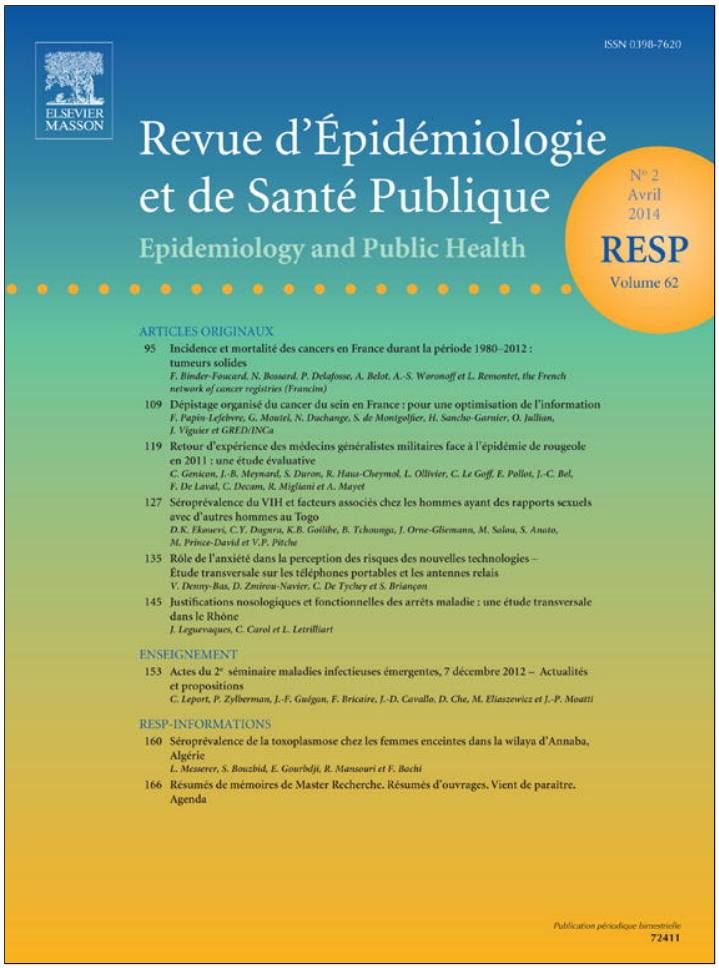

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Proceedings of the 2nd seminar on emerging infectious diseases, December 7, 2012 – Current trends and proposals

Actes du 2e séminaire maladies infectieuses émergentes, 7 décembre 2012 – Actualités et propositions

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1. Introduction

As with the previous seminar, this second Val-de-Grâce seminar has as its goal to invite politicians, medical doctors, researchers, teachers and journalists to share their knowledge, experience and thoughts on the threat of emerging infectious diseases (EIDs). The first session addressed the following questions: "How should we prepare? How should we respond?" The current issue selected as the focus of this second session, as presented in the report by French Minister of Health Geneviève Fioraso on synthetic biology, was "Infectious agents manufactured and modified by humans." The seminar ended with a round-table discussion on a topic concerning both preparation and current events, titled "Inform but not alarm".

2. Current issues: presentations and debates

2.1. Emerging infectious threats: how should we prepare and respond?

Moderators: Muriel Eliaszewicz (Pasteur Institute) and François Bricaire (Pierre and Marie Curie University)

2.1.1. Keynote presentation: The French Senate report (Fabienne Keller, Senator)

Fabienne Keller commented upon the 53 proposals and 10 injunctions of the "New Threats of Emerging Infectious Diseases" report (July 2012) prepared at her initiative, in the context of the Senate Projections Delegation, which is mandated to develop long- and short-term projections aimed at shaping policy decisions.

Future trends depend on several factors, including globalization of trade and air transportation, climatic variations, demography and the development of the megalopolis, and agricultural practices. Preparing societies for EIDs therefore remains a priority, not only medical but also environmental and political, including the adapted development of healthcare systems. How to prepare is a crucial problem since, whatever scenario is imagined, it seems nearly impossible to closely match the reality of conditions observed in the field, and the primary tendency is to project the most alarming worst-case scenario in preparing a response to an epidemic. Despite simulations conducted by NATO as well as the existence of information available on the web (including the French Senate blog) and despite European calls on the subject, crisis management remains a real problem. The most important injunctions for fighting these new threats include:

- raising public awareness of the globalization of the phenomenon on a planetary scale;

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- inventing broad interdisciplinary coordination methods, linking practitioners, researchers, concerned industries and politicians in order to create trusting relationships and facilitate the implementation of emergency measures in a pandemic situation;
- promoting new intervention tools (space observation, epidemiological data collection through mobile phones and the internet, modeling of disease spread for different types of infectious agents and EIDs, the ''Sim Infection'' exercise on the French Senate site, etc.), allowing for a graded adaptation according to the magnitude of the crisis;
- regulating the movements of health practitioners from Southern hemisphere countries toward the North while maintaining practitioners in Southern and within Northern countries, between those in need of personnel and those who can supply them;
- and facilitating access to treatment and vaccines for Southern populations.

2.1.2. Assessment of an emerging signal and risk management

Presenters: Didier Che (InVS), Denis Coulombier (ECDC), Paolo Guglielmetti (European Commission, DG-SANCO)

Different signals, from scientific, media and international surveillance organizations, or via surveillance networks, are currently transmitted to InVS, the French Center for Disease Surveillance and Control. After checking sources and exploratory assessment of potential risk, the InVS sets in motion a risk assessment process, and based on this, sounds the alarm and communicates the information necessary for the management and handling of the risk to the appropriate authorities. This assessment remains a difficult process, involving elements coming from the infectious agent (its pathogenesis, the modes and level of contagion or transmissibility), from the host (incubation period, risk factors, etc.) and from the environment. Three recent situations – the Bocavirus respiratory infections in 2005, *Klebsiella* K2 septic shock cases in 2010 and Schmallenberg virus infections in bovine and ovine populations in November 2011 – illustrate the diversity of what must be considered in risk assessment. Updating the assessment as knowledge improves allows us to respond more appropriately and if needed to sound the alert. Historical data are to be included in the analysis, such as the SARS experience, given the current emergence of the new Middle East Respiratory Syndrome (MERS) coronavirus (CoV).

This requires coordination on both a national and European-wide scale. Since 1998 two axes have come under the responsibility of the European Commission (EC) and the European Parliament: surveillance, entrusted to the ECDC created in 2005, and response to events having a cross-border impact. The two pillars of the ECDC are both recording diseases in common (52 have been recorded thus far) and gathering epidemiological information through surveillance of events as they occur. The ECDC's role is to detect, assess and communicate emerging public health threats related to EIDs. The ECDC provides epidemiological data gathered from the various EU member states (MSs), reviews risk assessment studies and gives its scientific opinion. The ECDC has a shared fast alert system in all MSs and can provide technical support for training, scientific communication and public safety communication as needed. Its crisis center based in Stockholm has at its service a dedicated team as well as standardized procedures with on-call backup, allowing a collegial approach to a potential crisis. This agency ensures that information is shared and also has liaison personnel who travel between the agencies of MSs, allowing for greater cohesiveness throughout Europe. Currently, the EID management systems and regulations for sample gathering remain quite different from one country to another. Collaborative operational links with the WHO and the creation of EU platforms with Southern and Eastern countries have yet to be developed. A proposal for a new organizational structure is under negotiation (for 2014–2020) in order to improve exchanges and interprofessional work (for example, between veterinarians and agriculturalists, which is important in limiting multiresistant bacterial infection pandemics). The goal is to centralize preparation and standardize practices in a global approach to CBRN and also to climate-related risks (decision-making is currently the responsibility of each MS).

2.1.3. How should regulatory authorities prepare for clinical research in a public health crisis situation?

Presenters: Philippe Juvin (European Parliament), Elisabeth Frija (CPP – Institutional review board, France), Catherine Choma (DGS)

Many areas of dysfunction have been observed regarding the directive on clinical trials on medicinal products for human use (2001): the drop in the number of subjects included in trials, the mounting costs, and a certain relocalization of clinical research.

The European Commission published a new regulation draft in July 2012. Once validated it will be immediately applicable and mandatory for all MSs. It will cover all European clinical trials (single- or multi-center) with the exception of non-interventional trials.

The four broad objectives of this project are: to standardize the regulatory demands of the 27 MSs and to standardize the documents to submit for the clinical trial application; to reinforce cooperation among MSs; to make possible a logistic and ethical approach founded on the over-risk implied in research; and to strengthen safety and transparency. Trial acceptance timelines would be shortened, and their implementation would be simplified thanks to the developer's submission of the project to a centralized European portal. The evaluation would be in two stages: an initial scientific and technical advisory on the project's feasibility by a given MS reporter for all MSs involved (25-day deadline, shortened in case of a pandemic, 10 days for low-risk trials) and an ethics evaluation handled by each MS (10 days). Trial results would be published in a public-access database. It seems essential to have specific regulations for research in situations of public health emergencies (as in the case of EIDs), including epidemio-clinical trials closely linked to therapeutic research, the structured supervision of which is particularly important in this context.

What is the status in France of the Jardé's law on human subject research, published on March 5, 2012? The decree currently being drawn up will be submitted to the ''Conseil d'État'' (Council of State) and the CNIL (French Data Protection Authority). It makes distinctions between interventional studies that come under the advisory of the CPPs (Institutional review boards) and the ANSM (French Drug Agency), studies with ''minimal risk and constraints'' and non-interventional studies, under the sole advisory of the CPPs. The National Human Subject Research Commission's mission is to designate the CPP mandated to assess the research file and to coordinate and standardize the CPPs' operation.

Established in 2006, the CPP's mission is twofold: to protect persons participating in research and to guarantee that the legislation is respected, and to act as an advisory to the Ministry on the collection of biological samples. Their usual mode of functioning – monthly meetings, physical quorum, popular representation, regional advisory with a national impact – was adapted during the A(H1N1)pdm2009 pandemic to give priority treatment to cases affected by the public health emergency, with no change in the advisory's quality. Nevertheless, in an emergency, the cases submitted are often incomplete or include ill-suited informational documents, which risks delaying the CPP's decision.

In the case of a serious crisis, as with EIDs, the Ministry avails itself of legislative and judicial tools to dictate exceptional measures adapted from these organizations. However, the financing of clinical research in the case of EIDs comes under the jurisdiction of neither the PHRC (Hospital Clinical Research Program) nor the ANR (French National Research Foundation) and remains an unresolved question.

2.1.4. Coordinated response to public health emergencies

Presenters: François Bricaire (Epidemic and Biological Risk Coordination (EBRC)), Nicole Gros-Pelletier (EPRUS)

Since the SARS episode, a clinical network (now national) has been developed for the management of individuals suspected of an EID: the EBRC network, an operational cell for expertise with priority given to emergency medical services (EMS) and emergency room (ER) personnel, and relying on civilian–military cooperation. EBRC's general mission is to establish coordination measures for infectious emergencies that be simple to activate. The EBRC ensures the development and updating of procedures quickly made available as needed, and also has as its mission teaching, informing and conducting research to improve the clinical aspect of this risk management. In 2010, the EBRC published a standardized management procedure for the greater Paris area. This procedure makes it possible to articulate in a coherent manner the individual and collective actions to be taken: screening, protection, treatment, warning and directing (http://www.biostat.fr/docs/procedure-COREBonlinejan11.pdf). One of the difficulties encountered by the EBRC concerns the modest means available (nearly nothing), while having the mission to deploy on a national scale and beyond. EPRUS (Health Emergency Preparedness and Response Agency), established in 2007 under the auspices of the Health Ministry, is mandated to ensure the organization and logistical support of three main missions: the administrative, operational and financial management of public health resources; the creation and management of strategic supplies (defined annually with the Ministry of Health) and health products; and provision of logistical and medical expertise for the cohesiveness of defense and rescue plans. In order to ensure a response in coordination with public health services, EPRUS works in particular with the French Armed Forces health services to jointly stock products and materials, and to try to set up a form of collaboration that will foster complementarity and a sensible mobilization of means. The complexity of these activities points to the need for cooperation on political, medical and logistical levels to attempt to best respond in the advent of a potential large-scale crisis. This strictly French organization is the subject of a reflection on Europe-wide sharing, in view of a European legislative bill.

2.2. Man-made or -modified infectious agents (synthetic biology)

Moderators: Jean-François Guégan (IRD) and François Képès (Génopole).

Presenters: François Le Fèvre (CEA), Patrice Binder (Inserm), Ariel Linder (Descartes University) + Debate: Alain Blanchard (INRA - Bordeaux Segalen University), Bernadette Bensaude-Vincent (Panthéon-Sorbonne University), Alexei Grinbaum (CEA-Saclay/LARSIM).

Synthetic biology, based on an experimental approach, targets: i) the design and manufacture of artificial biological systems and ii) the reconstruction of biological systems already present in nature in order to produce new functions (http://biologie-synthese.cnam.fr). This emerging field is at the crossroads of several special fields such as biology, bioinformatics and ethics. It proceeds through different types of approaches (bioengineering, synthetic genomics, protocells and xenobiology) and draws upon different techniques (microfluids, robotics, biological reactor, computer science, sequencing techniques, synthesis technology, etc.). This field is generating industrial applications and is the subject of ethical consideration by various national and international bodies.

Currently, given the ever-greater accessibility of these approaches, all pathogens and particularly viruses appear to be potentially synthesizable at a rapidly decreasing cost. Nevertheless, it remains necessary to control the possession and manipulation of these pathogens in secured and monitored locations in order to ensure the traceability of exchange (their storage, sampling, handling, future, destruction) while respecting the issue of biological safety. This assumes ensuring protection against the potential danger of a technical accident as well as biological safety to ensure active protection against the potential danger of an intentional threat. On a general level there exist many texts, often recent, concerning work-related biological risks and those related to monitoring exchanges. At present, risks linked to bioterrorism and to microbiological accidents (including leaks of pathogens or their vectors) are still underestimated.

There is a possible risk that this knowledge and know-how originating from biology and chemistry could pose a dual threat: the diversion of competence, facilities and critical knowledge essential to conducting research or the perfecting of synthetic agents by powers or groups for use toward more or less hostile or uncontrolled ends. The authorities responsible for these laboratories' security are all in the process of defining modes of risk assessment in a cohesive and transparent manner on a European level. However, the mastery of synthetic organisms nevertheless remains problematic, especially outside of containment laboratories.

Synthetic biology seems clearly to fall within the field of application of the convention banning biological and chemical weaponry (BTWC), which applies to every state in the world. However, it remains essential to reconcile security needs with the freedom and independence of the scientific process and innovation that strives to pursue new research in the public interest. While there is an internal will to contain and codify research, the risk of a diverted use of synthetic biology seems difficult to target and foresee. Prior to any initiative, a risk–benefit analysis of products of synthetic biology, their possibilities as well as their potential dangers should be undertaken. How should we co-habit with these synthetic organisms that are beyond the experience of our societies?

2.3. Inform but not alarm – can we do better?

Roundtable chaired by Marie-Christine Blandin (Senator) and Patrick Zylberman (EHESP), with Paul Benkimoun (Le Monde daily newspaper), Olivier Henry (East Paris University-Créteil), Christophe Pouthier (Berger-Levrault Publishing), Sylvie Sargueil (independent health journalist).

Marie-Christine Blandin emphasizes France's weak development of scientific culture and education. Now more than ever it is necessary to value researchers who are eager to share their gains with the public.

No doubt part of this mission is the role of the press. In March of 2003 during the world alert put out by the WHO (an unprecedented act) at the start of the SARS epidemic, it was still necessary to ''fight'' to convince the editorial board of the daily newspaper *Le Monde* of the importance and significance of that episode. Another problem involves the scalability of news. The avian flu in 2005 dominated the news, overshadowing the Chikungunya outbreak, occurring at the same time and even more devastating, on Reunion Island, a French ultraperipheral territory. *Le Monde* focused on the first problem, and H5N1 became, little by little, an enduring fixture in the columns of France's leading newspaper, like a sort of soap opera, at the expense of Chikungunya, an event considered to be a local and remote phenomenon. Obviously the paper latched onto the ''dress rehearsal'' theme, which has been much in fashion among the international intelligentsia ever since the SARS epidemic. The flu pandemic of 2009 is unlikely to deviate from this pattern. It polarizes the news, and by multiplying the headlines, runs the risk of saturating the newspaper's readership.

Thus is the media confronted with the same uncertainty as the public authorities, and like them experience great difficulty handling it. Shouldn't we instead now anticipate the quality of the media's handling of the question, which means training journalists whose knowledge of science and of the stakes involved is limited? Scientific topics are hardly ever brought up in basic journalistic training: the media flounders in confusion, particularly regarding public health issues.

Of course in today's world, journalists are no longer alone in broadcasting information. ''New actors mean new problems.'' Twitter, Facebook: we must reach adolescents (or ''adulescents''). But try to explain the concept of uncertainty (or risk–benefit) in 140 characters! Consider also press releases from public health agencies or research institutions: useful when they help journalists sort through the information, these releases have the disadvantage of discouraging all contact with the primary source material, scientific publication of the research articles or even the abstracts. Moreover, the public has also changed, becoming more heterogeneous, sometimes better informed. So how should one speak to this audience, without dumbing down everything? We cannot lie, hiding behind the excuse of reassurance. Even bad news must be communicated to readers and listeners.

3. Synthesis and proposals

In bringing closer together the questions raised by new infectious agents, whether emerging naturally or through human synthesis, this second conference has put into perspective common points between naturally occurring and bioterrorist epidemiological risks. The social sciences and humanities are indispensable in understanding the human determining factors involved in the genesis of and response to these collective threats.

3.1. State of preparedness – proposals for action

3.1.1. Strengths

The primary and most important strength is the greater and greater awareness that preparedness and anticipation are the supporting columns of the EID response. It is supported as much by institutions such as InVS, EPRUS and INSERM as by professionals in the field, clinicians, logisticians, and by elected officials and journalists. However, this dual process remains incomplete as regards the populations involved as well as corporate action and established organizations.

Another area of awareness: recognition of the limits to our knowledge and competence, state-of-the-art as they may be, when faced with these situations of emergence. The need to mobilize and cross-reference expertise in order to improve our capacity for adaptation to the unprecedented is recognized in several areas of operational organization such as supply management, frontline medical intake and treatment of patients suspected of having an EID.

A whole body of advanced work has yet to be done: recognition of weak signals by monitoring systems, scientific prospection and research preparation, training of health professionals responsible for intake of the first patients, setting

up bio-banks, adaptation of regulations, development of scientific and medical diplomacy, both in France and throughout Europe.

3.1.2. Weaknesses

The understanding that today preparedness for EIDs cannot be handled within a single country or region of the world independent of others contrasts with organizational and geopolitical functioning as well as with observed differences in culture, language and economics. Preparedness must be the subject of coordinated interactions and exchanges among countries with the support of international institutions. In this area, the need to strengthen ties between Northern and Southern nations is most keenly felt, the latter countries representing those regions at greatest risk of emergence.

The conviction that the attribution of funding allocated to preparedness can be a source of considerable savings, not only in a crisis situation, but also in periods of normal functioning in our societies, is far from being widely held. The absence of anticipation contributes to slowing down the development of exploratory scientific work, with the risk of disconnecting response plans and their concrete application.

3.1.3. Priority proposals

Priority proposals can be outlined as follows:

- Support European, international programs and actions, particularly in Southern hemisphere countries;
- Encourage interactions among clinicians, veterinarians, as well as specialists in the environmental sciences and the social sciences and humanities;
- Rely upon civilian–military cooperation to promote shared first-aid response procedures, flexible and effective logistical organization;
- Instigate a culture of experiential feedback, currently much neglected in France;
- Develop drills and training through simulation of scenarios: an exercise per year, or every 2 years, depending on its scope. Test diverse sectors, organizations and priority circuits. Involve trustworthy citizens' networks, and work with the help of military personnel with particular experience in this type of procedure;
- Prepare research in a pandemic situation, particularly epidemio-clinical research, and research in social and political sciences, involving infected or exposed individuals, which entails major specific constraints in a crisis situation. Analyze how surveillance and research can work conjointly and be mutually reinforcing in this context;
- Take into account these interactions with research that can be developed at a distance through stored information (development of mathematical and computer models to test hypotheses/scenarios, genetic analysis from bio-banks, etc.);
- Ready prototypical protocols for rapid activation as needed. Projects concerning epidemic situations should be supported by decision-makers and funding bodies in this perspective, to test and train researchers at all levels, investigators, developers, methodology and management centers both public and private, institutional review boards and the medicines agency.

3.2. Biotechnologies, expertise and citizens – how can they live together?

3.2.1. Regulatory and ethical problems raised by synthetic biology

The problem faced by the development of synthetic biology (microbiology and virology) concerns the dual use (the same substance having beneficial and undesirable effects depending on how it is used) that can be made of these procedures and products. Earlier than in Europe, Americans became aware of the serious problems posed by this type of research. The report issued by the committee presided over by MIT geneticist Gerald Fink, which had been formed in 2002 to advise the White House on the means required to limit the risk of proliferation of biotechnical research, proposed that in the case of an unexpected discovery posing a threat to public health or safety, its publication could be at least temporarily postponed. The committee of course realized full well that an overly security-based approach could impede new discoveries of public and global interest.

In response to this work, in March 2004 Washington created a National Scientific Advisory Board for Biosecurity (NSABB) placed under the auspices of the National Institutes of Health (NIH). Made up of 25 independent experts (science, security, public health, intelligence) and representatives of the administration (without voting privileges), this board met for the first time in June 2005. Its actions were initially limited to supervision of publicly funded works, carried out on sensitive biological agents – a list drawn up in 1999 by the Centers for Disease Control (CDC). Its actions continue under the responsibility of the NIH Office of Biotechnology Activities (http://oba.od.nih.gov/oba/index.html).

In France and in the rest of Europe where the primary concern is monitoring exported goods and dual-use technologies (EC regulation No. 428/2009 of May 5, 2009), the judicial framework for research in the area of biotechnologies is woefully inadequate. Synthetic biology only partially comes under the field of application of the 1972 Convention prohibiting the development, manufacture and storage of biological weaponry, to which 162 countries have agreed thus far. Unfortunately, this treaty is undermined by the absence of oversight measures, which renders its real impact practically nil.

Are research organizations willing to codify their research practices, working on programs posing a risk of proliferation? In 1985, the American Society of Microbiology, then the International Red Cross in 2002 and finally the British Medical Association in 2004, proposed that laboratories adopt a code of good behavior for life sciences. The formula has had since a ripple effect.

Uncertainty remains as to the risks linked to bioterrorism, accidents and laboratory leaks (essentially of pathogens and vectors). On a broader scale, research and development on man-made or -modified infectious agents raise enormous ethical problems. These synthetic organisms are beyond the experience of our societies. How do we live with objects devoid of history, sharing no history with humankind? The ethical debate on these

subjects is still in its infancy. A beginning, useful albeit modest, would perhaps be to encourage the training of interdisciplinary work groups, bringing together theoreticians, researchers and practitioners, around the question of biotechnologies in research and the life sciences. A fieldwork ethic could be kindled and expanded in laboratories, inviting the appropriate competent contributors for work on a set research project.

3.2.2. Media and public health

Journalists and educators have an obvious role to play in these debates. For the former, we would have to ward off a deep lack of knowledge – some would say even a lack of trust – which often distances journalists from the scientific community. Each of the two groups is ignorant of the other, leaving the door wide open to experts' confusion and increased fear and worry on the part of the public. On the contrary, it is urgent to create a cultural bridge, regular pathways connecting the media and the world of healthcare and research. The complex nature of the problems – typical of public health problems – means they cannot be addressed in the heat of the moment. Working with those media that have a health focus (such as women's magazines or the popular science press for young and general readers) (''cool'' media) is perhaps an option to pursue. The development of reciprocal, shared training programs may be another path to explore.

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Lexicon of acronyms

ANR: French National Science Foundation
CBRN: Chemical, Biological, Radiological and Nuclear (hazards or defense)
CEA: Atomic Energy Commission
DGS: Directorate General for Health (*Direction générale de la santé*)
EPRUS: Health Emergency Preparedness and Response Agency (*Établissement de préparation et de réponse aux urgences sanitaires*)
EU: European Union
INRA: French National Institute for Agronomic Research (*Institut national de recherche agronomique*)
NATO: North Atlantic Treaty Organization