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Impact of flock segregation according to the Maedi-Visna status on reproduction and lamb rearing – a field study in Mecklenburg-Vorpommern

Der Effekt einer Herdentrennung nach Maedi-Visna Status auf Reproduktion und Lämmeraufzucht – eine Feldstudie in Mecklenburg-Vorpommern

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Summary

The chronic infection with the Maedi-Visna virus, a small ruminant lentivirus (SRLV) poses a substantial risk for herd health in sheep. A representative SRLV screening in Mecklenburg-Vorpommern in 2009 revealed an average serological prevalence of 51.2% of herds and an average prevalence of 28,8 % within infected herds.

Based on these results the effect of the infection on selected herd parameters was investigated through segregation of Maedi-Visna positive and negative individuals at a study farm involving a total of 249 ewes. The results of our field study illustrate the serious impact of SRLV infection on the age of ewes in general and number of pregnancies in particular, on lamb rearing as well as lamb weight development post partum. Against the backdrop of a high SRLV prevalence level in the country's sheep flocks, farmers are called upon to adhere to the state guidelines for the voluntary Maedi-Visna scheme. In this context it is necessary to emphasize the need to revise animal health legislation with regards to Maedi-Visna in sheep as well as Caprine Arthritis Encephalitis in goats, which is currently at the expense of sheep farms already participating in SRLV screening programs.

Keywords: Maedi-Visna, sheep

Zusammenfassung

Die chronisch verlaufende Infektion mit dem Maedi-Visna-Virus, ein Lentivirus des Kleinen Wiederkäuers (small ruminant lentivirus; SRLV) ist ein substanzielles Risiko für die Herdengesundheit bei Schafen. Ein repräsentatives SRLV-Screening in Mecklenburg-Vorpommern im Jahr 2009 ergab eine durchschnittliche serologische Herdenprävalenz von 51,2 % und eine durchschnittliche Einzeltierprävalenz in infizierten Betrieben von 28,8 %.

Aufbauend auf diesen Ergebnissen war es das Ziel, den Effekt der Infektion auf die Wirtschaftlichkeit an ausgewählten Herdenparametern zu prüfen. Zu diesem Zweck erfolgte eine Teilherdenbildung auf der Grundlage serologisch positiver bzw. negativer Einzeltierbefunde in einem Schafbestand unter Einbeziehung von insgesamt 249 Mutterschafen. Die Ergebnisse unserer Feldstudie verdeutlichen den gravierenden Einfluss der SRLV-Infektion auf die Wirtschaftlichkeit im Versuchsbetrieb. Die Zahl von Trächtigkeiten als auch die Lämmerverluste sowie die Gewichtsentwicklung der Lämmer post partum sind mit dem Maedi-Visna-Status der Muttertiere assoziiert. Vor dem Hintergrund des hohen SRLV-Durchseuchungsgrades in den Schafbeständen des Landes sind diese aufgerufen, die Landesrichtlinie zur freiwilligen Sanierung von Schafbeständen auf Maedi-Visna und die damit verbundenen Beihilferegulungen in Anspruch zu nehmen. In diesem Zusammenhang ist die Notwendigkeit einer Novellierung tierseuchenrechtlicher Bestimmungen hinsichtlich Maedi-Visna bei Schafen als auch der Caprinen Arthritis-Encephalitis bei Ziegen zu betonen, welche derzeit zu Lasten SRLV-untersuchender Betriebe greifen.

Schlüsselwörter: Maedi-Visna, Schaf

Background

Results of a SRLV screening (Hüttner et al., 2010) revealed an average serological herd prevalence of 51.2% and an average within-herd prevalence of 28.8% in infected herds. Out of 41 sheep farms participating in this screening, a professionally managed organic farm of 400 blackface sheep on the island of Usedom was selected for investigations into the efficacy of SRLV control measures. Sufficient pasture and stable areas existed for an effective separation of SRLV-positive and negative individuals. The SRLV prevalence at the initial point added up to 26%. Testing intervals and SRLV control measures were applied according to Maedi-Visna guidelines of the sheep & goat society M-V (http://www.schafzucht-mv.de/fileadmin/pdf/RL_MV_10-04-10.pdf).

Field trials commenced in January 2010. They included 249 ewes born between the years 2001–2011 and their 1012 offspring produced by 684 lambings between 2002–2013. All animals of the SRLV-negative herd were blood tested half yearly using IDEXX ELISA (IDEXX GmbH, Ludwigsburg, Germany). Animals with SRLV positive or inconclusive test results were slaughtered. Additional investigations into diseased animals as well as feedstuffs were initiated in order to pinpoint or minimize distorting effects on SRLV control. Animal data are summarized in Table 1.

Apart from lambing also stillbirths, mortalities and weights were recorded. Data collection was carried out using BelExpert®. The statistical analyses were performed using SPSS for Windows version 21 (SPSS Inc., Chicago, Illinois, USA). Test & cull was carried out between January 2010 and September 2011 in half yearly intervals which finally led to a certified Maedi-Visna status of the very farm in the year 2014.

TABLE 1: Study population and animal data according to Maedi-Visna status

MV-status	Σ ewes	Σ pregnancies	Σ lambs	Σ lambs (male)	Σ lambs (female)	Σ lambs (unknown sex)	Σ stillbirth	Σ lambs dead
neg	207	600	892	356	147	389	160	131
pos	42	84	120	49	30	41	37	34
total	249	684	1012	405	177	430	197	165

Results

Number of pregnancies vs. SRLV status

Looking at the number of pregnancies of SRLV positive and negative ewes it shows that 48.8% of positive ewes gave birth only once, while just 17.4% of negative ewes rendered solely one pregnancy (Fig. 1).

Lamb rearing rate vs. SRLV status

Statistical analysis of none-normal distributed lamb rearing rates less the stillborn and pre-weaning mortalities revealed highly significant differences between negative (median/mean rank: 1,0/133,9) and positive (0,7/78,2) ewes (Mann-Whitney U, 2381,5, p-value: 0.000) as illustrated in Figure 2.

Lamb weights vs. SRLV status

The analysis of the normal distributed weight data is shown in Table 2.

Noticeably birth weights of lambs in either SRLV status group do not differ. However, mean lamb weights at 14 days post partum between positive and negative ewes show marginal significant differences. Due to lack of

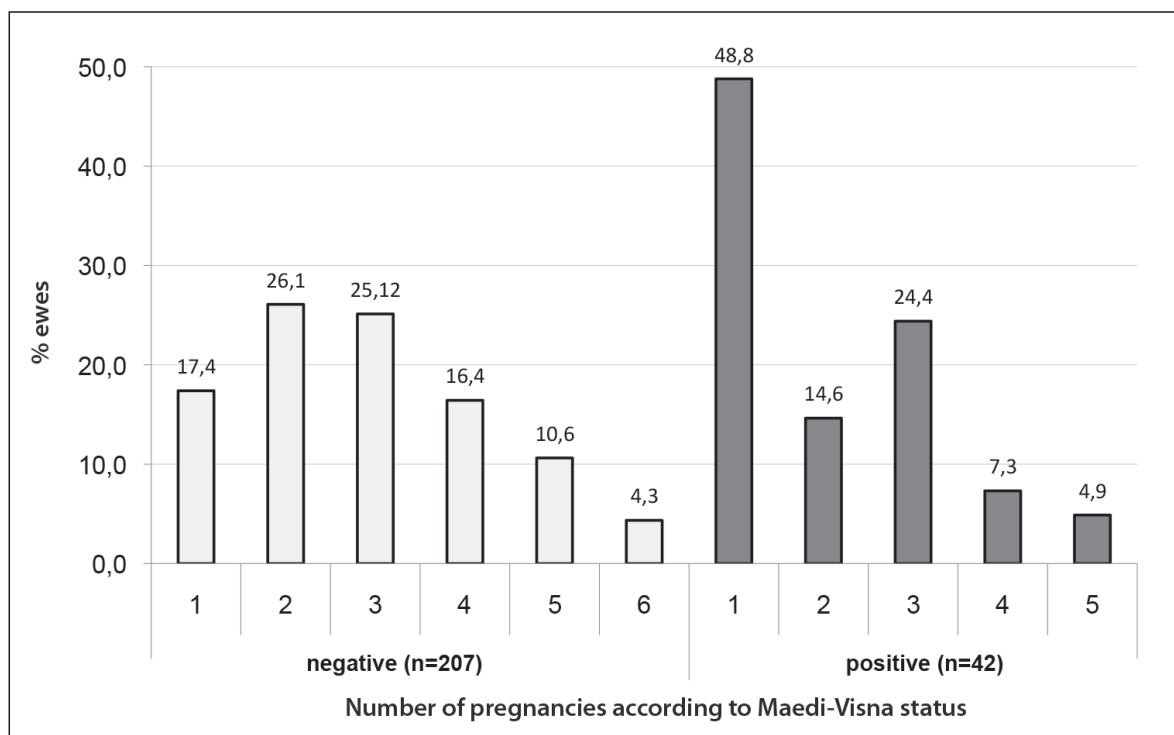


FIGURE 1: Percentage of ewes reflecting their number of pregnancies according to Maedi-Visna status

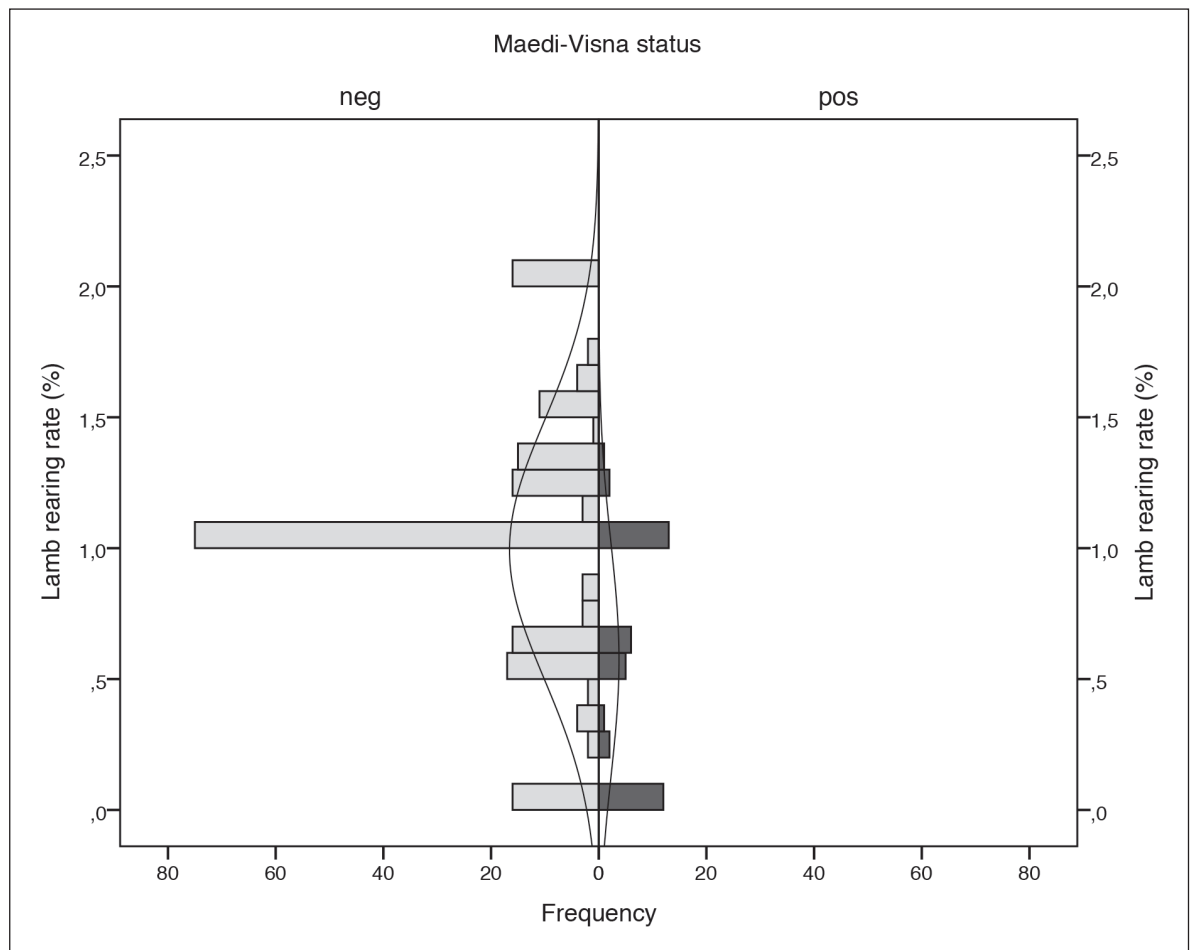


FIGURE 2: Pre-weaning rearing rate of ewes according to their positive (n = 42) and negative (n = 207) Maedi-Visna status

data for lambs of positive ewes at weaning no reasonable deductions could be drawn. Overall, the mean weight of lambs at different measurements on average is higher in negative compared to positive ewes.

Discussion

SRLV eradication by means of serological segregation can be achieved through considerably less effort compared to the control of other infectious diseases such as paratuberculosis or foot rot. Given a disciplined herd management and close herd monitoring this will lead to an efficient SRLV eradication as several authors have reported (Graber and Ganter, 2005; Reina et al., 2009; Perez et al., 2013). However, studies on the effect of MVV

control on herd productivity are rather limited. Subclinical SRLV-infection can be a gateway for a range of serious herd health problems (Behrens, 1987). SRLV commonly coincides with diarrhea, lung disorder, internal parasites, poor body condition and reproductive performance of different causal origin (Peterhans et al., 2004). Benavides et al. (2013) investigated two highly infected dairy flocks and found severe lesions associated with SRLV in 52% and 80% of the sheep, respectively, affecting lungs, brain and/or mammary glands. In one of the flocks 70% of animals died or were culled because of neurological symptoms. In our study 48,8% of Maedi-Visna positive ewes achieved only one pregnancy while just 17,4% of negative ewes rendered solely one parturition during their life span, thus illustrating a decrease in average age of ewes through SRLV infection. Arsenault et al. (2003)

studied the impact of SRLV on sheep production in 29 commercial flocks in Canada. They found a decrease in weaning weight of 0.94 kg per lamb raised by seropositive ewes > 4 years of age, while seropositivity in ewes of any age was associated with an increase in 0–30 days lamb-mortality. These findings agree with our results, whereby the mean weight of lambs is higher in negative compared to positive ewes. Moreover, lamb rearing rates as an equivalent to survival showed highly significant differences between negative and positive ewes.

TABLE 2: Lamb weights at different measurements according to Maedi-Visna status of ewes

weight (kg)	descriptive data						one-way ANOVA				
	MV-status	n	mean	sdv*	min.	max.	sum of squares	df*	mean square	F*	p-Wert
at birth	neg	180	5,8	1,1	3,2	9,2	0,0	1	0,0	0,018	0,895
	pos	15	5,8	1,6	3,0	8,3					
at 14d p.p.	neg	161	13,5	3,0	8,3	23,5	31,9	1	31,9	3,666	0,057
	pos	12	11,8	2,9	8,3	17,6					
at weaning	neg	73	28,7	6,8	10,4	47,5	15,4	1	15,4	0,337	0,563
	pos	4	26,7	5,4	23,1	34,5					

* sdv: standard deviation; df: degree of freedom, F: F-value for variance estimations

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Conflict of interest

The authors declare that there are no protected, financial, occupational or other personal interests in a product, service and/or a company which could influence the content or opinions presented in the manuscript.

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