



Harmonization and flexibility in a multi-country project

FAO MERS-CoV surveillance in camels

Background

Since September 2015, the **Food and Agriculture Organization (FAO)** has been conducting surveillance on Middle East Respiratory Syndrome coronavirus (MERS-CoV) in camel populations under the **United States Agency for International Development's Emerging Pandemic Threats programme (USAID EPT-2)**.

The aim of the project is to better understand the epidemiology and dynamics of this zoonotic pathogen in its animal reservoir

species with the ultimate goal to minimize the risk of spread and spillover into human populations. Surveillance is being conducted in four countries: **Egypt, Ethiopia, Jordan and Kenya**. Implementing a multi-country project has many challenges. Outputs including epidemiological and laboratory data should be harmonized, yet resources, logistics, priorities, and the structure and function of the camel sector differ in each country rendering project standardization extremely challenging.

Objectives

1. **Assist project countries in estimating the prevalence of MERS-CoV exposure** (detection of antibodies) and shedding (detection of viral RNA) in different camel populations, to identify risk factors for the two outcomes
2. **Build national capacity of implementing countries to detect MERS-CoV** in other livestock species in close contact with camels.
3. **Allow for harmonization of project activities at a global level** and more direct comparison of data by using the same study design in all countries.

Contact information: EMPRES-Animal-Health@fao.org
Food and Agriculture Organization of the United Nations

Methodology

- **FAO Guidelines for cross-sectional MERS – CoV surveillance with laboratory testing protocol (serology and PCR)** provided a common framework with standardization of key elements yet flexibility to adapt to a country's context.
- **Capacity building of national laboratories** ensured appropriate and harmonized testing capacities.
- **Strong collaborative relationships between global, regional, and country-level FAO offices** provided the organizational structure.
- **Country-level partnerships between FAO and national partners** and government agencies were crucial to successful implementation.
- **High level technical meetings** created an enabling environment for project implementation and a platform to communicate progress made and knowledge gained.

Results to date

- Over **6500** serum samples as well as nasal swabs collected from camels and other livestock species
 - Although standardized sample size calculations were provided, some local amendments had to be made
 - Generally, **high sero-prevalence (~70%) detected in camels** through a harmonized testing protocol
 - There was **no virological evidence for MERS-CoV in other domestic livestock species tested**
- **Different nodes along the camel value chain** were targeted, depending on country context:
 - Sampling sites included camel farms, villages, border checkpoints, live animal markets and/or slaughterhouses and differed between countries
 - Serological evidence for MERS-CoV in camels was found in all of the sites.
- **Camel value chains have been described and mapped**

Outputs & Lessons Learned

- **MERS-CoV is endemically circulating in camel populations along the whole value chain** in the Horn of Africa
 - Camel value chains do therefore not constitute a key risk for MERS-CoV introduction
 - For the identification of potential risk factors other study designs need to be applied
- Implementing surveillance in different husbandry and production systems is challenging and **close collaboration with national veterinary authorities and camel owners, adjusting surveillance plans to each country context, was key to achieving project objectives**
- **Other domestic livestock species do not seem to play a role in MERS-CoV epidemiology**



Fig. 2: Camel sampling in Jordan

Future activities

- **Implement longitudinal surveillance studies in camels, specifically designed to better understand:**
 - Infection and transmission dynamics within camel herds
 - Herd immunity and antibody kinetics
 - When individuals get infected and how long virus is shed
- **Conduct comparative anthropological studies**
 - Designed to identify and describe risky practices that could facilitate human exposure
 - In collaboration with WHO and PREDICT-2
 - Harmonized with work in the Arabian Peninsula, conducted by WHO
- **Conduct advanced genetic characterization through**
 - Sequencing and virus isolation
 - Phylogenetic analysis to compare camel and human viruses as well as viruses from different geographic areas



Fig 1. Egypt map showing camel trade route