

EFFECT OF ANTIBIOTIC AND SULPHONAMIDE TREATMENT ON THE DEVELOPMENT OF POST-VACCINATION IMMUNITY TO TRICHOPHYTOSIS IN CATTLE

A. RYBNÍKÁŘ,¹ J. KUJA,² J. PETRÁŠ³ and V. VRZAL¹

Bioveta, 683 23 Ivanovice na Hané,¹ District Veterinary Administration, 682 00 Vyškov,² Institute for State Control of Veterinary Biologicals and Drugs, 621 00 Brno³

Received July 24, 1990

Abstract

Rybníkář A., J. Kuja, J. Petráš, V. Vrzal: *Effect of Antibiotic and Sulphonamide Treatment on the Development of Post-Vaccination Immunity to Trichophytosis in Cattle*. Acta vet. Brno, 60, 1991: 351–356.

Calves treated with chloramphenicol or apramycin at the time of vaccination against trichophytosis were less resistant to experimental infection with *Trichophyton verrucosum* culture than vaccinated calves not treated with these antibiotics. Treatment with preparations containing penicillin, streptomycin, oxytetracycline, rolitetracycline, tylosine or sulphonamide had no immunosuppressive effect on the development of post-vaccination immunity.

Trichophyton verrucosum, vaccination, antibiotics, sulphonamides, immunosuppression

Immunosuppressive effects of some antibiotics have been reported (Nouza and Joun 1987; Vrtiak 1990). According to Kanjuka and Šutiak (1990) antibiotics suppress the immune response of animals to living bacteria and also slow down the production of artificial immunity. We thought it of interest to find to which extent treatment with antibiotics or sulphonamides would affect the post-vaccination immunity of cattle to a dermal mycotic disease, bovine trichophytosis.

Materials and Methods

The experimental animals were 1-month-old calves of the Bohemian Pied Breed coming from herds without a history of trichophytosis. They were in good nutritional and health status.

In each experiment one or two antibiotics or sulphonamide were tested by administering them to calves at the time of their vaccination against trichophytosis. The results were compared with those obtained in vaccinated calves receiving no antibiotic or sulphonamide treatment.

The experimental animals were injected i.m. with the following preparations in doses given per kg body mass per day for 5 days: Penstrepten inj. (benzylpenicillium 10 000 IU . kg⁻¹, dihydrostreptomycinum sulfuricum 100 mg . kg⁻¹; active ingredients: penicillin and streptomycin), Biopran 200 inj. (20 mg . kg⁻¹; active ingredient: apramycin), Chronicin inj. (12 mg . kg⁻¹; active ingredient: D-chloramphenicol), Oxymycoin inj. (8 mg . kg⁻¹; active ingredient: oxytetracycline), Rolitetracyclin inj. (10 mg . kg⁻¹; active ingredient: rolitetracycline), Tylan 200 inj. (100 mg . kg⁻¹; active ingredient: tylosine) and Duon inj. (sulfadimidinum natricum 395 mg . kg⁻¹, trimethoprimum 80 mg . kg⁻¹).

At the time of the last injection with one of the afore-mentioned preparations the calves were vaccinated with prophylactic doses of lyophilized vaccine against bovine trichophytosis (manufactured by Bioveta, Ivanovice na Hané). Vaccinated at the same time were further calves that received no antibiotic or sulphonamide treatment. All these groups were revaccinated 14 days later. One month afterwards all the vaccinated calves and non-vaccinated controls were challenged with a virulent culture of *Trichophyton verrucosum* by epicutaneous inoculation of the suspension onto a 10 × 10 cm clipped and gently scarified area of the right flank at the rate of 4 to 5 million conidia per animal and then observed for 32 days. Any clinical dermal lesions observed were examined microscopically and by culture at the end of the experiment.

Results

The results are presented in Tables 1 to 6. It can be seen that the calves vaccinated against trichophytosis without previous antibiotic treatment proved highly resistant to experimental trichophytosis. In these animals dermal changes at the challenge site were either absent at all or were only slight and of short duration. At the end of the experiment (32 days after challenge) no signs of trichophytosis were observed in any of these animals. Similar results were obtained in those vaccinated calves that were treated with Oxymycoin, Penstrepten, Rolitetracycline, Tylan or Duon at the time of vaccination.

The degree of protection conferred by vaccination to calves treated with Chronicin or Biopran was lower than in the preceding groups: throughout the experiment the proportions of clinically diseased animals were higher than in the groups of vaccinated calves that received no antibiotic treatment. At the end of the experiment 2 out of 10 Biopran-treated calves were clinically ill and 1 animal showed a dubious reaction. Out of 21 Chronicin-treated calves 2 developed clinical signs of trichophytosis and 2 animals showed dubious reactions.

All the control non-vaccinated and challenged calves developed marked trichophytic crusts that merged to continuous lesions and persisted till the end of the experiment without any tendency to self-healing.

The results of examination by culture and of microscopic examination were in keeping with the clinical findings: they demonstrated the challenge strain in clinically positive animals and were negative in calves showing no signs of trichophytosis.

Discussion

Practical experience reported by Gorobec (1972) showed that further immunoprophylactic treatment of cattle at the time of their vaccination against trichophytosis had a negative effect on the development of immunity against this disease. Immunosuppressive effects were observed particularly upon vaccination against foot-and-mouth diseases with Soviet vaccine TF-130 (Ruchljada et al. 1973). As regards the immunity to trichophytosis, the possible effects of concurrent administration of trichophytic vaccine and antibiotics have not been studied in detail. Our challenge experiments including 147 vaccinated calves and 43 non-vaccinated controls contribute to a better understanding of this question.

It is a well-known fact that almost all antibiotics interfere, to a higher or lower degree, with the immune response. The most active of them in this sense is chloramphenicol (Bier et al. 1981). This also became apparent in our present study: some calves treated with chloramphenicol at the time of vaccination against trichophytosis proved less resistant to experimental infection with *T. verrucosum* culture than vaccinated animals receiving no chloramphenicol treatment. Immunosuppressive effects were also observed in some calves treated with Biopran, a preparation containing apramycin. On the other hand, penicillin, streptomycin and tetracycline which were regarded by Vrtiak (1990) as potential immunosuppressors did not exert any immunosuppressive effects in our study. Similar results were recorded by us also for Tylan and Duon.

The findings reported here are of value particularly to veterinary practice in the field. Prophylactic vaccination against trichophytosis is generally carried out

Table 1
Effect of Chronicin on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																			
		15 d after challenge			20 d after challenge			27 d after challenge			32 d after challenge										
		-	±	+	-	±	+	-	±	+	-	±	+								
Non-vaccinated controls	12	1	3	1	5	2	0	1	0	2	9	0	0	1	4	7	0	0	0	6	6
Vaccination without antibiotic treatment	20	6	3	7	4	0	9	6	4	1	0	19	1	0	0	0	20	0	0	0	0
Vaccination plus Chronicin	21	4	4	6	6	1	10	3	1	7	0	14	2	4	1	0	17	2	1	1	0

- No clinical dermal mycotic changes

± Minute dermal changes

+ Solitary mycotic foci

+++ More than 10 mycotic foci

+++ Merging of the foci to confluent crusts

Table 2
Effect of Oxymycoin on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																			
		14 d after challenge			19 d after challenge			27 d after challenge			32 d after challenge										
		-	±	+	-	±	+	-	±	+	-	±	+								
Non-vaccinated controls	6	1	2	2	1	0	0	1	0	3	2	0	0	0	2	4	0	0	0	2	4
Vaccination without antibiotic treatment	10	5	5	0	0	0	10	0	0	0	0	10	0	0	0	0	10	0	0	0	0
Vaccination plus Oxymycoin	10	4	6	0	0	0	9	1	0	0	0	10	0	0	0	0	10	0	0	0	0

For explanation of the symbols see Table 1.

Table 3
Effect of Rolitetracycline on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																			
		13 d after challenge			20 d after challenge			26 d after challenge			32 d after challenge										
		-	±	+	-	±	+	-	±	+	-	±	+								
Non-vaccinated controls	6	0	3	3	0	0	0	0	0	1	5	0	0	0	1	5	0	0	0	1	5
Vaccination without antibiotics	10	2	6	2	0	0	9	1	0	0	0	10	0	0	0	0	10	0	0	0	0
Vaccination plus Rolitetracycline	9	5	3	1	0	0	9	0	0	0	0	9	0	0	0	0	9	0	0	0	0

For explanation of the symbols see Table 1.

Table 4
Effect of Penstrepten on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																			
		14 d after challenge			20 d after challenge			27 d after challenge			32 d after challenge										
		-	±	+	-	±	+	-	±	+	-	±	+								
Non-vaccinated controls	6	0	3	2	1	0	0	0	0	2	4	0	0	0	2	4	0	0	0	2	4
Vaccination without antibiotics	10	2	5	3	0	0	9	1	0	0	0	9	1	0	0	0	10	0	0	0	0
Vaccination plus Penstrepten	10	3	5	1	1	0	7	3	0	0	0	10	0	0	0	0	10	0	0	0	0

For explanation of the symbols see Table 1.

Table 5
Effects of Biopran and Tylan on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																		
		13 d after challenge			19 d after challenge			26 d after challenge			32 d after challenge									
		-	±	+	++	+++	-	±	+	++	+++	-	±	+	++	+++				
Non-vaccinated controls	7	3	3	1	0	0	0	0	2	5	0	0	0	2	5	0	0	0	2	5
Vaccination without antibiotics	9	4	3	2	0	0	6	3	0	0	7	2	0	0	0	9	0	0	0	0
Vaccination plus Biopran	10	3	3	3	1	0	4	3	2	1	0	6	2	1	1	7	1	1	1	0
Vaccination plus Tylan	10	1	6	3	0	0	5	4	1	0	0	9	1	0	0	10	0	0	0	0

For explanation of the symbols see Table 1.

Table 6
Effect of Duon on the development of post-vaccination immunity to trichophytosis in cattle

Group	No. calves	No. calves showing dermal mycotic changes at the site of challenge with <i>T. verrucosum</i> culture																			
		14 d after challenge			19 d after challenge			26 d after challenge			32 d after challenge										
		-	±	+	++	+++	-	±	+	++	+++	-	±	+	++	+++					
Non-vaccinated controls	6	2	1	2	1	0	0	0	1	1	4	0	0	0	1	5	0	0	0	2	4
Vaccination without sulphamides	9	2	5	2	0	0	6	2	1	0	0	8	1	0	0	0	9	0	0	0	0
Vaccination plus Duon	9	2	5	2	0	0	7	1	1	0	0	9	0	0	0	0	9	0	0	0	0

For explanation of the symbols see Table 1.

in calves between 1 and 2 months of age, i. e. at a time during which respiratory and intestinal diarrhoeal infections of these animals are a frequent problem, often making treatment with antibiotics and sulphonamides inevitable. From our results it appears that chloramphenicol and apramycin are less suited for concurrent administration with antitrichophytic vaccine than antibiotic preparations containing penicillin, streptomycin (these two antibiotics were likewise found by Poljakov (1981) to exert no immunosuppressive effects in calves vaccinated with TF-130), tylosine, oxytetracycline or rolitetracycline or than sulphonamide-containing Duon. However, further studies along this line are needed to confirm the present results. They should be carried out on a larger number of animals and should cover different lengths of time elapsing between vaccination and antibiotic treatment.

Vliv antibiotik a sulfonamidů na postvakcinační imunitu proti trichofytóze u skotu

Telata, ošetřená v době vakcinace proti trichofytóze chloramfenikolem nebo apramycinem, byla k experimentální infekci kulturou *Trichophyton verrucosum* méně rezistentní než telata vakcinovaná, ale neošetřená těmito antibiotiky. U antibiotických přípravků, obsahujících penicilin, streptomycin, oxytetracyklin, rolitetracyklin, tylosin a sulfonamid nebyl imunopresivní vliv na postvakcinační imunitu prokázán.

Влияние антибиотиков и сульфонамидов на поствакцинационный иммунитет к трихофитозу у крупного рогатого скота

Телята, принимавшие в период вакцинации против трихофитоза хлорамфеникол или апрамицин, отличались по отношению к экспериментальной инфекции культурой *Trichophyton verrucosum* меньшей сопротивляемостью по сравнению с вакцинированными но не принимавшими упомянутые антибиотики телятами. У антибиотических препаратов, содержащих пенициллин, стрептомицин, окситетрациклин, ролитетрациклин, тилозин и сульфонамид, иммуносупрессивное влияние на поствакцинационный иммунитет не было установлено.

References

- BIER, O. G. — DA SILVA, W. D. — GÖTZE, D. — MOTA, I.: Fundamentals of immunology. Springer-Verlag, New York, 1981
- GOROBEČ, A.: Opyt ozdorovenija chozajstv ot striguščego lišaja. Veterinarija (Moskva), 1972, (10): 69—70
- KANJUKA, A. I. — ŠUTIĀK, V.: O niektorých problémoch pri používaní antibiotík vo veterinárnej praxi. Veterinárství, 40, 1990: 206—207
- NOUZA, K. — JOUN, C.: Imunologie zdraví a nemoci. Avicenum, Praha, 1987
- POLJAKOV, I. D.: Vlijanije povtornych immunizacij vakcinov TF-130 (VIEV) na obščee kliničeskoe sostojanie i sensibilizaciju teljat. Bjul. Vses. Nauč. Issl. Inst. Exp. Vet., 42, 1981: 35—38
- RUČHLJADA, V. V. — NIKOLAEV, S. M. — ŠUTJUK, V. K.: Effektivnosť specifičeskoj profylaktiki trichofitii. Veterinarija (Moskva), 1973, (6): 54—56
- VRTIAK, O. J.: Význam imunopresie. Veterinárství, 40, 1990: 53—57