

# The occurrence of maedi-visna virus in Lebanon

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## Summary

Maedi-visna (MV) is a chronic viral disease prevalent in adult sheep that is caused by a virus belonging to the small ruminant lentivirus group (SRLV). This disease is considered to affect the international trade of sheep and is classified in the World Organisation for Animal Health (OIE) list of notifiable animal diseases.

Although maedi-visna virus (MVV) has been detected in many countries, no study on its occurrence has been carried out in Lebanon. For this purpose, a serological survey of infection with MVV was conducted in seven of the eight Lebanese governorates using a competitive enzyme-linked immunosorbent assay (ELISA).

A total of 184 individual blood samples from sheep of the local breed 'Awassi', originating from 16 farms distributed throughout the seven Lebanese governorates, were collected and analysed. Among the 184 tested sheep, 131 sheep from the 16 farms visited were MVV positive. This presents a prevalence of 71% MVV-positive animals and 100% MVV-positive farms. The results indicate the need for further systematic investigations into the between-herd and within-herd prevalence of MV in Lebanon.

## Keywords

Lebanon – Maedi-visna – Serological survey – Sheep.

## Introduction

Maedi-visna (MV) is a contagious disease, mainly affecting sheep, that is caused by the maedi-visna virus (MVV), a retrovirus of the Lentivirus family belonging to the small ruminant lentivirus group (SRLV). The name of the disease is formed from two Icelandic words that describe two of the clinical signs it produces: 'maedi', a progressive pneumonia, and 'visna', a nervous form; the disease sometimes also causes mastitis and arthritis (1). The MVV is not transmissible to humans but the OIE must be notified because it affects the international trade of sheep (2). Currently, there is no vaccination or treatment that is effective against MVV (3).

With the exception of Australia and New Zealand, the disease is present in all countries and can cause important losses (4). The MVV is closely related to the caprine arthritis encephalitis virus (CAEV) that is adapted mainly to goats (5).

Although the approximate number of sheep in Mediterranean countries is 100 million, few studies have been made on the prevalence of MVV in this region and relevant data are rather scarce. Furthermore, for a number of countries such as Lebanon, Syria, Egypt and Algeria, studies on the occurrence of SRLV do not exist (6).

France is the only Mediterranean country that has national accreditation of MV-free flocks (6); this followed its first clinical detection and pathological confirmation of maedi cases in 1977 (7). France started the national MV accreditation programme in 1990. The programme involves two types of accreditation: i) certification for MV-free flocks to be exported to other countries, in which 'sheep of the flock older than one year must be blood tested'; and ii) certification of flocks for the internal market in France, where '50 sheep are tested randomly from the entire flock'. In 1997, a national MV sampling and testing of 915 flocks revealed 507 flocks certified as MV-free for exportation,

84 flocks certified as MV-free for the internal market and 324 flocks infected, among which 5 presented more than 10% MVV-seropositive sheep (6).

In Greece, MV was initially described in 1967 (8), appearing first in East Friesian sheep that had been imported from Germany. Some data showed that 17% of sheep in the Larissa region in central Greece had lesions in their lungs equivalent to signs of maedi. Sheep on the island of Crete were blood tested in 1994, indicating an MV herd-level prevalence of 33.5% (9). However, the MV prevalence in the isolated islands of the Aegean Sea was reported as 5.7% (10). In Spain, MV was first described in 1984 but a detailed distribution of the virus in the country has not been provided (11). Interestingly, one study suggests a very high MV herd prevalence in the north-east of Spain, where 97% of the sampled flocks were seropositive (12). In Italy, the herd prevalence of MV is also relatively high, as it can reach 90% of the flocks in some districts (13).

In Turkey, 324 sheep of various flocks were tested at slaughter, showing 4% of these animals to be seropositive (14). In Morocco in the early 1980s, of 13 flocks tested, 1 imported flock was MV positive (15). In Lebanon, there have been no studies to assess the real impact of MVV on sheep production. However, one study confirmed the presence of CAEV in Lebanese goats (5), leading the authors to investigate the presence of MVV in the Lebanese sheep population.

## Materials and methods

A total of 184 sheep above 12 months of age, belonging to 16 farms, were sampled. Farms were chosen randomly from seven of the eight Lebanese governorates: Lebanon South (three farms), Mount Lebanon (four farms), Lebanon North (two farms), Nabatiyeh (two farms), Bekaa (two farms), Baalbeck-Hermel (two farms) and Akkar (one farm). (The governorate of Beirut was not included in this study.) At least 10% of individuals were sampled from most flocks, but on farms with fewer than 20 animals samples were taken from all the sheep in the flock.

Blood samples for serological analysis were taken from the jugular vein under aseptic conditions. The animals were restrained to ensure that they remained in an upright position.

All samples were tested in triplicate for MVV antibodies using a commercially available direct enzyme-linked immunosorbent assay (ELISA) kit (cELISA:CHEKIT<sup>®</sup> CAEV/MVV, No.: FLI-B 424 version 06-40799-02; IDEXX, AG Laboratories, Switzerland). This competitive (c)ELISA kit uses 48-well microtitre plates coated with an inactivated viral antigen (+Ag).

A questionnaire was completed by the livestock producers in order to collect information on the herd size, production system, breed and other health and herd management parameters. These data will be analysed at a later date.

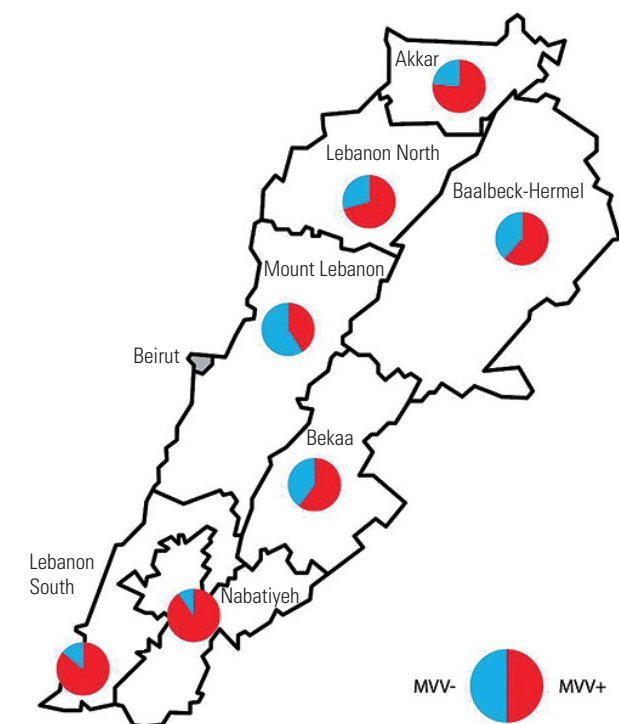
## Results and discussion

The results of the MVV ELISA tests (Table I) showed that 131 (standard deviation [sd] 27.3) of the 184 sheep were positive, representing an overall infection rate of 71.2%. Sheep that tested positive originated from all of the 16 farms included in the study. Therefore, the MV herd prevalence rate reached 100%.

**Table I**  
Occurrence of maedi-visna virus in Lebanon

Parameter	(n)	MVV ± (sd)
Number of sheep	184	131 (27.3)
MVV-infection rate (%)		71.2
Number of farms	16	16
MVV-infection rate at farm level (%)		100

MVV: maedi-visna virus  
sd: standard deviation



**Fig. 1**  
Maedi-visna prevalence in each of the seven governorates included in the study

The governorate of Beirut is shaded as it was not included in the study

**Table II**  
**Occurrence of maedi-visna virus on 16 farms in Lebanon**

Region	Governorate	Herd size (no.)	Samples (no.)	MV-seropositive (sd)	Within-herd prevalence (%)
Saida	LS	75	7	7 (0.7)	100
Tyr	LS	170	17	16 (1.4)	94
Jezzine	LS	84	8	5 (1.4)	63
Bent Jbeil	N	153	17	16 (1.4)	94
Marjeoun	N	96	9	8 (2.1)	89
Baabda	ML	14	9	3 (1.4)	33
Aley	ML	25	2	1 (0.7)	50
Keserwan	ML	13	8	5 (0.7)	63
Chouf	ML	86	9	4 (2.1)	44
West Bekaa	B	60	5	1 (1.4)	20
Zahle	B	148	15	11 (4.2)	73
Baalbeck	BH	173	17	11 (4.2)	65
Hermel	BH	187	18	11 (0.7)	61
Zgharta	LN	88	9	5 (2.8)	56
Koura	LN	168	17	14 (0.7)	82
Akkar	A	166	17	13 (1.4)	76
Mean		106.6	11.5	8.2	66.4

A: Akkar  
B: Bekaa  
BH: Baalbeck- Hermel

LS: Lebanon South  
LN: Lebanon North  
ML: Mount Lebanon

MV: maedi-visna  
N: Nabatiyeh  
sd: standard deviation

A relatively wide geographical variation was observed for the farms in the different Lebanese geographical regions, as outlined in Table II and Figure 1.

The results indicate that most Lebanese sheep flocks have probably been in contact with MVV. Throughout the sampling period severe clinical signs of MV were not observed, which may indicate that Lebanese sheep breeds have some form of natural protective immunity against MVV. In Lebanon, most sheep and

goats are kept at pasture day and night with only a shelter provided against extreme weather conditions. In addition, they are not protected against parasites or infections. The data from this study indicate relevant exposure of Lebanese sheep flocks to MVV and probably many more viral and other infectious diseases that need further investigation.

## Détection du virus maedi-visna au Liban

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### Résumé

Le maedi-visna (MV) est une maladie virale chronique causée par un virus appartenant au groupe des lentivirus des petits ruminants (SRLV) et affectant les moutons adultes. La maladie a une incidence sur les échanges internationaux d'ovins et figure sur la liste des maladies à déclaration obligatoire de l'Organisation mondiale de la santé animale (OIE).

La présence du virus maedi-visna est attestée dans de nombreux pays mais jusqu'à présent aucune étude ne lui avait été consacrée au Liban. Pour y remédier, une enquête sérologique recourant à une épreuve immuno-enzymatique (ELISA) par compétition a été conduite dans sept des huit gouvernorats du Liban afin de déterminer la prévalence de l'infection par le virus maedi-visna.

Au total, 184 échantillons sanguins prélevés sur des moutons de race locale (Awassi) originaires de 16 élevages répartis dans les sept gouvernorats ont été analysés. Des résultats positifs ont été obtenus sur 131 des 184 prélèvements ; tous les élevages étaient représentés. La prévalence est donc de 71 % à l'échelle des individus et de 100 % à l'échelle des élevages. Il ressort de ces résultats que la prévalence à l'intérieur des élevages ainsi que celle entre élevages devraient faire l'objet d'enquêtes systématiques plus poussées au Liban.

#### **Mots-clés**

Enquête sérologique – Liban – Maedi-visna – Mouton.



## Presencia del virus maedi-visna en el Líbano

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#### **Resumen**

El maedi-visna (MV) es una enfermedad viral crónica prevalente en ovejas adultas, cuyo agente etiológico es un virus del grupo de los lentivirus de los pequeños rumiantes. Figura en la lista de enfermedades de declaración obligatoria de la Organización Mundial de Sanidad Animal (OIE) porque se considera que afecta al comercio internacional de ovejas.

Aunque el virus maedi-visna (VMV) ha sido detectado en muchos países, nunca antes se había estudiado su presencia en el Líbano. Para ello se llevó a cabo un estudio serológico de la infección por el virus en siete de los ocho distritos administrativos del país mediante un ensayo inmunoenzimático (ELISA) de competición.

Se extrajeron y analizaron un total de 184 muestras sanguíneas de ovejas de la raza autóctona «awassi» procedentes de 16 explotaciones repartidas en los siete distritos libaneses. De esas 184 muestras, dieron resultado positivo para el VMV 131, correspondientes a ovejas de las 16 explotaciones visitadas. Ello supone una prevalencia del 71% de animales positivos al virus y del 100% de explotaciones positivas. Los resultados ponen de manifiesto la necesidad de investigar más sistemáticamente la prevalencia del maedi-visna entre los rebaños y dentro de los rebaños del Líbano.

#### **Palabras clave**

Estudio serológico – Líbano – Maedi-visna – Ovejas.



## References

- de la Concha-Bermejillo A. (1997). – Maedi-visna and ovine progressive pneumonia. *Vet. Clin. N. Am. (Food Anim. Pract.)*, **13** (1), 13–34. doi:10.1016/S0749-0720(15)30362-5.
- World Organisation for Animal Health (OIE) (2017). – OIE-listed diseases, infections and infestations in force in 2017. Available at: [www.oie.int/en/animal-health-in-the-world/oie-listed-diseases-2017/](http://www.oie.int/en/animal-health-in-the-world/oie-listed-diseases-2017/) (accessed on 20 February 2017).
- Pétursson G., Matthíasdóttir S., Svansson V., Andrésdóttir V., Georgsson G., Martin A.H., Agnarsdóttir G., Gísladóttir E., Árnadóttir S., Högnadóttir S., Jónsson S.R., Andrésón O.S. & Torsteinsdóttir S. (2005). – Mucosal vaccination with an attenuated maedi-visna virus clone. *Vaccine*, **23** (24), 3223–3228. doi:10.1016/j.vaccine.2004.11.074.
- Pépin M., Vitu C., Russo P., Mornex J.-F. & Peterhans E. (1998). – Maedi-visna virus infection in sheep: a review. *Vet. Res.*, **29** (3–4), 341–367. Available at: <https://hal.archives-ouvertes.fr/hal-00902532/document> (accessed on 11 July 2017).
- Tabet E., Hosri C. & Abi-Rizk A. (2015). – Caprine arthritis encephalitis virus: prevalence and risk factors in Lebanon. *Rev. Sci. Tech. Off. Int. Epiz.*, **34** (3), 915–921. doi:10.20506/rst.34.3.2405.
- Christodoulopoulos G. (2006). – Maedi-visna: clinical review and short reference on the disease status in the Mediterranean countries. *Small Rum. Res.*, **62** (1–2), 47–53. doi:10.1016/j.smallrumres.2005.07.046.
- Savey M., Espinasse J. & Parodi A.L. (1981). – Maedi: clinical disease and pathological confirmation in France. *Vet. Rec.*, **109** (3), 65. doi:10.1136/vr.109.3.65-a.
- Bizaki A., Katsavelis C. & Sbokou I. (1993). – Serological investigation of sheep progressive pneumonia in the region of Iraklion Crete. In Proc. 6th Greek Veterinary Congress, Athens, Greece, 72.
- Minas A., Koutsoukou-Hartona E., Papasavas M. & Tsantas H. (1994). – Survey of sheep and goat flocks of North Sporades for the presence of paratuberculosis and maedi-visna. *Bull. Hellen. Vet. Med. Soc.*, **45**, 25–30.
- Varea R., Monleón E., Pacheco C., Luján L., Bolea R., Vargas M.A., van Eynde G., Saman E., Dickson L., Harkiss G., Amorena B. & Badiola J.J. (2001). – Early detection of maedi-visna (ovine progressive pneumonia) virus seroconversion in field sheep samples. *J. Vet. Diagn. Invest.*, **13** (4), 301–307. doi:10.1177/104063870101300404.
- Lujan L., García M.J., Fernández D.L.D., Vargas A., & Badiola J.J. (1991). – Pathological changes in the lungs and mammary glands of sheep and their relationship with maedi-visna infection. *Vet. Rec.*, **129** (3), 51–54. doi: 10.1136/vr.129.3.51.
- Pérez M., Biescas E., de Andrés X., Leginagoikoa I., Salazar E., Berriatua E., Reina R., Bolea R., de Andrés D., Juste R.A., Cancer J., Gracia J., Amorena B., Badiola J.J. & Luján L. (2010). – Visna/maedi virus serology in sheep: survey, risk factors and implementation of a successful control programme in Aragón (Spain). *Vet. J.*, **186** (2), 221–225. doi:10.1016/j.tvjl.2009.07.031.
- Tolari F. (2000). – Maedi visna ovina: eziologia, diagnosi, prevenzione e risanamento. *Summa*, **17** (Suppl. 8), S23–S25.
- Yilmaz H., Gurel A., Turan N., Bilal T., Kuscü B., Dawson M.M. & Morgan K.L. (2002). – Abattoir study of maedi-visna virus infection in Turkey. *Vet. Rec.*, **151** (12), 358–360. doi:10.1136/vr.151.12.358.
- Mahin L., Chadli M. & Houwers D.J. (1984). – A preliminary report on the occurrence of maedi-visna in sheep in Morocco. *Vet. Q.*, **6** (2), 104. doi:10.1080/01652176.1984.9693921.

