MERS-CoV (Middle East Respiratory Syndrome Coronavirus) outside the Arabian Peninsula an One Health approach: Understanding the role of wildlife, livestock and human in the virus dynamic


Context
One of the major paradoxes of the MERS-CoV epidemiology is the apparent lack of human cases in large parts of Africa where the virus and an animal host, the dromedary camel, are present. Those facts challenge the recent observation that in Kenya antibodies against MERS-CoV were detected in human population (Lilijander, 2016). Understanding the chain of transmission of the virus among wild / domestic animals and humans and the differences between the African and the Arabian Peninsula (where MERS is now endemic) is now crucial.

1. The role of livestock : camels in Africa and central Asia

**PHASE 1 / 2015 CROSS SECTIONAL SURVEY**

**PHASE 2 / 2016 LONGITUDINAL SURVEY**

**Research questions**

- What is MERS-CoV transmission dynamics in camel herds in Africa? Are there seasonal patterns of MERS-CoV infection in camel populations?
- What is the effect of antibody generated from prior infection on re-infection?
- What is the duration of passively transferred maternal antibodies in calves and does this protect calves from re-infection?
- Genetically and phenotypically characterize MERS-CoV in Morocco and Ethiopia? How does MERS-CoV evolve as it transmits within a camel herd?
- What is/are the mode(s) of transmission of MERS-CoV in camel herds and the associated risk factor(s)?

**Results**

- First negative results in dromedary camels in Africa and Eurasia ⇒ MERS-CoV is not universally endemic, reasons?
- The low camel densities in Turkey and Iran ⇒ The mountain chain in Western Turkey and Northern Iran? Bats are the true natural reservoir and absent in Kazakhstan?
- Risk Factors in dromedary herd in Africa: Hypotheses
  - The virus is circulating in farms and abattoirs
  - Younger animals have less antibodies and more virus than older animals
- More individuals are detected with antibodies in large herds
- Nomad and sedentary lifestyles are more at risk compared to mixed

2. The role of wildlife : bats in Africa

**PHASE 1 / 2016 CROSS SECTIONAL SURVEY**

**PHASE 2 / 2016 LONGITUDINAL SURVEY**

**Research questions**

- Are bats ancestral / natural reservoirs for MERS-CoV? (Munster 2016 Nature)
- Capture of bats in Ethiopia from populations living in oasis or houses close to camel’s farms
- Oropharyngeal and rectal swabs + blood
- Species captured and sampled :
  - Chaerephon pumilus
  - Epomophorus labiatus
  - Mops condylus

3. Risks for humans : farmers and abattoir workers in Africa

**PHASE 1 / 2016 CROSS SECTIONAL SURVEY**

**Research questions**

- What is the infection risk in humans?
- Is it a zoonotic virus and what are the way of transmission?

- In parallel to the camel's longitudinal survey a cross-sectional sero-prevalence survey in human on high risk population, will be conducted by the Institut Pasteur in Morocco.