European Animal Health & Welfare Research
COLLABORATIVE WORKING GROUP

STAR-IDAZ
International Research Consortium on Animal Health

Meeting report

PANDEMIC! A one health view of emerging infectious diseases.

What veterinary sciences can contribute.

With the support of:

DISCONTOOLS animalhealth europe icrad One HEALTH EJP APRE Agenzia per la Promozione della Ricerca Europea

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Summary

Aim and layout of the webinar

A **global interactive webinar** was organised in a cooperation between the Collaborative Working Group on Animal Health and Welfare Research (CWG-AHW) and the Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses and its related International Research Consortium (STAR-IDAZ IRC). The webinar received the support of AnimalhealthEurope, DISCONTOOLS, ERA-NET ICRAD, One Health EJP and APRE, and aimed to investigate on the role of veterinary sciences in coping with, and preventing, future animal and zoonotic pandemics.

The webinar presented lessons learnt from the COVID-19 pandemic. It discussed how research on animal infectious diseases can contribute to prevent and control future human and animal pandemics and how Strategic Research Agendas in animal health can be improved to respond to emerging animal diseases.

The event was run on the 30th of June and was structured in two phases: (1) invited talks setting the scene and summarizing the current knowledge and (2) a round table discussion with experts. Webinar attendees were invited to participate in the round table discussion by responding via an interactive web tool to specific questions.

The event was attended by 506 participants from academic and public research institutions, industry, veterinary services and other government bodies from 53 countries.

This report summarises the main meeting outcomes, considering both inputs provided by the experts during the invited talks and the round table discussion, as well as from the audience. It outlines **identified research needs** and **policy recommendations** for the prevention and control of human and animal pandemics. These can give a new direction to Strategic Research Agendas on animal health and promote collaboration between the different actors.

The full webinar can be viewed here.

Fig 1. Word cloud of participating countries in the webinar

Learning lessons from COVID-19

New infectious diseases are continually emerging. A conservative estimate is that there is one new human infectious disease every eight months, with even more emerging in animals. Emerging infectious diseases are a persistent threat for mankind and livestock systems, and new ways are needed for their prevention and control. Moreover, it is becoming increasingly evident that human pandemics have also a general negative impact on the control and management of other infectious diseases in animals.

There are several lessons regarding veterinary medicine that can be learnt from the COVID-19 crisis; the two central questions around which the webinar was built were:

How can research on animal infectious diseases contribute to prevent and control future human and animal pandemics?

How can Strategic Research Agendas in animal health be improved to prevent and respond in a timely manner to new and emerging animal diseases?

These questions were scrutinised starting from 5 themes (in bold):

- **One Health:** Veterinary research can contribute to finding answers for human pandemics on epidemiology, immunology, host-pathogen interaction, and animal reservoirs, with far-reaching significance including for human medicine.
- **Biosecurity rules across the environment, animals and humans:** The COVID-19 pandemic has confirmed and underscored the importance of hygiene, biosecurity, and preventive measures as first lines of defence against emerging infectious diseases with unknown aetiology, epidemiology and clinical manifestations.
- **Preparedness:** Effective disease control requires early detection and good understanding of the disease aetiology, epidemiology and pathology, in all affected species. Animal models are still fundamental for studying and developing new vaccines and therapeutics.
- The successful management of infectious diseases at a global level is dependent on the availability and efficacy of **control tools**. Rapid and accurate diagnostics and efficacious ways of intervention such as vaccination are two of the main pillars in combating a disease. Rapidly emerging new infectious agents, however, severely constrain the available time to develop, test, regulate, produce, and deploy effective control tools.
- **Research management:** Coordinated international collaboration among different actors following a mutually agreed Strategic Research Agenda is key to guide research funding and define innovative solutions.

Theme 1: One Health

The holistic One Health vision, that is a health model based on the integration of different disciplines across animals, the environment and humans, is old and at the same time modern. It recognises that human health, animal health, and ecosystem health are intrinsically linked and therefore should be approached together.

In the early years of the 21st century, scientists highlighted the need for greater interdisciplinary collaboration to cope with emerging zoonotic viruses with pandemic potential. Anthropogenic driven changes (e.g. land use, trade and travel patterns) can increase opportunities for infectious diseases to cross the interspecies border and transmit among animals and people. Thus, existing or emerging zoonotic diseases can easily transform into a pandemic.

One Health is globally recognised[1] as a relevant strategy in all sectors that benefit from collaboration between different disciplines and actors (e.g. medical doctors, veterinarians, environmentalists, economists, sociologists).

Key messages from the presentation given by Ilaria Capua - *COVID-19 as accelerator of multidisciplinary research*

- The COVID-19 crisis has highlighted again the importance of hygiene and biosecurity.
- This pandemic shows the fragility of how people have organised life in the cities and the risks related to traditional food markets where traditional foods are sold.
- Movement of people accelerated the spread of the infection.
- Social disturbances and mass gatherings fuel the spread of infection that hits the most vulnerable populations.
- Interdisciplinary, circular health approaches (integrating links between among others climate change, pollution, nature and resilience, animal surveillance, mobility) may contribute to better manage and prepare for future major health crises.

Round table

- Some animal species, such as farmed mink, have shown to be susceptible and able to transmit SARS-CoV-2 to conspecifics and to other species.
- We need to integrate a bigger set of disciplines, building on One Health. This should lead to a much broader and multifaceted view.
- The One Health EJP Horizon 2020 project demonstrates the ability of public reference laboratories to share data, evaluate surveillance activities and work together under a shared research agenda. Such big projects allow collaborating across institutions, ministries, and agencies at different governance levels to improve preparedness.

Audience contributions

The main obstacles identified by participants (**169 contributions** were collected) in the effective implementation of the One Health approach were the **lack of collaboration**, **coordination,** and **communication** among authorities. These 3 keywords drew attention to poorly collaborating sectors and the need to create the conditions to enable deeper interaction and mutual understanding. The participants also highlighted the **lack of**

[1] Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries.

multidisciplinarity. A coordinated approach should overcome the **lack of knowledge exchange** between disciplines, which constitutes a barrier, by sharing resources (e.g. data) and experience, as well as by training and education.

Also, **political barriers** were mentioned and were defined by some participants in terms of lack of transparency, excessive bureaucracy, and lack of coordination among institutions involved. Another identified barrier was the lack of **resources**, in terms of funding but also of infrastructures.

The main obstacles identified in this session were in line with the concerns and proposals emerging from the discussions in the following themes.

Recommendations

Research needs	Increase investigations at the human-animal interface of diseases. Develop strategies for controlling emerging human diseases with a potential animal reservoir.
Policy recommendations	Promote open and multidisciplinary research in veterinary sciences. Improve data sharing/transparency. Ensure coordination among institutions. Promote cross-sectoral/cross-disciplinary communication and mutual training. Ease bureaucracy burden of research programmes Ensure adequate resources (funding and infrastructure), including for promotion of cross-sectoral activities.

Theme 2: Biosecurity

The guidance principle of biosecurity is that "Prevention is better than cure". Biosecurity refers to a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of diseases, infections or infestations to, from and within a population[2].

During COVID-19 outbreaks, biosecurity has been key in protecting the most vulnerable populations as well as healthcare workers. Biosecurity is long known of importance to protect the entire agricultural production chain (from farm to fork). Its main goal is to stop the transmission of pathogens by preventing, minimising, or controlling contacts among animals, animal products, and other potential fomites (e.g. caretaking humans or equipment). There are further advantages of adopting a biosecurity programme: it can improve the cost-efficiency of the farm and enhance the reputation of the producer. The successful control of a contagious disease on a farm enhances the reputation and trust in the safety of the products of the whole sector.

Effective biosecurity management practices can prevent or minimise the risk of transmission of infectious diseases to people, animals, and plants. A biosecurity programme is one of the most effective means of disease control available, and no disease

[2] OIE Terrestrial Animal Health Code

prevention programme will work without it.

Key messages from the presentation given by Linfa Wang - *The role of wildlife in emerging threats*

- The line between wildlife and farmed animals is blurry. Wild animals are often farmed, also in the wild. Still, policies dealing with wildlife and farmed animals are completely separated and enforced and maintained independently from each other.
- Wildlife can play various roles in disease emergence and spread: as natural reservoir, intermediate host, amplifying host, spillback host, new "non-natural" reservoir. For instance, bats in America could become a spill-back reservoir for COVID-19, which could, via a new intermediate host, fuel new epidemic waves among humans.
- PCR and next generation sequencing have become significant tools for surveillance, but their window of detection is narrow. Therefore, we also need Next Generation Serology: multiplex serology against all known human viruses and surrogate virus neutralisation tests independent of virus species that work in all animal species.

Round table

- Biosecurity is currently the only available response to COVID-19. In this respect, the strategies applied for the control of this diseases are similar to those applied for controlling infectious diseases in the animal populations, such as implementation of hygiene measures, sanitation and disinfection of tools and facilities, use of adequate disposable protective materials, and movement restrictions (including distancing among susceptible individuals).
- On the animal health side, we can learn from the control of African Swine Fever (ASF) in pigs where, in the absence of a vaccine, prevention relies today completely on biosecurity. An important difference with control by vaccination (only) is that a vaccine can offer protection by a few dedicated actions in the animal's life (i.e. administration of the vaccine), while biosecurity requires compliance 24/7. Compliance is therefore of utmost importance in biosecurity. Progress is being made by developing farm-specific biosecurity plans.

Audience contributions

The audience was asked towards the best methods to ensure biosecurity across the One Health spectrum. The **209 collected responses** could be clustered in 5 main areas: (1) control activities, (2) practical actions to implement, (3) long-term strategies, (4) capacity building and (5) awareness.

Control activities should be implemented all along the food value chain, and certainly at the farm and animal level. This could be facilitated by the production of manuals and procedures.

Practical actions proposed included development of protocols and guidelines, new and more harmonised regulations on wildlife and market hygiene conditions, adoption of quarantine measures and contact restrictions.

Long-term strategies included *measures to increase knowledge* by data sharing platforms and insights in the societal effects of lack of biosecurity; *boosting cooperation and multidisciplinarity* through involving different stakeholders and competences; and *protecting the environment* by mitigating the effects of human activities and limiting human encroachment in wild territories.

Capacity building, including both training and education. *Training* was especially targeted to farmers and veterinarians by developing accurate, easily understandable, and applicable

materials. *Education* was mentioned several times, for instance by including One Health in students' curricula in the post-secondary grades.

Raising Awareness through better communication and information activities was proposed several times, targeting the general public. It could include explaining biosecurity, animal health procedures, risks, and diseases.

Recommendations

Research needs	Development of multiplex serology against all known human viruses and surrogate virus neutralisation tests independent of virus species, to work in all animal species.
Policy recommendations	Strengthen cooperation and inter-sectoral communication between wildlife and domesticated animal institutions and policies. Set-up joint actions and multi-actor approaches involving a broad set of disciplines to improve, share and disseminate knowledge on biosecurity. Support training initiatives on biosecurity in farms and for healthcare workers.

Theme 3: Preparedness

Ensuring adequate preparation prior to a disease emergency is essential to ensure that there is sufficient capacity, resources, and legislative support to conduct the activities needed to allow timely disease control[3]. Disease emergency preparedness planning should cover both the development of capabilities for early warning and for early reaction to disease epidemics[4].

Emergency preparedness and response planning will help to optimise a country's response to a variety of disease emergencies such that diseases can be detected and controlled as rapidly and effectively as possible.

Health emergencies, both on the public health and animal health side, often require coordinated international response: effective coordination across government, scientists and international bodies should be built in peace time, to ensure delivering appropriate responses.

Key messages from the presentation given by Mark Woolhouse - *Emerging threats: how close are we to being able to predict the next pandemic*

- RNA viruses form three quarters of the emerging infectious diseases (EID) and three quarters of EID are of zoonotic origin.
- WHO produced a list[5] of disease priorities needing urgent R&D attention back in 2018. This included "Disease X", representing the knowledge that a serious international epidemic could be caused by a pathogen currently unknown to cause human disease, which was proven true for SARS-CoV-2.

[3] OIE, 2018. Manual 9 - Emergency preparedness and response planning.
[4] FAO, 1999. Manual on the preparation of national animal disease emergency preparedness plans.
[5] WHO R&D Blueprint

- The majority of new human viruses with epidemic potential are related to, but did not evolve from, other viruses that are transmissible in human populations. The next pandemic will most likely come from a mammal or bird.

- Transmissibility between humans is a key characteristic. We estimate that over 50 human-transmissible RNA virus lineages have evolved to date.
- The emergence of both SARS-CoV and SARS-CoV-2 during a 16-year period increases concern that a third SARS-like coronavirus will emerge in the future.
- Where will the next pandemic emerge? Top factors in predictive models are advanced or rapidly growing economies, urbanisation, climate and biodiversity hotspots. However, studies cannot separate real drivers of emergence from the human efforts in discovering new viruses (i.e. most emerging diseases are also found in the regions that make the largest diagnostic efforts).

Round table

- The cost to characterise the global virome (possibly millions of viruses) and predict the next pandemic has been estimated at around 4 billion USD. This would be a huge collaborative effort among agencies and laboratories in which it is critical to involve also veterinary sciences.
- Emerging diseases are mostly due to spill-over of pathogens that are already out there, rather than due to evolution of known pathogens. Therefore, ecology is of utmost importance to understand drivers of spill-over events.
- Besides surveillance activities, better policies and regulations must be developed for the trade of wildlife, including "farmed" wildlife.
- It seems unlikely that global economies can be redesigned to mitigate the effects of recognised drivers of disease emergence (e.g. urbanisation, land use change, trade and travel). The most feasible route forward seems to focus on early detection and response.
- Movement restriction measures in place to control the current human pandemics are affecting animal health, through lower frequency of herd visits and environmental sampling, reduced surveillance and monitoring activities, and low availability of diagnostic reagents which are reserved for human tests.

Audience contributions

The audience was asked input on the types of surveillance that could give the best shot at early detection to detect spill-over. From the **138 responses received**, both active and passive surveillance emerged as fundamental, with focus on *wildlife surveillance*, (risk-based) *syndromic surveillance, transparency in data collection and management, rapid diagnostics, (online) surveys* and *tracking of movements* of people, animals, including invasive species.

The production of **manuals and procedures** and the use of **early detection technologies** and **vaccination** were considered very important.

Recommendations

Research needs	Upsurge discovery effort and surveillance activities of zoonotic viruses. Involve veterinary sciences to improve preparedness for the next pandemic strike. Integrate various surveillance methods and ensure transparency between geographies.
Policy recommendations	Facilitate cross-sectoral collaboration on disease surveillance activities. Develop policies and guidelines to maintain fundamental animal health activities in case of pandemic events. Develop international policies and regulations for the trade of wild animals.

Theme 4: Control tools

The successful management of infectious diseases at a global level is dependent on the availability and efficacy of **control tools**. Significant advances have been made over the last decades and important vaccines developed include those against rabies, anthrax, Foot and Mouth Disease, Classical Swine Fever and West Nile Virus. On the other hand, many critical control tools are still missing. Critical control tools available and lacking are described for over 50 infectious diseases in the DISCONTOOLS[6] database. However, the level of public and industry investment in animal health research and development have tailed off over the last years and companies are finding growing barriers to innovation[7]. We need to find ways to upsurge the innovation capacity in veterinary sciences and maintain the pipeline for innovative control tools against infectious animal diseases.

Key messages from the presentation given by Jean-Christophe Audonnet - *ZAPI modular vaccine design approach as an answer to pandemic and panzootic threats*

- It is impossible to predict where, when and to which target species a (re-)emerging virus will trigger the next pandemic or panzootic event. But we do know the most likely suspects.
- The only way to face unexpected viral outbreaks is to develop capacity to execute an immediate and decisive intervention, but the challenges to this are:
    - How to react very fast while in the same time avoid chasing false alerts?
    - How to address exponential needs that cannot be covered by traditional manufacturing capacities?
- Vaccine development is based on years of work, which can be divided in 3 time periods: (1) Scientific time (understanding); (2) Technical and industrial time (manufacturing) and (3) Regulatory time (registration and marketing). We need to support technologies and procedures that can reduce each of these 3 time periods.

[6] http://www.discontools.eu
[7] AnimalhealthEurope, 2020. Innovation in animal health. Breaking down barriers to innovation.

- Robust and flexible vaccine platform technologies (one technology fit for multiple vaccine targets) can reduce the technical and regulatory time with the potential to have a vaccine against an emerging threat in a few months:
    - Reduce technical and industrial time by focus on robust immunogen expression platforms with very high yields and short cycle times.
    - Reduce regulatory time by adopting quality by design approach, use of an established and trusted platform delivering an inherently safe vaccine.
- A potential remaining bottleneck is to have pertinent animal models available for efficacy testing.

Round table

- Like in human health, the key diagnostics to contain epizootics are a test targeting the pathogen and a test detecting the immune response. But more important is to have enough diagnostic capacity and supply of tests to estimate epidemiological parameters for monitoring the epidemic and the effect of interventions.
- Diagnostic capacity and supply is also more important than having a "perfect" test.
- The same applies for vaccines. Rather than striving for the ideal vaccine, we need to focus on vaccines that can be scaled up rapidly from production to distribution. For example, for COVID-19, over 100 vaccines are in development, but only few can be manufactured. We have to reverse this order and focus effort on the ones that can be manufactured in order to be able to cover 80% of the population and block the outbreak.
- Besides vaccines, also antibody technology has advanced a lot and has a lot of potential as therapeutics.
- Animal models are key to study viruses and to develop disease control tools. However, it is difficult to have an animal model ready for each new virus. Therefore, we should concentrate on the "known unknowns" such as the beta-coronaviruses. It is also important to develop animal-free models such as organoids.

Audience contributions

The question "What can be done to accelerate the development and validation of key diagnostics and vaccines for managing emergencies?" yielded **173 replies**, with two crucial words: "**coordination**" and "**cooperation**". Indeed, participants believed that key diagnostic tests and vaccines during an emergency can be developed faster through international joint activities, harmonisation of protocols, multidisciplinary approaches and support for public-private partnerships to the development of products.

Many participants thought that more coordination and coordination require more funding in research and infrastructures. Changes in the regulation could lead to a reduction in time to approval for vaccines.

Finally, some participants proposed to work more on the animal models, asking for their standardisation or improving their accuracy.

Recommendations

Research needs	Deepen understanding of the host pathogen interactions. Develop vaccine platforms. Improve and standardise animal models for vaccine testing. Develop animal-free models such as organoids.
Policy recommendations	Secure and increase funding for basic and applied research and infrastructures. Develop tools for improving research coordination and collaboration. Focus vaccine development efforts on vaccines that can be scaled up rapidly for production and distribution. Develop procedures and policies to accelerate registration of safe and effective vaccines. Ensure diagnostic and vaccine capacity and supply.

Theme 5: Research Management

The risk of disease emergence seems to have increased over recent decades. This may be the result of increased globalisation of trade and movements of people, animals, and their products and the consequent transfer of pathogens. It may also be the result of pathogen evolution in a response to control measures and other anthropogenic pressures.

The globally decreasing research funding in the animal health sector risks to weaken the scientific foundation for underpinning national policies and strategies to disease control (including zoonoses) and to protect the sustainability of the livestock sector and animal health industries. Better management, data sharing and communication are needed to maintain efficient and effective research. This requires coordination and collaboration at the international level.

Key messages from the presentation given by Alex Morrow - *STAR-IDAZ IRC: improving the focus of the research effort to deliver the necessary disease control tools*

- STAR-IDAZ IRC[8] is a global initiative to improve coordination of research activities on the major infectious diseases of livestock and zoonoses to hasten the delivery of improved control methods.
- Coordination is done at the level of funding agencies and programme owners.
- Governance structure includes an Executive Committee, a Scientific Committee and a Secretariat.
- Working Groups are established to perform research gap analyses on priority topics, which include specific diseases as well as cross-cutting issues, such as vaccine platforms.

[8] STAR-IDAZ International Research Consortium on animal health

- Based on inputs received from its Working Groups, the STAR-IDAZ IRC developed Research Roadmaps[9] covering the research needs from basic science to the target product (vaccines, diagnostics, therapeutics) and an overarching road map for control strategies. By mapping current and recent research projects over the needs, the research gaps are identified. This is a joint effort by researchers and research funders.

Round table

- International collaboration is fundamental to avoid duplication, fragmentation, redundancy and gaps in research coverage.It can ensure that the results from research investment can be rapidly translated to improved disease control strategies, including diagnostics, vaccines and treatments.
- At EU level, when it comes to animal health emergencies, it is difficult to react as quickly as for public health emergencies. For instance, research working programmes of the European Commission run over 2-years and are not updated in between. Quickest responses can likely be achieved in partnership programmes like ERA-NETs.
- Research programmes should support preparing in peace time for the next epizootic e.g. by improving surveillance programmes and capacity building.
- Animal health research funding tends to decrease. It has to compete with a lot of issues. Although animal health is intrinsically linked to many societal challenges (e.g. antimicrobial resistance, animal welfare, pandemics), decision makers seem not prepared to match the challenges with research funds.
- One Health should include animal(-only) diseases as well, because for emerging diseases we often do notknow yet if they have zoonotic potential or not.

Audience contributions

The reflections of the audience (**133 responses**) on how to improve mechanisms for research funding and management included boosting **collaboration at the international level** through creation of international funding programmes. These could be supported by the definition of a **common and international Strategic Research and Innovation Agenda**. Such Strategic Research Agenda should cover both basic research as well as innovation activities, adopt a multidisciplinary approach and be able to adapt according new emerging threats.

Many comments were received on the **management of funding programmes** which should target bureaucracy reduction, accessibility and transparency and adopt a clearer definition of the calls and the funding objectives. On the other hand, a group of participants also called for time-to-grant reduction realized via smaller projects that can quickly reply to emerging needs. Also, the **creation of emergency funds** (at various levels) was proposed to increase fast research response to new pandemics.

[9] STAR-IDAZ IRC Research Road Maps

Recommendations

Research needs	Analyse gaps on priority diseases and on potential emerging threats.
Policy recommendations	Support efforts to collect research projects in joint database to map over the needs in order to identify research gaps (e.g. STAR-IDAZ IRC). Build effective policy and network to implement surge capacity platforms on a constant basis (peace time) on all potential "targets" to prevent starting from scratch when the next pandemic or panzootic will strike. Operationalise One Health approaches with balanced representation of public health, veterinary and environmental sciences. Facilitate the development of public-private partnerships.

Appendix – Research needs identified during the webinar

1. **Increase investigations at the human-animal interface of diseases.**
2. **Develop strategies for controlling emerging human diseases with a potential animal reservoir.**
3. **Development of multiplex serology against all known human viruses and surrogate virus neutralisation tests independent of virus species, to work in all animal species.**
4. **Upsurge discovery effort and surveillance activities of zoonotic viruses.**
5. **Involve veterinary sciences to improve preparedness for the next pandemic strike.**
6. **Integrate various surveillance methods and ensure transparency between geographies.**
7. **Deepen understanding of the host pathogen interactions.**
8. **Develop vaccine platforms.**
9. **Improve and standardise animal models for vaccine testing.**
10. **Develop animal-free models such as organoids.**
11. **Analyse gaps on priority diseases and on potential emerging threats**.

Appendix – Policy recommendations emerging from the webinar

1. **Promote open and multidisciplinary research in veterinary sciences.**
2. **Improve data sharing/transparency.**
3. **Ensure coordination among institutions.**
4. **Promote cross-sectoral/cross-disciplinary communication and mutual training.**
5. **Ease bureaucracy burden of research programmes**
6. **Ensure adequate resources (funding and infrastructure), including for promotion of cross-sectoral activities.**
7. **Strengthen cooperation and inter-sectoral communication between wildlife and domesticated animal institutions and policies.**
8. **Set-up joint actions and multi-actor approaches involving a broad set of disciplines to improve, share and disseminate knowledge on biosecurity.**
9. **Support training initiatives on biosecurity in farms and for healthcare workers.**
10. **Facilitate cross-sectoral collaboration on disease surveillance activities.**
11. **Develop policies and guidelines to maintain fundamental animal health activities in case of pandemic events.**
12. **Develop international policies and regulations for the trade of wild animals.**
13. **Secure and increase funding for basic and applied research and infrastructures.**
14. **Develop tools for improving research coordination and collaboration.**
15. **Focus vaccine development efforts on vaccines that can be scaled up rapidly for production and distribution.**
16. **Develop procedures and policies to accelerate registration of safe and effective vaccines.**
17. **Ensure diagnostic and vaccine capacity and supply.**
18. **Support efforts to collect research projects in joint database to map over the needs in order to identify research gaps (e.g. STAR-IDAZ IRC).**
19. **Build effective policy and network to implement surge capacity platforms on a constant basis (peace time) on all potential "targets" to prevent starting from scratch when the next pandemic or panzootic will strike.**
20. **Operationalise One Health approaches with balanced representation of public health, veterinary and environmental sciences.**
21. **Facilitate the development of public-private partnerships.**

Appendix – Meeting Programme

Speakers

Moderator: Stefano Messori (STAR-IDAZ IRC / OIE)

COVID-19 as accelerator of multidisciplinary research approach	***Ilaria Capua,*** Head of the One Health Center of Excellence for Research and Training, University of Florida, USA
The role of wildlife in emerging threats	***Linfa Wang,*** Director of the Programme in Emerging Infectious Diseases at Duke-NUS Medic School, Singapore
ZAPI modular vaccine design approach as an answer to pandemic and panzootic threats	***Jean-Christophe Audonnet,*** Senior Director, Vaccines R&D, Coordinator of ZAPI IMI Project, Boehringer Ingelheim Animal Health, France
Emerging threats: how close are we to being able to predict the next pandemic	***Mark Woolhouse,*** Chair of Infectious Diseases Epidemiology, Usher Institute, University of Edinburgh, UK
STAR-IDAZ IRC: improving the focus of the research effort to deliver the necessary disease control tools.	***Alex Morrow,*** Chair of STAR-IDAZ IRC secretariat and International Evidence Lead Animal Health and Welfare at Defra, UK

Additional speakers for the round table discussion

Arjan Stegeman	Utrecht University, The Netherlands
Jean Charles Cavitte	European Commission, DG AGRI, Belgium
Hein Imberechts	Coordinator *One Health EJP* / Chair CWG AHW, Belgium
Luke O'Neill	Trinity College, Ireland

Appendix – Statistics of the event

Registration stage

Registrations were open on the 3rd of June and collected through the Webex platform. People were asked to fill a form in which they provided also more information about their origin, entity, role and how they received information about the event. In total, **821 people from 69 Countries registered** for the event.

People were asked to declare the typology of the entity they work for. As showed by the graph below, more than the half of the registered people belonged to two categories, the research sector (including academia) and the veterinary services. However, also other groups where represented,

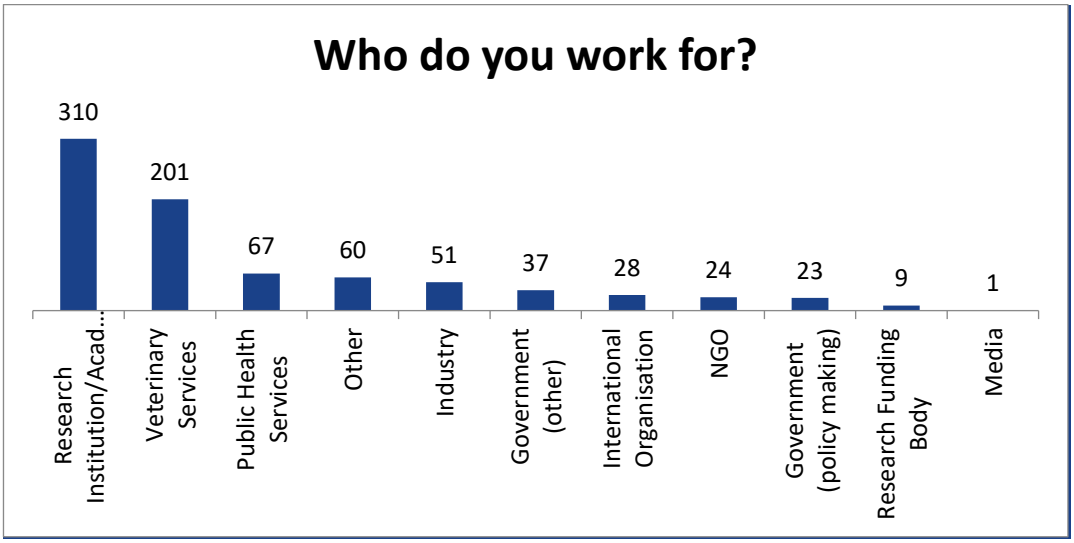

Figure 1 - Entities represented by the people registered for the event

Moreover, the form assessed the role that registered people have in their own organization (please, note that more than one reply was admitted). The graph below shows that two roles were strongly predominant: veterinarian and researchers from public institutions (63 people declared that they are both).

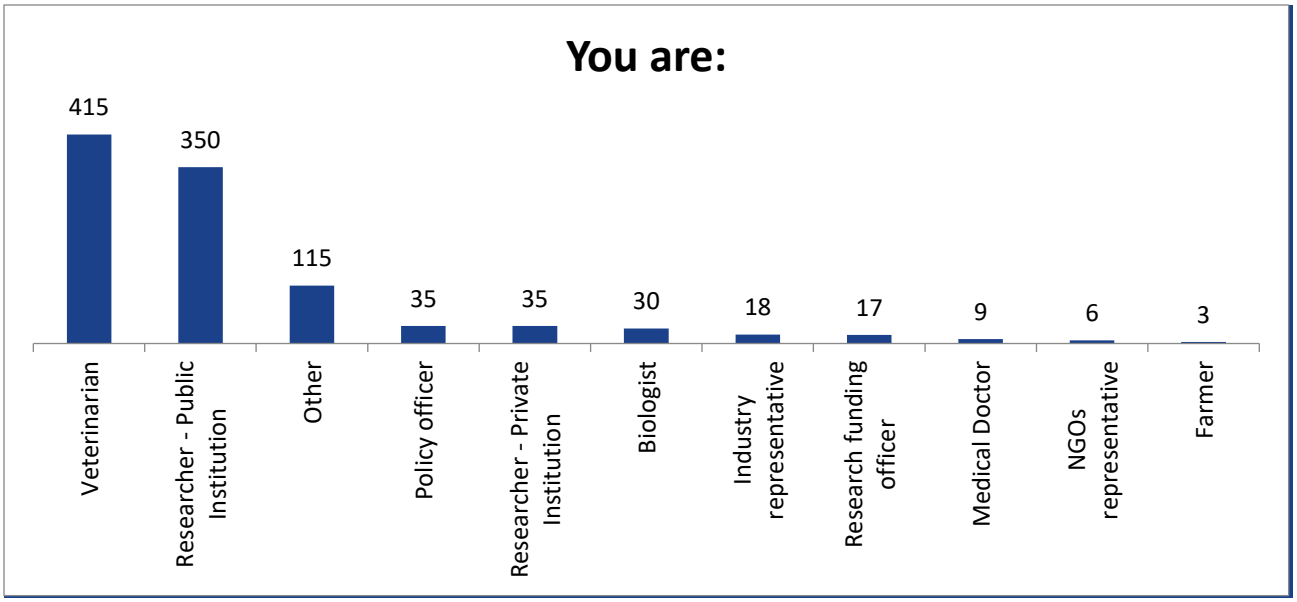

Figure 2 - Job of the people registered for the conference

Participation in the event

In total, **506 people from 53 Countries joined the event**. However, the number of participants changed during the various sessions: indeed, during the first minutes of the event, **more than 422 attendees were in the room**; whereas, **the minimum number of participants, 280 circa**, was registered during the last question of the roundtable (after two hours and half from the event starting). However, neither big fluctuation in the participants numbers nor a high attendee's abandonment rate were registered during the event sessions.

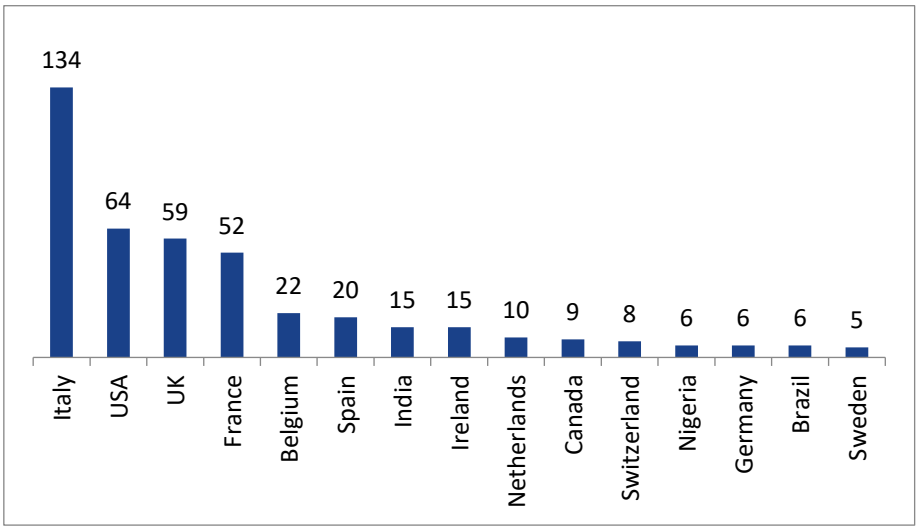

Figure 3 – Number of participants per country for the top-15 countries

The graph above shows the top 15 Countries for participation: even if the majority of attendees were located in Europe, **the event had an international relevance**. Indeed, as highlighted by the table below, there were many people connected and attending the event from other geographical areas with meaningful variations in local time zones (USA, India, Canada, Malaysia, etc).

Country	# of attendees
Top 15	(Figure 3)
Greece	4
South Africa	4
Austria	4
Norway	3
Botswana	3
Portugal	3
Mexico	3
Australia	2
Turkey	2
Grenada	2
Kenya	2
Ukraine	2
Russia	2
Denmark	2
Poland	2
Tajikistan	1
St Vincent	1
Peru	1
Guinea	1
Nepal	1
Albania	1
Bolivia	1
Qatar	1
Gabon Republic	1
Romania	1
Bosnia-Herzegovina	1
Colombia	1
Taiwan	1
Serbia	1
Finland	1
Singapore	1
Croatia	1
Somalia	1
Hungary	1
Malawi	1

Table 1 – List of Countries of events' attendees