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Diseases of Camelids

Infectious diseases of camelids



Ad-hoc group OIE on Camel Diseases



- Establishment of the list of camelid diseases and of the official diagnosis
- Remove the dromedary from the OIE list of foot and mouth disease susceptible animals;
- Establish specific guidelines for trade in camelids and camelid products.

SIGNIFICANT PARASITIC DISEASES IN DROMEDARY CAMELS



Diseases	Identification of the agent	Serological tests	Recommendations for prevention
Trypanosomosis	OIE <i>Terrestrial Manual</i> 2008, Chapter 2.4.8, Page 352	CATT, Indirect ELISA, c-ELISA (Neither ELISA is commercially available)	Systematic control for trade. Treatment of positive animal (for example melarsomine)
Mange (<i>Sarcoptes scabiei</i>)	OIE <i>Terrestrial Manual</i> 2008, Chapter 2.9.8,	c-ELISA	Quarantine and good drug for treatment Development of vaccine
Hydatidosis Echinococcosis	OIE <i>Terrestrial Manual</i> 2008, Chapter 2.1.4,	ELISA	Treatment of the dogs. Development of vaccine

Bacterial diseases in camel

- **Significant diseases**

- Brucellosis (abortus and melitensis)
- Tuberculosis
- Paratuberculosis
- Anthrax
- Caseous lymphadenitis
- Pasteurellosis
- Salmonellosis
- Colibacillosis



Bacterial diseases in camel

(OIE *Ad hoc* group on camelidae diseases)

- **Disease for which camelids are potential pathogen carriers**
 - Yersiniosis
 - Leptosiprosis
 - Q fever
- **Minor or non significant diseases**
 - Glanders
 - Chlamydiosis

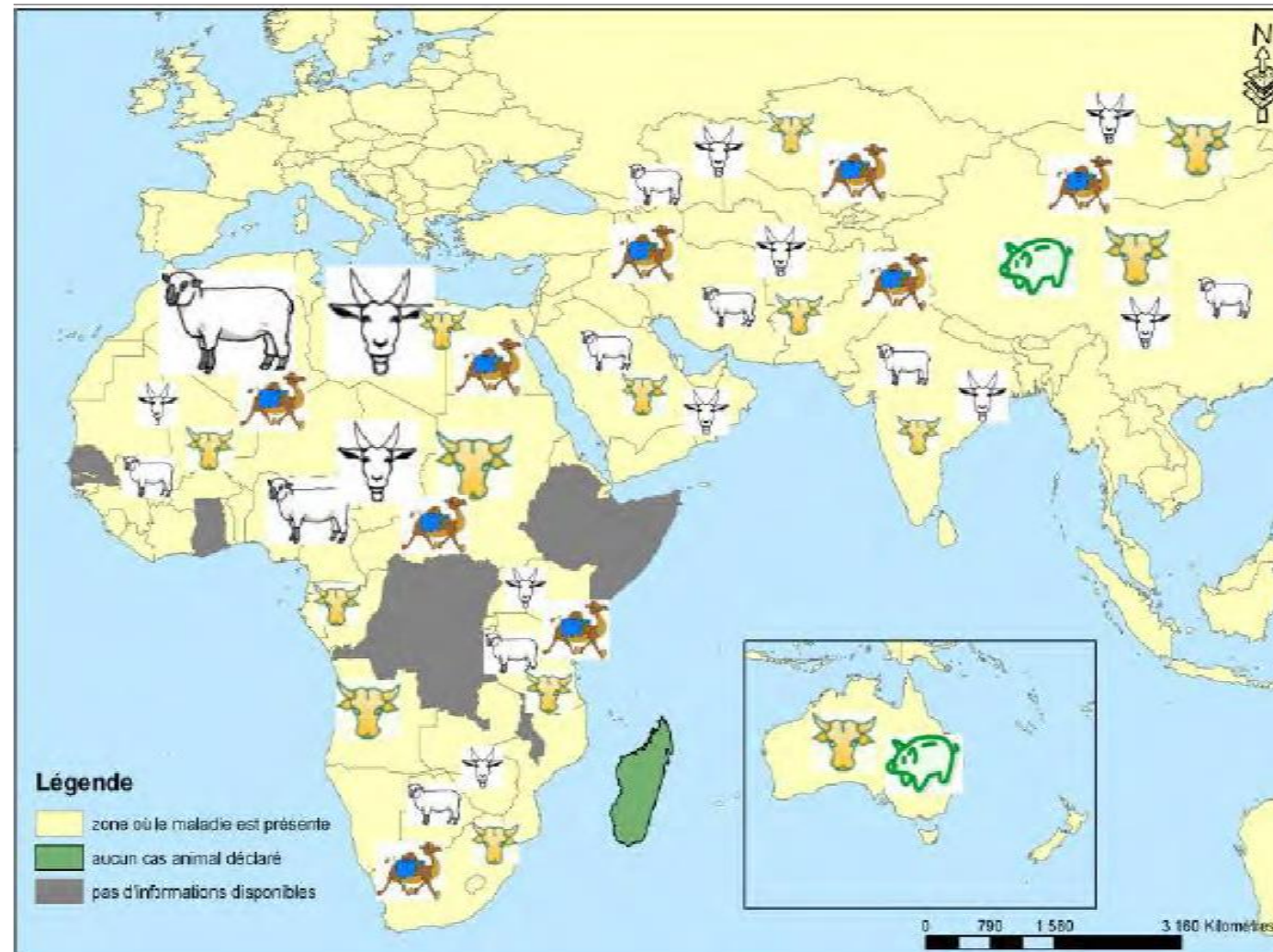
Camelids - zoonoses

- **Bacterial diseases acquired from camels and Llama**
 - Brucellosis
 - Q fever
 - Plague (*Yersinia pestis*)
 - Salmonellosis
 - Campylobacteriosis

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 Africa and Asia



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

Species of Brucella isolated from camels

Country	Species isolated	Organ cultured	Reference
Iran	B. melitensis biovar 1	Lymph nodes	Zowghi and Ebadi (1988)
Jordan	B. melitensis biovar 3	Aborted foetus	Al Majali et al (2008)
Kuwait	B. melitensis biovar 3	Lymph nodes	AlKhalaf and El Khaladi (1989)
Libya	B. abortus biovar 1	Foetal stomach contents	Gameel et al (1993)
Saudi Arabia	B. melitensis biovars 1, 2, 3	Milk, aborted foetus, vaginal swab	Radwan et al. (1995, 1992)
Sudan	B. abortus biovar 3	Lymph nodes, testes, vaginal swabs	Agab et al. (1996)

Camel brucellosis - epidemiology

- Many gaps exists in knowledge of the epidemiology of the disease
- Prevalence of brucellosis is usually low in herds kept under extensive husbandry, and relatively higher in camels maintained under intensive conditions
- Important role of the intercalving interval in the transmission of infection between camels within a herd
- Brucellosis contamination occurs following an abortion or delivery by an infected female

Seroprevalence of camel brucellosis in some countries

Country	Number of samples	Tests used	Prevalence	Reference
Egypt	360	SAT	11.6	Ahmed and Nada (1993)
Iran	1123	RBPT	10.5	Rafieipour and Ziaei (2007)
Jordan	412	RBT, FC, ELISA	12.1	Al-Majali et al. (2008)
Kuwait	698	SAT, CFT, RBPT	14.8	Al Khalaf and El Khaladi (1989)
Libya	967	RBPT,SAT, CFT	4.1	Gameel et al. (1993)
Saudi Arabia	2536	RBPT	8.0	Radwan et al. (1995)
Sudan	3274	RBPT	7.8	Musa and Shigidi (2001)
Sultanate of Oman	1502	RBPT	7.0	Yagoub et al. (1990)

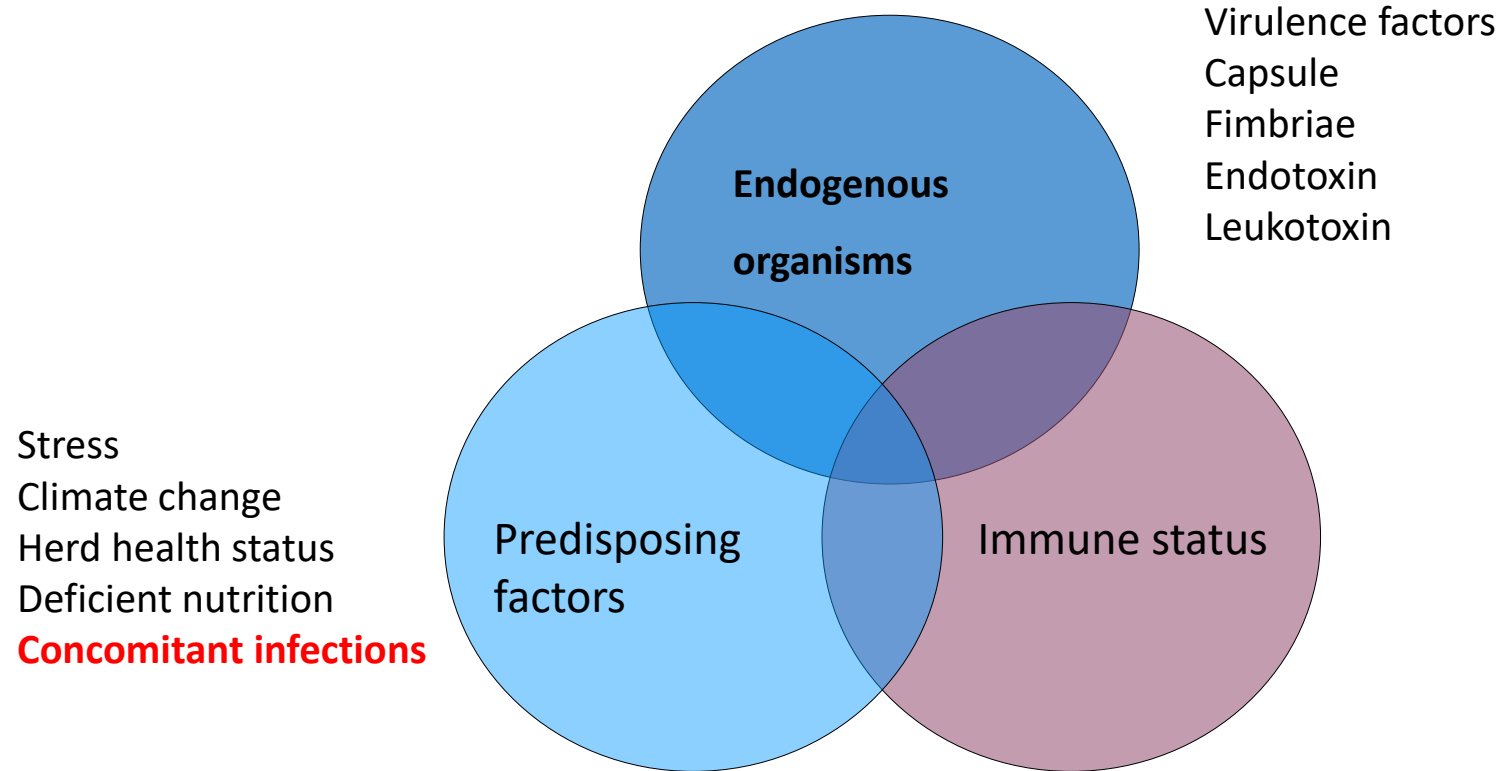
Brucellosis control strategies

- Lack of clear-cut policies regarding the control of the disease in camels
- Control strategies depend on
 - Level of prevalence (seroprevalence)
 - Production systems (extensive vs intensive)
 - Financial resources
 - Capacity of veterinary services
 - Participation of herders
- Whole herd vaccination in extensive management system using S19 or Rev1 vaccine (dose and route !)
- Public education and sensitization

Respiratory diseases: Pasteurellosis

- May be responsible for considerable loss of production and deaths
- Represents a wide range of pulmonary and septicaemic infections
- Associated with *Pasteurella Multocida* and *Mannheimia haemolytica*
- Both organisms are frequently isolated from the upper respiratory track of both sick and apparently healthy animals
- *M. haemolytica* infections include a wide range of primary and secondary pneumonia (pneumonic pasteurellosis)
- *P. multocida* is associated with hemorrhagic septicaemia in adults and enzootic pneumonia complex in young animals

Development of pasteurellosis



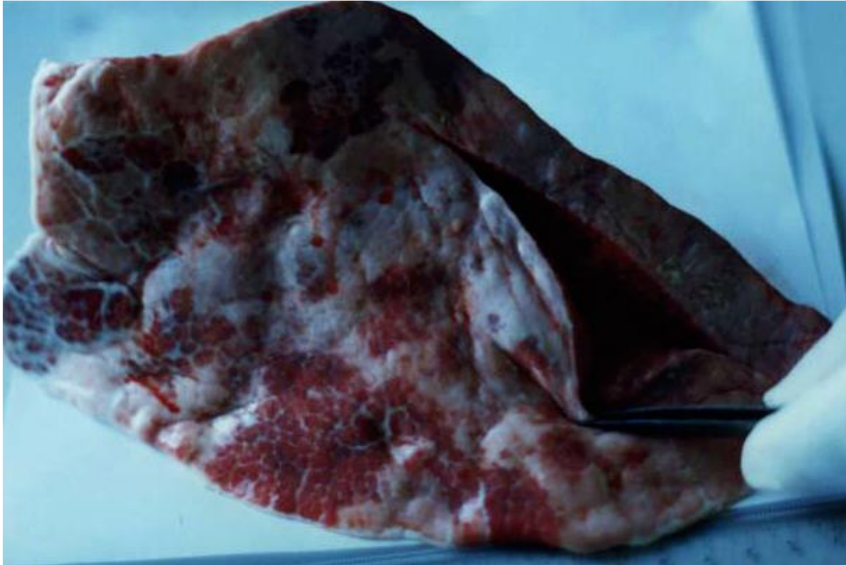
Pneumonic Pasteurellosis

- *Mannheimia hemolytica* (*P. hemolytica* biotype A)
- acute febrile respiratory disease with fulminating fibrinopurulent bronchopneumonia and fibrinous pleurisy
- Disease develops within 10 to 14 days (cough, dyspnea, mucopurulent nasal and ocular discharges)
- Animals may die as a result of toxemia (young animals (2-3 days) before development of pulmonary lesions)

Bacteria associated with pneumonic lungs

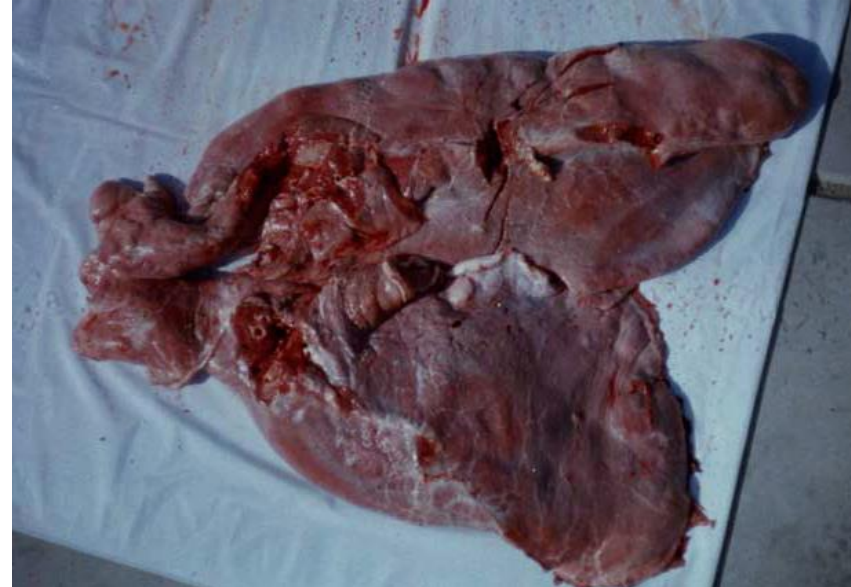
- *M. haemolytic* (56.3%)
 - *Actinomyces pyogenes* (18.8%)
 - *Escherichia coli* (12.5%)
 - *Streptococcus spp.* (12.5%)
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Bacterial lung lesions (pasteurellosis)



Lung with severe congestion
(Credit Al Ani et al.1998)

Lung with pulmonary emphysema
(Credit Al Ani et al.1998)



Pyogenic infections: Pseudotuberculosis

- Caseous lymphadenitis : *Corynebacterium pseudotuberculosis* (and *C. pyogenes*)
- Reported from several countries in Middle East (Egypt, KSA, UAE, Iran), Asia (India, China, Russia), East Africa (Kenya and Ethiopia) and Australia
- chronic infection which often affects the lymph nodes at the base of the neck, around the rump and lower part of the mandible
- abscesses are usually closed, cold and painless
- Erythromycin and penicillin for treatment



VIRAL DISEASES OF DROMEDARY CAMEL

- Camelpox
- Contagious ecthyma
- Rabies
- Rift Valley Fever



Viral Diseases for which Dromedary Camels are potential pathogen carriers

- MERS CoV,
- BT,
- AHS?
- PPR?



Viral diseases acquired from camels (Zoonosis)

- Camel pox (Minor)
- Rift Valley Fever (Vector Borne)
- Rabies
- MERS CoV
- West Nile and Crimea-Congo Fever (Vector Borne)





CAMEL POX



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- Camel Pox occurs in almost every country in which camel husbandry is practiced.
 - The disease is endemic in these countries and a pattern of sporadic outbreaks occurs with a rise in the seasonal incidence usually during the rainy season.
 - Camelpox virus is an *Orthopoxvirus* the most closely related to variola virus, the aetiological agent for small pox.

Camelpox: epidemiology

- Transmission is by either direct contact between infected and susceptible animals or indirect infection via a contaminated environment. The infection is usually achieved by inhalation or through skin abrasions.
- Serological surveys taken in several countries reveal a high prevalence of antibodies to camelpox.
- Morbidity rate is variable and depends on whether the virus is circulating in the herd.
- Mortality rate in adult animals is between 5% and 28% and in young animals between 25% and 100%.
- Dried scabs shed from the pox lesions may contain live virus for at least 4 months and contaminate the environment.
- The camelpox 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, but it appears that only one suspected case of human camelpox has been described, underlining that camelpox is of no public health importance.

Camel Ecthyma



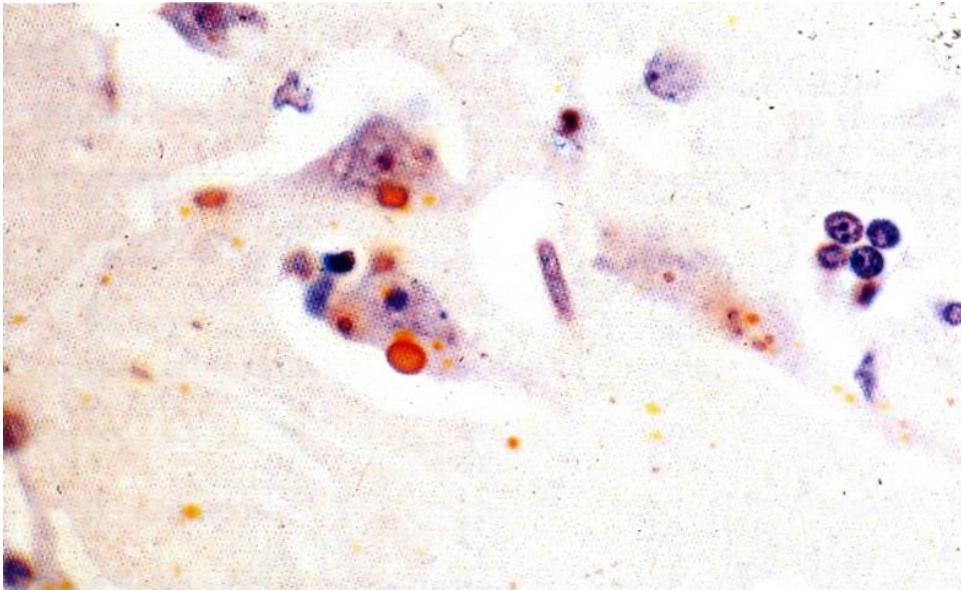
- Contagious ecthyma is a highly contagious, zoonotic, viral skin disease that affects camels, sheep, goats and some other ruminants.
- The skin lesions are painful and often occur on the mouth and muzzle, where they can cause anorexia or starvation. Lesions on the udder may result in the abandonment of offspring, and foot lesions can cause transient lameness. Secondary bacterial infections can occur and, in rare cases, the lesions may extend into the internal organs.
- Usually resolves spontaneously and the mortality rate is generally low, fatality rates up to 10% have been reported.
- Very difficult to differentiate clinically from camel pox. CCE has been described in camels from many different countries: Kazakhstan, Mongolia, Kenya, Somalia and Sudan.

Rabies

- Rabies is *a major zoonosis* caused by a neurotropic virus of the genus *Lyssavirus* of the family *Rhabdoviridae*, and is transmissible to all mammals.
- It is invariably fatal once signs of the disease have appeared. Infection is usually spread by the bite of an infected animal because the virus is present in the saliva.
- Rabies of camels has been observed in many African and Asian countries, Morocco, Mauritania, Oman and the U. A. E.
- Two forms of rabies have been described in the dromedary: the »raging fury« and the »silent fury«. The latter form is seldom seen in camels
- Following an incubation period of 3 weeks to 6 months, the following symptoms are seen in cases of the »raging fury«: restlessness, aggression, biting and snapping, self-mutilation, hypersalivation 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



As there is no gross pathognomonic lesion for rabies, diagnosis can only be made in the laboratory. Laboratory techniques are preferably conducted on central nervous system (CNS) tissue removed from the cranium.

Presence of Negri bodies can be confirmed histologically. The virus itself is confirmed using the in vivo mouse tests and by immunofluorescence. In all of the rabid dromedaries examined, massive numbers of rabies virus particles of varying sizes were seen immunofluorescently in the brain

Rift Valley Fever



- Rift Valley Fever is an infectious zoonotic disease affecting sheep, goats, camels and cattle.
- First discovered in Kenya in 1931, it is characterised by a short incubation period, fever, hepatitis, high morbidity in lambs 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 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.

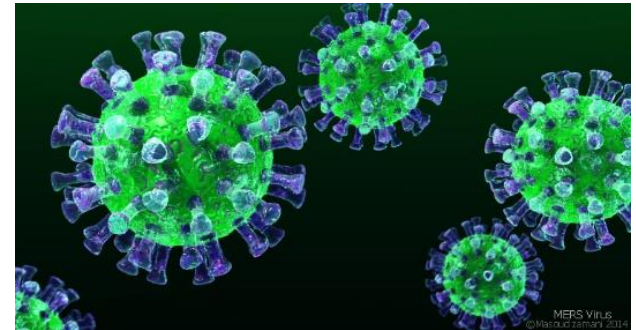
Middle East Respiratory Syndrom CoV

Novel disease in humans – first reported April 2012

- More than 1000 confirmed cases with 30% deaths.
- 17 countries including traveler cases outside Middle East
- Doesn't appear to easily spread between humans

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
- Serology surveys suggests widespread exposure of camels to MERS CoV or a similar virus in Africa and ME detected as far back as 1992



Bluetongue



- Bluetongue virus (BTV) infection involves domestic and wild. It is caused by an orbivirus, and there are 24 serotypes of the virus.
- BT is a non contagious, insect-borne viral Infection inapparent in the vast majority of infected animals but causes fatal disease in a proportion of infected sheep, deer and wild ruminants.
- Although cattle rarely show clinical signs, they are important in the epidemiology of the disease due to the prolonged viraemia in the absence of clinical disease.
- Recent research demonstrate that camel can be infected and multiply the virus to represent a source for other culicoides infection. Camels are suspected to play a role as a carrier reservoir of BTV in sub-Saharan Africa.

Bluetongue, AHS & EHD in camel

BTV Serology prevalence

- Egypt 14,3 %
- Iran 6 %
- Yemen 13 %
- Sudan 17 %
- Morocco 15 to 65 %



AHS reported between 5 to 23 % in Egypt and Sudan

Minor or non-significant diseases

- AHS
- PPR
- West Nile fever
- CCHF



African Horse Sickness



- African horse sickness is a highly fatal and infectious disease, which affects horses, mules and donkeys. It is caused by an orbivirus, and there are nine strains of the virus.
- The disease is not directly contagious between horses, and is endemic in sub-Saharan Africa. The disease has spread as far north as Morocco and the Middle East. Zebras and camels may be infected without showing signs of disease. Dogs can also be severely infected by the virus, usually by eating infected horsemeat.
- Camels serological prevalence reported between 5 to 23 % in Egypt and Sudan

Peste des petits ruminants in Camel



- Contagious disease goats and sheep characterized by erosive stomatitis, enteritis, pneumonia and death.
- Economically it is the most important animal diseases in Africa.
- peste des petits ruminants (PPR) antibody seroprevalence was 3% in camels (Ethiopia 2005, Sudan).
- A huge number of *camels* in Africa and Saudi Arabia have mysteriously died (immune systems depressed because of the presence of the *PPR* virus)

WEST NILE And Crimean-congo Haemorrhagic FEVER

West Nile virus (WNV) is a member of the family Flaviviridae. The arbovirus is maintained in nature by cycling through birds and mosquitoes.

Many species of mammals have been infected with WNV including cattle, sheep, goats and camels but clinical disease is rare. In endemic countries, seropositive rates vary widely among ruminant species and may approach 75%. *Among mammals, clinical disease is primarily exhibited in horses and humans.* Camel is considered to be a low-risk species.

- CCHF is a tick borne disease caused by a virus of the Bunyaviridés family. During a survey carried out in Saudi Arabia on imported livestock and humans in contact, antibodies to Crimean-Congo haemorrhagic fever virus were detected in 3/354 (0.8%) humans, 88/2162 (4.1%) sheep, 14/432 (3.2%) goats and 1/182 (0.6%) cattle. Camel and horse sera were negative.
- Serological evidence of Crimean–Congo haemorrhagic fever viral infection among camels imported into Egypt 1990 and Mauritania (*43 sérums positives/80 tested, 1986*).

Diagnostic Tests

- Infections in camels are usually diagnosed clinically.
- The diagnosis should be confirmed by laboratory testing on clinical cases or by retrospective serological surveys on susceptible species and populations.
- Samples of serum, total blood, swabs, scabs, should be collected from animals in earlier stages of the disease. PCR tests are available for most of the pathogens.
- Uncommonly used tests include pathogens isolation and characterisation.
- Virus isolation can be attempted in a variety of cell cultures or embryonated eggs.
- Serological tests include serum neutralization, agar gel immunodiffusion (AGID), complement fixation and agglutination. ELISA is frequently used for diagnosis.

Conclusion



- 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
- Epidemiological studies should be designed to study significant diseases based on systematic methods
- Greater attention should be given to zoonotic diseases (brucellosis, TB, Rift Valley Fever, Mers CoV) or high impact diseases (camel Pox Pasteurellosis, Trypanosomiasis)
- Greater support from international development agencies (OIE AHG, FAO, WHO)

8 Diseases of priority:

Disease	Transmission mode/	Cyclicity	Diagnostic test	Preferred source of samples
Camel Pox*	Direct contact/endemic	Yes	VN/PCR	Skin lesion
Rift Valley fever*	Vector borne/epidemic	Seasonal	Elisa/PCR	Total blood, serum
Bluetongue	Vector borne/endemic	Seasonal	Elisa/VN/PCR	Total blood, serum
Rabies*	Dog bite/sporadic	No	IF/PCR	Neuronal tissue
Brucellosis*	Direct contact/endemic	No	Elisa/PCR/isolation	Serum fetus lymph nodes
TB*	Direct contact/endemic	No	Elisa/PCR/isolation	Swabs, lung lesions
Pasteurellosis	Direct contact/endemic	No	Isolation /PCR	Swabs, lung lesions
Caseous lymphadenite	Direct contact/endemic	No	Isolation /PCR	Abscess

شكرا

