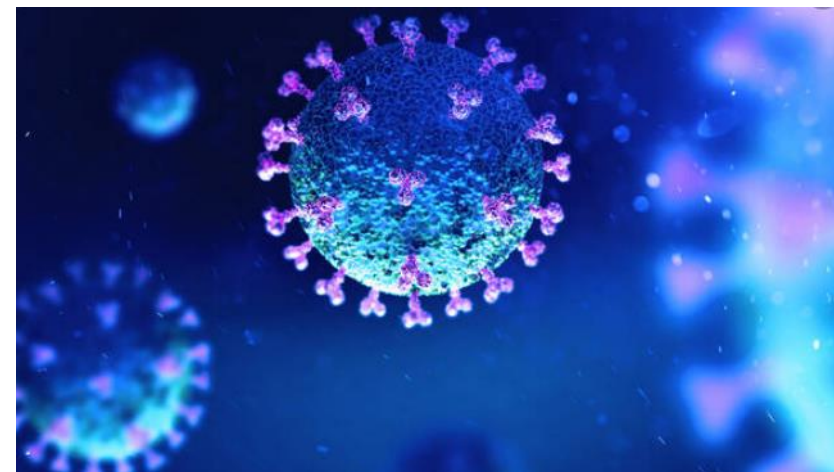
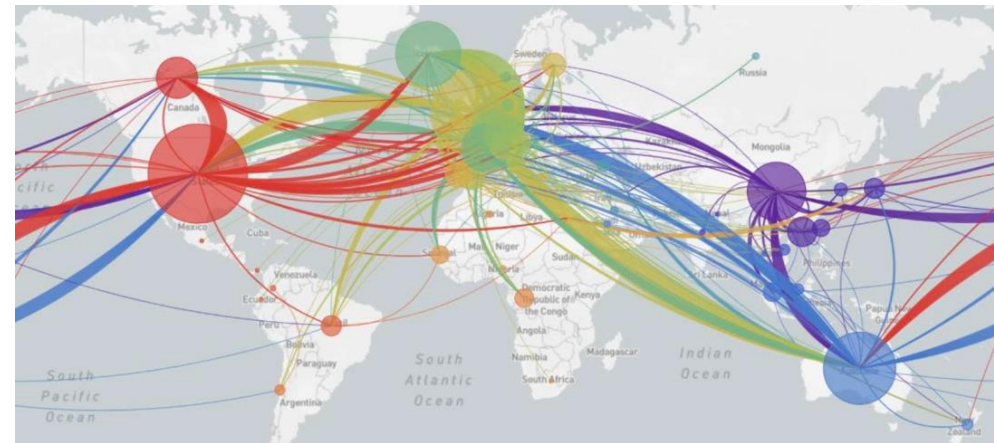




S.I.Me.Ve.P.
Società Italiana di
Medicina Veterinaria Preventiva

Crisis management of Covid-19 and future pandemics through cross-sectoral collaboration in practice

Maurizio Ferri, DVM



Outline

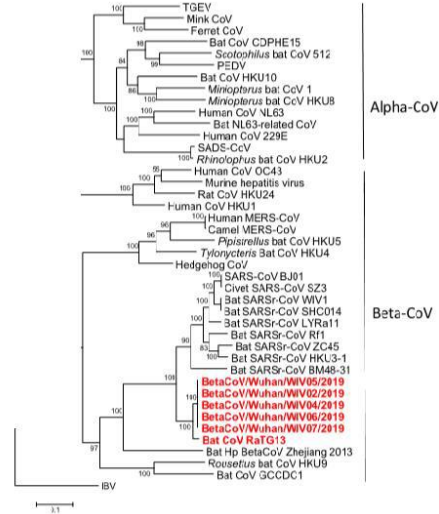
- The Covid-19 within the Veterinary perspective (the role of animals)
- The need of stronger interprofessional collaboration according the One Health approach
- How veterinary profession can contribute to management of Covid-19 and future pandemic
- How can we improve?

A necessary caveat



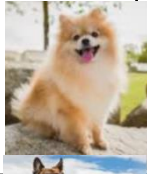




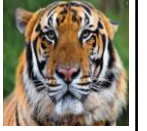

- 72% of human emerging disease events are caused by zoonotic pathogens
- 60% in wildlife (eg non-human primates, rodents and bats)
 - SARS virus
 - Ebola virus
 - Marburg virus
 - Hendra virus
 - MERS virus
 - Nipha virus
 - Zika virus
 - SARS-2 virus
- Covid-19 infection is a zoonosis, which means that it originated from the animals, jumped to humans, and spread by person-person transmission.

SARS-CoV-2 animal reservoir



- SARS-Cov-2 closest identity (96%) with the bat virus CoV RaTG13
- RaTG13-like viruses are most likely the reservoir, but not the immediate sources of SARS-CoV-2.
- potential of pangolins to act as the intermediate host of SARS-CoV-2: RBD (Receptor Binding Domain) region exhibit strong similarity to SARS-CoV-2
- the confirmation is not yet possible due to sequence diversity on the spike (S) protein.

Animals and Covid-19: evidence of transmission

4 dogs			no symptoms
		Pomerian	1 symptoms +1 no symptoms
		German sheperd	no symptoms
		American bulldog	some with symptoms
10 cats			
8 large cats (tigers, lions)			contracted from infected zookeeper
minks			symptoms

Animals and Covid-19: evidence of transmission



- >10 minks farms SARS-CoV-2 positive (mostly in Netherlands)
- several farms in Denmark
- minks farm in quarantine
- mass culling 500.000 minks
- Ab found in three cats present on an infected mink farm
- plausible spread from mink to employee
- humans spillback?

Animals and Covid-19: experimental studies



New Results

Susceptibility of ferrets, cats, dogs, and different domestic animals to SARS-coronavirus-2

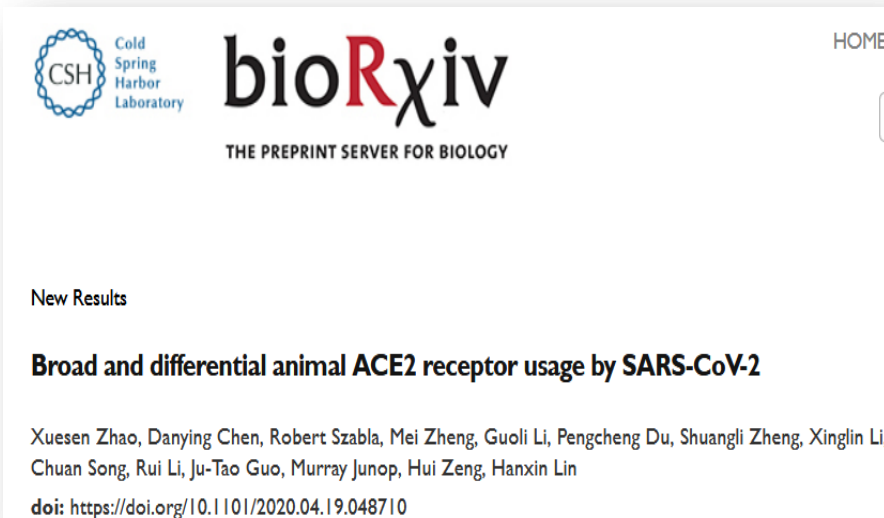
Jianzhong Shi, Zhiyuan Wen, Gongxun Zhong, Huanliang Yang, Chong Wang, Renqiang Liu, Xijun He, Lei Shuai, Ziruo Sun, Yubo Zhao, Libin Liang, Pengfei Cui, Jinliang Wang, Xianfeng Zhang, Yuntao Guan, Hualan Chen, Zhigao Bu

doi: <https://doi.org/10.1101/2020.03.30.015347>



- cat-to-cat spread and the production of IgG against SARS-CoV-2
- statistical outliers?
- surveillance for SARS-CoV-2 in cats should be considered?
- is likely the community spread in the new target species following acquiring genetic transmission tool?

Animals and Covid-19: potential panzootic?



- no scientific evidence of the possibility that farmed animals contribute to the global spread of Covid-19 human infection
- however similar or **identical SARS cellular receptors in mammals species** lead to consideration of the potential adverse effects on animal populations and the **jump of adapted animal viruses** into humans (reverse zoonosis).
- Covid-19 evolving into panzootic???

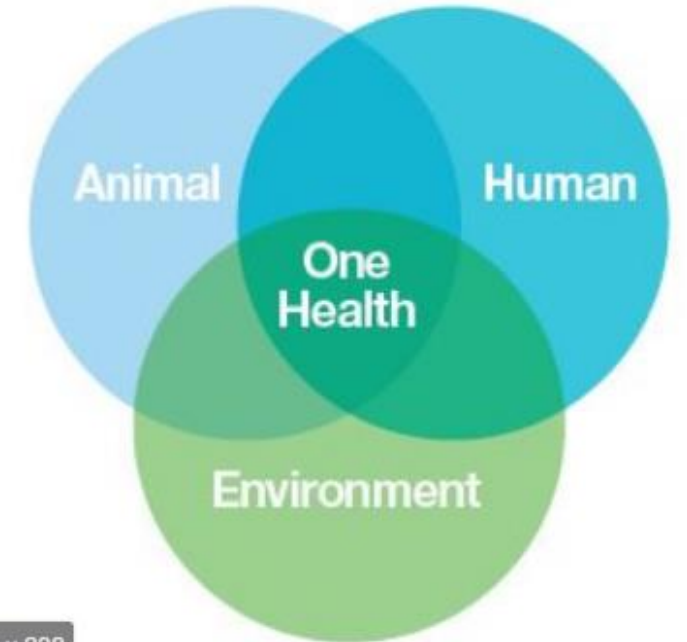
SARS-CoV-2 uncertainties

- protean SARS-CoV-2, many known unknowns/unknown unknowns
 - veterinary
 - original animal reservoir
 - intermediate host
 - route and dynamics of transmission to humans (food? and domestic animals?)
 - virus mutation
 - human clinical
 - efficiency of Ab response
 - therapeutic regimes
 - length of total recovery
 - long-term neurological sequelae



The Covid-19 pandemic holistic approach

- Covid-19 control strategy requires consideration of our environment and the inter-sectoral collaboration between doctors, veterinarians and environmental experts according to the One Health approach
- The 2019 Berlin Principles on One Health



ABOUT US THE 2019 BERLIN PRINCIPLES ON ONE HEALTH

The Berlin Principles on One Health, 2019

Fifteen years ago, the Wildlife Conservation Society (WCS) brought together stakeholders to discuss global health challenges at the nexus of human, animal, and ecosystem health. The

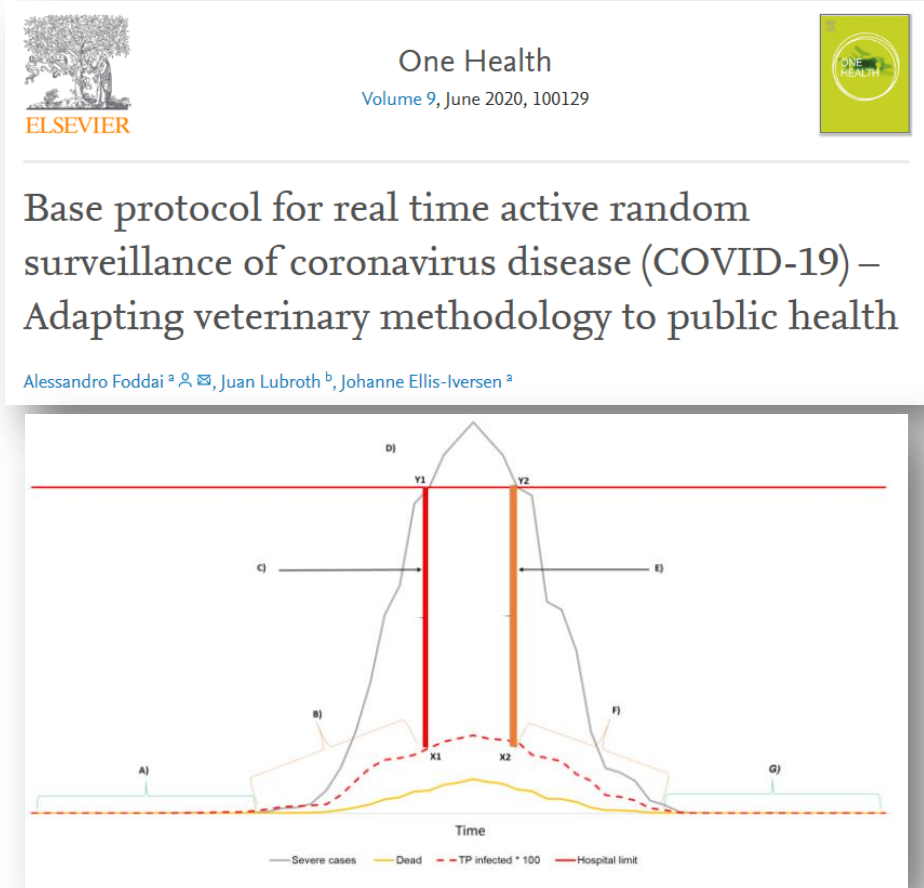
Veterinary support to management of Covid-19

- veterinary knowledge on management and control of past animal epidemics
- the surveillance of wildlife-reservoir for detecting emerging pathogens in risky hot spots
- the veterinary laboratory services to diagnose and characterize pathogens
- the veterinary research on animal vaccine to prevent coronavirus family of diseases



Veterinary knowledge on past animal epidemics

- control of past epidemics (e.g. Blue tongue, FMD, CBPP, avian and swine flu, Brucellosis and TBC, BSE).
- variety of surveillance methods
- animal epidemic toolbox for public health
 - protocol based on widely known veterinary surveillance methodologies is proposed for setting real time active random surveillance for Covid-19.
 - authorities could consider if the protocol is applicable for public health (fit for purpose)



Veterinary knowledge on past animal epidemics

nature

<https://doi.org/10.1038/s41586-020-2488-1>

Accelerated Article Preview

Suppression of a SARS-CoV-2 outbreak in the Italian municipality of Vo'

Received: 2 April

Accepted: 23 Jun

Accelerated Article

stanze Ciavarella, Gina Cuomo-Dannenburg,
Lucia Rossi, Riccardo Manganelli, Arianna Lorigian,
Luca Sciro, Stefano Merigliano, Ettore De Canale,
Giovanni Gatti, Francesca Saluzzo, Francesco Onelia, Monia Pacenti,



- similar protocol was applied in the Italian municipality of Vo' (Veneto region) to detect the SARS-Cov-2 prevalence
- swab test carried out on almost whole population before and after the lockdown
- new insights on:
 - frequency of asymptomatic infection and infectivity (as measured by the viral load)
 - transmission dynamics
 - the efficacy of the implemented control measures.

Veterinary surveillance of for detecting pathogens



- many studies clarified the origin, diversity and distribution of CoVS among different animals, bats along with rats are natural hosts for human coronaviruses (e.g. HCoV-NL63 and HCoV-229E)
- provided the backbone of surveillance in wildlife at hot spots marked by risky human-animal interfaces
- veterinary epidemic intelligence
- integration with human medicine for detecting signals of potential risk of zoonotic transfer

Veterinary surveillance of bat population

- Italian veterinary surveillance studies on CoVs in bats in area in close proximity to other animal hosts, with the potential of a spill-over to humans
- unique report of PMVs in bats in Italy
- researched detected of novel sequences of β -Coronavirus circulating in bats in Sardinia not previously described.

> [BMC Vet Res.](#) 2017 Dec 22;13(1):396. doi: 10.1186/s12917-017-1307-x.

Coronavirus and Paramyxovirus in Bats From Northwest Italy

Francesca Rizzo ¹, Kathryn M Edenborough ², Roberto Toffoli ³, Paola Culasso ³, Simona Zoppi ⁴, Alessandro Dondo ⁴, Serena Robetto ⁴, Sergio Rosati ⁵, Angelika Lander ², Andreas Kurth ², Riccardo Orusa ⁴, Luigi Bertolotti ⁵, Maria Lucia Mandola ⁴



> [Virus Genes.](#) 2019 Feb;55(1):60-67. doi: 10.1007/s11262-018-1614-8. Epub 2018 Nov 13.

Molecular Identification of Betacoronavirus in Bats From Sardinia (Italy): First Detection and Phylogeny

Roberta Lecis ^{1 2}, Mauro Mucedda ³, Ermanno Pidinchedda ³, Marco Pittau ^{4 5}, Alberto Alberti ^{4 5}

Affiliations [+ expand](#)

Veterinary surveillance of novel wild host



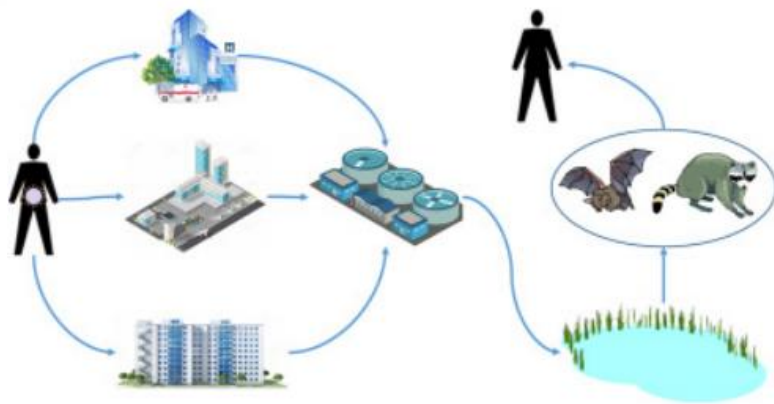
Science of The Total Environment

Volume 733, 1 September 2020, 139358



Spillover of SARS-CoV-2 into novel wild hosts in North America: A conceptual model for perpetuation of the pathogen

Alan B. Franklin , Sarah N. Bevins



- SARS-Cov-2 contaminated sewage into the natural aquatic environment where wildlife become infected
- SARS-CoV-2 spillback from infected humans to naive wildlife hosts (bats, racoon, in North America)?
- conclusion: wildlife surveillance near waste water treatment plants (WWTP) would elucidate whether SARS-CoV-2 has spilled over into wildlife
- bat becoming permanent reservoir of SARS-Cov-2?

Vet laboratory support to PH response for Covid-19



- SARS-CoV-2 diagnosis is currently performed in Italy in a One Health perspective, with the support of the network of the IZSs.
- facilitate the inter-professional collaborations with the doctors (Public Health sectors)
- development of common diagnostic and data exchange protocols.

Vet laboratory support to PH response for Covid-19

- OIE high level guidance for veterinary laboratories working with public health services to support testing of human samples
- OIE currently developing guidance on the circumstances under which exceptional testing of animals might be justified.

Version 1
1 April 2020

Veterinary Laboratory Support to the Public Health Response for COVID-19

TESTING OF HUMAN DIAGNOSTIC SPECIMENS IN VETERINARY LABORATORIES

The COVID-19 pandemic is creating unprecedented pressure on Public Health services world-wide. A multidisciplinary collaborative ('whole-of-society') approach is required to minimise the impact of this rapidly spreading virus. Veterinary Services can support Public Health services to meet the extraordinary surge in demand for diagnostic testing of human samples for SARS-CoV-2 by making available appropriately equipped and competent veterinary laboratories. In some countries human laboratory diagnostic services are at maximum capacity and, as an alternative, veterinary laboratories are being asked to provide support.

Veterinary research on animal vaccine



- Veterinarians have known of CoVs and related diseases affecting animals (dogs, cats and livestock) for decades and **effective vaccines already exist** to prevent many of them.
- poultry coronavirus vaccines (viruses unchanged for decades)
- valuable lessons for development of sought-after coronavirus vaccine for people?
- Covid-19 has triggered close consultation and information sharing between animal health specialists and colleagues in human medicine.

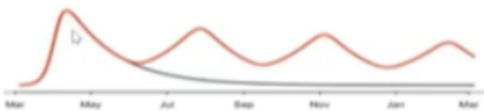
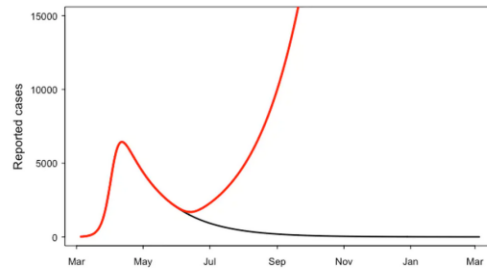
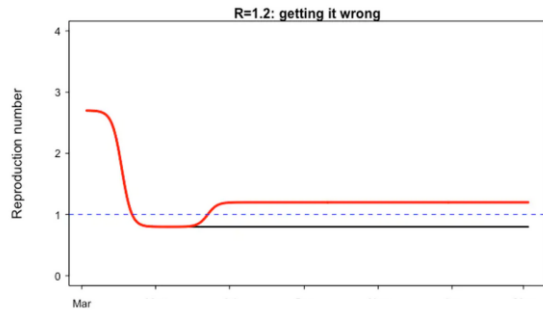
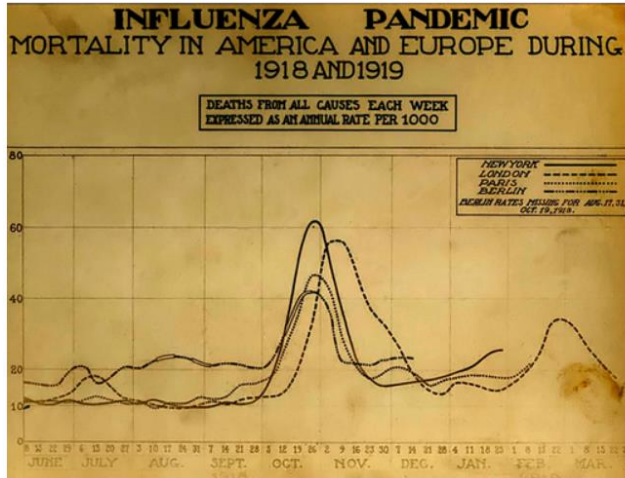
Veterinary research on animal vaccine



- animal research on papilloma viruses in rabbits and cows played a vital role in the development of the HPV (human papillomavirus) vaccine to prevent cervical cancer in girls



Can we do better? Human health strategy

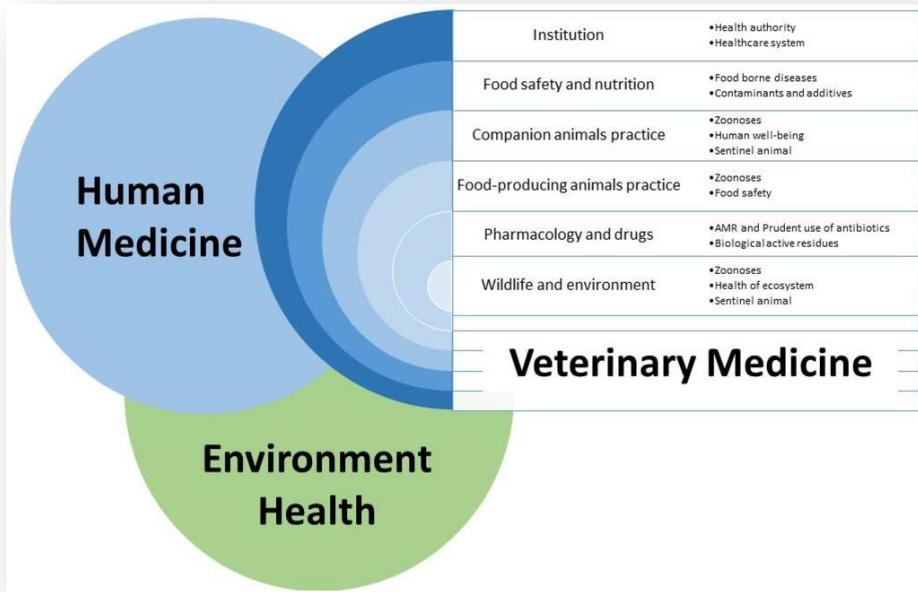


Statistics by Adam Kleczkowski

- Human side

- the prospect of second wave of SARS-CoV-2 infection across Europe cannot be excluded
- population immunity between 2% and 14%, still 85% to 90% of the population is susceptible
- a relatively modest change of R to 1.2 would result in a large outbreak causing the second wave
- **mass testing, contact tracing and containment measures are key elements of the strategy**

Can we do better? Communication



- One Health perspective

- more discussion and review processes with the public health colleagues
- communication for the successful management of an emergency
 - between agencies
 - between governments/stakeholder organisations/ the public.
- a transparent process for priority setting

Can we do better? Coordinated response



- At EU level
 - renewed model for engaging government, business and public health authorities
 - veterinary contribution to reform the risk-based contingency planning
 - reconsider the role of the EU in such crisis and avoid fragmented response (Decision 1082/2013/EU)
- At national level
 - Regulatory Agencies
 - Ministries
 - Stakeholders

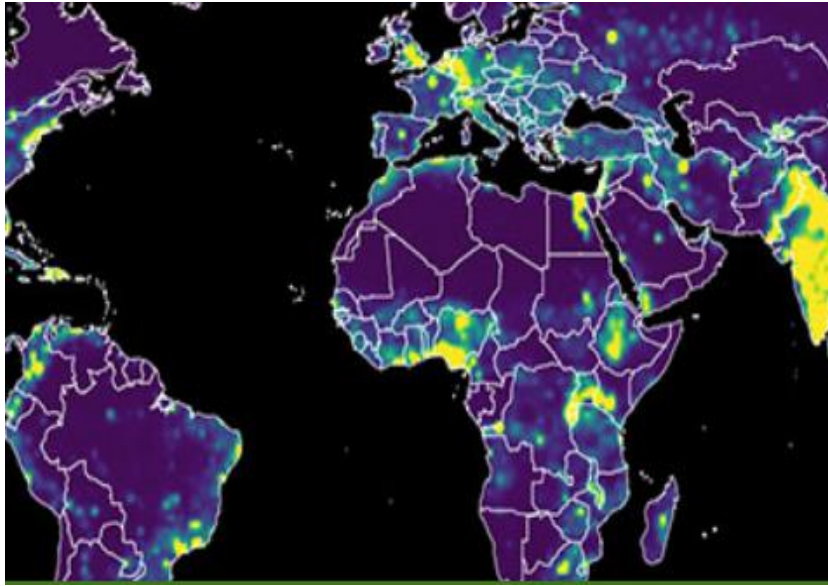
Can we do better? Preparedness



15 years ago!!!!!!

- concept of peace time and war time
- a military like-model for preparedness plan to fight potential pandemic with a strengthen contingency plans during peacetime
- preparedness plan with human and animal health components considering the potential shift from pandemic to panzootic
- up to date modelling systems, conduct annual exercises to simulate an epidemic

Can we do better? Regional and global surveillance



- develop harmonized guidelines for animal (wildlife+food animals) surveillance and intervention to bolster a better understanding of viral spread in novel host populations.
- carry out extensive epidemiological surveillance programs to identify viruses with genetic prerequisites for human infection
- serological surveillance (NGS)
- create global collaborative projects under the One Health umbrella (i.e. **PREEMPT** and **PREDICT**)

Can we do better? One Health R&D



- more funding of collaborative partnership of human and veterinary research to create shared platforms and technologies to streamline practical and swift response to emerging or re-emerging zoonoses
- Innovative Medicines Initiative (IMI) and ZAPI project - Zoonoses Anticipation and Preparedness Initiative

Can we do better? Veterinary funding



- Animals and health funded under Horizon 2020, 179 M€ (2014-2020)
- Topics 2018-2019-2020: AMR, ASF
- ERA-NET on international coordination of research on infectious animal diseases (€5million)
 - major groups of infectious diseases of animals
 - role of wildlife in the emergence and transmission of infectious diseases to livestock, and on related disease surveillance and control
 - data sharing, integration and analysis
 - Vaccines
- STAR-IDAZ international research consortium

Can we do better? Veterinary funding



- more than €1,000 billion is spent on healthcare in the EU each year (OECD/EU (2018))
- huge grants are available for research in human healthcare (e.g. epidemiology, diagnostics, vaccines, etc..)
- **not adequate funding allocations** in the EU budget for animal health veterinary research (e.g. epidemiology, vaccines or treatment for animals) to prevent disease in humans.
- European Research Area corona platform: no funded projects on One Health or veterinary research.

Meat companies became hotbeds for Covid-19



Food animals are not the cause of the Covid-19 outbreaks in meat plants.

- Outbreaks of Covid-19 in slaughterhouses and meat processing companies occurring in a number of countries in Europe and around the globe (US)
- contributing factors for the virus spread
 - large plants size with many workers working in close proximity and precarious workplace hygiene conditions (equipment and PPE)
 - lack of social protection
 - socio-economic conditions of subcontracted workers lodged in overcrowded collective housing provided by the company
 - air cooling system

Key messages

- Covid-19 is a great opportunity for multidisciplinary collaboration within the public health sector
- to better operationalize the One Health approach PH veterinarians are keen to provide an essential contribution to the management of Covid-19 and future pandemics (e.g. viral surveillance in animal reservoirs and of surveillance and sampling strategies for animal infectious epidemics).
- sharing of veterinary information, data, laboratory genomic analysis, informative of emerging zoonosis with human epidemic or pandemic potential.
- more focus on funding of R&D to promote and integrate veterinary and medical professionals.

Thank you

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