• Encourage research on the economic, historical, social and cultural contexts of human and animal health, as well as political analysis of crisis situations.

• Further involve the social sciences in the "scientific and technical monitoring" process through a better knowledge of their networks and meeting points (seminars, master's and post-doc programmes overseas, bids).

• Support a national interdisciplinary EIDs research program, involving those working out in the field, in non-profits, and in the private sector.

Hybrid training

Create a mandatory element in initial and ongoing training programs dedicated to EIDs for general practitioners and specialists as well as other professionals (biologists, clinicians, veterinarians, epidemiologists, social scientists...).

- Prompt the creation of cross-disciplinary training modules, to include at least two disciplines (biomedical and social science).
- Develop public health informational and educational activities on risk factors for infection, including in schools.
- Give special recognition to cross-disciplinary career profiles (co-directing of theses).
- Support the role of social sciences in training programs in developing nations, taking into account local culture and knowledge.

Continuity of existing recommendations on monitoring and practices

Optimise surveillance and ensure its progression

- Favor multi-sector approaches and modelling of rare and extreme events.
- Coordinate surveillance processes: specific and non-specific, syndromeand etiology-focused, human-animal, national-international...
- Coordinate human surveillance structures with non-human ones, including the pre-critical phase sharing of tools between institutions.
- Support operational research on proposed indicators and new tools.

Be prepared to act

 Develop a generic and strategic plan on EIDs, placed under the responsability of a permanent interministerial coordinating body of a flexible modular design.

- Make provisions for an emergency fund for research, risk assessment, and biomedical and sociopolitical response to new EIDs.
- Continue promoting good practice in use of anti-infectious and insecticide substances to limit resistance of infectious agents and vectors of EIDs. Pursue research on these forms of resistance and their progression in the environment.
- With social science partners conduct drills on response procedures to EIDs public health threats: strategic but also scenario-based planning.
- Explore the crucial question of communication (public and media) on EIDs and public health crises. Reinforce the role of social sciences in public health education.
- Encourage French experts' participation in the work of the Commission and of the European Parliament.

Summary

Emerging infectious diseases: current status and future perspectives

Emerging Infectious Diseases (EIDs) result from infection with a microorganism, previously unknown or known for some time but that have springed from changes in host, vector, pathogenicity or drug resistance of a new strain, geographic distribution or environmental conditions. Considering EIDs impacts on social, economical and political decisions and issues in a globalizing world, the present report focused on human EIDs develops four components: EID case-studies, current knowledge about determinants and situations of emergence, surveillance indicators and disease risk assessments in public health, and contribution of social sciences to basic knowledge, forecasting and health policy decisions.

Based on four "strong messages", a global and interdisciplinary approach, a permanent prospective and expertise group, a generic plan for EID, and an interministery emergency fund, this report suggests 25 recommendations focused on research and training, that should help public health authorities and decision-makers to better respond to EIDs in the future.

Key words

Infectious diseases, infection, emerging infectious disease, infectious risk, epidemics

For further information

Leport Catherine et Guégan Jean-François (chairmen).

Les maladies infectieuses émergentes : état de la situation et perspectives

Rapport édité par la documentation Française (2011).

Tel.: 01 40 15 70 10 www.ladocumentationfrancaise.fr

Haut Conseil de la Santé Publique

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Full report available at www.hcsp.fr/explore.cgi/accueil?ae=accueil



Emerging Infectious Diseases: current status and future perspectives

In 2009 the French High Council on Public Health, in order to support future national policy, took the initiative to respond to the need to produce a collective work entailing a both qualitative and quantitative consideration of how to best manage and react to future public health crises connected to an emerging infectious disease (EID).

Mise en page : Laurent CORSINI - IRD / DIC - Octobre 2011



documentation Française

Synthesis - Status assessment

Long a major cause of death around the world, infectious diseases (ID) are still responsible for 43% of deaths in the least-developed countries, whereas they have declined in more developed ones (1% of all deaths) thanks to improved hygiene and urban sanitation, to antibiotics and to vaccinations. The fight against epidemics is also part of French national public health policy laws as of August 9, 2004.



Diagram illustrating etiological agent-host-environment interrelationships

An EID is a new ID or an already-known ID, the incidence of which has changed in a given region or population. This phenomenon varies widely: from a few isolated cases to a very broad pandemic; some quickly resolving, others stretching across periods of many years.

The emergence of an ID flows out of the interaction of several factors based on the triad host-pathogen-environment. Understanding this interaction demands that it be considered globally - knowing the infectious agent but also the potential human, animal (the origin of around 60% of all human IDs) or vectorial host, as well as the physical, ecological, social or political environment in which all living beings evolve and adapt.

Descriptive approach

To illustrate, four recent EIDs have been selected: severe acute respiratory syndrome (SARS), West Nile and Chikungunya viral infections, and finally glycopeptide-resistant enterococcal infections. The differents conditions which foster their appearance and multiple forms (respiratory, neurological, rheumatological) are described, as are their various routes of transmission : vectorial agents, respiratory, oro-fecal, bloodstream, transcutaneous or sexual transmission. The predictable evolution of EIDs seems completely unsure; a better understanding of the drivers responsible for emerging disease should allow us to develop a true culture of epidemiological risk and the transposition of already-acquired knowledge and skills to new situations.

Emergence factors and situations

The emergence of new infectious agents is most often the result of a complex combination of different factors, often insufficiently understood. As the central player, humans are exposed given an increased susceptibility which can be due to a temporary or prolonged alteration in their means of defense and to changes in behaviour. The environmental factors may be physical or ecological (deforestation etc.), socio-economic (war, close contact between humans and animals, changes in their respective habitats, etc.) or organisational (lack of adequate sanitation system). Changes in the infectious agent may also intervene through genetic mechanisms or pressures of selection.

Areas of emergence are characterized by instability leading to an imbalance of multiple dynamics between the causative agent, its host populations (reservoirs or vectors) and the environment. The exceptional biological diversity of microorganisms and their accidental transmission to humans are discussed via a few simple examples such as the emergence of microorganisms' resistance to antibiotics.

Indicators and means of surveillance

Early prediction and detection is founded upon epidemiological surveillance, ongoing and systematic analysis of data gathered from medical practitioners, biologists, national reference centres, veterinarians, entomologists, meteorological services and environmental "watchdog" organisations; police, customs, the military, and national and international agencies. This analysis concerns infectious agents and their behaviour, the diseases they cause, and factors linked to the host and to the environment. Analysis of warning signs should thus make it possible to rapidly evaluate the risk to public health and to define what measures should be taken. Indicators will make possible the surveillance of:

- the overall population;
- caregivers and care centres;
- specific at-risk populations in function of their professions or geographic location;
- vectors involved;
- animal reservoirs;
- the environment;
- changes in socio-economic and cultural behaviours.

The difficulty in surveillance lies in the necessary reconciling of research on the greatest possible number of pertinent signs with the huge task of reinforcing intermediate processing of signs already recorded, in order to continuously adjust decision-making to characteristics of the phenomenon as it occurs.

Social Sciences - Contributions

Given the role of human beings as key players in emergence, the social sciences should also play a large part in helping to monitor EIDs and their consequences. They should allow us to better take into account certain "inequalities of vulnerability", and thus to offer responses adapted to local and regional contexts.

Five case studies are proposed: establishment of primary prevention of HIV/AIDS in the 80's and 90's: the social and cultural anthropology of the fight against Ebola (and Marburg) fever epidemics; the 2003 SARS outbreak; flu pandemics (H1N1 and H5N1); lay strategic approaches to the 2009 A/H1N1 flu in France. Added to these are three transversal analyses: analysis of mechanisms and multiple factors capable of explaining the emergence (or non-emergence) of problems normally falling under the domain of public health, particularly that of "society" as well as experts and politicians in the definition and hierarchization of emerging problems; focusing on the principle theoretical models developed by the social sciences to elucidate "laymen's" (as opposed to experts') perception of risk: an historical and anthropological-based consideration of the limits of popular participation in preventive and combative measures against infection, especially in the fight against resistance and in the "acceptability" of flu vaccination. The outbreak of the A/H1N1 flu pandemic of 2009 in fact points up these limits, and confirms the pertinence of this report. Though little-explored here due to lack of adequate perspective, this should be the subject of critical analysis in the near future.



Recommendations

Four major points:

- a global, interdisciplinary approach,
- an expert health monitoring group,
- a flexible generic and strategic plan,
- an interministerial emergency fund.





A daring research and training strategy for more effective assistance in the management of emerging infectious diseases (EIDs).

Priority recommendations

Interdisciplinary approach

An indispensible principle in the fight against EIDs to be promoted in research, analysis, risk management, and action, and which should become part of official public health policy. EIDs is synonymous with lack of knowledge and an area of great uncertainty. It is thus urgent that research and training be closely connected, as well as research and action, to make possible a more global understanding of this phenomenon, and to generate more open and innovative proposals.

Innovative organisation

Creation of a permanent monitoring body of experts capable of analyzing, interpreting and advising risk managers "in real time" on any and all EIDs. Accorded the necessary financial and human means, its mission will be to interpret new information, to synthesize essential experimental data, and to conduct a critical analysis of actions carried out; to coordinate an innovative organisational structure founded on multidisciplinary networking, constantly active and reactive; to share information with authorities in other fields of security: industry, military, aviation, nuclear energy... in order to propose new avenues of research and action; and to produce an annual status assessment of the battle against EIDs. Public reporting on its activities should help sensitize both professionals and laymen to the risk of EIDs.

Detailed recommendations

For integrated, innovative research

Develop prospective descriptive research on EIDs using clinical-biological and socio-ecological models which view the system with a bigger picture.

• Achieve a better understanding of the role of host species, reservoirs and/or vectors in emergence and its transmissibility to human.

• Prompt international scientific cooperation on EIDs, particularly in tropical regions where French overseas territories are located, or those with a high level of migration toward continental France.

• Foster the use of mathematical and computerized modelling to better understand transmission, and which take into account the complexity of the mechanisms involved and the diverse scales of emergence.

 Improve biomedical research on EIDs: infectious agents (particularly Class 3 and 4) and diseases, prevention and treatment, with the setting up of epidemio-clinical cohorts of EIDs-infected patients coupled with biological samples.