

ZOONOTIC DISEASES SESSION

This is a report of the session on zoonotic diseases that took place on 6th October 2016 in Brussels, in the framework of the European OneHealth/EcoHealth workshop organised by the Belgian Community of Practice Biodiversity & Health which is facilitated by the Belgian Biodiversity Platform



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INTRODUCTION

Humans interact with animals in their daily lives. Animals are raised for food and kept in homes as companion pets. Increasing of human driven activities such as movements of people, trade of animals and animal products may account for spread and re-emergence of old or new zoonoses. In addition, recreational activities in nature, reintroduction of green areas in cities and forestry activity favour more and more the contact with territory/habitat of wildlife. This session has covered different topics related to zoonotic agents that are transmitted under natural circumstances from vertebrate animals to humans. A total of 11 presentations and four posters were shared during the session. They were organised to tackle the *One Health*

concept of zoonotic diseases from three perspectives:

1) *General overview*: this part aimed at providing global overview on zoonotic diseases important for Europe and the rest of the world, by providing examples on specific pathogens and integrating analysis on specific drivers;

2) *Surveillance*: this part overviewed the current surveillance initiatives present at the Belgian level (*taken as an example*) to survey for emergence of zoonotic diseases in humans and domestic production animals;

3) *Control*: this part provided insights on past and ongoing control programmes to fight against zoonotic diseases with emphasis on success and pitfalls.

PRESENTATIONS

1) Generalities and biology of zoonotic diseases

In order to provide a general overview of zoonotic diseases of European importance, and description of likely drivers and changes over time, a presentation ([by Sally Cutler](#)) outlined boundaries of zoonoses at the twenty-first century. Risk of zoonotic diseases is largely related to multi-factorial factors associated with changes in human activities. Increased human population size, large connections for food supply, travel to exotic areas, caring of exotic-type of companion animals are among examples of activities leading to increased exposure to zoonotic pathogens. Amid these multi-factorial risk factors, largely resulting from changed human behaviour, the presentation considered pathogen factors such as the evolutionary bottlenecks and constraints imposed by depletion of natural reservoirs. Social, ecological and epidemiological pathogen drivers were identified and illustrated during an avian influenza epidemic by H7N3, H5N1,

H7N9, H5Nx clade 2.3.4.4 viruses (*as presented [by Marius Gilbert](#)*). It was illustrated how emergences were linked to modifications to the extent of interfaces (wild / domestic hosts, domestic hosts / humans), to the changing density and global connectivity of wild, domestic and human populations, and how targeted interventions have been able to prevent disease circulation in a number of countries.

The timing and biogeography of HIV strains, that permitted to as just a few human *Simian Immunodeficiency Virus* infections to become epidemic ([Anne-Mieke Vandamme](#)) and the different virological and epidemiological histories of HIV variants (*Helene De Nys and [Martine Peeters](#)*) were illustrated by two consecutive speeches. The geographic origin and host species of all HIV-1 and HIV-2 groups are now clearly identified, together with the role of certain viral, host



Impression of the group during presentations

and social factors that were associated with adaptation and epidemic spread in the human population. Another example was highlighted with the *Monkeypox* (MKPX) virus (*by Anne Laudisoit*). The dramatic increase in prevalence in MKPX in the last 3 decades has been associated to the cessation of *smallpox* vaccination, decreased immunity against *Orthopoxvirus* and reported in populations relying

on bushmeat for survival. The strong relationship between the animal and human strains shows an active circulation of the virus among wildlife and humans, and illustrates how wide the host range is.

2) Surveillance

Surveillance approaches in Belgium in humans were described (*by Sophie Quoilin*). In order to

better understand the impact of a disease and to propose adapted control measures, it is necessary to distinguish diseases following the main route of transmission (food-, vector-, rodent-, water-borne) and to define zoonoses like those diseases transmitted by direct contact between vertebrates and human. Routine surveillance systems in Belgium are used to describe the epidemiology of pathogens and it is mainly based on laboratory diagnosis. Data are gathered through the sentinel laboratory network and the national reference centres. In Belgium, most of the zoonoses are rare diseases; nevertheless it is essential to have a transversal approach regarding zoonotic infectious diseases because the main factors influencing the emergence of these diseases, and making them a public health problem, are actually human induced, therefore zoonotic diseases should rather be called: '*human induced infectious diseases*'. The surveillance programmes in animals ([Claude Saegerman](#)) and their importance was also described. The purpose of these programmes include detecting emerging

diseases, determining the real importance of the diseases, prioritise diseases for control measures as well as assessing of the control measures applied. This is particularly important for zoonoses, as the prevalence of infection in animal reservoirs might determines the incidence in human cases. Concerns were raised about the illegal import of bushmeat from Africa into Europe ([Anne-Lise Chaber](#)). It was highlighted that illegal bushmeat traffic is an important threat to biodiversity conservation with "*cities*" species being not only imported for personal consumption but also as part of a lucrative organised trade.

3) Control

Examples of control of zoonotic disease on a *One Health* perspective included management of *Brucellosis*. One talk (by [Jacques Godfroid](#)) focused on the transmission of *Brucella* spp. at the livestock/ wildlife/ human interface. Strategies related to animal brucellosis control and eradication, in a *One Health* conceptual framework,

and the role of wildlife were presented. Understanding ecological niches and ethological behaviours of reservoir is a fundamental pillar for instance for rodent-borne zoonotic infection ([Steven Belmain](#)). Experts recognise that rodents are fundamental in



Marcella Mori & Javiera Rebolledo coordinating the session

perpetuating leptospirosis in the environment and in promoting human cases. The dynamics of rodent populations and their density is closely linked to rainfall and habitat availability, and research is desperately needed to correlate the seasonal dynamics of rodent abundance with leptospira prevalence/incidence. Highly effective tools and strategies exist for managing rodent pest populations. However, more often than not, these tools are poorly applied, adapted and monitored which leads to treatment failure and widespread apathy among the people who are suffering rodent problems.

Policy responses to livestock-associated zoonotic threats in historical perspective were also presented, with a view in the Netherlands ([Floor Haalboom](#)). It argued on how policy responses to livestock-associated zoonoses have been shaped in the Netherlands during the twentieth century, and how stakeholders from the public health and agricultural domain related to one another.

DISCUSSION

Prior to the workshop, some points emerged within the working group session and were proposed in order to feed the discussion of the session. Questions were identified and grouped following specific keywords:

Keyword: Hierarchy?

Questions: Fragmented expertise on zoonotic diseases (*different scientific groups, different institutions, different geographical locations, different topics, different perspectives/angles for the same topic, etc...*): need for a network/platform/consortium? If yes, how? Hierarchisation/prioritisation of diseases? if yes, how? Social perception (*scientific interest*) of the disease or real epidemic potential?

Keyword: Integration?

Questions: Could an “integrated” surveillance, which tackles the three dimensions: environment, animals (*wildlife and domestic*) and humans, be useful to prevent, detect and for zoonotic disease

management? Is it doable/realistic? What are the gaps/constraints of an integrated surveillance in Belgium and at EU level? Utopia or reality?

Keyword: Gaps & assessment

Questions: What are the actual/current gaps on zoonotic disease control management? Should be focused on “hierarchisation” of diseases? How the gaps of knowledge in the society and the media influence disease control management? Are there assessments of the control management activities done in the past? Have control management worked? Yes, no? How could they be improved?

Despite the initial attempt to drive discussion on specific topics, it became evident quite soon that we may not have the same understanding of keywords. The audience started to enquire about the need of standard definitions for zoonotic diseases and related issues. Expertise on zoonotic diseases is most often fragmented

therefore clear definitions are needed to tackle any needs. The term “zoonotic diseases” seem to be broad (*e.g. food-borne zoonotic diseases, non-foodborne, etc.*), care should be taken when using it; the same word may have different meaning across disciplines. Scale of action could be probably different if zoonotic disease is intended as disease of zoonotic origin, and further evolved/adapted to be pathogenic in humans, or zoonotic in term of transmission dynamics. For instance HIV is not (*or rarely*) a zoonotic disease as of transmission dynamics but it is of animal origin. This point stressed on the fact that narrowing and better identifying the problem in zoonotic diseases (*with a clear definition*) will help to identify expectations and final impact of specific measures. *Ad-hoc* interventions would be better tailored if the problem is well identified.

The concept of *OneHealth* should not be restricted to zoonotic disease but remain a cross-sectional

/ multidisciplinary approach, and issues raised during the session, could be applicable to other sessions. One question was raised on “*why are we split in different parallel sessions if we are discussing about One Health and a multidisciplinary approach?*” Gathering expertise is certainly the first and immediate solution. Working together, on the other hand, looks to be sometimes utopist because of barriers for progressing for example realistic difficulties in sharing data. The way of working together should also state under a common language: should it be called “*network*”, or “*federation*”, or “*platform*” or “*consortium*”, or “*forum*” in order to better identifying common research themes and collaborate? Independently of the chosen way to work, ideally the subjects to work together should be identified and the area where collaboration is of an added value clearly stated. By showing the added values of working together (*instead of isolated groups*) to decision maker will facilitate the introduction of

new funding schemes. For the moment, it is still difficult to channel funding for multidisciplinary study, probably related to the lack of perception on the added value (*versus silos of research groups/ topics*) that might arise from such type of projects. When dealing with zoonotic diseases, in particular when transmission dynamics could be sourced back to direct contact with domestic production animals, it is possible to intercross with country economic interests. Although we might have a scientific consensus on many *One Health* issues, the way we should deal with the economic conflicts of private parties or with interests at higher political/ institutional level appears as a difficulty. Putting in practice research results in case of diseases of animal origin can also be cumbersome considering that the private interest might jeopardise these results. These provide barriers for progressing. It is acknowledged that funding exists for zoonotic diseases but these are provided after an epidemic crisis. Proactive investment toward development of early warning diagnostic tools

(*pen-side / bed-side test*) together with appropriate initiative in supporting the understanding in the biology of pathogens, the relationship of the pathogen with the host and the host immune responses are needed. In general a proactive rather than reactive funding should be encouraged so that money will be not only driven to solely control intervention but also in understanding the ecology and biology of pathogens: prevention rather than intervention. About narrowing funding by providing an objectivised priority list, it has received mitigated appraisal among the participating scientists. Priority lists are already prepared by stakeholders, therefore similar approaches should not be encouraged, and instead it should be favoring the understanding of the biology of human zoonotic diseases. Finally, a last point was raised about communication, in particular with the public. The public, or intermediate organisations closely related to the public, need to be involved in the research activity. Such initiative will fill the

gaps which exist now between, for instance, patients/farmers and science. Science should open more doors for “ground” forum in order to be able to achieve results in a multi cross sectional approach as the *One Health* approach. By involving the public, it would be probably clear and understandable that zoonotic diseases are not solely as such but might derive from

human activities (*trading/movement*). Under the umbrella of zoonotic diseases have to be considered the fact that many of them are anthropogenic-induced zoonotic diseases. Zoonotic diseases are facing a challenging moment; for some transmission dynamics are strongly influenced by climate change.

CONCLUSION

Clear definition of what is understood as zoonotic diseases (*of animal origin or contracted from animal or man-made zoonotic disease*) is needed to tailor and tackle proper needs, that once identified, will lead to targeted scales of action. The idea of working in networks is critical, and involving the public at large, and with well identified stakeholders is seen as an added value. Again, working together has to be well identified under a common language, in particular because results of research on zoonoses are often jeopardised by institutional/ private/ national interests.

It is important to try to work on a proactive/preventive perspective rather than a reactive one, after epidemics have already risen. Prioritisation of diseases is an option currently explored by the stakeholders but it is not shared as the best option within the scientific community. Support should be devoted to early warning diagnostic tools (*pen-side / bed-side test*), possibly multiplexed, together with initiatives to understand the biology of pathogens, their ecology, the relationship of the pathogen with the host and the host immune responses.

Annex

List of questions raised by participants after the presentations.

<i>Topic</i>	<i>Questions raised by participants</i>
Generalities	Does getting insight into SIV biodiversity will help us understanding spill-over into humans? Is it chance or genetic factors that enhance the cross-species transmission?
	Given the increase of monkeypox cases, why is this disease still classed as 'concern' without global intervention?
	How to manage zoonoses as anthropogenic disease (<i>human-induced diseases</i>)? What are the next steps? Is it behavioural change? How to implement when trust in scientists is limited?
Surveillance	How to improve biosecurity in products imported from foreign countries (e.g. China)?
	How to make surveillance global and sustainable? Is it seen as too expensive when it should be considered as crucially needed? There is a need to find solutions on how to act (especially in developing countries).
	What can we do to control bushmeat?
Control	How to protect biodiversity by wildlife intervention? Depopulate rodents, then vaccinate target species? How to control leptospirosis?
	Is the way forward to engage decision-makers with economic prediction?
	What should be a good zoonotic policy for countries in the EU? Stop travelling? Stop import of pets? Others?

Videos and presentations accessible at:
<http://www.biodiversity.be/health/58>