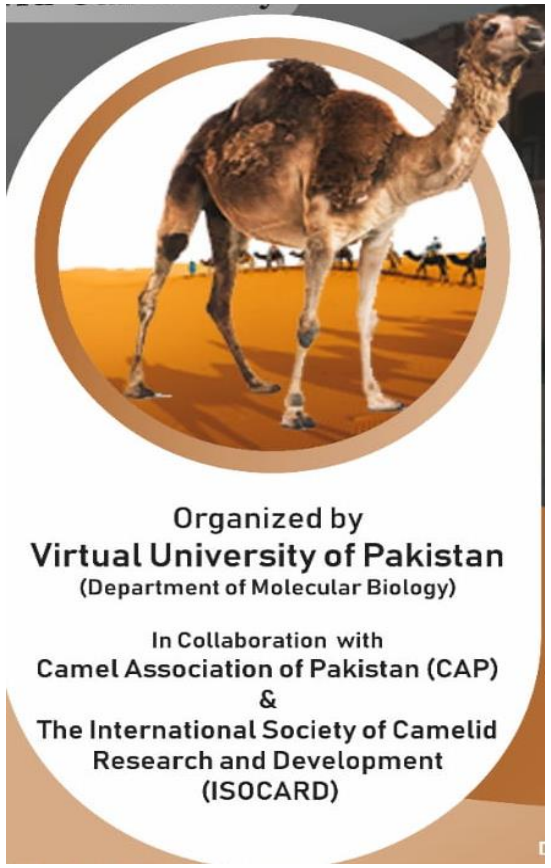


# WORLD CAMEL DAY, 22 June 2020
# International Symposium on
# "Camel as the Animal of Future"

# Zoonotic diseases Associated with Camelids

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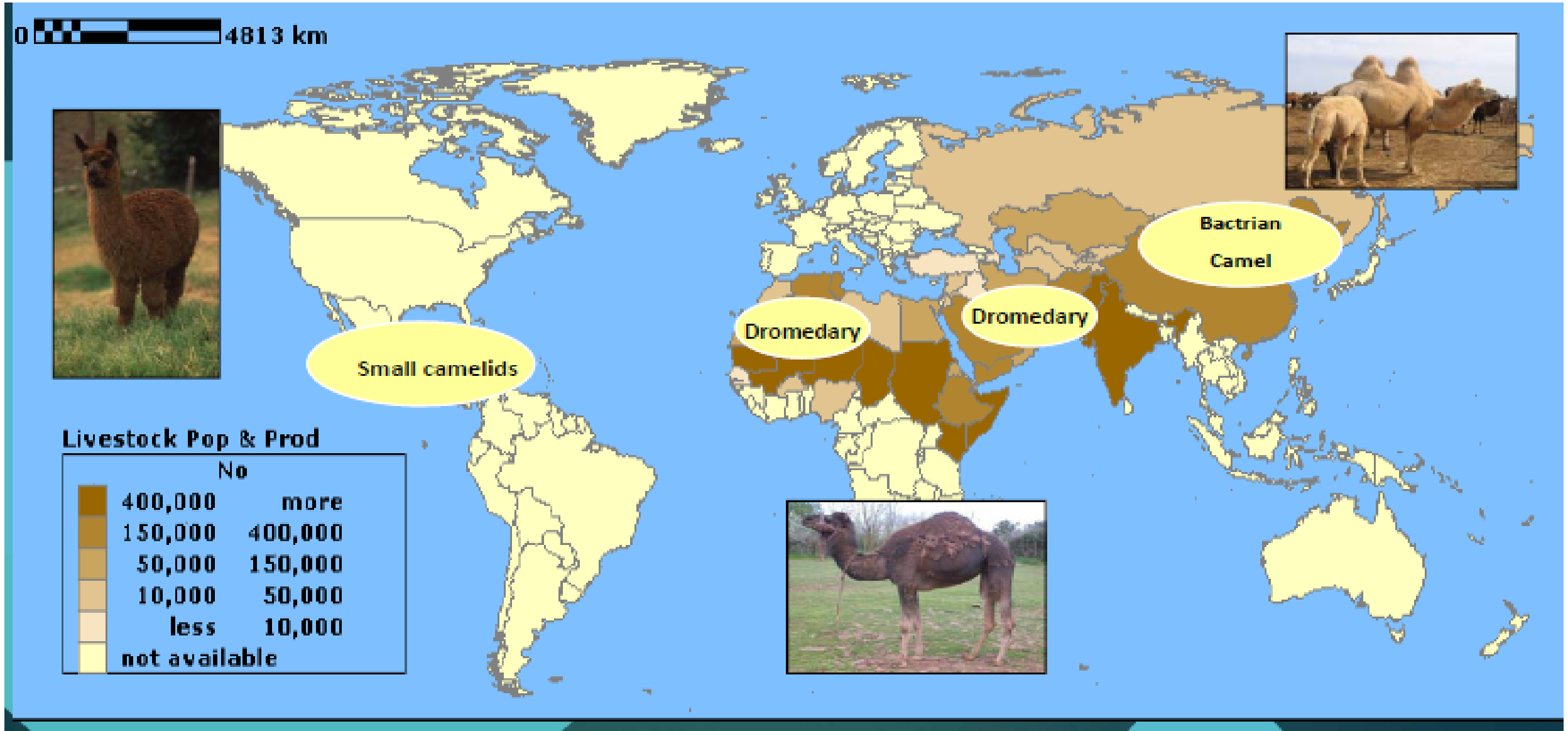
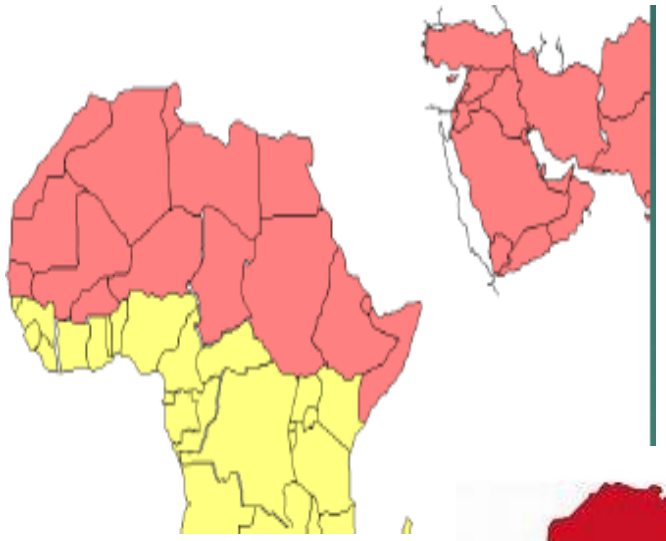
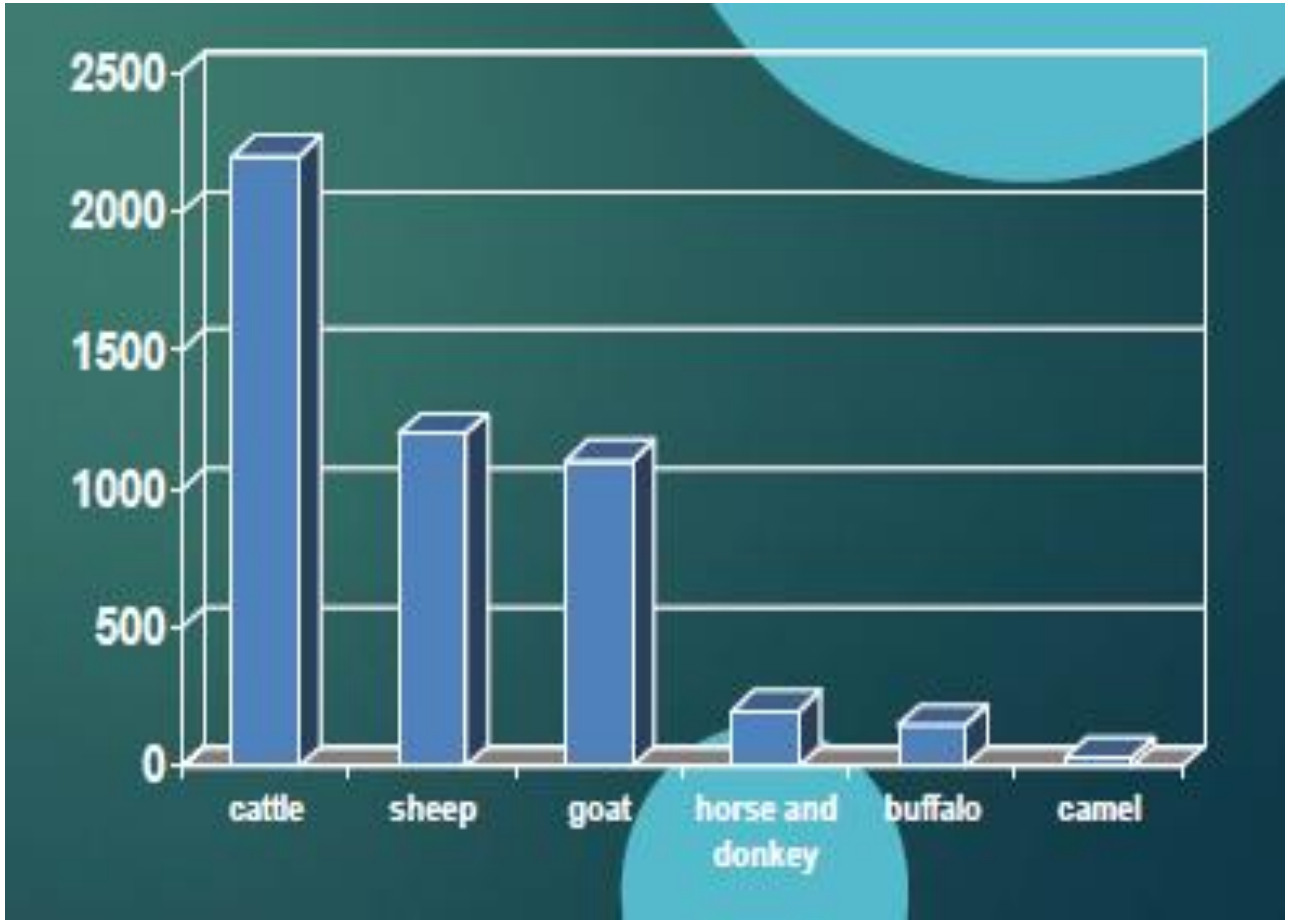
# Key points

- Distribution of the camelidae worldwide
- Introduction to Zoontic diseases
- Zoonotic diseases associated with Camelids
- Summary

# Distribution of the camelidae worldwide






A world population under estimated  marginal production 0.2% of the world milk production  ( herbivorous only)

# Camel considered as virtuous animal because:

**Sobriety, endurance, fidelity, longevity**

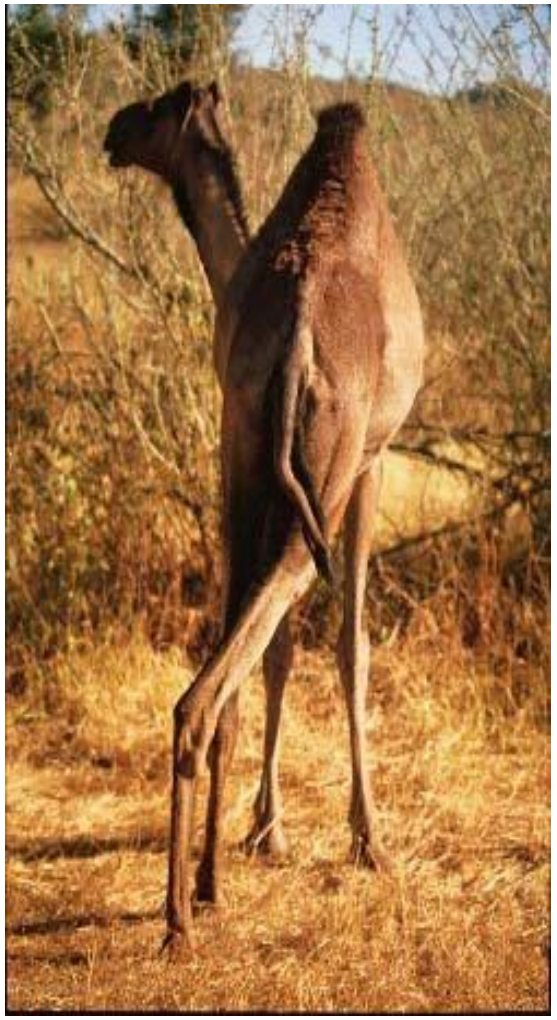

**Milk with medical proprieties**

**A low cholesterol meat**

**Quality wool and skin**

# The emerging diseases in camel population

Several unexplained diseases with over mortalities occurred the last ten years



# Camel Pathology

- Little is known about the pathogens that circulate in camel populations and how these pathogens interact with the camel.
- Very few diagnostic tests are validated for use in camels, and it is not fully understood how they respond to vaccines.
- Role of camels in the human disease ‘Middle East Respiratory Syndrome (MERS)’ and questions about the validity of **antibody tests for MERS in camels** have **highlighted the need to better understand disease dynamics in these creatures**

# Challenge in raising camel herd

- The most important challenge in the raising camel herds is the Zoonotic associated diseases.
- **Zoonoses** are infectious diseases of animals (usually vertebrates) that can naturally be transmitted to humans.

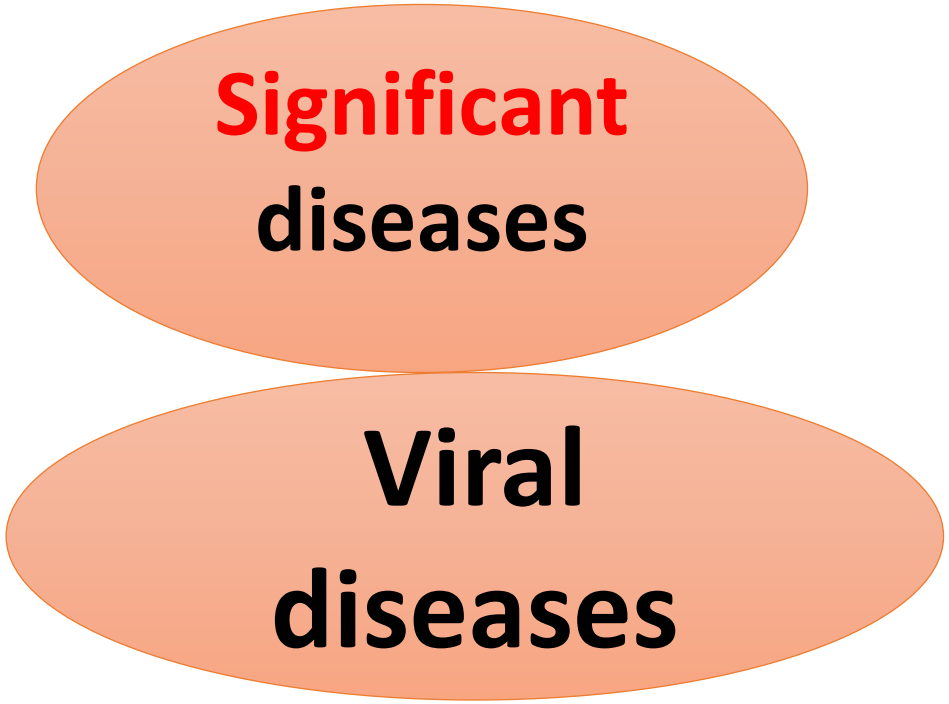
Major modern diseases such as COVID-19, MERS-CoV, Ebola virus disease and salmonellosis are zoonoses.

The Zoonosis diseases of Camelids are divided into three groups:

**Significant diseases**

**Diseases for which Camelids are potential pathogen carriers**

**Minor or non-significant diseases.**




- Camel Pox (Dromedary and Bactrian camels)
- Rabies (all species)

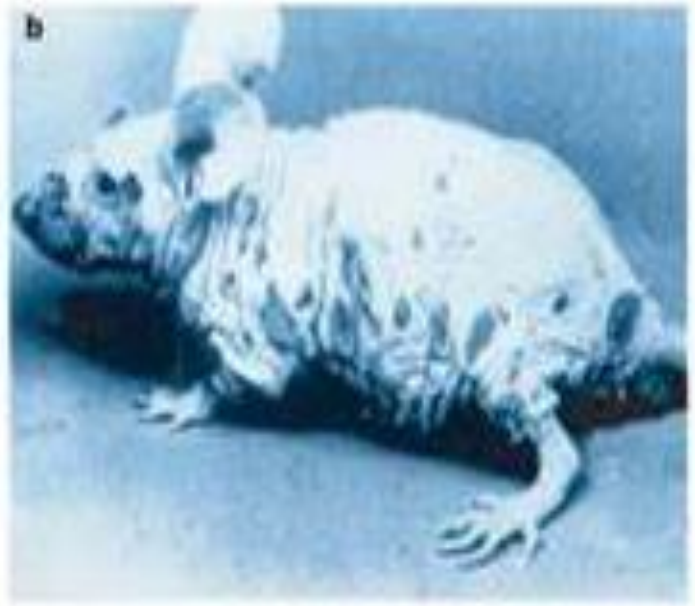
# Camel pox


- Camel pox occurs in almost every country in which camel husbandry is practiced .
- Camel pox virus is an **Orthopoxvirus** the most closely related to variola virus, the aetiological agent for small pox.
- The camel pox virus is very host specific and does not infect

other animal species, including cattle, sheep and goats.

- Field reports of **mild skin lesions in humans** associated with camel pox have been made in the past.
- Human camel pox has been recently described in India, underlining that camel pox may be of public health concern. More investigations needed for confirmation.
- **The virus carrying genes responsible for host immune evasion mechanisms owing to the threat posed by potential biowarfare agents ( biological weapon).**


a


b


c

# Camel pox prevention

- Life-long immunity **follows after natural infection**
- Different strains of camel pox virus may show some variation in their virulence. However, no major differences from the vaccine strain have so far been demonstrated.
- Prevention of Camel Pox has been successfully conducted using vaccinia virus in several countries.
- Live, attenuated vaccine provides protection against the disease for many years. Inactivated vaccine provides protection for 1 year only.

# Rabies in camels

- Rabies of camels has been observed in many African and Asian
- countries, Morocco, Mauritania, Oman , the U. A. E and Iraq.
- Rabies-like diseases with hindquarter paresis have been reported in Somali dromedaries

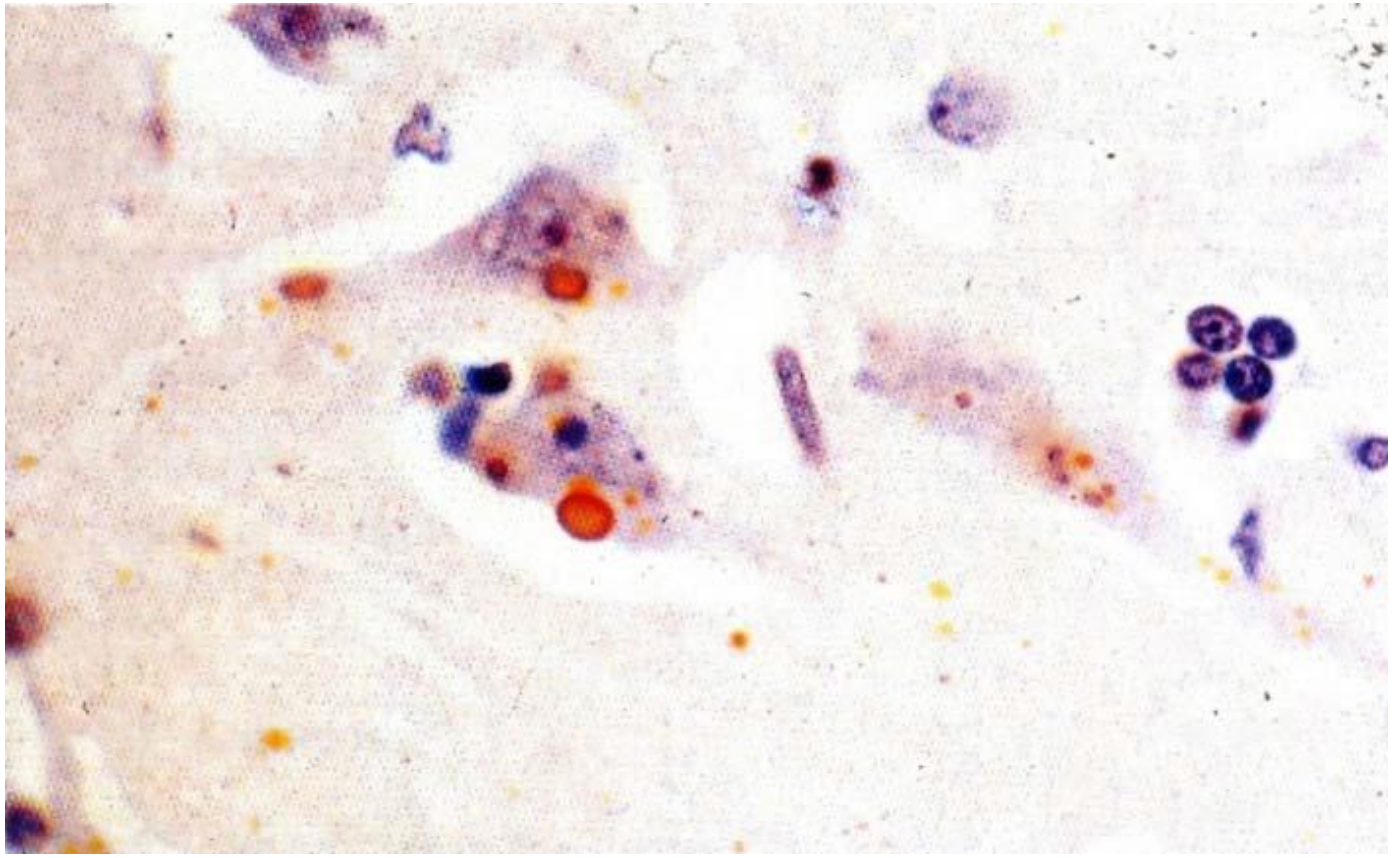
- **Two forms of rabies have been described in the dromedary:**

  - the raging fury
  - the silent fury : it is seldom seen in camels

- An incubation period of 3 weeks to 6 months followed by symptoms in cases of the ”raging fury”: restlessness, aggression, biting and snapping, self-mutilation, hyper salivation and muscle tremor.
- This excitative state is followed by the paralytic phase, the rabid dromedaries lie on their sides and flail with their limbs.
- Prior to death, the dromedary attempts to yawn continuously

# Rabies diagnosis and Prevention

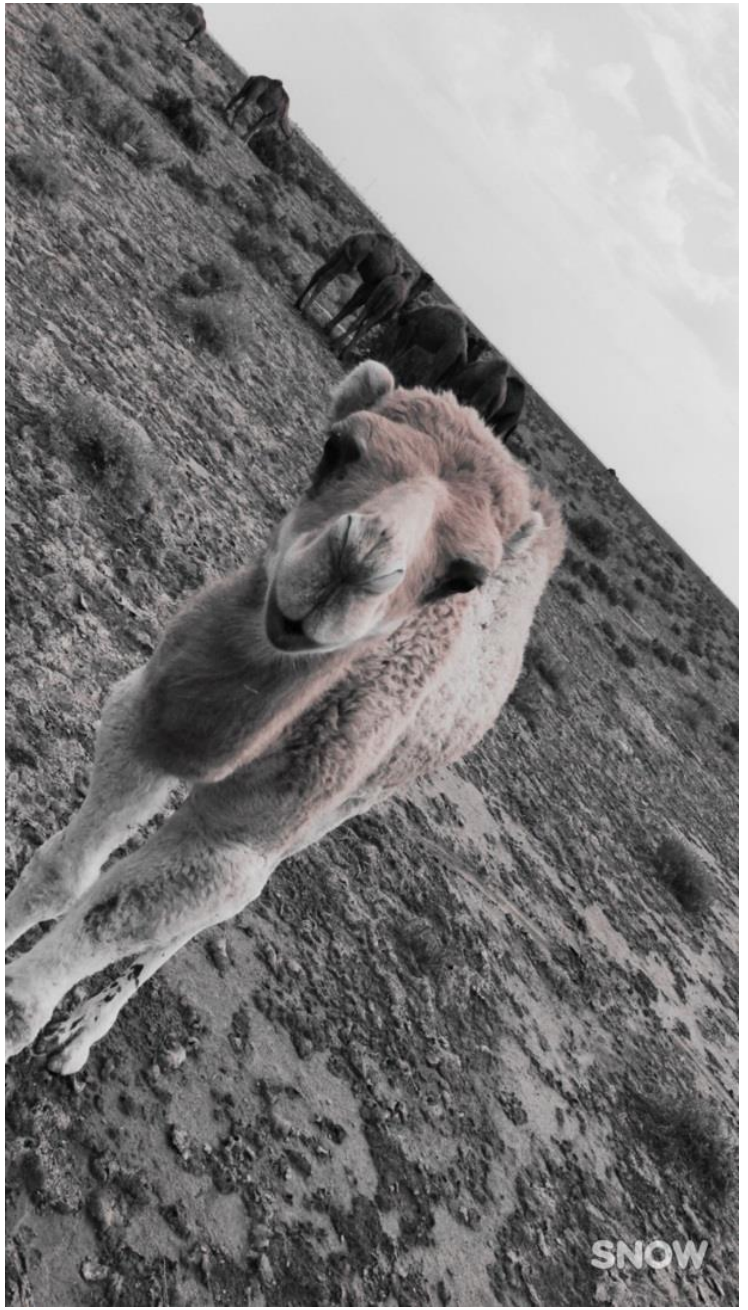
- Presence of **Negri bodies** can be confirmed by immunofluorescence. In all of the rabid dromedaries examined, massive numbers of rabies virus particles of varying sizes were seen in the brain.



- **Active immunisation** is possible with inactivated vaccines.
- The data show that one cattle dose of inactivated rabies vaccine induces good but short term serological conversion **in dromedary camels**.
- Therefore a booster dose of vaccine is necessary 6 to 8 months after primary vaccination.

Diseases for which Camelids are **potential pathogen carriers**

- ❑ **MERS-CoV**
- ❑ **Rift Valley fever**



# Middle East Respiratory Syndrome-Coronavirus (MERS-CoV) (ancestral of COVID-19)

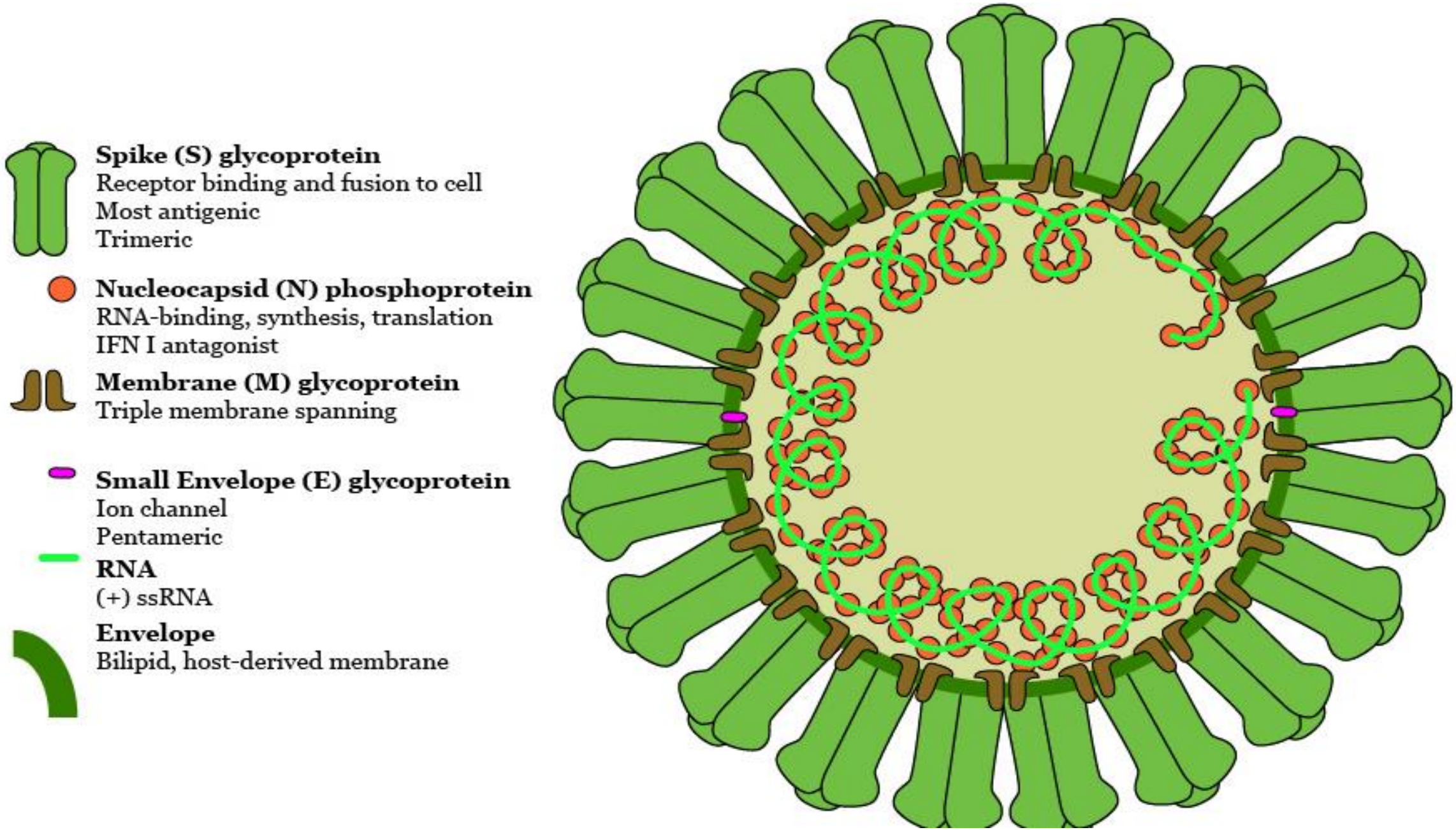
- Novel disease in humans – first reported April 2012.
- MERS-CoV is the cause of acute respiratory syndrome associated with a high case fatality rate (804 fatalities & **35.5% case fatality**) from 2266 total confirmed cases (http://www.who.int/emergencies/mers-cov/en/).

- MERS-CoV was continued to spreading and producing sporadic outbreaks within the Arabian Peninsula as well as in countries where the infected patients traveled.

- MERS is **a zoonotic disease,** and the dromedary camels were the source of transmission into human populations according to the results of serological and molecular investigations (Azhar et al., 2014).
- Subsequently, doubt has been raised about the role of camels as an intermediate host or reservoir, and the studies have found a genomic fragments material of MERS-CoV identical to humans in bat populations (Memish et al., 2013).
- Human- to the human nosocomial transmission had occurred in the most reported cases, such as the outbreak that occurred in a Korean hospital, when a single patient admitted and led to 186 infections comprised 36 fatal cases ( Arabi et al., 2017).
- Most secondary human cases appear to be acquired from other humans (nosocomial)

**Epidemiological data point towards an animal reservoir of MERS-CoV Camels likely to be the natural host of MERS CoV**

- Some primary cases have reported contact with camels
- Evidence of Subclinical infection in human in contact with camels
- limited human-to-human transmission,
- Serology surveys suggests widespread exposure of camels to MERS CoV or a similar virus in Africa.


**Spike (S) glycoprotein**
Receptor binding and fusion to cell
Most antigenic
Trimeric
**Nucleocapsid (N) phosphoprotein**
RNA-binding, synthesis, translation
IFN I antagonist
**Membrane (M) glycoprotein**
Triple membrane spanning
**Small Envelope (E) glycoprotein**
Ion channel
Pentameric
**RNA**
(+) ssRNA
**Envelope**
Bilipid, host-derived membrane

# MERS-CoV

Carrier

Infection

Fever

Pneumonia

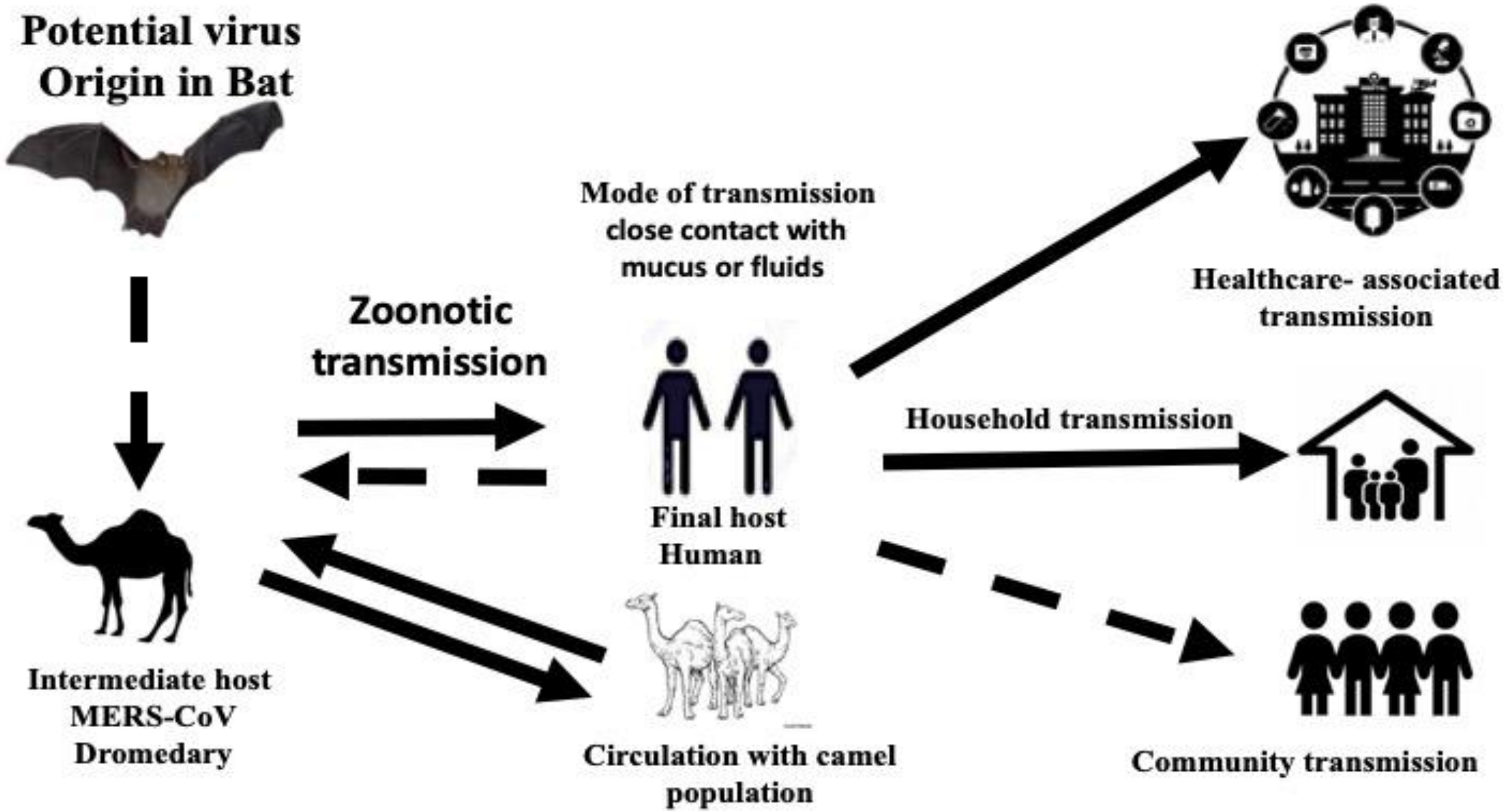
Diarrhoea

Kidney failure

Mask

Hygiene

Crowd


Potential virus
Origin in Bat
Mode of transmission
close contact with
mucus or fluids
Zoonotic
transmission
Healthcare- associated
transmission
Household transmission
Final host
Human
Intermediate host
MERS-CoV
Dromedary
Circulation with camel
population
Community transmission

# MERS CoV in Camels

- Smaller number of MERS CoV infections reported

in camels (mild or subclinical).

- PCR positive results from camels in some countries; virus isolated
- Camel serology positive to MERS CoV in 11 countries. Study suggests antibodies from camels detected as far back as 1992 but probably much longer.
- Dromedary camels may play a role as reservoir
- carrier of the virus
- OIE declared MERS CoV as a notifiable disease in camels (23/05/14 Oman)

# Rift Valley Fever

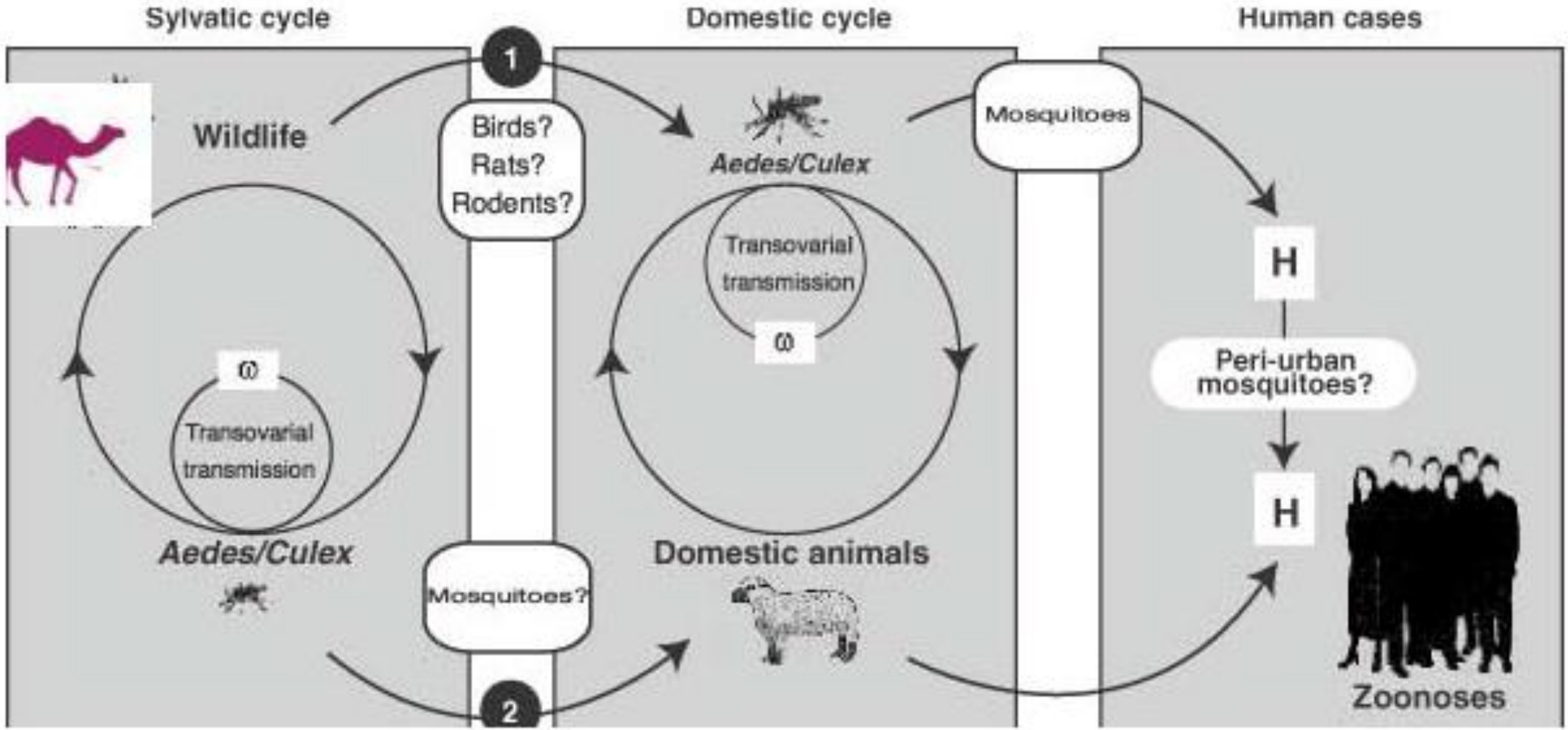
- Rift Valley Fever is an infectious zoonotic disease affecting sheep, goats, and cattle.

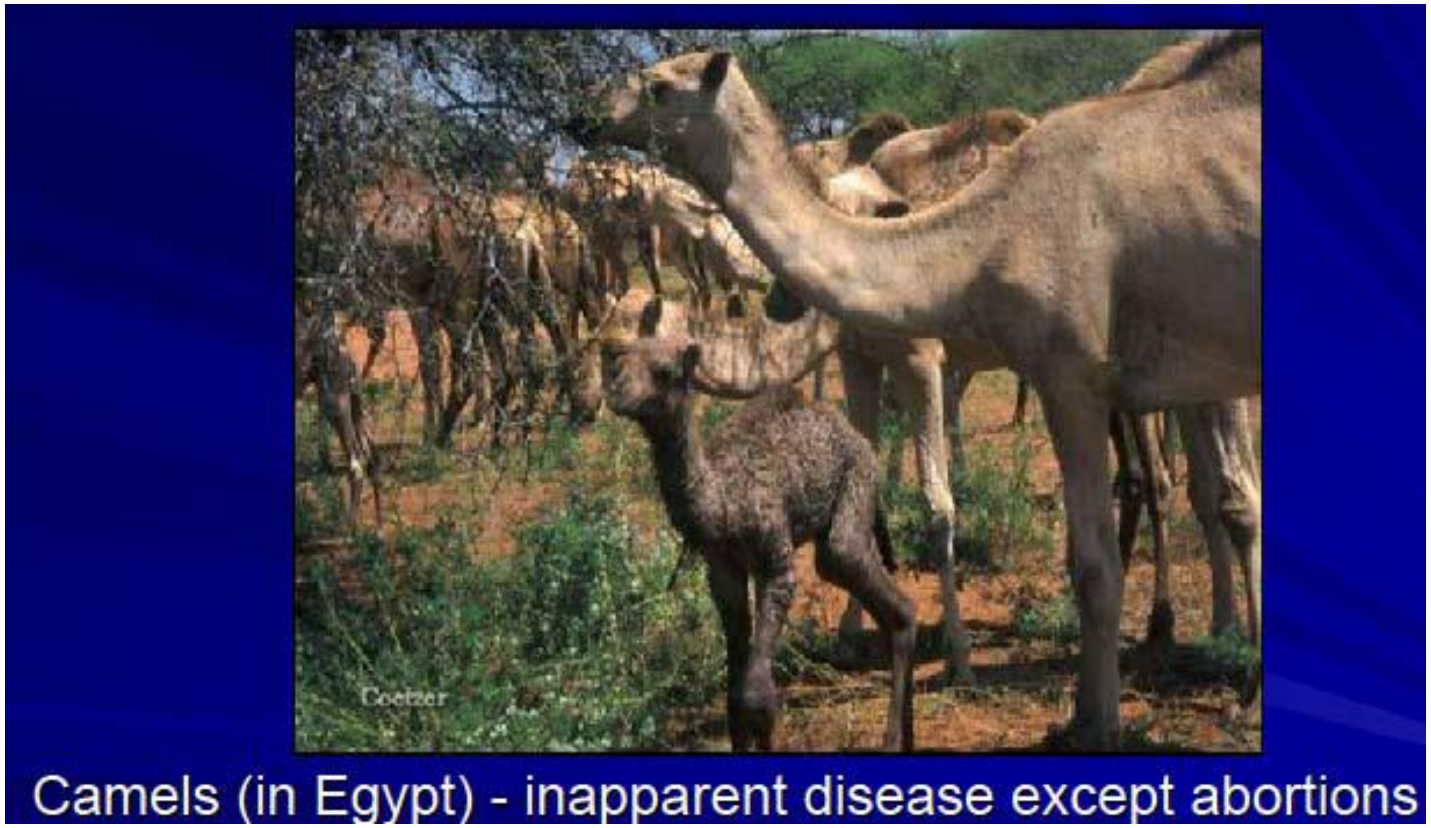
- First discovered in Kenya in 1931, it is characterized by a short incubation period, fever, hepatitis, high morbidity in newly born animals less than one week of age, and high abortion rates.

- The disease is caused by the Rift Valley Fever (RVF) virus, a member of the genus Phlebovirus in the family Bunyaviridae and the disease is transmitted by mosquitoes.
- Limited to Africa in earlier years

, it causes enormous waste of livestock, especially in wet conditions.

- **In 2001 Rift Valley Fever also occurred in Saudi Arabia and the Yemen.**


Sylvatic cycle
Domestic cycle
Human cases
1
Wildlife
Birds?
Rats?
Rodents?
Aedes/Culex
Mosquitoes
Transovarial
transmission
ω
H
Peri-urban
mosquitoes?
Transovarial
transmission
ω
Aedes/Culex
Mosquitoes?
Domestic animals
H
Zoonoses
2



Camels (in Egypt) - inapparent disease except abortions

**RVF in human causes hemorrhagic fever, Encephalitis, , blindness, and severe livers damage in man**

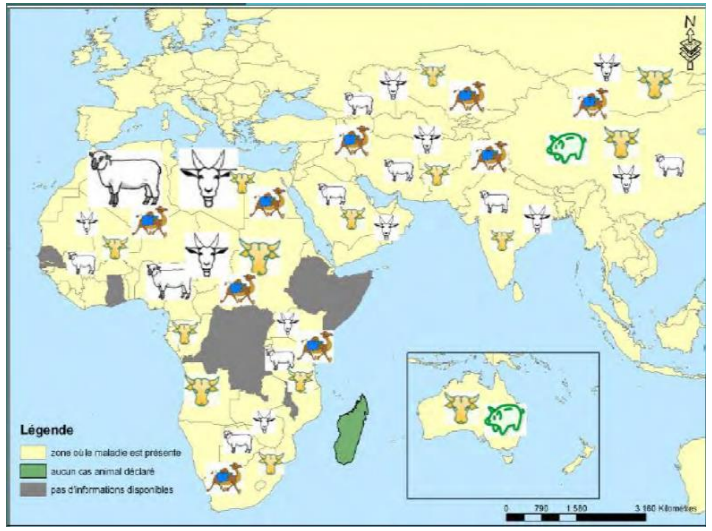
*During the epidemic of Rift Valley fever (RVF) that occurred in Egypt and other areas of North Africa in 1977, the virus was isolated from various species of domestic animal and rats (*Rattus rattus frugivorus*) as well as man. The highest number of RVF virus isolates were obtained from sheep; only one isolate was recovered from each of the other species tested, viz. cow, camel, goat, horse, and rat. RVF virus was reisolated from both camel and horse sera, apparently for the first time.*

**RVF Severe disease in Camels of West Africa during 2010 outbreak in Mauritania, Senegal**.

**Minor or non-significant diseases.**

- Brucellosis (abortus and melitensis)
- Tuberculosis
- Paratuberculosis
- Anthrax

# Camel brucellosis




- Brucellosis in camels and other livestock considered the most widespread zoonosis in the world
- Can have a dramatic impact on livelihood and public health
- increasingly important with the explosion of urban and peri-urban livestock
- Brucellosis in camels seems to display less clinical signs than in other ruminant animals

# Brucellosis in camel : Etiology

- Infection in camels is caused by different biotypes of *B. abortus* and *B. melitensis*
- *Brucella melitensis biotype 3* seems to be the most prevalent
- Isolation of Brucella from internal organs (lymph nodes) is relatively easier compared to milk

# Conclusions

- The camel has great economical potential and is anticipated to make a significant contribution to the pastoralists in solving their problem in transportation, food shortage and milk supply
- Data relating to camel diseases is scarce, from both a clinical and pathological point of view
- OIE listed camel diseases of priority and highlighted need of diagnostic techniques validation and vaccination protocols defined.
- Epidemiological studies should be designed to study significant diseases based on systematic methods
- Greater attention should be given to zoonotic diseases

(MERS, brucellosis, RVF)

- A warning should be taken during camel's sampling because it can be the biggest threat during laboratory diagnostic confirmation.
- Serologic tests **form the basis for surveillance** in most countries.
- Molecular diagnostics **(RT-PCR)** are rapidly replacing conventional isolation procedures
- **Virus/bacteria isolation** is needed to determine the pathogenicity of field isolates.
- Need of **camel reference laboratories** for diagnosis techniques validation.

# Thank you for kind attentions



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