined threshold exceeded, triggers active surveillance and medical record review
 - Possible use of the new media (facebook, twitter.....)
- Limitations
 - Numerous software packages
 - Requires compatible electronic formats
 - May be difficult to define sensitivity to individual or combined measures being used
 - Require more resources to operate as compared to other systems – false alarms
 - Costly to maintain
 - Need appropriate laboratory support

Indicator vs. Event-based surveillance

- Indicator-based surveillance (Syndromic Surveillance)
 - computation of indicators upon which unusual disease patterns to investigate are detected (number of cases, rates, proportion of strains...)
- Event-based surveillance
 - the detection of public health events based on the capture of ad-hoc unstructured reports issued by formal or informal sources.

Epidemic Intelligence Framework



Main points to be addressed to face EID

- **Surveillance and prevention:**
 - Early warning systems (prompt detecting, investigating and monitoring of EID events),
 - Systems monitoring the factors influencing EIDs;
- **Infrastructures:**
 - Laboratories able to perform initial and differential diagnosis, Isolation units and biocontainment laboratories BSL 3-4, biobanks;

**Are infrastructures
adequate to face EIDs?**

Are our infrastructures adequate to face EIDs?

two surveys, in UK and USA:

- In UK, only 24% of surveyed hospitals had isolation facilities available in the ED. Up to 30% of hospital do not isolate patients with suspect infectious diseases.
Conclusion: EDs in the UK are not prepared for emerging biological threats. With current facilities it is highly likely that an infectious agent will spread to staff and other patients.
- In USA, more than one-half of surveyed hospitals (278 of 410) expressed concerns about their facilities' preparation and capacity for managing SARS cases.

Anathallee M et al, J Infect 2007

Srinivasan A et al, CID 2004

Main points to be addressed to face EID Infrastructures - Laboratories

Emerging of new diseases



Emerging of new diagnostic
needs

Multiple Roles/Missions of a Laboratory for EIDs

- Diagnosis
- Epidemiological surveillance
- Reference in specific areas
- Training activity
- Diagnostic innovation
- Dissemination of knowledge and research
- And...

Moving diagnostics from the bench to the bedside

Researchers have been able to miniaturize elements of potential diagnostics, but what will it take to put them together into a workable device? Jim Kling investigates.

NATURE BIOTECHNOLOGY VOLUME 24 NUMBER 8 AUGUST 2006



World Health Organization

Developing laboratory partnerships to detect infections and prevent epidemics

Why public health laboratories are on the margin of public health

- lack of public awareness of the role of public health laboratories
- lack of confidence in laboratory results
- lack of training and leadership among laboratory staff
- laboratory staff do not recognize their own value
- poorly-funded and not income-generating
- lack of optimization of resources
- lack of tangible outcomes



**World Health
Organization**

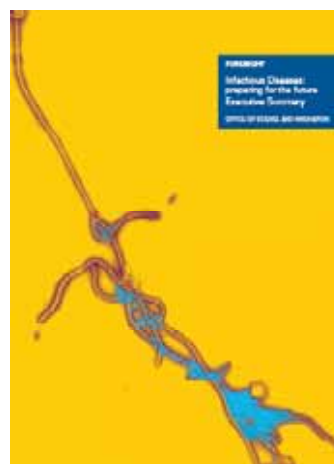
**Developing laboratory
partnerships to
detect infections and
prevent epidemics**

Why public health laboratories are on the margin of public health in many developing countries

- lack of public awareness of the role of public health laboratories
- lack of confidence in laboratory results
- lack of training and leadership among laboratory staff
- laboratory staff do not recognize their own value
- poorly-funded and not income-generating
- lack of optimization of resources
- lack of tangible outcomes

**The three factors
important in
the detection of newly
arrived
pathogens are:**

- diagnosis,**
- diagnosis, and**
- diagnosis**



Rogers DJ & Sanderson V. Foresight. Infectious Diseases: preparing for the future. OSI, London (2006).

How to interact with labs

- One World, One Health, One Lab
- Multiple agents vs single agent approach
- Not just viruses
- Labs must be able to perform differential diagnosis in real (appropriate for clinical and public health decisions)

Main points to be addressed to face EID

- **Surveillance and prevention:**
 - Early warning systems (prompt detecting, investigating and monitoring of EID events),
 - Systems monitoring the factors influencing EIDs;
- **Infrastructures:**
 - Laboratories able to perform initial and differential diagnosis, Isolation units and biocontainment laboratories BSL 3-4, biobanks;
- **Research:**
 - Integration between basic and translational research;

Some aspects of Research for EIDs

- Targeting**
- Sensitivity**
- Specificity**
- Resources**
- Public Health driven/oriented**
- Sustainable**

Priority areas for research in EIDs

- clinical epidemiology (human and animal) and surveillance including disease burden estimation,
- identification of reservoirs and vectors,
- laboratory diagnosis including new technologies, but not just omics
- molecular studies
- case management,
- modelling and mathematical modelling,
- methods for risk analysis, decision analysis, support to the diagnosis,
- animal research,
- socio-anthropological
- sample storage/banking

Priority areas for research in EIDs

Surveillance and Epidemiology-1

- case definitions to be applied in western countries
- case definitions to be applied in developing countries
- rapid identification of infected returning travellers
- reporting system

Priority areas for research in EIDs

Surveillance and Epidemiology-2

- critical parameters in transmission and development of protocols for identification of sites of transmission to interrupt the disease
- risk factors related to exposure, infection, disease development and severe outcomes
- the natural history of the disease and underlying causes/dynamics for its rapid spread
- ethological, anthropological and behavioural determinants of import, spread and transmission of EIDs

Priority areas for research in EIDs

Surveillance and Epidemiology-3

- evaluation of circulation of microbes in animals
- assessment of the risk of local dissemination and establishment
- determination and validation of threshold levels of virological parameters to develop early warning systems
- Immunological correlates to understand the level of herd immunity, if any
- use of laboratory based surveillance

Priority areas for research in EIDs

Laboratory diagnosis and molecular studies

1. Development and evaluation of new, field applicable and rapid diagnostic tools with high sensitivity and specificity in different settings
2. Molecular characterization of viruses to understand genetic diversity for use in molecular epidemiology/ diagnostics
3. Define new transparent procedure for strains share

Priority areas for research in EIDs

Immunology/vaccinology/treatments

- increased susceptibility in special patients
- immune response to EIDs agents
- set-up of diagnostic immunological tests
- design, preparation and validation of vaccine candidates
- identify and test new antivirals as evaluate old ones for new viruses
- evaluate potential immunotherapy
- new vaccine delivery

Priority areas for research in EIDs

Preparedness

- research infrastructure
- high containment lab
- communication
- multidisciplinary integration
- international cooperation
- capacity building
- increasing awareness and public-private partnership
- new public health regulation, in respect of privacy and not intrusive, for tracing humans, animal, food, movement

Priority areas for research in EIDs

Environmental Research

1. Quantification of potential impact of climate change on the transmission of EIDs agents
2. Use of RS, GIS and other new low cost technologies in mapping risk for making decisions in control and the possibility of their use in developing an early warning system

Cooperation & partnership

Networks/cooperation: why?

The response to newly emerging global concerns must be:

- Coordinated
- Effective
- Rapid

A trans-national response to trans-national threats

International cooperation on infectious disease health issues: an utilitarian definition

- The ability to **treat infectious diseases in the source country** to prevent spread in other countries.
- The early and continued **exchange of information** between countries for surveillance and control of infectious diseases.
- The development of international agreements on any **restrictions to travel**, if and where necessary in the future.
- International cooperation among scientists and governments over the exchange and development of **specimens and tissue banks** for new and emerging infections, to enable development and research into control measures such as early diagnostics and vaccines.

Bases on Foresight Report on the future control of infectious diseases in humans 2005

International Collaboration/Cooperation

Objectives

To improve health in the developing countries by:

- Supporting growth of health system and health care delivery
- Funding operational research and research into major health issues
- Developing surge capacity

Main points to be addressed to face EID

- **training:**
 - Informatic systems,
 - Specific training modules,
 - Interdisciplinarity, multidisciplinary and new core curriculum;

Main points to be addressed to face EID

- **Response:**
 - Elaboration of effective tools for intervention.

Response

- Elaboration of Evidence Bases and effective tools for intervention
- Understanding the demand and answering with ethical, feasible approach, time and money saving
- Consider human and socio-economic drivers
- Involve public opinion and all stakeholders in the process

Summary of Needs

- Ensure a **rapid and effective response** to health threats deriving from natural infection by EIDs agents or their deliberate release
- Stimulate **complementarity** and prevent **duplication**
- Promote **exchange of information and international cooperation**
- Share **good practice and protocols**
- Cooperation agreement for **training, communication, and service availability** to other Countries
- Promote new regulation and code of ethics

Are we ready?

- Address policy, organizational, planning and human/material resource gaps
- Preparedness and response planning, preparation, training, practice, evaluation = readiness
- Be ready to put the problem in the political agenda

Take home messages for the future:

- **Respecting Values- Working and Learning Together**
- **BridgingThe Resource Gap: Improving Value for Money In EIDs**

