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

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Outline

• The Covid-19 within the Veterinary perspective (the role of animals)
• The need of stronger interprofessional collaboration according the One Healh 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 (e.g., non-human primates, rodents, and bats) rather than livestock
  - 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

<table>
<thead>
<tr>
<th>4 dogs</th>
<th>Pomerian</th>
<th>no symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>German sheperd</td>
<td>1 symptoms +1 no symptoms</td>
</tr>
<tr>
<td></td>
<td>American bulldog</td>
<td>no symptoms</td>
</tr>
<tr>
<td>10 cats</td>
<td></td>
<td>some with symptoms</td>
</tr>
<tr>
<td>8 large cats (tigers, lions)</td>
<td></td>
<td>contracted from infected zookeeper</td>
</tr>
<tr>
<td>minks</td>
<td></td>
<td>symptoms</td>
</tr>
</tbody>
</table>
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

- 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
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 are proposed for setting 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

- 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.
many studies clarified the origin, diversity and distribution of CoVS among different animal, 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
- CoV circulating in Sardinian bats, novel sequences detected not previously described as β-Coronavirus hosts
Veterinary surveillance of novel wild host

- 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)?
- Wildlife surveillance near waste water treatment plants (WWTP) would elucidate whether SARS-CoV-2 has spilled over into wildlife
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.

- Strenght of IZSs
  - IZSs belong to the national health system and are coordinated by the MoH
  - each IZS has the technical and scientific capacities to manage the extraordinary surge in demand for diagnostic testing of human samples for SARS-CoV-2.
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.
Veterinary research on animal vaccine

- existing veterinary understanding of coronavirus can give Covid-19 vaccine developers a head start
- valuable lessons for development of sought-after coronavirus vaccine for people?
- poultry coronavirus vaccines (viruses unchanged for decades)
- 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
Human side

- The prospect of a 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.
- Test, trace, and contain and local responses 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

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

15 years ago!!!!!!
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 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
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.
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

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