

PROTECTIVE EFFICACY OF VACCINE AGAINST BOVINE TRICHOPHYTOSIS AFTER INTRAMUSCULAR, SUBCUTANEOUS AND INTRADERMAL ADMINISTRATION

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Abstract

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Protective efficacy of TRICHOBEN AV vaccine against experimental infection with *Trichophyton verrucosum* after intramuscular and subcutaneous administration proved satisfactory, the proportions of calves thus protected being 100% and 94,7%, respectively. After intradermal administration only 62,5 % of the calves were protected.

Trichophyton verrucosum, mode of vaccination, experimental infection

Vaccination of cattle against trichophytosis is a major tool for combatting the disease in a number of European countries (Gudding and Lund 1995). Several commercial vaccines are available. In Russian LTF-130 vaccine (Sarkisov 1976), Polish vaccines Trichovac and Bovitrichovac (Wawrzkievicz and Chrol 1977, Wawrzkievicz and Wawrzkievicz 1984) and Czech vaccines TRICHOBEN and TRICHOBEN AV (Rybníkář et al. 1996) intramuscular administration has been recommended. Our present objective was to find whether a satisfactory protective effect could also be achieved after subcutaneous and intradermal vaccination against trichophytosis. The experiment was carried out with TRICHOBEN AV vaccine containing a living avirulent *Trichophyton verrucosum* strain.

Materials and Methods

The protective efficacy of TRICHOBEN AV vaccine (manufactured by Bioveta, plc., Ivanovice na Hané, Czech Republic) was tested using the challenge method similarly to the procedure used in our previous report (Rybníkář et al. 1993).

The experimental animals were 4-to-6-week-old calves of the Bohemian Pied breed, in good health and nutritional status, kept under the stanchion barn system. They were divided into the following four groups:

Group 1 animals were vaccinated intramuscularly twice into the gluteal muscle.

Group 2 animals were vaccinated subcutaneously twice in the neck region.

Group 3 animals were vaccinated intradermally twice in the neck region. The vaccine used in these three groups was TRICHOBEN AV of the same batch. In Groups 1 and 2 it was administered in prophylactic doses of 2,5 ml per animal. Group 3 animals were vaccinated at the rate of 0,25 ml per animal, the inoculated amount of the vaccination strain being the same as in Groups 1 and 2 (use was made of ten times concentrated vaccine). The interval between the vaccinations was 14 days in all three groups.

Group 4 animals were not vaccinated and served as controls.

Thirty days after revaccination all the vaccinated animals and non-vaccinated controls were each challenged by epicutaneous inoculation of the suspension of *T. verrucosum* challenge culture at the rate of 5 million CFU into a 10 x 10 cm clipped and gently scarified area of the right flank. The animals were then observed for clinical skin changes twice to three times a week for 32 days after challenge.

At the end of the experiment skin lesion specimens were collected from clinically positive calves and examined by culture and microscopically (Rybníkář et al. 1993).

Results

The results are presented in Table 1 showing, for the sake of clarity, only the data concerning the major phases of the experiment, i.e. the onset of clinical skin mycotic changes (day 14 after challenge), their spread in the controls and disappearance in the majority of the vaccinated calves (day 23 after challenge) and the outcome of the final examination (day 32 after challenge).

Table 1
Test of the protective efficacy of TRICHOBEN AV vaccine after intramuscular, subcutaneous and intradermal administration

Group	Mode of immunization	No. animals	Clinical skin changes after challenge, No. calves														
			Day 14					Day 23					Day 32				
			-	±	+	++	+++	-	±	+	++	+++	-	±	+	++	+++
1	Intramuscular	20	10	5	5	0	0	19	1	0	0	0	20	0	0	0	0
2	Subcutaneous	19	10	5	4	0	0	17	1	1	0	0	18	1	0	0	0
3	Intradermal	16	2	8	6	0	0	8	3	5	0	0	10	2	4	0	0
4	Control group	14	6	7	1	0	0	0	0	1	3	10	0	0	1	4	9

- No skin mycotic changes.
- ± Minute skin changes, - scales, papillae.
- + Solitary alopetic foci.
- ++ Mycotic foci covering more than a 1/4 of the inoculated area.
- +++ Mycotic foci covering more than half of the inoculated area.

As can be seen from Table 1 the protective efficacy of TRICHOBEN AV vaccine after intramuscular and subcutaneous vaccination was good: examination of these calves after challenge revealed no clinical signs of trichophytosis in half of them and only minute short-term skin changes in the remaining animals. At the end of the experiment all 20 (100 %) calves vaccinated intramuscularly and 18 of the 19 calves (94,7 %) vaccinated subcutaneously were clinically negative and the remaining calf showed a dubious reaction.

In calves vaccinated intradermally the skin mycotic changes observed after challenge were more pronounced than in the other two groups. At the end of the experiment 10 (62,5 %) of the 16 calves were clinically negative and the remaining animals showed persisting trichophytic changes.

All 14 non-vaccinated controls responded to challenge by development of mycotic lesions of various extent, mostly showing marked deep scabs covering more than half of the infected skin area. All these animals were clinically affected with trichophytosis also at the end of the experiment, and observation confirmed upon microscopic examination and by culture. In clinically positive vaccinated calves these laboratory tests yielded less unequivocal results: the challenge *T. verrucosum* strain was isolated from half of the specimens.

Discussion

Only a few published data on the optimum mode of immunization of cattle against trichophytosis are available. Inactivated antitrichophytic vaccines inoculated

subcutaneously or intradermally have failed to provide a satisfactory degree of protection and have not been introduced into veterinary practice (Dokudovskij 1962; Kielstein and Richter 1970 a.o.). Moreover, their administration was reported to give rise to undesirable reactions (mainly inflammatory infiltrates) which persisted for up to three months (Rasulev 1974).

Vaccines prepared from living *T. verrucosum* strains have found a wide practical application (Gudding and Lund 1995). Sarkisov (1976) found the best efficacy of LTF-130 vaccine after its intramuscular administration in two doses. Other modes of inoculation of the vaccine (subcutaneous and intradermal) tested by the same investigator proved less satisfactory, but the actual results were not reported.

Our experiments were made with TRICHOBEN AV, a living avirulent vaccine, known abroad under the trade name Permavax - Tricho (Gudding and Lund 1995). A good protective effect of this vaccine after intramuscular vaccination of cattle has been demonstrated in previous experiments (Rybníkář et al. 1991; Siesenop et al. 1994) and in the field (Rybníkář et al. 1996). In contrast to the findings reported by Sarkisov (1976) our tests with TRICHOBEN AV vaccine showed a high protective effect also after subcutaneous administration. The immunization of calves by the intradermal route proved unsatisfactory: only 62,5 % of the calves were protected against experimental trichophytosis, whereas the remaining animals of this group were clinically positive after challenge. Although the clinical manifestation of the skin changes in all these animals were practically the same, the final examination demonstrated the challenge strain in only half of the cases. Nevertheless, the fact remains that the protective efficacy of TRICHOBEN AV after intradermal inoculation was lower than that obtained after intramuscular and subcutaneous administration. Moreover, all the calves vaccinated intradermally developed subcutaneous indurated infiltrates 1 to 1.5 cm in size at the site of vaccination and these changes persisted throughout the experiment. From the results reported here it appears that intradermal administration of TRICHOBEN AV is not suited for practical use. We recommend therefore to follow the instructions and administer the vaccine by the intramuscular route. Apparently, a satisfactory protective effect of the vaccine may also be obtained after subcutaneous administration, but further tests on a larger number of animals in the field are needed to confirm the results reported here.

Protektivní účinnost vakcíny proti trichofytóze skotu po intramuskulární, subkutánní a intradermální aplikaci

Protektivní účinnost vakcíny TRICHOBEN AV proti experimentální infekci *Trichophyton verrucosum* byla po intramuskulární a subkutánní aplikaci vyhovující. Bylo dosaženo 100%, resp. 94,7% chráněnosti. Nižší účinnost vakcíny (62,5 %) byla zjištěna u telat imunizovaných intradermálně.

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