



Scrapie in Eastern Libya: Case Report in Sheep

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Abstract: Here we report neuropathological features of possible scrapie cases detected between 2018 and 2022. Fourteen cases of sheep older than two years, from several regions in Libya with neurological clinical signs resembling those with Scrapie, were submitted to the Veterinary Teaching Hospital at Omar Al-Mukhtar University, Al-Bayda, Libya. The animals were euthanized and subjected to postmortem examinations. Samples from different organs were submitted for histopathological examination using routine Hematoxylin and Eosin stain (HE). Nine cases showed neuronal vacuolation that is characteristic of Scrapie in sheep. Two cases were suspected of Scrapie and needed more advanced methods such as Immunohistochemistry (IHC) to confirm the diagnosis. The other three cases were diagnosed with Rabies, Listeria, and Echinococcus granulosus.

Keywords: Scrapie; Prion; Transmissible Spongiform Encephalopathy; Sheep; Libya.

INTRODUCTION

Transmissible Spongiform Encephalopathies (TSEs), or prion diseases, are a group of progressive neurodegenerative diseases that affect the central nervous system (CNS) of many animals and humans. Seventeen different types of prion diseases have been reported; nine in humans and eight in animals, as in Table (1). Scrapie is the oldest recorded prion disease. It has been known since 1732 in the UK, and the last described prion disease was in Camel in Dromedary, in Algeria, in 2018 (Babelhadj et al., 2018; Imran & Mahmood, 2011).

According to the World Organization for Animal Health (OIE), Scrapie is an infectious and notifiable disease that naturally affects both sheep and goats (Arnold & Rajanayagam, 2020; Greenwood, 2002; Konold et al., 2020).

The etiological agent of these diseases is an infectious protein called a prion that results in the conversion of the normal cellular prion protein (PrP^c) into a pathological isoform called pathological prion protein (PrP^{sc}) (Guijarro et al., 2020).

The name Scrapie is derived from one of the condition's symptoms, wherein the affected animals will compulsively scrape off their fleece against rocks, trees, or fences (Nair & Johnson, 2011). Scrapie can be transmitted between animals, either directly or via the environment (Cassmann & Greenlee, 2020).

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Table: (1). Prions disease in animals and human

Prions Diseases in Animals		
1.	Scrapie in sheep and goat.	(Sc)
2.	Bovine Spongiform Encephalopathy in cattle.	(BSE)
3.	Chronic Wasting Disease in cervides.	(CWD)
4.	Feline Spongiform Encephalopathy in cats.	(FSE)
5.	Transmissible Mink Encephalopathy in mink.	(TME)
6.	Exotic Ungulate Spongiform Encephalopathy in kudu & Nyala.	(EUE)
7.	TSE in Non-Human Primates in lemurs.	(NHP)
8.	Camel Prion Disease in Dromedary.	(CPD)
Prions Diseases In Humans		
1.	Sporadic Creutzfeldt-Jakob Disease.	(s CJD)
2.	Sporadic Fatal Insomnia.	(sFI)
3.	Variably Protease-Sensitive Prionopathy.	(VPSPr)
4.	Familial Creutzfeldt-Jakob Disease.	(FCJD)
5.	Gerstmann Sträussler Scheinker Syndrome.	(GGS)
6.	Fatal Familial Insomnia.	(FFI)
7.	Iatrogenic Creutzfeldt -Jakob Disease.	(iCJD)
8.	Variant Creutzfeldt Jakob Disease.	(vCFD)
9.	Kuru.	

The incubation period of scrapie is 2-5 years, and death occurs within two weeks to six months after clinical onset. Clinical symptoms may include behavioural changes, blindness, ataxia, incoordination, hyper-excitability, and tremors. Intense pruritus is the most common symptom, which usually leads to wool loss by rubbing and scraping. Scrapie is a slowly progressive disease with no inflammatory or immune response, which reduces the chances of early detection in affected animals.

Histopathological lesions are restricted mainly to the brain and skin (Saegerman et al., 2007). Neuropathological lesions are spongiform vacuolation, astrogliosis, and the deposition of PrP^{Sc} amyloid plaques in (CNS) (Imran & Mahmood, 2011).

There is no early diagnosis or specific therapeutic treatment (Chen et al., 2020; Llorens et al., 2018). Scrapie diagnosis is mainly based on observations of the typical clinical neurologic signs, while the confirmatory diagnosis depends on histopathological examination of the brain (Schreuder, 1994).

More sensitive methods for diagnosis involve the detection of the abnormal isoform of the prion protein PrP (PrP^{Sc} isoform) in the tissues using IHC and Western blot (WB) techniques (Fast & Groschup, 2013).

Recently, IHC and WB techniques had become of great importance since there was evidence that the Scrapie prion could be related to the Bovine Spongiform Encephalopathy (BSE), forming a variant that might affect humans. The importance of these sensitive techniques began after detecting this dangerous variant in infected goats (Farias et al., 2017 ; Monleon et al., 2005).

The true state of Scrapie in Libya is still unknown and neglected. Here we report the neuropathological features and the histopathological lesions of Scrapie cases detected between 2018 and 2022 in the eastern part of Libya.

CASE HISTORY

Between 2018 and 2022, fourteen cases of sheep older than two years, with clinical neurologic signs resembling those with Scrapie from several areas in eastern Libya, were presented to the Veterinary Teaching Hospital at Omar Al-Mukhtar University, Al-Bayda, Libya. The cases were fourteen ewes and one ram. The mean age of all fourteen cases was 3.5 years. Neurologic symptoms have been observed more often in older sheep at the antemortem examination. The clinical signs include weight loss; behavioral abnormalities; and neurologic signs, such as tremors, bruxism, repeated licking of the lips, typical down and upward movements of the

head, hesitant and uncertain gait, ataxia of the hind limbs, occasional falls, blindness, and bunny hopping. According to owners' descriptions, the early stage of the disease was characterized mainly by behavioral signs, such as loss of appetite and sensitivity to noise and movement. Also, separation from the herd at pastures coincided with the disease progression, and neurologic signs became obvious; animals showed ataxia that eventually led to recumbency and death. Owners reported that signs progressed slowly, and that the duration of the disease varied from one to three months, and some animals were found dead without any previous clinical signs.



Figure: (1). Scrapie affected sheep. (a) Two-year-old ewe, showing ataxia, weakness, and loss of body weight. (b) Scrapie affected sheep: Two year-old ewe showing loss of weight, wool, and incoordination of movement.

Post Mortem lesions:

There are no characteristic gross lesions in scrapie, although there may be nonspecific changes, such as wasting or emaciation, and

skin or wool lesions resulting from pruritus.

MATERIALS AND METHODS

Animal sources:

- Veterinary Teaching Hospital at Omar Al- Mukhtar University/Al-Bayda.
- Slaughterhouses.

Tissue samples: All vital organs of 14 sheep with clinical signs resembling those with Scrapie were collected and submitted to the veterinary pathology laboratory. Brain samples were taken from different parts, especially from the medulla oblongata at the level of the obex.

Samples were fixed in 10% neutral buffered formalin. These tissues were routinely processed through ascending grades of alcohol (70%, 80%, 95%, and 100%), cleared in xylene, and embedded in paraffin wax. The paraffin sections were cut into 4 to 5- μ thick, stained with routine hematoxylin and eosin stain, and examined under a light microscope.

RESULTS

The histopathologic examination of the brain in nine cases showed spongiform change (spongiosis), gliosis, and neuronal loss in several areas of the brain. The clearest vacuolations were found in the neurons in the dorsal motor nucleus of the vagus nerve in the brainstem. Mild perivascular infiltrations, and astrocytosis were observed in vacuolated areas.

Two cases were scrapie-suspect sheep but were not considered histologically as positive because they didn't show the characteristic neuronal vacuolization lesions of Scrapie. The remaining three cases were diagnosed positive for Rabies, Listeria, and Echinococcus granulosus.

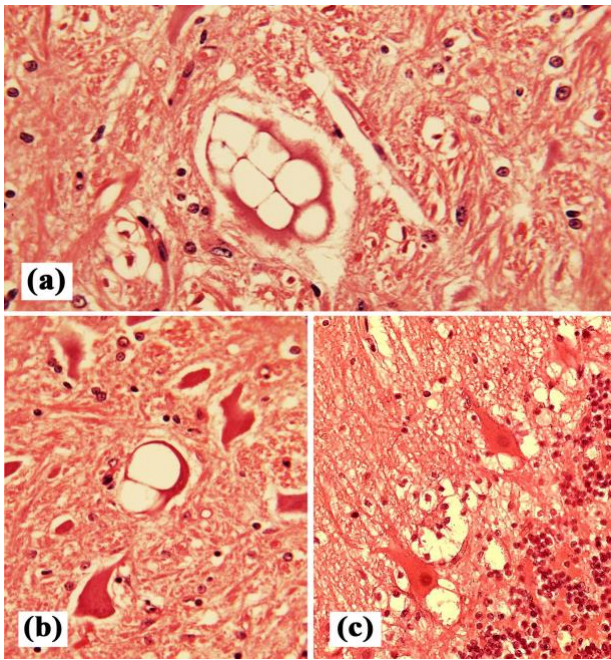


Figure: (2). Histopathology of Scrapie-infected sheep with clear signs of spongiform encephalopathy in the brainstem. Multiple vacuoles in the neurons of the dorsal motor nucleus of the vagus nerve (a) & (b). In some cases, cell damage was observed in the Purkinje cells layer of the cerebellum with intraneuronal and perineuronal vacuolations (c). (H&E staining, 400X).

DISCUSSION

No scientific research has been published so far on Scrapie in sheep in Libya. The disease was first reported by the Libyan national center for animal health in 2014, as reported on the OIE website (OIE, 2014).

This work indicates that Scrapie constitutes most cases (nine out of fourteen). The description of the situations of the disease in Libya was based only on these cases, and thus, it does not necessarily represent the actual epidemiological feature in Libya.

The presence of one case of Rabies made us more careful through collected samples. The cases of Listeriosis and Echinococcosis are usually detected by veterinarians and generally sent to slaughterhouses. Therefore, the presence of one case of Listeriosis and one case of Echinococcosis in our study do not represent the true prevalence of these diseases.

A positive diagnosis of Scrapie in sheep and goats depends on the observation of typical clinical neurologic signs and the finding of a combination of characteristic histologic lesions (Fast & Groschup, 2013). The characteristic vacuolar changes in the brain, with the typical neuroanatomic distribution, are pathognomonic, while the other histologic features of TSE, such as the presence of florid plaques, astrogliosis, and neuronal loss, can support the diagnosis of Scrapie but are not sufficient alone for diagnosis in the absence of the vacuolations. So, the diagnosis in such cases needs to be confirmed by the use of more sensitive methods, such as IHC (Monleon et al., 2005) or WB (Gavier-Widén et al., 2005) analysis.

According to the OIE, scrapie is the eighth cause of sheep and goat loss worldwide (Taranukha et al., 2020). It can cause severe economic damage to the sheep industry due to the nature of the disease with extraordinary properties of the agent and the disease, such as (a) long incubation periods (months, years, and even decades) that allows the silent spread of the disease; (b) resistance of the agent to high temperature; (c) resistance of the agent to most common disinfectants as well as the resistance to ultraviolet and ionizing radiation. All these properties and the lack of genetic material make rendering elusive regarding eradication and control of this disease. For those countries or regions in which the disease has become endemic, elimination efforts have spanned decades and, in most cases, have not been successful. The traits of the disease have been the primary cause of this lack of success.

Despite the little information that has been collected from the animal owners, we suggest that the disease has been present in different areas of Libya for a long time. Therefore, spreading awareness among sheep and goat breeders about this disease could be the most important measure used to control the disease in the future.

CONCLUSION

Scrapie exists in Libya and is widely distributed. If we exclude the other three cases of Rabies, Listeriosis, and Echinococcosis, nine of eleven Scrapie suspected cases were confirmed as Scrapie using the routine histopathology technique. That means the routine histopathology technique has a sensitivity of 82% for diagnosing Scrapie.

Other confirmatory methods such as IHC and WB are highly recommended to increase the sensitivity and to exclude the presence of the dangerous variant which can harm public health.

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Conflict of interest: The authors declare that they have no conflict of interest.

REFERENCES

- Arnold, M., & Rajanayagam, B. (2020). Will there be any more classical scrapie cases in sheep in Great Britain? A modelling study to predict future cases. *Epidemiology & Infection*, 148.
- Babelhadj, B., Di Bari, M. A., Pirisinu, L., Chiappini, B., Gaouar, S. B. S., Riccardi, G., . . . Vaccari, G. (2018). Prion disease in dromedary camels, Algeria. *Emerging infectious diseases*, 24(6), 1029.
- Cassmann, E. D., & Greenlee, J. J. (2020). Pathogenesis, detection, and control of scrapie in sheep. *American Journal of Veterinary Research*, 81(7), 600-614.
- Chen, C., Lv, Y., Hu, C., Xu, X.-F., Zhang, R.-Q., Xiao, K., . . . Shi, Q. (2020). Alternative complement pathway is activated in the brains of scrapie-infected rodents. *Medical microbiology and immunology*, 209(1), 81-94.
- Farias, G., Frohlich, E., Sanhueza, P., Jara, P., & Lecocq, C. (2017). Differential diagnosis of scrapie in post mortem goats by immuno histo chemistry. *Journal of Dairy, Veterinary and Animal Research*, 5(4), 121.
- Fast, C., & Groschup, M. H. (2013). Classical and atypical scrapie in sheep and goats. *Prions and Diseases*, 15-44.
- Gavier-Widén, D., Stack, M. J., Baron, T., Balachandran, A., & Simmons, M. (2005). Diagnosis of transmissible spongiform encephalopathies in animals: a review. *Journal of Veterinary Diagnostic Investigation*, 17(6), 509-527.
- Greenwood, P. (2002). Federal disease control—Scrapie. *The Canadian Veterinary Journal*, 43(8), 625.
- Guijarro, I. M., Garcés, M., Andrés-Benito, P., Marín, B., Otero, A., Barrio, T., . . . Monzón, M. (2020). Assessment of glial activation response in the progress of natural scrapie after chronic dexamethasone treatment. *International journal of molecular sciences*, 21(9), 3231.
- Imran, M., & Mahmood, S. (2011). An overview of animal prion diseases. *Virology journal*, 8(1), 1-8.
- Konold, T., Spiropoulos, J., Thorne, J., Phelan, L., Fothergill, L., Rajanayagam, B., . . . Coates, N. (2020). The scrapie prevalence in a goat herd is underestimated by using a rapid diagnostic test. *Frontiers in bioengineering and biotechnology*, 8, 164.

- Llorens, F., Barrio, T., Correia, Â., Villar-Piqué, A., Thüne, K., Lange, P., . . . Bolea, R. (2018). Cerebrospinal fluid prion disease biomarkers in pre-clinical and clinical naturally occurring scrapie. *Molecular neurobiology*, 55(11), 8586-8591.
- Monleon, E., Monzon, M., Hortells, P., Bolea, R., Acin, C., Vargas, F., & Badiola, J. (2005). Approaches to Scrapie diagnosis by applying immunohistochemistry and rapid tests on central nervous and lymphoreticular systems. *Journal of virological methods*, 125(2), 165-171.
- Nair, R. R., & Johnson, J. K. (2011). Prions and neuro degenerative diseases. *African Journal of Biotechnology*, 10(13), 2366-2374.
- Saegerman, C., Vanopdenbosch, E., & Berkvens, D. (2007). Current status of scrapie.
- Schreuder, B. (1994). Animal spongiform encephalopathies - an update part 1. Scrapie and lesser known animal spongiform encephalopathies. *Veterinary Quarterly*, 16(3), 174-181.
- Taranukha, N., Bezgina, Y., Fedota, N., Gorchakov, E., Ozheredova, N., Stepanenko, E., . . . Simonov, A. (2020). Ensuring food security and control of sheep and goat scrapie. E3S Web of Conferences,
- (OIE,2014)<https://wahis.oie.int/#/dashboards/country-or-disease-dashboard> (Accessed 8 Feb 2022).

سكريبي في شرق ليبيا: تقرير عن الحالات في الاغنام

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المستخلص: هنا نبلغ عن السمات المرضية العصبية لحالات مرض السكري المكتشفة بين عامي 2018 و2022. تم تقديم اربعة عشر حالة من الأغنام أكبر من عامين مع علامات سريريته تشبه تلك المصابة بمرض سكري من عدة مناطق في ليبيا إلى المستشفى البيطري التعليمي بجامعة عمر المختار / البيضاء. تم أخذ أجزاء مختلفة من الانسجة المختلفة بما فيها الدماغ من كل منها وفحصها نسيجياً باستخدام الصبغة الروتينية الهيماتوكسيلين والأيزون. أوضحت النتائج أن تسعة عينات أظهرت تغيرات في شكل فجوات بالخلايا العصبية والنسيج البيني في الدماغ وبالتالي تم تشخيصها نسيجياً على أنها مصابة بمرض سكري. حالتان لم يتم اعتبارهما إيجابيين من الناحية النسيجية لسكري بالفحص النسيجي المرضي الروتيني وتحتاجان إلى مزيد من الفحص بواسطة الكيمياء المناعية النسيجية، بينما تم تشخيص باقي الحالات الثلاثة من العينات بأن احداها مصابة بداء الكلب وواحدة بالليستريا والأخيرة بداء المشوكة الحبيبية.

الكلمات المفتاحية: سكريبي؛ برون؛ اعتلال الدماغ الإسفنجي؛ الأغنام؛ ليبيا.

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