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Short communication/Kurzmitteilung

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Effect of *Map*-vaccination in ewes on body condition score, weight and *Map*-shedding

Der Effekt einer Map-Vakzinierung auf Kondition, Gewicht und Map-Ausscheidung von Mutterschafen

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Summary

Vaccination against *Mycobacterium avium* subspecies *paratuberculosis* (*Map*) in sheep receives growing attention worldwide, particularly in countries with national *Map* control strategies. A field study was conducted, investigating the effect of GUDAIR® on body condition, weight and *Map*-shedding in a professionally managed but largely *Map*-affected suffolk flock prior and after vaccination. For this, 80 ewes out of 1000 animals were randomly sampled. In the univariate analysis body condition scores of ewes twelve months after vaccination improved significantly compared to those sampled prior to vaccination. At the same time the rate of ewes shedding *Map* was reduced by 37%.

Keywords: ovine johne's disease, sheep, vaccination, Mecklenburg-Vorpommern

Zusammenfassung

Impfmaßnahmen gegen die Paratuberkulose in Schafbeständen erfahren in Abhängigkeit von nationalen Strategien weltweit zunehmendes Interesse. Im Rahmen einer Feldstudie wurde in einem professionell geführten, jedoch stark von *Map* betroffenen Suffolkbestand mit 1000 Tieren der Effekt einer Impfung mit GUDAIR® auf Kondition, Gewicht und Erregerausscheidung von jeweils 80 zufällig selektierten Muttertieren geprüft. In der univariaten Analyse zeigten die Mutterschafe ein Jahr nach Impfung signifikant verbesserte Werte und eine um 37 % reduzierte Zahl von *Map*-Ausscheidern.

Schlüsselwörter: Paratuberkulose, Schafe, Vakzinierung, Mecklenburg-Vorpommern

Introduction, Material and Methods

Sound international data on *Map* flock-prevalence levels in sheep are scarce (Nielsen and Toft, 2009), making a precise assessment of ovine johne's disease (OJD) as a herd health risk factor at the regional or national level difficult. However, data on the use of vaccination for control of *Map* in sheep and goat enterprises are available from around the globe as reviewed comprehensively by Batista and Juste (2011). Given this, OJD is obviously a health concern for many regions which deserves adequate attention. In the federal State of Mecklenburg-Vorpommern, 4900 farms keep about 126 000 sheep, among them are about 135 purebred farms.

In 2009, clinical and diagnostic findings at a well managed suffolk farm keeping 1000 animals pinpointed *Map* as the major cause for serious herd health problems. Annual mortalities in ewes developed from 6.2 to 9.5% between 2003 and 2008. Post mortem examination of four fallen ewes revealed diffuse lymphocytic granulomatous enteritis and histopathological lesions consistent with paratuberculosis in all but one animal. *Map* was detected in the faeces by PCR in all animals examined.

With this background a field study was designed to look into the metaphylactic effect of *Map*-vaccination on body condition and herd health using GUDAIRÒ (http://www.czveterinaria.com/), an inactivated vaccine containing strain 316F. 80 clinically healthy ewes were randomly selected for sampling of blood and faeces prior to, four weeks and twelve months after vaccination, respectively, for evaluation of the effect of immunization on *Map*-shedding and *Map*-seroconversion. Serology was performed using ELISA CATTLETYPE® MAP Ab, manufactured by Labordiagnostics Leipzig (http://www.lab-leipzig.de/). Nucleid acid was extracted using NucleoSpin® Soil manufactured by Macherey-Nagel (http://www.mn-net.com/) through quantitative real time polymerase chain reaction (PCR) used as an inhouse-method targeting sequence IS900 (84bp) based on Khare et al. (2004). Moreover, measurement of weight and body condition (BCS) were carried out on two occasions, prior to and twelve months after vaccination. The BCS estimates the level of muscling and fat deposition over and around the vertebrae in the loin region on a scale from 1–5 (Thompson and Meyer, 1994).

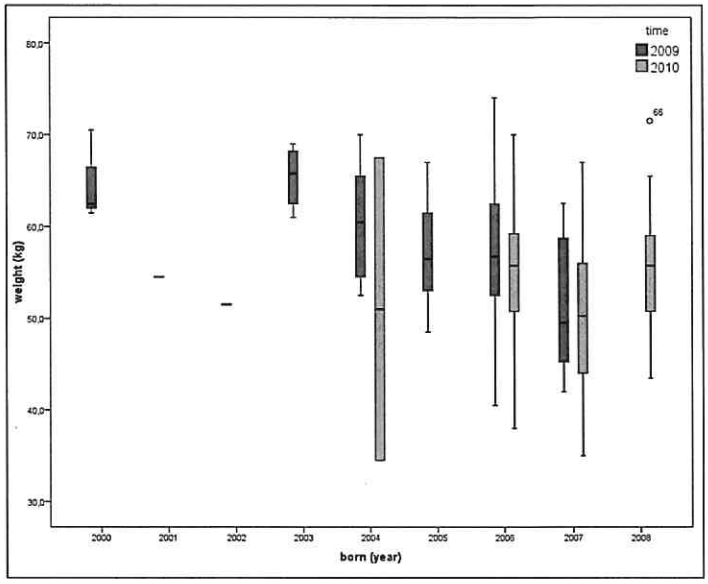

FIGURE 1: *Boxplot illustrating age and weight distribution of sampled ewes according to time of measurement.*

Data were stored using Microsoft ACCESS 2006 (Microsoft Corporation, USA). The statistical analyses were performed using NCSS 2000 (Number Cruncher Statistical Software, USA and SPSS for Windows version 16 (SPSS Inc., USA). The Kruskal-Wallis test procedure was used to compare medians of ranks prior to and after vaccination (Montgomery, 2005). P-levels ≤ 0.05 were considered significant.

Results and Discussion

Given 20% of *Map* shedding ewes and 47.5% serological reactors prior to vaccination as shown in Table 1, the initial diagnostic screening suggested OJD as causal for a declining herd health situation. The humoral responses four weeks after vaccination in vaccinated and likely yet not *Map*-infected ewes induced an antibody coverage of 98.8% which agrees with other authors (García-Pariente et al., 2004; Nedrow et al., 2007). Our findings also showed, that faecal shedding of *Map* decreased by 37% one year after vaccination. Reddacliff et al. (2006) reported a reduced prevalence of shedders among vaccinates by about 90% while Gollan et al. (2010) modified these findings, indicating an approximately 50% reduction in shedding in flocks three years after vaccination. Batista and Juste (2011) state a quantitative reduction in *Map*-isolation between 11% and over 50%.

Our data on the effect of *Map*-vaccination on body condition are summarized in Table 2. The overall score in vaccinated ewes comes to 2.8 compared to 2.3 in unvaccinated ewes which is significantly different ($p < 0.000$). This agrees with Reddacliff (2005), who reported that subclinically infected sheep had lower condition scores than uninfected sheep between 18 and 42 months post vaccination. The author found no statistical differences in weight or condition score due to *Map* infection status.

TABLE 1: *Results of diagnostic screening prior to and after vaccination*

Time of sampling	Material	Ewes (n)	Neg. (n)	Pos. (n)	Pos. (%)
Prior to vacc.	blood	80	44	38	47.5
	faeces	80	64	16	20
4 weeks after vacc.	blood	80	1	79	98.8
	faeces	48*	38	10	20.8
12 months after vacc.	blood	65	2	63	96.9
	faeces	79	69	10	12.7

* Yarding of sheep for prolonged periods resulted in many sheep having defecated, making sampling impossible.

TABLE 2: *Body condition scores (BCS) and weight prior to and after flock vaccination*

Time	Ewes (n)	ø Age (years)	ø Weight (kg)	Weight (sd)	BCS medians (s.error) I Proc. spinosus	II Proc. transversus	III Eye muscle/ fat cover	Kruskal-Wallis test I-III Median (s. error)	df	χ^2	p-value
2009	80	4.0	57.9	6.9	3.0 (1.5)	3.5 (1.6)	3.0 (1.5)	2.3 (1.5)	1	13.7	.000
2010	80	3.5	53.0	10.0	4.0 (1.5)	4.0 (1.6)	2.5 (1.5)	2.8 (1.5)			

However, despite improved overall scores in our study, unvaccinated ewes had higher average weights (57.9 kg) as compared to vaccinated animals (53.0 kg). This effect originates from a higher proportion of older ewes in the unvaccinated group as illustrated in Figure 1. In addition to diagnostic and clinical findings, the adult mortality rate declined for the first time since 2003 from 9.5% to 8.4%. Besides this, the herd manager reported an alteration towards dark-black faeces in most adult animals for three days after vaccination and vaccine injection site lesions in more than 70% of the animals.

Thus, a general positive effect from vaccination for *Map*-affected flocks can be derived from our data, which agrees with Batista and Juste (2011) who considered positive production, epidemiological or pathogenetic effects of *Map*-vaccination in ruminants in their review. However, there is a worldwide need for effective *Map*-vaccines that do not hinder the control of tuberculosis in farmed animals (Benedictus, 2005), since sensitisation with *Map*-vaccines causes interference with immunological tests used for the diagnosis of natural *Map* infection and tuberculosis due to *M. bovis* infection.

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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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