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VACCINATION AGAINST RINGWORM OF CALVES IN SPECIALIZED BEEF PRODUCTION

By

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TÖRNQUIST, M., P. H. BENDIXEN and B. PEHRSON: *Vaccination against ringworm of calves in specialized beef production.* Acta vet. scand. 1985, *26*, 21—29. — To evaluate the effect of vaccination with a Russian live vaccine (LTF 130) against ringworm in specialized beef production, half of the calves on 3 farms were vaccinated on arrival with 5 ml. A booster vaccination was given 2 weeks later. Statistically significant protection was achieved only on 1 of these farms. When the vaccine dose was increased to 2×10 ml on 2 farms, a statistically and biologically significant preventive effect was recorded at both.

trichophytosis; field-trials.

In specialized beef production in Sweden 3—7 week-old calves are purchased from dairy herds over a period of 1 to 2 weeks. The calves spend the first 2 months in single boxes or in small groups in the receiving unit. They are then moved to the fattening unit, where 10 or more calves are kept together in each box. This mingling of animals, with varying experience with regard to microbial exposure, favours the occurrence and spread of a number of contagious diseases. Ringworm infections are widespread in this production system, with a peak incidence during the first couple of months (*Törnquist* unpublished).

In dairy herds vaccination of calves against ringworm has been reported to yield satisfactory protection (*Aamodt et al.* 1982, *Pehrson & Törnquist* 1983, *Sarkisov et al.* 1983). In an experiment 3 vaccinated calves were immune, whereas 3 unvaccinated controls developed ringworm after the introduction of 1 infected pen mate (*Naess & Sandvik* 1981). No information is available from field trials evaluating the effect of vaccination in specialized beef production. This paper presents the results from 5 trials on farms, where ringworm infections regularly occur.

MATERIAL AND METHODS

Animals

Male calves of Swedish Red and White and Swedish Friesian breed, were sold by dairy farmers and distributed through the local livestock mediation service at an age of 3—7 weeks. Two calves had small ringworm lesions, while the rest, 397 animals, showed no clinical signs of ringworm at the time of purchase. The calves were allocated to the vaccinated and unvaccinated groups by randomization, with allowances necessitated by the purchase procedure. The 2 animals with ringworm were left unvaccinated and excluded from the incidence estimations. Vaccinated calves and unvaccinated controls were kept separately for 8 weeks in the receiving units. After transfer to the fattening units the groups were mixed.

Vaccination procedure

A Russian live vaccine against Trichophytum verrucosum (LTF 130) was used. Vaccination was performed according to the recommendations of the manufacturer (5 ml intramuscularly) within the first week after arrival. A second vaccination (5 ml) was given 2 weeks later. Due to the limited effect in the first trials the vaccine dose was doubled (2×10 ml) after consulting the manufacturer.

Farms

Two trials were made on farm A. In the first, 40 calves were vaccinated with 2×5 ml and 47 unvaccinated calves served as controls. In the second trial 50 animals were vaccinated with 2×10 ml and 37 were left unvaccinated. On farm B, 22 calves were vaccinated (2×5 ml) and 9 unvaccinated. On farm C each group consisted of 39 animals. The vaccine dose was 2×5 ml. On farm D, 47 calves were vaccinated with 2×10 ml and 69 were unvaccinated.

Clinical examinations

The animals were examined in the fattening units on 2 or 3 occasions. They were classified as free from ringworm or infected, using a 3 grade scale (Grade 1: few, small lesions; grade 2: numerous lesions; grade 3: large confluent areas).

Analytical methods

The epidemiological measures were calculated using the following formulas (*Kleinbaum et al.* 1982):

$$\text{Point prevalence (P)} = \frac{C}{N},$$

where C is the number of animals with ringworm lesions at the time of examination and N is the number of animals in the examined group.

$$\text{Cumulative incidence (CI)} = \frac{I}{N_o - (W / 2)},$$

where I is the number of animals developing lesions during the observation period, N_o is the number of animals without lesions at the beginning of the observation period and W the number of animals lost to observation during the period.

$$\text{Relative risk (R.R.)} = \frac{CI_v}{CI_{un}},$$

where CI_v is the cumulative incidence for vaccinated animals during the entire observation period and CI_{un} is the cumulative incidence for unvaccinated animals during the entire observation period.

$$\text{The estimated number of prevented cases} = \frac{I^* \text{ (PF)}}{1 - PF},$$

where I^* is the number of infected animals in the herd during the entire observation period, irrespective of vaccine status, and

$$\text{Prevented fraction (PF)} = 1 - \frac{CI_h}{CI_{un}},$$

where CI_h is the cumulative herd incidence for the entire period, when using the above formula for all animals in the herd, irrespective of vaccine status.

Statistical differences between proportions of animals with ringworm lesions in the vaccinated and unvaccinated groups were analysed by χ^2 testing. Calves with lesions at one or more examinations were calculated as infected, calves lost to observation were assigned the value of half an uninfected animal.

RESULTS AND DISCUSSION

No adverse effects from vaccination were observed apart from a few small local reactions at the site of injection.

Vaccination of 46 %, 71 % and 50 % of the animals on farms A, B and C with 2×5 ml resulted in a significantly lower number of vaccinated animals developing ringworm on farm A only. On this farm (Fig. 1) the cumulative incidence of the unvaccinated group first rose and then declined as the majority of animals became lightly infected during the first observation periods. Most animals recovered and few unaffected developed lesions during the last observation period as shown by the low point prevalence and cumulative incidence rates at the final examination of this group. In the vaccinated group the infection spread at a slower rate, but the animals developed more severe lesions. Thus vaccination seems to have delayed rather than prevented transmission of disease within the observation period on farm A.

On farm B (Fig. 2) all unvaccinated animals developed ringworm during the first observation period (cumulative incidence = 100 %) and all recovered during the following period (point

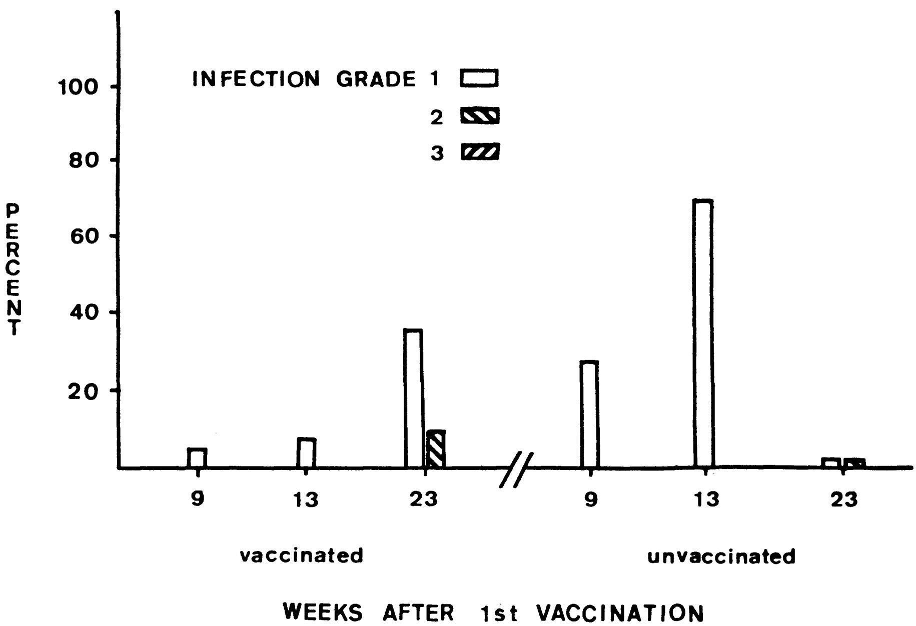

Figure 1. Point prevalences of vaccinated (2×5 ml) and unvaccinated calves on farm A.

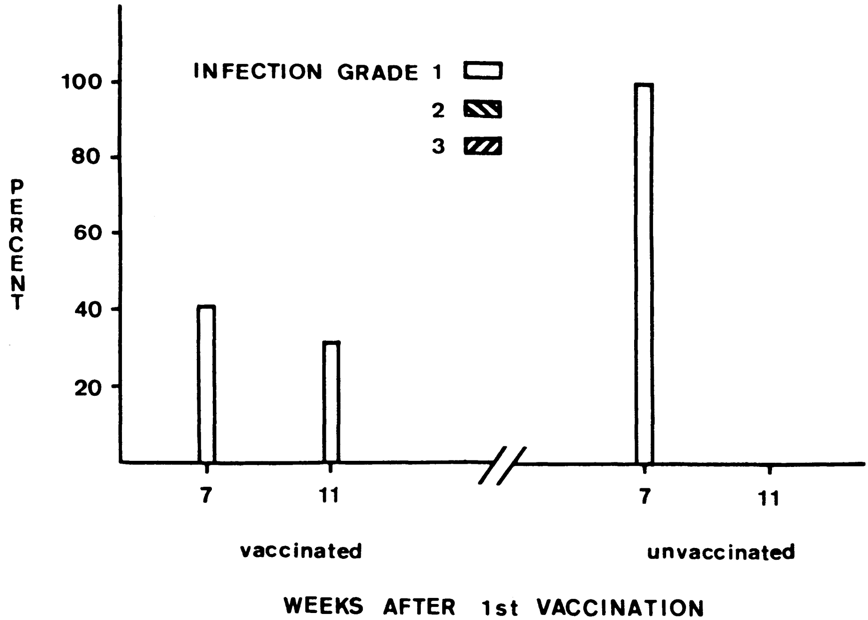

Figure 2. Point prevalences of vaccinated (2×5 ml) and unvaccinated calves on farm B.

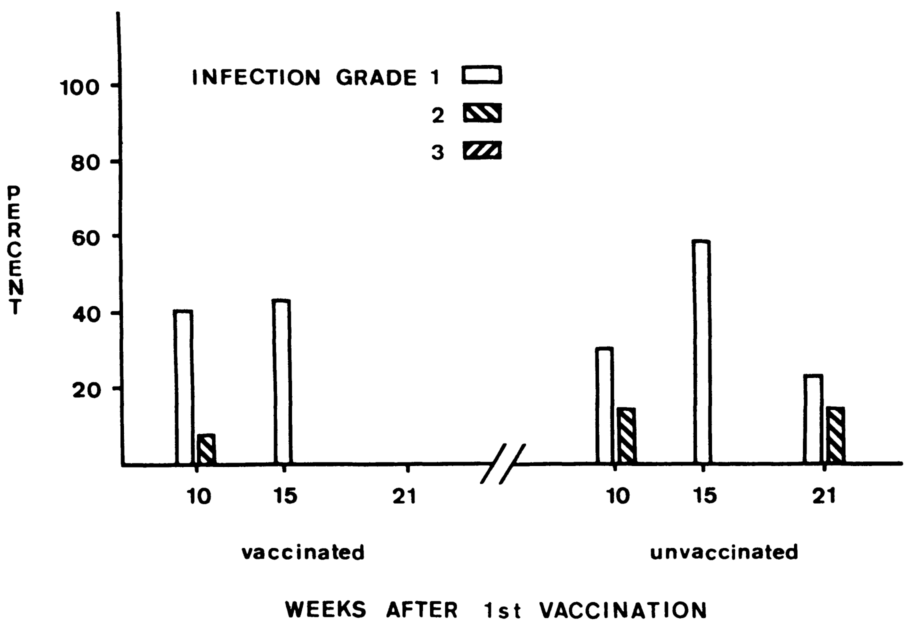

Figure 3. Point prevalences of vaccinated (2×5 ml) and unvaccinated calves on farm C.

prevalence = 0 %). In the vaccinated group the rather constant cumulative incidence and point prevalence indicate a slower spread of infection and frequent spontaneous recovery.

On farm C (Fig. 3) a large proportion of animals in both groups developed lesions within the first observation period. Vaccination did not seem to induce an immunity capable of delaying clinical manifestations. However, no new cases appeared in the vaccinated group during the last observation period and all animals had recovered at the final examination (cumulative incidence and point prevalence = 0 %), whereas the point prevalence for the unvaccinated group represents both new (cumulative incidence = 48.3 % unrecovered cases. Thus the clinical course in the vaccinated group on farm C was mitigated when compared to the control group.

Vaccination of 57 % and 41 % of the animals on farm A and D, respectively, with 2×10 ml resulted in a significantly lower number of vaccinated animals showing ringworm infections on both farms. On farm A (Fig. 4) no new cases among the vaccinated animals occurred after the first observation period cumulative incidence = 0 %) and the point prevalence observed at the second examination represents animals that had not recovered spontaneously. In contrast, the cumulative incidence rose in the unvaccinated group, as well as the point prevalence evincing the infection pressure in the environment.

On farm D (Fig. 5) 6 % of the vaccinated animals showed clinical signs during the first observation period whereafter no new cases were observed (cumulative incidence = 0 %). All these animals recovered within the second observation period (point prevalence = 0 %). In the unvaccinated group the cumulative incidence reached a maximum in the second observation period, and the point prevalence at the last examination reveals the continued presence of infection at that time.

Transmission of trichophytosis among calves in specialized beef production will depend partly on infection pressure in the environment and partly on the contact between individuals, which is always intensive. Attempts to evaluate the effect of vaccination meet with fundamental difficulties. Trials with historical controls or contemporary controls raised in a different environment suffer from doubts of validity, and in trials leaving a group of animals unvaccinated the infection pressure will be increased in comparison to practical conditions when all animals are vaccinated.

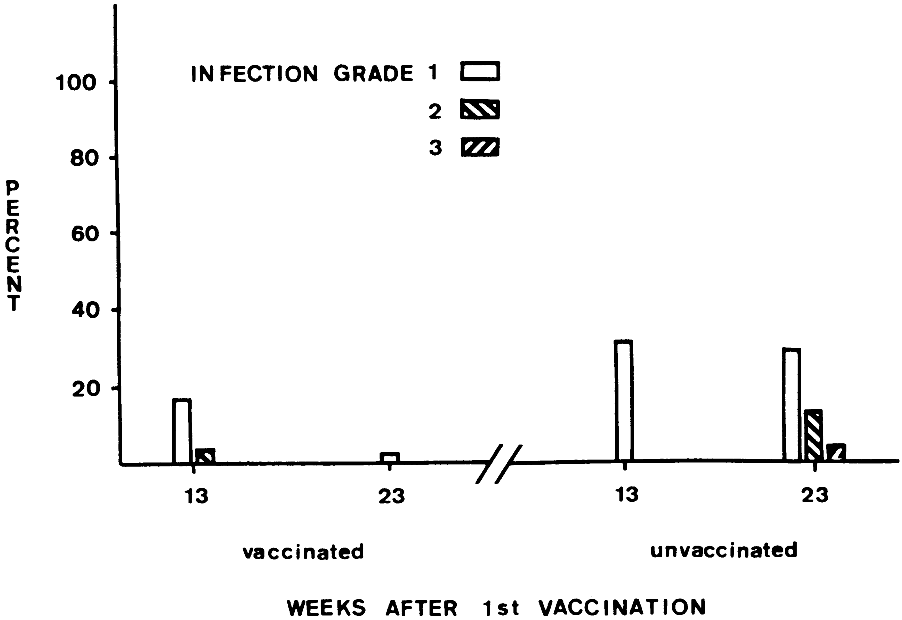

Figure 4. Point prevalences of vaccinated (2×10 ml) and unvaccinated calves on farm A.

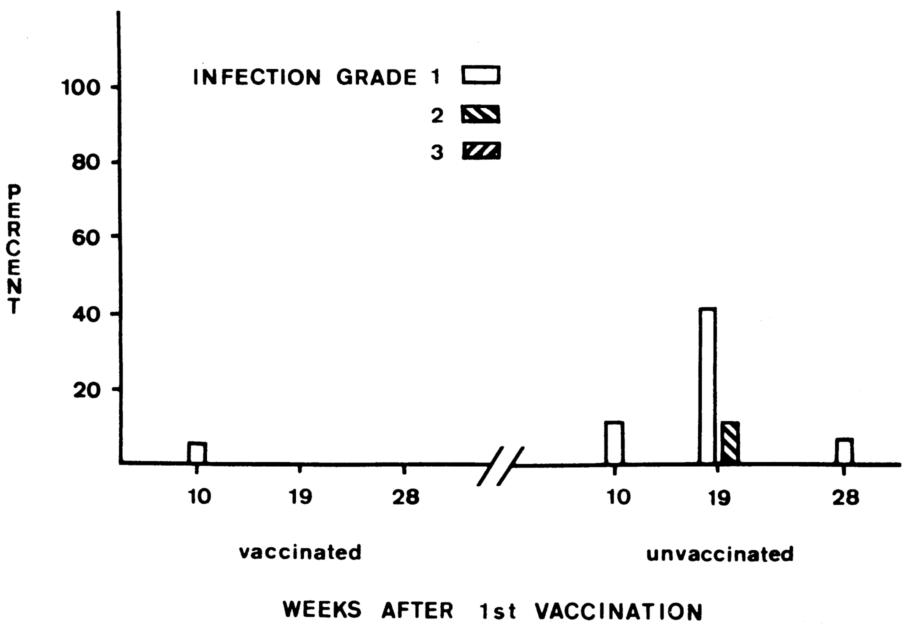

Figure 5. Point prevalences of vaccinated (2×10 ml) and unvaccinated calves on farm D.

The relative risk measures the strength of association between ringworm infections and vaccination. The greater the decline of the relative risk from 1 the greater the preventive effect of vaccination. In the 3 trials in which statistically significant protection was demonstrated, the R.R. varied between 0.62—0.10. The lower values of 0.10 and 0.33 are interpreted as biologically significant.

The prevented fraction estimates the proportion of potential new ringworm cases that would have occurred on the farm in the absence of vaccination. Knowing the actual number of ringworm cases on the various farms the estimated number of prevented cases can the calculated. As can be seen from Table 1, the largest

Table 1. Cumulative incidences, χ^2 test, calculated R.R. and estimated number of prevented cases in 5 ringworm vaccine trials.

Farm (n = number of animals)		Cumulative incidences, % 1 period	2 period	3 period	entire period	χ^2	R.R.	Estimated number of prevented ringworm cases
A	Vaccinated 2×5 ml	5.0	2.6	46.6	50.6			
	n = 40					6.3	0.62	12
	Unvaccinated	27.7	68.7	7.4	82.2	P<0.05		
	n = 47							
B	Vaccinated 2×5 ml	40.9	38.5	N.O.	63.6			
	n = 22					2.7	0.64	8
	Unvaccinated	100.0	—	N.O.	100.0	N.S.		
	n = 9							
C	Vaccinated 2×5 ml	48.7	60.0	0.0	80.5			
	n = 39					1.3	0.87	5
	Unvaccinated	46.2	61.9	48.3	92.1	N.S.		
	n = 39							
A	Vaccinated 2×10 ml	22.0	0.0	N.O.	22.0			
	n = 50					16.4	0.33	22
	Unvaccinated	32.4	52.0	N.O.	67.6	P<0.001		
	n = 37							
D	Vaccinated 2×10 ml	6.4	0.0	0.0	6.3			
	n = 47					36.3	0.10	28
	Unvaccinated	11.6	59.5	0.0	66.2	P<0.001		
	n = 69							

N.S. = not significant
N.O. = not observed

number of prevented cases was found when using the double dose of vaccine.

No cost-benefit analysis was attempted. Provided that clinical ringworm does not render the animals more susceptible to other diseases or reduce the weight gain, the economic benefit will be limited to avoidance of price reduction for damaged skins. However, the transmissibility of infection to humans further justifies attempts to prevent the disease.

In conclusion, the vaccine dose recommended by the manufacturer, 2×5 ml, did not confer adequate immunity to calves in fattening units. Administration of the double dose to animals on 2 farms resulted in statistically and biologically significant protection against ringworm on both farms.

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SAMMENDRAG

Vaccination mot ringorm hos kalvar i specialiserad köttdjursproduktion.

I 3 besättningar vaccinerades ca hälften av kalvarna vid 3—7 veckors ålder mot ringorm med 2×5 ml av ett ryskt, levande vaccin. Signifikant positiv effekt uppnåddes endast i 1 av dessa besättningar. En höjning av vaccindosen till 2×10 ml i 2 besättningar medförde ett signifikant skydd mot sjukdomen i båda besättningarna.

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