Working Document on Camel Prion Disease (CPrD)

2019

Content:

Knowledge gaps:

Multiple areas of understanding and knowledge of CPrD especially pathogenesis, immunity, risk factors, epidemiology, zoonotic potential and treatment remain unclear. Prion diseases still have many knowledge gaps:

- Is it a newly emerged disease or it is a long existing but unrecognized disease of dromedaries?
- What is its origin?
- Are any other animal prion disease present in the CPrD-affected area?
- Prion strain characterization (similarities and differences with other animal prion strains).
- Descriptive epidemiology (age of affected animals, geographic distribution, incidence in affected herds, etc.)
- Risk factors (host/population: PRNP polymorphisms, breeding practices, etc. - country: import flows, detection capacity, etc.)
- Is it sporadic or infectious? (of relevance for animal health).
- Besides dromedaries, what camelid and other animal species are susceptible to CPrD?
- Pathogenesis and prion/infectivity distribution in dromedary tissues (of relevance for human risk).
- If transmissible, what is the mode of transmission?
- Risk for other animal species (sheep, goat, cattle) and for humans (experimental transmission in mice expressing PrP of the target species is a possible approach)
- Risk for humans investigated by means of parallel surveillance of prion diseases and risk factors analysis.

- Others.

– Camel Prion Disease case definition

- **Introduction**
- Camel prion disease (CPrD) is a neurological disease of dromedary camels recently (2019) reported from Algeria and Tunisia. The disease is thought to exist since the 1980s in southern Algeria without a human case linked to the consumption of camel meat.
- **Clinical criteria**

  The signs of CPrD observed in Algeria include weight loss; behavioral abnormalities; and neurologic signs, such as tremors, aggressiveness, hyperreactivity, abnormal and excessive movement of the neck and head, hesitant and uncertain gait, ataxia of the hind limbs, occasional falls, and difficulty getting up as the disease progresses.
- Neurological symptoms in adult animals (≥4 years) in which rabies and other diseases causing neurological symptoms have been ruled out.

Laboratory criteria

Laboratory criteria rely on detecting pathognomonic neurodegeneration and disease-specific prion protein (PrP^{Sc}) in brain tissues by:

1- Immunohistochemical detection of PrP^{Sc} with L42 monoclonal antibodies
2- Western blot analysis of PrP^{Sc} from brain homogenates

Epidemiological criteria

- History of neurological signs in camels in the area.
- Animals coming from areas in which CPrD cases have been reported.

Case classification

It is still early for a formal case classification. The lack of solid data about the mean age of affected animals is one of the main problems. Nevertheless, a preliminary classification is required for the time being and can be refined gradually as knowledges progress.

1-Possible case: possible case of CPrD is any case with one of the following clinical signs:

a- Behavioral abnormalities including tendency to kick and bite
b- Nervous signs such as tremors, aggressiveness, hyperreactivity
c- Abnormal and excessive movement of the neck and head, hesitant and uncertain gait, ataxia of the hind limbs.
d- Three years old and over.

2-Probable case: any camel meeting the clinical criteria, over 3 years old and with epidemiological link to a known infected area.

3-Confirmed case: Any camel meeting the laboratory criteria for case confirmation whether it fulfil the clinical criteria or not.

Risk Factors of Camel prion disease:

Import risk factors

1. Import of dromedaries from infected areas.
2. Import of dromedaries products from infected areas.
3. Incursion of free-ranging infected dromedaries through permeable country borders.
4. Epidemiological situation of all animal TSEs in the country or zone.
5. Potential incursion of disease by importation of contaminated camels feed with meat and bone meal.
6. Potential incursion of disease by importation of infected live animals (camel, cattle, sheep, goats and cervids).

Risk factors within the country

1. Presence of susceptible animals.
2. Type of production system:

- ✓ Mixed flocks including (camel, cattle, sheep, goats and cervids) in the country or zone.
- ✓ Horizontal & vertical transmission by infected camels in farms.
- ✓ Extensive breeding systems with different dromedary herds sharing common pastures

3. Processing of animal waste in slaughterhouses and farms.
4. Absence of animal identification and traceability.

Risk factors for humans

1. Consumption of central nervous system from infected camels.
2. Consumption of other meat products from infected camels.

3. Biosafety guidelines:

4. The highest concentration of prions is found in the central nervous system (CNS), and caution must be exerted when handling CNS samples. In BSE-affected cattle, more than 90% prion infectivity is found in the CNS, while in sheep scrapie, prions are spread in the CSF, spleen/lymph nodes, lung, liver, kidney, placenta, etc. Very preliminary results in CPrD suggest similarities with sheep scrapie as respect to prion distribution.
5. Depending on the country, animal prions are classified in the risk class 2 or 3, with scrapie always included in class 2 and BSE in 2/3 or 3. Prions are, normally, not transmitted via respiratory route.
6. Risk assessment is required to work with prions and biosafety protocols need to be developed for both laboratory work and sampling activity in the field.
7. The main risks are wounds from cutting, inoculation or accidental ingestion. Personal protective equipment and ad hoc procedures need to be developed to minimize these risks.
8. Prions are resistant to chemicals and procedures traditionally used for decontaminating classical infectious agents. They are very resistant to chemical and physical agents and are very persistent in contaminated environments.

9. Therefore, working area for prions should be separated from other activities and frequently decontaminated. Instruments and other material should be dedicated to prions and left in the prion area.
10. Decontamination protocols suggest using solutions of NaOH 2N or NaClO with 20.000 ppm of active chlorine for the decontamination of laboratory surfaces, instruments, etc. Alternatively, heat-resistant materials can be submitted to autoclave with gravity replacement or steam input at 134 ° C for at least 30 min.

Capacity building and training of the laboratory staff and field veterinarians on CPrD:

In-country training courses on CPrD include:

1. Improving the capacity of Veterinarians in the fields to:

11. Learn on the causative agent and epidemiological features
12. Biosafety guidelines to protect both the personnel and the environment (biocontainment)
13. Perform active surveillance
14. Recognize suspected cases and clinically diagnose CPrD
15. Make differential diagnosis with other neurological diseases
16. Collect correct samples at post-mortem in slaughterhouses or other collection site (incinerator facility, farm), storage and transport to the lab.
17. Appropriate documentation by using Data Collection Form (Collection Site Type, Animal ID, sex, age, farm number, owner name, origin country if imported, clinical signs, any additional data, collector name, date of collection, date of submission ……)
18. Audiovisual aids for CPrD
19. Perform communication protocols
20. Preventive and Control measures

2. Building and strengthening existing capacities of laboratory diagnosis of CPrD:

- Complement laboratory equipment with necessary material, reagents and chemicals.
- Training laboratory personnel on safety and laboratory procedures to diagnose CPrD.

- Training of laboratory personnel on detection and confirmation tests for prion diseases approved by the World Organization for Animal Health (OIE), as well as the methods applied to the detection and confirmation of the CPrD in Algeria (1)

Most of these tests are based on the detection of pathognomonic neurodegeneration and disease-specific prion protein (PrP^{Sc}) in brain tissues and include:

1. Tests approved by OIE (3):

- Histopathological examination to detect pathological changes in brain tissue
- Methods of immunohistochemistry (IHC) to detect and confirm PrP^{Sc} using L42 monoclonal antibodies.
- Western blot analysis of PrP^{Sc} from brain homogenates for the confirmation purposes.
- ELISA for detection of PrP^{Sc} Ag from brain tissue.

2. Other test used for CPrD investigation:

a. PrP gene sequence analysis with prion primers (1,2).

N.B. Sequence analyses in prion diseases cannot be applied for diagnosis since prions are devoid of nucleic acid. However, PrP sequence analysis is important because in sheep, goat and deer, PRNP polymorphisms have a strong influence on prion susceptibility/resistance.

Epidemiological surveillance of CPrD

A. The active surveillance covers testing of two categories of camels:

1. Testing of all "at risk" animals, such as:

✓ Fallen Stock which have died or been killed, but not in the framework of an epidemic.

✓ Emergency slaughtered animals, 'down' dromedaries (any dromedary that is recumbent - lying down on chest or side and unable to stand unassisted), or animals with clinical nervous signs at the ante mortem inspection preceding slaughter.

2. Testing of risk animals ≥ 3 years old at slaughterhouses.

B. The passive surveillance consists of reports of suspected tested animals or during disease surveillance.

Coordinated Emergency Response:

Detection and reporting - Rapid case detection, efficient reporting to key contacts.

National coordination - Strategical operation plan with a strong command and control center, well identified key roles and efficient/effective communication.

Communicating with veterinary and food sector services as well as with public health sector - Access to and analysis of real-time data.

When capacity building is not available at national level, countries should build a regional capacity-sharing system.

Animal health management and Public health management - Involvement and participation of all stakeholders, including breeders' associations. Information and education is crucial.

Public information and the media - Providing a transparent information and establishing a strong emergency response system is key in improving the trust and tranquility of public.

Rapid and efficient communicating with OIE and international organizations also for possible foreign technical and economic support.

Risk communication and awareness

If Camel Prion disease is detected, the strategy will be to eradicate the disease as quickly as possible. Therefore, having a well-prepared risk communication plan as a part of the response plan is a very critical step.

The risk communication plan is a document that address who should know about the incident and what his/her responsibility/s, and what is the communication pathway. It is important to include in this plan all the personnel whom decisions are critical in the disease containment. Below are the key positions which should be included in this plan and it might differ from one country to another:

- Veterinarian
- Epidemiologist

- Pathologist
- Laboratories managers
- Animal Health manager
- Slaughterhouse manager
- Human healthcare representative
- Food market control and inspection representative
- Media representative

Those personnel are composing the response team who are responsible to:

- Measure all the relevant risks that correlate to the camel prion disease
- Draft the response plan, and discussed with the decision makers
- Lead the event and report back periodically to the decision makers
- Coordinate the internal and the external notifications

In parallel to this, communication with community is another task should be considered in term to minimize the unwanted and unforeseen social disruption and economic consequences, and to maximize the effective outcome of the response.

The community communication should include:

- Stakeholders: are Government organizations, Ministries, people or organizations that have special connections to the agency, the disease / event, affected members of the public, or the specific emergency. The role of the stakeholders during risk communication is:
    - To understand risk perception of their sector.
    - To identify issues from their sector that can enhance the risk of spread of the disease and aim at risk communication on these aspects.
    - To bring about safe behavior practices by risk communication: By education of their own community in risk identification and thereby risk reduction.
    - To consider application of control measures to their community for risk reduction of spread of disease.
    - To coordinate with other sectors in enhancing multi sectoral risk communication for the community.

- Partners: are agencies and groups who will be assisting in a response. Partners could be vaccine manufacturers, Pharmaceutical industry, people concerned with supply of drugs/ Logistics etc. They are expected:
    - To understand risk perception of community
    - To understand how the health sector is able to respond to the risk.
    - To identify issues from their sector that can reduce the risk of spread of the disease and aim at risk communication on these aspects. (drug delivery/ manufacture, logistic support etc.)
    - To strengthen the coping ability of the health system in reducing the risk. By support manpower, management of communication on community responsibility in reducing risk behavior which leads to disease spread)
    - By education of their own community in risk identification and thereby risk reduction.
    - To consider application of control measures to their community for risk reduction of spread of disease, health workers etc.
    - To coordinate with other sectors in enhancing risk communication for the community.

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