



New paradigms for early detection, prevention, and control at the human-animal interface are needed to reduce persistent global threats from influenza and other emerging zoonotic diseases. Given the complexity of zoonotic disease emergence in an increasingly globalized world, effective strategies for reducing future threats must be identified.

Within this context, FAO, OIE, and WHO convened a joint scientific consultation to examine specific viral zoonoses, including zoonotic influenzas, and to identify commonalities among them at the human-animal interface. The meeting brought together expert scientists from multiple disciplines from five continents. The goal of the meeting was to explore existing knowledge in order to provide a technical basis for developing or modifying policies and strategies to more effectively prepare for and respond to the next emerging zoonotic event. A critical objective was to review virological and epidemiological factors particularly relevant to the human-animal interface that may have influenced the emergence of known “high public health impact” zoonoses, using influenzas, viral hemorrhagic fevers, human and simian immunodeficiency virus infections, and several other examples as the basis for discussion. The experts then drew conclusions about factors related to emergence and the human-animal interface for other emerging or potentially emerging viral diseases, and how understanding these factors could potentially improve detection, prevention, and control of future emergence or re-emergence.

It became clear during the course of the consultation that, in the context of disease emergence and the human-animal interface, there are commonalities in the way we study, detect, prevent and control the various diseases discussed. Therefore, the key findings of the consultation in general do not focus on any single viral zoonotic disease but instead can be broadly applied. Another consistently discussed theme was the need to more explicitly include expertise on both wildlife and ecosystems along with human and domestic animal health. This highlighted the need to partner with ecologists and wildlife scientists when addressing zoonotic disease emergence and the human–animal interface.

Another theme that consistently arose was the critical need for trust among partners. While building trust is not a new concept, there was consensus at the consultation that continually developing and nurturing trust was a fundamental requirement in order to work effectively at the interface and jointly move forward in any meaningful way, addressing the interests and needs of all partners.

KEY FINDINGS

Based on these discussions, participants identified major areas for which further study or scientific research on emerging zoonotic diseases are still needed. They also discussed the greatest opportunities to more broadly use existing scientific knowledge at the human-animal interface.

Priorities for further study or scientific research:

- **Effectively conduct surveillance at the human-animal-ecosystem interface**
 - What works best? -- Conduct research on how well different surveillance strategies work in different contexts and for different pathogens
 - Do we need new methods? -- Research into new surveillance strategies
 - How and where do we best target? – Identify or develop techniques to target surveillance to most appropriately and efficiently get data we need
 - Can we learn from previous emergence? -- Analyze past outbreaks of emerging zoonotic diseases to determine what kind of surveillance may have identified emergence earlier.
 - What are the reasons that surveillance does not work? -- Understand incentives that can promote early identification and reporting.
 - How can surveillance approaches be made more sustainable?—Consider the integration of the interests and approaches from different disciplines into a joint approach, in order to mutually benefit from data collected



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- **Better laboratory diagnostic tests and systems for early detection of emerging diseases**
 - How can we ensure valid samples are collected and available? -- Conduct operational research on the sample continuum from field to laboratory (collection, transport, testing and banking).
 - How can we optimize field diagnostics? -- Determine what technologies would be most useful at the field-level (e.g. pen-side / bedside) and how to develop them.
- **Effective ways to motivate behavior change**
 - What incentives work? -- Investigate incentives to behavior change that are economically viable and culturally acceptable.
 - What population -level behaviors have been problematic in the past? -- Study past changes in behavior that have been associated with disease emergence.
 - What has worked for others? -- Identify experts and methods successfully used to motivate behavior change in other contexts (e.g., corporate marketing, minimizing tobacco use, HIV treatment acceptance).
 - What other aspects are important to motivating change? -- Apply analytic methods that incorporate cultural, sociologic and economic components.
- **Understanding of ecosystems**
 - What is happening now? Collect and compile valid and more comprehensive baseline data for all components of ecosystems (e.g., human demographic and economic data, livestock density, wildlife species, ecotypes and climatic data, vector populations, pathogens data).
 - How and what do we need to map? -- Determine the direct and indirect indicators that best measure/reflect ecosystem change.
 - How can we mitigate the risk of emergence as ecosystems change? -- Research measures to minimize risks associated with ecosystem change in the face of the inevitable pressures of increasing human populations and their need for food and shelter.
 - What is the economic value of healthy ecosystems? -- Determine the costs and benefits of static and changing ecosystems.

WHAT KNOWLEDGE EXISTS, AND HOW CAN IT BE APPLIED MORE BROADLY?

- **Substantial data and databases in a variety of locations and on a variety of topics**
 - Protocols and systems for data sharing (including solutions to some policy, privacy and ownership issues) successfully applied in one context can be applied to other contexts
 - Existing data and databases can be optimized and linked to make them more useful and more widely used
- **The enhanced outcomes from multidisciplinary approaches**
 - Mutual benefits / outcomes of interest can be identified for all partners at all levels to ensure sustainable multidisciplinary engagements to the necessary extent.
 - The importance of social scientists, ecologists and economists as partners in addressing emerging disease questions would be recognized, including the integration of these disciplines into the work of the international agencies, national authorities, and other organizations.
 - Integrated, joint, or aligned curricula can be developed for a variety of educational settings to institutionalize multidisciplinary approaches.
 - Cross-training can be used to ensure partners share a common and mutual understanding of the nature and importance of all disciplines and sectors.
 - Continued availability of expertise in important disciplines for which the training of new scientists is declining (e.g., taxonomy, entomology) can be supported.

The consultation successfully concluded with many key institutions and individuals committing to taking concrete next steps for furthering research and study, and to implementing the concepts that were discussed during the consultation.