Informal Consultation

Anticipating Emerging Infectious Disease Epidemics

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ABSTRACTS

Session 1 – Back to the future: learning from the past

_Moderated by Didier Houssin_ (President, Agence d'Evaluation de la Recherche et de l'Enseignement Supérieur, France)

_Oyewale Tomori – Ebola West Africa: drivers and lessons learned (many elements)_

CONTROLLING EBOLA OR OTHER DISEASE EPIDEMICS IS THE PRIMARY RESPONSIBILITY OF EACH NATION.

The two year running Ebola Virus Disease (EVD) outbreak in West Africa is a humanitarian disaster affecting every aspect of life and living.

Ebola virus is the virulent and strident whistle blower exposing the deplorable state of health care system, especially in the three worst EVD affected countries. Yet it was not all a story of doom and failure, as four other countries, after witnessing the devastation caused by Ebola virus, were on a high level of vigilance. Rapidly detecting the imported cases and establishing accurate laboratory diagnosis of the infection, they introduced classical infection prevention and control (IPC) measures to successfully contain EVD from spreading widely in their territories. These countries demonstrated that given basic facilities and infrastructures, combined with strong political leadership, effective coordination of an immediate and aggressive response, disease outbreaks can be controlled before they become public health events of international concern (PHEIC).

Undue emphasis has been placed on the slow global response to the EVD disaster, as being responsible for the failure to rapidly control the EVD epidemic. This amounts to focusing on the minor, among major culprits. Our focus should be on repairing the unabated damage done to health systems by misplacing priorities, prosecuting civil wars and neglecting the welfare of the citizens, since the past fifty to years of independence of African countries. Securing the health of citizens of a nation, including protection from the ravages of disease outbreaks, is the primary responsibility of the government of the nation. Each nation must equip itself to recognize and respond timely and adequately to potential public health events of NATIONAL concern long before they become PHEIC.
Ronald Waldman – Multidisciplinary response: strengths and challenges (many perspectives)

From the Government of Albania to the Government of Zambia, from Acupuncturists Without Borders to the Zorzor District Women’s Care, Inc., from AT&T to Zenith Computers, health sector responses to humanitarian crises have almost always been characterized by an outpouring of generosity, an unbounded charitable spirit, and the desire to help those in greatest need. They have also been characterized by responders with highly variable sets of skills, from the most general (“we’ll do anything”) to the most specialized. The descent upon the scene of an emergency of actors from many agencies of the UN system, from many national organizations (foreign medical teams), from civil society (the NGO “community”), and from the private, for-profit sector has sometimes been referred to as “the humanitarian circus”.

What this circus has usually lacked (and in some, but by no means all, important ways the Ebola crisis has been an exception), is a strong and effective ringleader. As a result, humanitarian response in the health sector has more often than not been relatively uncoordinated, unsupervised, and totally unregulated. Attempts have been made to bring some order to what has been, in the past, a chaotic “system”, but these have been voluntary and the participants have been, for the most part, relatively unaccountable, dependent to a large degree only on the level of oversight insisted upon by their donors.

Several initiatives have made major contributions to the standardization and effectiveness of health interventions in humanitarian crises: the Sphere Project Handbook, the UN Humanitarian Reforms, including the cluster system, and the IASC initiatives are a few. What has been lacking is strong leadership, accepted followership, i.e., the willingness to be coordinated), and a set of rules and regulations that can be enforced and to which the humanitarian actors can be held accountable.

The question posed to me is: how can we maximize and harness all the involved sectors to collaborate for outbreak response. The answer: by empowering countries, with the technical support of WHO and the convening power of the UN system, to develop “whole of society” operational plans, to exercise those plans, and to regularly update those plans to ensure that local, national, regional and, if feasible, international authorities are able to technically sound and fully coordinated assessment and response activities. Lives depend on it.

Ronald K Saint John – New perspectives on outbreak response after SARS in Canada (many connections)

SARS – Foreshadowing Things to Come?

The SARS outbreak in Toronto is, in many ways, an example of what might be expected when the next global outbreak occurs. The fact that this virus was not highly transmissible did not minimize its impact in the health sector and in the population at large. There were many secondary effects that went beyond surveillance, morbidity and mortality. Among these were travel and transportation, social services for quarantined persons, huge economic consequences for the city, media frenzies, political concerns, and more. A more easily
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transmissible agent, e.g., a respiratory virus, will produce even greater, far-reaching distress. Anticipating this agent requires emergency planning and preparedness, such as revision and maintenance of national influenza control plans as a model for efficient and effective response to a new, unanticipated respiratory agent.

John Watson – A mild pandemic: criticism and anticipation (many conflicts, criticisms)

The occurrence of outbreaks of acute respiratory infection in Mexico and the United States in April 2009, and the recognition that these were associated with a novel influenza virus, H1N1pdm, immediately caused worldwide concern about the likely impact of the pandemic that was to follow. Early reports from Mexico suggested the occurrence of severe illness in many of those infected leading to the perception that the overall threat was of a severe pandemic. As the world had been preparing for the next pandemic for many years, response plans were deployed including the rapid development of pandemic specific influenza vaccine and the use of antiviral stockpiles (in those countries where they were available).

As the pandemic developed, it became clear that the illness caused was, in general, mild with high attack rates in children and young adults, and relative sparing of the elderly who appeared to retain some protection from prior experience of a similar virus. Nevertheless, antivirals were used in many countries both to treat those with severe illness and, in some, to treat anyone who developed a compatible symptomatic illness, however mild. Although vaccine was not available for the first wave of the pandemic in many, particularly northern hemisphere, countries vaccine became available and was administered to large numbers of people including children in particular. In some countries a rare but severe complication, narcolepsy, was reported to be associated with receipt of the pandemic vaccine.

The overall impact of the pandemic was ultimately considered comparable to that of a moderately severe seasonal influenza. Criticism of over-reaction was voiced in some quarters and many lessons were learnt. The experience of the 2009 pandemic led to revision of the WHO global approach to pandemic influenza as well as to national response plans.

Sean Casey – The role of NGOs and health sector partners (many actors)

Non-Governmental Organizations (NGOs) - both local and international - have critical roles to play in outbreak prevention, preparedness and response, as well as in post-outbreak recovery. NGOs have responded to most recent large-scale outbreaks – from Cholera in Haiti, to MDR-TB in Russia, to Ebola in West Africa. In the ongoing Ebola response, NGOs operated almost every Ebola Treatment Unit/Centre, operated many ambulances, trained and managed burial teams, launched and operated multiple training initiatives, trained and supported contact tracers, and implemented most community outreach and engagement efforts, often with support from various UN and donor agencies. While many of these NGOs had never worked on a large-scale outbreak before - and only one on Ebola, specifically – the West Africa experience highlights the speed and adaptability of non-governmental humanitarian actors, it underscores the importance of their role in responding, but it also reflects the need to partner with NGOs to increase their capacity to address non-traditional
hazards, including infectious disease outbreaks. This presentation will not only look at how NGOs can contribute to better preventing and controlling future epidemics – it will show that NGOs must be considered equal and vital partners in epidemic preparedness, response and recovery. At the same time, it will highlight key lessons learned from experiences in both the Haiti Cholera outbreak and the West Africa Ebola outbreak – regarding coordination, working alongside UN and local and foreign governmental agencies, and considering limitations to effective response. Finally, this presentation will look ahead - considering potential future outbreaks and discussing opportunities to improve partnerships and enhance our collective response capacity.
Session 2 – Future epidemics: moving and blurry targets

**Moderated by Malik Peiris** (Director, Division of Public Health Laboratory Sciences, University of Hong Kong School of Public Health, China)

**Monique Eloit – Human-animal interface: anticipating risks of emergence**

When we speak about emergence of pathogens, we have to be specific in how we distinguish the various types; there is:
- The re-emergence of known pathogens after a phase of silence: ref Ebola in West Africa
- The emergence of known pathogens but in an unexpected territory: ref West Nile in North America in 1999
- The emergence of unknown pathogens: ref AIDS, SARS or more recently MERS

We can anticipate (rather than predict), with much precaution the emergence of some pathogens by following the evolution of animal diseases in hotspots, by carrying out entomological surveillance (to better understand the dynamics of vectors), or by refining our knowledge on movements of live animals and their products which can help to identify high-risk areas. However, we cannot predict the emergence of unknown pathogens, because that would mean that we would need to be able to predict which pathogen (especially in wildlife) could go out of its usual ecosystem, possibly pass the species barrier to infect humans (or livestock). In any case, whichever type of emergence you consider, the most important thing is to identify the first cases, i.e. the first clusters, and then to have the capacity to act and to limit the spread of the disease.

At this point, HPAI is the only disease in which there has been significant investment across the globe in surveillance in wildlife, livestock and in humans. Unfortunately, diseases as HPAI are rare. Indeed, most of the time, the detection of animal diseases is difficult. Very often symptoms are very discreet, thus difficult to observe or symptoms are not specific (fever, fall in production). Symptoms are not noticed when the disease emerges in wildlife and wildlife are not often surveyed as possible reservoirs for emerging pathogens. The alert can come late and the diagnosis humans is often done prior to any observation in animals (ref MERS, RVF in Mauritania).

Therefore, it is important to improve the capacities for an early detection and for the notification of sanitary events observed in animals. That means better knowledge of pathogens (cf research programmes mentioned by other speakers), develop laboratory network etc. But it is also very important to connect with the people who are in contact with animals. These are the first line of defence in terms of observation of symptoms, behaviours or die-offs in animals. They can be hunters, farmers, gamekeepers, whoever is in contact with animals and is able to make observations and alert authorities. Thus, it is important to highlight that we have to consider the meshing of sentinels on the field and educating and informing average citizens on what to report, to whom they should report and how they should report. The first conclusion is the need of a well-structured Health Services linked to the Vet Services thanks to the support for capacity building and for good governance. Additionally, it is necessary to have an emergency plan to manage the alert, by knowing that...
the crisis of tomorrow will be different than the crisis of yesterday; thus experience and flexibility are important. It is important to highlight knowledge of the involved stakeholders, of the preparation of coordination among them, both at the national and local levels and of multidisciplinarity teams as well as evaluation of strengths and weaknesses in the common WHO-OIE tool.

In conclusion: it is necessary to combine sophisticated scientific works, studies of predictive epidemiology and field work to obtain good quality data and to organize the broadcast network of these data. In the long term we need to invest in national health services, in human as well as in animal sectors.

**Julio Pinto – Managing the risks of emergence at the animal level**

We live in an interconnected world. Today’s global context provides a myriad of ways in which individual, human lives weave together. In today’s world, we humans have become increasingly linked not only to each other, but also to all other life on the planet. Human health has become ever more intertwined with the health of our environment and the animals that populate it – the animals we rely on for food, draught power, savings, security and companionship as well as the wildlife inhabiting sky, land and sea. Diseases emerge, spread and persist in humans, livestock and wildlife, affecting all three with often devastating consequences. Animal diseases must be addressed at its source, particularly in animals. Livestock health is the weakest link in our global health chain, and disease drivers in livestock as well as wildlife are having increasing impacts on humans. Livestock densities are changing, and production systems are impacting each other in new ways. Livestock-related trade is on the rise, and climate change is creating new opportunities for animal diseases to thrive. Food chain dynamics are enabling more diseases to develop more quickly, and the degradation of natural habitats is reducing natural coping mechanisms. To respond effectively we must continue with efforts to have evidence to understand the problems and opportunities for change. Secondly, we must enable dialogue and information exchange through knowledge platforms, networks and harmonized procedures. Thirdly, we must be the change we seek by raising awareness, promoting health-conscious innovation, improving the way we produce, buy, sell and consume animal products – from ‘farm-to-fork’ – as well as enhancing how we jointly investigate and respond to health threats.

FAO is contributing to the development of tools and guidance built on true incentives for livestock health-positive change. These efforts must be interlinked within an approach that engages the whole of society for effective collaboration across animal, human and environmental health, from local to global. Intervention or preventive measures to zoonoses to avoid transmission to humans from infected animal or animal products particularly those where there is no human to human transmission such as HPAI, anthrax, brucellosis, rabies, etc. have demonstrated to be effective. The animal health sector usually integrates a set of public health measures such as safe manipulation of animal and animal products in abattoirs, safe animal processing (food industry), safe carcass disposal (veterinary inspection and control and sanitary measures) or for instance recommendations on the consumption of pasteurized products to prevent food borne...
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There are examples how effectively reducing the risk of transmission of pathogens to humans during slaughtering of birds at the household level or managing biosecurity and rest periods at live bird markets. Movement restrictions, quarantine and import requirements also are interventions that implemented correctly avoid introduction and spread of zoonotic pathogens. This intervention need to be assessed regularly in their impact, efficacy and social acceptance/ adoption based on social and cost/benefit analysis. Also targeted education and public awareness measures and interventions about health threats including zoonosis should not be overlooked.

Nadia Khelef – Knowledge on microbiome and research – under review

The role of the microbiota in diverse mechanisms regulating health and diseases has been discovered relatively recently and has already challenged several scientific paradigms.

This dense commensal flora, present in different organs is essential for several physiological processes. The gut microbiota is composed of trillions of microorganisms, mostly bacteria that have co-evolved with the host in a symbiotic relationship. Its functions range from absorption of nutrients, synthesis of essential organic compounds, contribution to the development of the immune responses, protection against pathogens. Perturbation of the gut microbiota is involved in chronic inflammation of the gastrointestinal tract, obesity, malnutrition, diabetes, cancer and brain disorders. Patients affected by most of these conditions are also at risk groups for more severe infections during epidemics.

Some examples of recent results will be presented on the role of microbiota in the development, prevention or response to infections as a basis for discussion on how to best elaborate the future strategies to fight epidemics. They will range from the role of the microbiota in modulating vaccine efficacy, including non-enteric and non-oral vaccines, the effect of disrupting microbiota by antibiotics and the consequence for pathogens colonization including resistant species, as well as the role of the microbiota on arthropods competence (the ability of insects to acquire, maintain, and transmit microbial agents).

Possible exploitations of this knowledge will be illustrated by some examples, including the development of therapeutic or preventive applications that have started demonstrating their efficiency and that will probably expand in future years. These include diagnostic methods to predict metabolic disorders (themselves possibly altering the overall susceptibility to infections), nutrition complements to stimulate immunity or fecal transplantation to treat infections (or other gastrointestinal diseases).

Findings on the composition of the microbiota and its variation between individuals, environment, nutrition, as well as during the lifetime of the individuals, will be discussed in a tentative reflection of a systemic view of the topic.
David Murdoch - From Science to Action: Microbiome and Respiratory Diseases

We are just beginning to explore the respiratory microbiome. What remains to be learned and how can we apply state-of-the-art knowledge to identify interventions for preparing for and controlling future respiratory epidemics?

Until recently, the notion that healthy lungs are sterile was a commonly held belief. Modern culture-independent techniques have since revealed that the lungs harbour diverse communities of micro-organisms, and we are now only beginning to explore the respiratory microbiome in health and disease.

Many key questions about the respiratory microbiome remain to be answered. What is the role of respiratory dysbiosis in the pathogenesis of pneumonia? Do changes in the microbiome predict lower respiratory tract infection? How do treatments affect the lung microbiome and what are the implications of this for disease? Can the respiratory microbiome be manipulated for therapeutic purposes? How do viruses affect the ecology of the respiratory tract?

Addressing these questions will provide important insights into the pathogenesis of acute lower respiratory tract infections, the role of epidemic viruses in causing or triggering severe respiratory disease, and may identify novel therapeutic or prophylactic interventions. It is of fundamental importance that research into the respiratory microbiome continues to be driven by important clinical questions.

Dennis Carroll – Ecosystem surveillance: predicting the next emergence?

New Surveillance Strategies for Forecasting and Possibility Preventing the Emergence of Zoonotic Disease Threats

In today’s globalized world, the speed with which emergent diseases can surface and spread raises serious public health, economic, as well as global security and development concerns. We have seen in our responses to SARS in 2003, the H1N1 influenza virus in 2009, and the ongoing Ebola epidemic that responding to a threat after it acquires sustained human-to-human transmission leaves the world vulnerable as we struggle to develop and deploy effective biomedical countermeasures. There is an urgent need to be able to more accurately forecast where, when and under what conditions new zoonotic threats might emerge and to be able to target the underlying “drivers” to mitigate the risk of emergence.

Through USAID’s Emerging Pandemic Threats Program, advances in our understanding of the ecologic and behavioral drivers underlying zoonotic disease emergence has begun to reshape our approaches to disease surveillance and strategies for preventing the emergence of new threats. This work has underscored that the risk of emergence is closely aligned with a limited pool of “high consequence” viral families that in turn are associated with a limited pool of animal species. This in turn has led to the recognition that there are “high risk” geographic areas where a combustible interplay between animal hosts, environment, and people underlie zoonotic disease emergence. Advances in genomics and informatics have further expanded our understanding of the biology of disease emergence and how we can
approach the early detection of future threat. In addition, greater understanding of how animals (domestic and wildlife) are moved along “value chains” from farms to markets enables more precise tracking of animal viruses, how they interact, and evolve and ultimately how their emergence can be prevented.

Building on this background this discussion will highlight two areas of ongoing work being supported under USAID’s EPT program for “prediction of emergence” and assessing the potential for the “prevention of emergence”:

1. A more-refined understanding that risk of disease emergence is associated with geographic “hot spots” and select wildlife taxa has led to the development of risk-based strategies for focusing “predictive surveillance” on those places, populations, times and situations where the drivers of emergence are most dynamic and the risk of new threats is greatest.

2. By exploiting knowledge about the movement of viruses along animal “value chains” we are initiating work to evaluate whether the emergence of new viral variants is associated with “hot spots” of viral diversity at specific points along value chains. Using influenza viruses as the initial model we ultimately are asking whether targeting viral diversity “hot spots” for intensified control measures can disrupt the emergence of “re-assortment” driven viral threats.
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Session 3 - Science and technology – opportunities and challenges

Moderated by Gabriel Leung – (Dean, Li Ka Shing Faculty of Medicine, University of Hong Kong, China)

Nur A Hasan – What’s new for surveillance and detection?

Next-Generation Sequencing and Ultra Rapid GENIUS® Bioinformatics:

Challenges associated with infectious disease detection and biosurveillance today are much broader and more complex. Previously recognized pathogens are evolving faster and becoming more virulent and resistant to available antibiotics. Etiology of many acute infectious diseases remains unknown or poorly known. Potentially dangerous novel pathogens are emerging every year. Nosocomial and mixed microbial infections are dramatically increasing and the role of resident microflora in health and wellness has continuously been implicated by numerous studies. Traditional pathogen detection methods in infectious disease surveillance are, therefore, no longer suitable to tackle the changing landscape of microbiology and infectious disease. In today’s genomics era, next generation sequencing (NGS) has the potential to revolutionize pathogen detection in public health laboratories for tracking diseases, classifying unique microbial signatures responsible for outbreaks, and discerning the presence of virulence determinants or genes conferring antibiotic resistance. Therefore, NGS based microbial genomics and metagenomics appears to be paramount to 21st century approaches to rapid microbial detection and precise subtyping of pathogens – be it for identifying and characterizing select agents (traditional, enhanced, and advanced), the microbial community, and/or minor variants within a single sample. It offers a unique opportunity to leverage whole genome sequence information to investigate the complete genetic make-up of microbial pathogens to understand evolution, pathogenesis, clonal transmission, and provides opportunity to comprehensively profile hundreds of species in a sample and even discover entirely new infectious agents. Recent advancement in sequencing throughput and turnaround time, automation in nucleic acid extraction and library construction, and significant advancement in developing ultrafast bioinformatics Package (GENIUS®) and curated genome databases (GenBook®) make this technology highly attractive for rapid integration into public health laboratories for routine microbial detection, biosurveillance, and outbreak investigation. We have already applied such technologies extensively in understanding the dynamics of enteric diseases. The 2011 foodborne German outbreak of Escherichia coli O104:H4 is a notable example where the causal pathogen escaped detection by legacy systems, i.e. more than 10,000 tests of various food samples failed to return a single positive result. Frustrated with the pace of the investigation, German investigators turned from the more conventional molecular epidemiological paths, to next-generation sequencing and bioinformatics. Even though genome sequence of this emerging pathogen was not available in the database, we were able to place the genome into the sequence space and conclude that this ‘single colony isolate’ was a chimera. Such approaches have also allowed us to perform high-resolution phylogenetic inference and population genetic analysis of V. cholerae outbreak strains as well as explore the community ecology of V. cholerae in its two very distinct habitats, human hosts and aquatic ecosystems. Utilizing isolate genomics we were able to infer antibiotic
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James Ajioka - Advances in biology and their applications

Synthetic Biology and Emerging Infectious Disease (EID)

As Drew Endy has suggested for "biological threats" in the context of Synthetic Biology, EIDs as natural threats require Detection, Analysis and Response. For detection and analysis, biosensors (in the broadest sense) may enhance our capabilities here. For “known” EIDs like influenza, synthetic biology may help by developing support methods for existing technologies. Response in the form of treatment or prophylaxis is the area where synthetic biology can greatly enhance our capabilities. Engineering synthetic pathways in yeast for the production of artemisinic acid as a precursor to artemisinins has already had a major impact on the global drug treatment of malaria. Vaccine development may also be greatly accelerated through characterisation and standardisation of “genetic parts” and “chassis” for both subunit and live-attenuated vaccines. Vaccine production methods such as production in plants may also similarly benefit. The production of influenza subunit vaccines using George Lomonossoff’s protein expression system in plants and a similar demonstration for cholera toxin show the power of this method. The production of neutralizing antibodies may also benefit through engineering the system.


Mark Perkins – What’s new in diagnostic?

The sophistication of detection technologies has grown dramatically over the past 20 years. Many of the tools first deployed in life sciences research have now been turned into clinical in vitro diagnostic devices with features that make them attractive for use in many developing world settings. The cumbersome ELISA began being replaced by lateral flow immunassays in the 1990s and now a new generation of immunoaassays is in development that offer multiplexing, quantitation, automation, and electronic reporting. Likewise, the invention of PCR revolutionized life sciences in the 1980s and when real-time amplification chemistries arose in the 1990s they began to find their way more quickly into clinical use because of the simplicity of detection. Now molecular testing systems have been developed for clinical use that automate specimen processing, amplification, detection, and wireless reporting. Thousands of such systems are now in use in developing countries. The development of Ebola assays for such platform has overnight created widespread surveillance capacity. This
talk will explore some of the opportunities provided by these advances in technology, and discuss some persistent obstacles to their broad impact in public health.

**Amanda McClelland – Risk perception and community engagement**

Risk perception is the core to how an individual and community understand, interpret and react to risk. This perception influences decisions about the acceptability of risk, but also influences behaviour, before, during and after the risk has passed.

Misconceptions of risk can distort the reaction to the risk and lead to inappropriate response such as stigmatization and isolation of those who are perceived as a potential source of infection. This distortion of reaction related to risk was seen in Ebola, not just at an individual level, but at a government and global level with the implementation of Nationwide by-laws to restrict movement and limit spread, with the fear of Ebola infection in western countries far exceeding the reality of potential exposure.

Risk perception is a complex result of the understanding and interpretation of the hazard, in this case the risk of contracting Ebola, and the personal beliefs, philosophies, experiences, societal influences and cultural norms of the individual. This complex interaction of beliefs and knowledge influencing the acceptability of risk was clearly demonstrated in the West Africa context with evidence that individuals and whole communities were weighing the risk of exposure and contracting Ebola against the risks of not fulfilling normal cultural practice such as completing burial rites, but also complicated by the risk of punitive measures. The acceptance or resistance of prevention measures to the hazard is therefore not solely determined by knowledge alone, but of the combination of all of these factors.

All population exposed to hazards want and need to be informed about risk characteristics, preventative measures, and appropriate behaviours during emergencies, especially epidemics where changing behaviour can be lifesaving. In the West Africa context, initial knowledge and understanding of the risk characteristics was low. This was a ‘new disease’ in a ‘new context’ and the opportunity for misconception, rumour and misinformation in the initial weeks and months heavily influenced the population’s perception of risk and resulting actions. The complexity of interaction between information related to risk, societal and cultural influences meant that direct risk communication and knowledge sharing did not result in a significant uptake of the preventative measures needed to stop transmission of the virus.

Given these complexities, it is clear that risk communication and knowledge transfer needs to be done in a context of cultural and societal understanding, working with individuals and communities to interpret and analyse risk resulting in the determination of appropriate actions. Community engagement based on joint problem solving, and collaborative action with all community stakeholders assists in moving beyond knowledge to action and is only possible once trust is established and open two way communication is established.

The Ebola operation gave us several good examples of how this could be done but the challenge in future epidemics remains how to balance the time, scale and need for speed in communicating risk with the obvious benefits of structured and deliberate community engagement that facilitates measured risk perception and appropriate actions.
UNICEF has a long history of communications and community engagement in emergency response related to disease epidemics (e.g. cholera, Marburg, Avian Influenza, H1N1). The Organization’s approach to the role of communications in this context builds on three core tenants: (1) Listening to communities and building trust, which is essential to providing a response based on the views, perspectives, voice and needs of communities; (2) Engaging with communities so that they own the response, which is essential for sustainable action, moving into recovery efforts; and (3) Understanding the communication landscape and diaspora, which is essential to tailoring appropriate, context-specific interventions. For example, with increasing access to social media, SMS and other new technologies, communities and audiences play a key role in generating content and messaging, in addition to governments and other stakeholders.

UNICEF builds on these tenants in its emergency response through data-driven community engagement, incorporating information from multiple data sources, such as rapid assessments, in-depth community-based research, and real-time data platforms. It’s important to emphasize that community engagement need not be high tech—in many settings, the convergence of old and new media communication technologies is proving to be a beneficial combination. Community radio, for instance, has been very useful to engage with communities in local languages, while allowing community members to use their mobile phones to call in or text questions and comments. It is important to note that data-driven community engagement requires substantial investment, to make it faster, more accurate, reliable and real time.

There is no “one size fits all” approach when it comes to communication and health emergencies. We must use the lessons of Ebola and other disease epidemics to strengthen future responses in three key areas: coordination, technical response and preparedness. Regarding coordination, we must arrive at a common understanding of terminology and work together in a harmonized approach. Regarding technical response and capacity building, we must be flexible, adaptable, and sensitive to drivers of the epidemics, and respond holistically to the needs of the community. Regarding prevention and preparedness, we must engage in long-term efforts to strengthen risk-informed programming and strengthen community systems and build trust and resilience—and engage communities in these prevention and preparedness activities.

Finally, a fourth area is innovation, which can play a key role in all phases, from prevention and preparedness through response and recovery. For example, the use of new technologies (e.g. U-Report, and other digital platforms) can provide information on early warning, support community-based surveillance, gather information about the availability of supplies and medications, determine if checkpoints are functioning, track rumors, and improve the quality of the communication response.
Christl Donnelly – Modelling outbreaks: pros and cons

The roles for modelling may be classified into preparedness, real-time and retrospective. The retrospective aspect is important for informing the next stage of preparedness, making it informed by evidence, and thus forming a loop. Analysis and modelling is needed in an ongoing way during an epidemic to check how/if the situation is changing and to ensure that controls are/remain on target for control.

Where modelling differs from analysis is that it can answer the “what if”s:

- What if ETU bed capacity had been increased a month earlier?
- What if point-of-care diagnostics had been available for use throughout the Ebola epidemic?
- What if transmission continued at its current pace?

This last one is the question we (the WHO Ebola Response Team) addressed in our September 2014 NEJM paper: “Assuming no change in the control measures for this epidemic, by November 2, 2014, the cumulative reported numbers of confirmed and probable cases are predicted to be 5740 in Guinea, 9890 in Liberia, and 5000 in Sierra Leone, exceeding 20,000 in total.” This work was very important in informing national and international players so that they understood the magnitude of transmission as it was occurring in autumn 2014 and its implications if things did not change.

Preparedness is particularly challenging, even when making good use of past work. What if A? What if B? It is possible to look at such a restricted set of scenarios as to be unrealistically constrained. Whereas if absolutely everything is possible, then the range of results is uninformative.

There are accompanying challenges relating to access to data and results of analyses/modelling:

- Who can access which data for analysis (and when)?
- Who gets to see the results as they come off the epidemiological press?
- If data are made widely available, how will sense be made of the various results that will be produced (separating the signal from the noise)?
- Can a group of modelling groups be coordinated to gain best value from all their efforts? (Artificially pushing groups toward more similar results can be misleading and thus counterproductive.)
**Paolo Ruti – Learning from successes in meteorology**

New sources of atmospheric observations, faster supercomputers and advances in weather science together have revolutionized weather forecasting in the latter part of the 20th century. On the global scale, we can today predict out to six days ahead as accurately as we could do for four days 20 years ago. This means society has much more advance warning of weather hazards than before, allowing people to prepare and, thereby, limit the loss of lives and property.

This progress has been possible because of the research and technical developments carried out in operational centres, academic institutes, by surface and spaced-base observational data providers and in the computing industry.

Three focal areas could be targeted for examining the contribution of World Meteorological Organization to the big-brother:

- A well-designed observing system is prerequisite for any prediction of the Earth system. Real time observations are essential for nowcasting, for initializing numerical weather prediction models, as well as for evaluating both the individual components (e.g. parameterizations) and the end products of a prediction system.
- Data assimilation is the foundation stone of numerical weather prediction bridging models and observations. Data assimilation methods combine increasing number and variety of observations with prior forecasts information to correct and improve the skill of the following forecasts.
- The inter-linked evolution of weather science and of high-performance computing is crucial for continuing the progress in numerical weather prediction and for providing more valuable services.

**Kamran Khan – Use of big data to anticipate epidemics and their evolution**

Over the past two decades there has been an explosion in the supply of diverse, timely, and large-scale health and complementary non-health data that can be leveraged to better prepare for and respond to future epidemics and pandemics. If harnessed appropriately, these data could (i) strengthen the early detection of important infectious disease events, (ii) help assess the potential for these events to evolve into epidemics or pandemics that threaten health, security, and prosperity in the world, (iii) help guide effective, efficient, timely, and coordinated cross-sectoral responses to public health emergencies arising from dangerous pathogens, and even (iv) avert epidemics by anticipating future risks and directing resources to prevent them from materializing in the first place.

As a vast and dynamic medium for information, the Internet has become a valuable source of epidemic intelligence that has complemented traditional public health surveillance of infectious diseases. Systems such as ProMED mail, the Global Public Health Intelligence Network (GPHIN) and others have enabled the collection, synthesis, and sharing of online data that offer timely access to global information about infectious diseases. Recent advances in transportation network data systems have expanded our ability to anticipate the local and global spread of pathogens by land, sea, and/or air travel. Data from orbiting satellites and
terrestrial sensors can shed light on environmental and climatic conditions, which when coupled with subject matter knowledge in insect biology for instance, can offer insights into biting patterns that drive transmission of disease to humans. Moreover, it is estimated that by 2020, 80% of all adults in the world will possess a smartphone, which could be used to gather and share relevant local data, while accessing valuable data and insights from others around the world.

However, the promise of big data also holds significant challenges. How will we share information with one another so that we can gain insights at the crossroads of different scientific perspectives? Will disincentives to data sharing be minimized and incentives maximized? When we overcome many of these data sharing challenges, who will Big Brother actually be? Will people trust this source of information or will they demand the decentralization and democratization of data access to gain their own insights and arrive at their own conclusions?

Cecile Wendling – Learning from the insurance expertise

Health surveillance is often a rather reactive process, with no real integration of early signals and wild cards. As a consequence it is difficult to detect radical changes having a strong impact on public health in the medium or long term. To embed this proactive dimension and increase proactiveness, foresight is a key approach to use. Many foresight methods exist among which the scenario approach.

Several steps are necessary in this approach: 1) Identification of a list of public health determinants that will be the focus of the scenario building. In the study conducted for INVS at Futuribles, three main determinant were studied: The trigger factors of health events, the diffusion factors of health risks and diseases and the response factors. 2) For each of these determinants, identification of key variables/drivers were made. For instance for the “trigger factors”, drivers were economic (analysis of the economic situation), social (analysis of the exposure of workers to stress), political (evolution of conflict zone) etc. 3) For each of the three groups, micro-scenarios were built 4) Identification of macro-scenarios, each built from the three micro-scenarios for each of the three groups. 5) Identification of issues and needs for the future of public health.

The exercise identified 22 key variables, 17 macro-scenarios and 5 micro-scenarios. These were: ‘Inequalities and fragmentation increasingly obvious and hard to manage’; ‘Ecological transition and health promotion’; ‘Controlled technology development ... to the extent possible’; ‘Global technological explosion’; ‘Disasters and disorganization’. The topics retained relate to issues on social and territorial health inequalities, the burden for health, the choice between individual and collective responsibility in terms of health, ethical aspects, emerging phenomena, ‘Big data’, data mining, new technologies supporting health, the interlocking of analysis scales.

The presented approach informs the programming of activities of INVS, the French health safety agency, in particular as regards monitoring and surveillance. In describing possible future scenarios, as well as the elements in favor of one scenario rather than another, health
surveillance can help decision makers to influence the context in order to guide towards one or more favorable futures.
Session 5 - Curing and not harming: that is the question

*Moderated by David Heymann* (Head and Senior Fellow, Centre on Global Health Security, The Royal Institute of International Affairs, Chatham House, UK)

**Abdullah M Assiri – Clinical practices and emerging diseases**

MISSING

**Dr Abdul Ghafur – Systemic view of infections in health care facilities**

Health care institutions can facilitate the spread of dangerous pathogens like Ebola, SARS and MERS-CoV; amplifying bugs originated in the community. Extensively drug resistant bacteria (XDR) such as Carbapenem resistant *Enterobacteriaceae* originate in health care institutions and then spill over to the community. Even hospital acquired and transmitted infections (*Acinetobacter, Pseudomonas* etc.) pose major threat to the medical field, affecting institutions across the world.

The magnitude of Ebola in West Africa was due to the inadequate health care and infection control infrastructure in the region, prompting the world to consider strengthening infection control facilities and practices a global priority. We learned that adherence to simple and basic measure such as hand hygiene is more important than building high tech facilities. At the same time we also learned that high tech facilities can help contain the infection at a very early stage, providing an argument for building similar well equipped infrastructure in more and more health care institutions in the developing world as well.

Health care institutions of the future should amalgamate modern strategies to improve human behavior and at the same time building and designing health care facilities to provide a safe environment with the least risk of creation and amplification of dangerous pathogens.

**Hélène Lepetit – Patient-doctor relationship in the age of the internet**

The web and social networks provide an exponential amount of health related data: in France in 2015, according to our monitoring of web and social networks, there were more than 60,000 new vaccine related contents per month; and there were more than 300,000 Google searches related to vaccination per month. This real time, uncontrolled, boundary-free, often anonymous circulation of information tends to favor the proliferation of rumors. Also, by offering free, unlimited, easy and anonymous access to health information, the web and social networks incite patients to take more control over their own health. And this trend will accelerate, as digital natives become adults, and connected devices will enable patients to track and manage their health.

As a result, the patient provider’s relationship is evolving: patients no longer want to be… patient! Increasingly, patients expect to discuss and sometimes challenge their doctors' recommendations.
In practice however, based on the analysis of (i) forums and discussions on parenting websites in France and in the UK, as well as (ii) social networks contents, and (iii) qualitative interviews with mothers, patients’ attitude towards vaccination may vary:

- The “Cartesian decider” wants to be in control of health related decisions. In case of doubt, she will research scientific and / or official sources of information on the web, consult other health professionals and ultimately make her own decisions.
- The “emotional decider” is also in charge, but she will take her decisions based on more emotional elements: testimonies, videos, news stories, word of mouth…
- The “expert reliant mum” trusts and relies on health professionals and other experts.
- The “peers reliant mum” similarly will not decide by herself. She will rely on advice from family members or friends – including “digital friends” - that she trusts, to make health decisions.

Accordingly, the role of health professionals remains fundamental - and maybe even more so as it becomes increasingly difficult to make informed health decisions in this era of overwhelming data. However, health professionals need to take into consideration patients’ new expectations, and patients’ health behavior profile. Also, doctors need to be assisted; and in this respect, the web may provide valuable tools, as demonstrated by various successful initiatives in this field: official websites providing answers to parents and health professionals’ questions, electronic systems sending reminders to parents and / or doctors upon vaccination dates, hospital blogs dedicated to parents, etc. Finally, content must be optimized for Google searches.

To conclude, the web and social networks may be viewed as a threat or an opportunity for vaccination. If a digital health strategy is implemented, the Internet may provide great resources to help fight vaccine hesitancy. If doctors adapt to their patients’ new expectations, and health behaviour profile, their relationship will be strengthened. To make this change, maybe patients could no longer be called… “patients”?

Idrissa Sow – Impact of strengthening the overall health system

Core components of strong health system¹ include health service delivery, health workforce, health information systems, access to essential medicine, health systems financing and leadership and governance. At the peripheral level where outbreaks usually strike, this could mean a geographical and financial access to primary and secondary care equipped with adequate logistics and supplies, led and managed by accountable, well-trained, experienced and motivated health personnel. These personnel should be able to timely generate, analyse quality data and take appropriate measures to monitor (including epidemic disease trends) and evaluate achievements. Unpacking these components and enhancing some elements such as emergency risks mapping (including epidemics), promotion of healthy behaviours, improved case detection, confirmation, safe case management as well as timely reporting should certainly boost measures aimed at preventing outbreaks and the spread of epidemics. Systematic hazards mapping and population knowledge, behaviour and practice should be

¹ WHO key components of well functioning health systems
carried out at early stage and repeated regularly to strengthen epidemic preparedness and response.

When implemented adequately, comprehensive components of health system strengthening should contribute to mitigating the impact of epidemics. These components should include required measures for control of epidemics. A strong health system aims at preventing regular recurrence of epidemics such as viral haemorrhagic fevers, cholera, Meningitis etc. Decentralised decision-making and accountability, experienced health personnel at all levels, solid multi-discipline and multi-stakeholder coordination are critical for alleviating impact of epidemics. Involvement of clinicians, at front line in health facilities, who are in best position to diagnose and manage an epidemic prone disease and report increasing number of patients, is key. A timely reporting and laboratory confirmation networks using accessible technology (e.g. rapid diagnostic technics) and well-established infection control measures contribute to the prevention of spread of epidemics. The knowledge of population socio anthropological perception of epidemic prone diseases before resistance to measures put in place during epidemics would help to achieve sound outbreak containment.

Gaps in implementing these components, particularly in low resource-settings, lead to a weak health system conducive to failure to contain outbreak and epidemic spread. The most deadly epidemics occur generally in low-income countries although some ill prepared middle-income countries still face challenges related to epidemic. The governments’ investments in health remain low despite their political commitment, the sustained growing economies and flow of external financing. Unless this lack of ownership is addressed, health system strengthening sustainability is doomed to failure. Among critical issues for future, when developing (or rebuilding in post emergency) health system, the following should be considered i) a thorough multi-stakeholders health system assessment/review using consensual indicators to identify gaps in the implementation of the components ii) a “menu à la carte” of low cost and high impact interventions to address gaps iii) learning from previous experiences on inter-country cooperation to ease detection and response to epidemic and conduct assessments of adjacent districts iv) enhance socio anthropology component of health system strengthening.
Ali S. Khan – Evolution of health security concepts

Recent costly missteps – measured in lives - have exposed weakness in our global health security system. Without discounting the tremendous personal sacrifices of myriad responders, the global preparedness framework for protection, response, and recovery is undergoing the necessary reform including organizational restructuring at WHO and development of a response contingency fund and a global response corp. These multilateral efforts are being supplemented by charitable foundations’ and national efforts such as the US Global Health Security Agenda that is designed to advance the International Health Regulations (IHR) as a bi-lateral approach in select countries with a focus on: antimicrobial infections, zoonotic infections, and bioterrorism. Health Security at a national level is broad-based protection, response, and recovery efforts to ALL public health threats: natural disasters; pandemics and other outbreaks; and intentional releases of biologic, chemical, or radiological materials. These are not necessarily just threats of international concern as defined by the IHR.

Ensuring health security requires capacity in ALL countries centered on the government. The current reform efforts should consider establish an essential core in all countries consisting of an emergency operation and data fusion unit. This unit should be responsible for national planning and exercising with the ability to receive routine data inputs and to disseminate information and to field and manage response teams. This essential core should be based on a comprehensive set of defined, objective, and measurable capabilities with a composite preparedness measure modeled on the US National Health Security Index. Suggested domains can derive from the IHR for: incident & information management; healthcare delivery and infection preparedness; environmental and occupational health; countermeasure management; community planning and resiliency, and surveillance and research.

Financing these state efforts could be modernized by establishing a new Global Fund for Health Security modeled on the Global Fund for HIV/AIDS, TB, & Malaria for state-level preparedness efforts consistent with the IHR and independent of the efforts to fund responses. The role of the Global Outbreak and Response Network (GOARN) should be expanded to provide technical assistance to these new investments in national health security including innovations in digital disease detection and to recruit, train, maintain, and deploy global response teams.

However, ensuring global health security is not just a function of the health sector and requires national level leadership and the in-country support and planning of multiple other sectors (e.g. defense, agriculture, finance, social welfare, and civil affairs). A permanent office in the UN Secretary-General’s Office or attached to the UN Security Council with an Under-Secretary could facilitate the necessary state-to-state dialogue for global preparedness.
for the full spectrum of health emergencies including the necessary response to climate change with operational support during responses from the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). An Under-Secretary could also address the root causes of emerging infections and other health threats. The drivers include changes genetics and biological factors, ecology and the physical environment; human behavior and demographics; and social, political, and economic factors. Most of these drivers are manmade and can be addressed.

With wishes, dreams, and believing, we can make this possible.

**Marty Cetron – Revisiting traditional containment measures (delivered by Inger Damon)**

The key to success is aligning incentives of victims, exposed and a fearful public by building trust and investing in community supports. All possible efforts are needed to avoid stigma. Education must be the vaccine against fear and must be culturally sensitive to win "hearts and minds". Denial is a self preserving part of human nature in response to fear- as is fight, flight, and hiding. Denial is rarely an attempt to inflict intentional harm on others; hence victims need to be supported physically and emotionally, not criminalized. This means not only food, water, early diagnostics, available Rx and prevention; but also psychosocial support in culturally relevant manner through empowerment. There are a thousand ways to do I/Q wrong for every 1 way to do it right. It is resource intensive in short run and requires rigorous planning, not a knee jerk military reaction like West Point. Cordons are an extreme example of last resort, not the norm for I/Q public health measures. I/Q really should be thought of as a full continuum of movement and monitoring guidelines and options. Officials need to thread the needle carefully choosing least restrictive means to balance public good and civil liberties. Nonetheless, most perceive I/Q only as Cordon Sanitare, immoral death sentences and throw away critical public health tools along the continuum. They don't need to be ironclad to work; "leaky" measures may still be effective and they should be "risk-based" and "voluntary" whenever possible but not capricious and arbitrary as this is not only unethical but erodes trust of those who comply. We must recognize the limited times when compulsory measures are necessary and not fear to use them sparingly and in time-limited fashion. I frequently ask myself 3 questions before considering these I/Q options.

1. May I? i.e. Legal authority
2. Can I? Operational and technical capacity
3. Should I? Is it the right thing and necessary to do - both technically and ethically.

The "Should I?" Question is the most important to answer before considering the others. One must avoid the trap of "I may" and "I can" therefore "I should". Since, in the real world, epidemics of disease occur in conjunctions with epidemics of fear and stigma; care and attention must be given to all 3 simultaneously for successful control. The use of public health measures must delicately balance a fearful public without stigmatizing victims while justifiably controlling transmission through restrictive means. We also must be willing to back off the restrictions promptly when they are no longer justified by the risks or are failing
Hayley MacGregor – Managing epidemics in urban settings
Across the world, the populations of cities are rising due to internal growth as well as immigration. Megacities are an established reality but growth of smaller cities is also receiving increasing attention. The challenges associated with managing epidemics in urban areas are particularly acute in low and middle income countries with public sector resource and capacity constraints, and weak health systems. Population growth can lead to denser habitation of existing areas of cities, which has implications for the spread of infectious diseases. Furthermore, recent migrants usually have stronger ties with rural hinterlands and can move back and forth to urban areas in circular patterns that encourage disease spread across wider areas. In some cities, the urban perimeter expands outwards as the population grows. Peri-urban areas can be characterised by inadequate or no service provision and a high degree of informality. On the one hand, urban contexts can provide better job opportunities, incomes, and access to better healthcare and nutrition. On the other hand, rapidly expanding populations can place pressure on the provision of basic public health, such as water and sanitation, pest control, disease surveillance, food safety regulation, disease detection and healthcare delivery. It is noteworthy that inequalities in living circumstances, incomes and access to services has become a feature of many large cities, which can leave people in certain parts of a city more vulnerable to disease. Moreover, informality is now a well-recognised phenomenon in many cities: informality of living conditions, of work and livelihoods, and of regulation. Using the example of risks of zoonotic disease in urban and peri-urban areas, I will focus in particular on the implications of urban inequalities and urban informality for risk in urban areas and for seeking strategies for preventative responses that could mitigate risk and build resilience.

Dirk Glaesser – Epidemics and tourism
International tourism involves millions of people every year, increasing the mixing and spread of pathogens. How can health and tourism sectors work together to concretely address challenges of international threats?
Travel and tourism is a growingly important economic and societal activity. Many countries are using travel and tourism as a priority tool for economic development. Closely linked to the travel and tourism activity is the aviation sector which is pivotal for any international tourism development. Of today’s 1.1 billion tourist arrivals, more than 50% are using aircrafts as mode of transportation.

However, travel and tourism is heavily depending on an intact environment, whether this is natural, cultural, social or human or animal health environment thus, can be easily affected by negative events. Just to recall SARS in 2003 affected 26 countries and caused economic losses of US$ 60 billion. A similar experience was made in 2009; although the impact of the
Pandemic virus was mild and caused mostly only limited impact, the consequences for the travel and tourism sector were in many countries and subsectors quite significant. In the specific case of Mexico the Pandemic (H1N1) 2009 caused economic losses in the travel and tourism sector of nearly 3 billion Euros according to the Economic Commission for Latin America (ECLA), half of the overall losses for the economy of Mexico.

The spread of communicable diseases can be, among other measures, efficiently supported through fast and sincere reporting. However, fast and sincere reporting requires that unnecessary repercussions are limited as much as possible. The travel and tourism sector is therefore grateful on the concrete actions undertaken by WHO to develop a set of Best Practices for the Naming of New Human Infectious Diseases in which, urging geographic locations, among others, to be avoided when naming a new disease thereby encouraging countries to communicate at a very early stage outbreaks and incidents as well.

The close cooperation with WHO within the framework of the International Health Regulations (IHR), alongside with ICAO and other leading actors, allows UNWTO to better coordinate two-way targeted communications with the Tourism Emergency Response Network (TERN) to provide timely information and to promote safe travelling behavior, while ensuring uniformity in information sharing, developing practical response strategies, and providing recommendations for the tourism and travel sector.

Fabienne Keller – Political perspectives of global risk

The New Threats of emerging infectious diseases: Summary of a prospective report for the French Senate

Future trends in variables are outlined which will impact the emergence of infectious diseases, taking into account both voluntary, favourable course of action and also negative changes. It does not focus specifically on the scientific aspects, rather it describes the driving forces and public policy measures that could prevent a disaster from occurring.

Humanity has always had to deal with major epidemic outcomes, from Neolithic times to the modern days. Infectious diseases are responsible for 14 million deaths worldwide every year and over 90% of these deaths are recorded in the southern countries. 334 new infectious diseases were discovered since 2040, 60% are forms of zoonosis, 72% of which originate from wild animals. The emerging zones are located primarily in the south, which are also areas of major political, economic and climate uncertainty.

The likely trends for changes in key factors or variables will increase the risk of emerging diseases. Studies and prospective exercises done in Great Britain, the US, China and by the APEC show the only convincing scenario is the disastrous scenario: an unknown disease with rapid incubation, high level of mortality, and high inter-human transmission.

The political authorities face three challenges:
1. How to apply in the 21st century traditional public health measures in a complex, mobile and selfish society in crisis?
2. How to talk about risk and uncertainty given the approach adopted by new media sources such as internet.
3. How to guarantee fair access to resources in case of a crisis in democratic societies?

There are two key responses

1. Preparation of societies
   - Take into account constraints in terms of population information: prevention and reaction, heading towards a dynamic, interactive and flexible model
   - Use communication methods in an epidemic situation: the potential offered by the new tools on internet has not yet been adequately exploited
   - Tackle approaches to unknown situations through a better understanding of collective behaviour

2. Choices to be clarified regarding changes in health systems
   - size up the warning mechanisms
   - organize how health care systems will be managed during the health crisis
   - boost care, research and training in the southern countries
   - define research priorities regarding emerging infectious diseases

Ten Actions to fight against the threats associated with emerging infectious diseases

1. Boost public awareness of the global phenomenon of emerging infectious diseases and the importance of North South relations
2. Act on all factors involved in the emergence and spread of the diseases in an attempt to slow down or even reverse the major negative trends observed (urbanisation, changes in the use of soils, population migration, at various levels of organisation (international, national, regional, local)
3. Consider the prevention of infectious diseases as a major cause for humanity, and prevent and repress actions that increase the threats
4. Provide more information in both the North and the South on diseases, carriers and the prophylaxis
5. Invent and develop broader multidisciplinary methods to build confidence and facilitate the implementation of emergency plans to control the crises
6. Reintroduce traditional protocols to fight against pandemics
7. Promote new tools to treat emerging diseases: space observation, creation of database with access to internet and mobile phones, modelling diffusion phases of various types of diseases
8. Regulate the movements of health practitioners in the southern countries to the north, and facilitate access to vaccines for populations in the southern countries
9. Support and direct research towards vaccines and the treatments of infectious diseases, by harmonising the policies adopted at different levels;
10. Encourage decentralised cooperation between local communities in the North and the South