

EFFICACY OF SALINOMYCIN, MONENSIN AND LASALOCID AGAINST SPONTANEOUS EIMERIA INFECTION IN RABBITS

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Dedicated to Dr. J. Prokopíč, Corresponding Member of the CAS, on the occasion of his 60th birthday

Abstract. Rabbits spontaneously infected with coccidia of the genus *Eimeria* were treated with salinomycin, lasalocid and monensin. The drugs were applied in pellets in the doses of 50 ppm. The weight gain in rabbits treated with salinomycin and monensin was higher than in those treated with lasalocid and by 22.6 % higher than in control animals. The weight gain in animals treated with lasalocid was almost the same as in the control group. The oocyst production was suppressed most significantly by salinomycin.

Salinomycin, lasalocid and monensin are fermentation products of moulds of the genus *Streptomyces*. They are polyethers binding to cations (monensin and salinomycin to univalent and lasalocid to bivalent ones) and thus they affect the transport of these ions through the cell membranes. Chappel (1979) found that salinomycin affects particularly the sporozoites in chicken coccidia. Lasalocid and monensin may be supposed to produce a similar effect. These three drugs are widely used in practice in the poultry breeding farms. The present paper deals with their effect on various species of coccidia of the genus *Eimeria* in spontaneous rabbit infections.

MATERIAL AND METHODS

The experiment was performed in cooperation with the Department of Zootechnics of the Agriculture University in Prague. The animals originated from 14 different litters (25—27 March 1983). In most cases hybrids of two or more breeds of more lines were involved. The animals from each litter were evenly divided into four groups each of them containing the same number of males and females. Individual groups were fed with KO 16 pellets, the first with the addition of 50 ppm of salinomycin (Hoechst), the second with the addition of 50 ppm of monensin (Elanco), and the third one with the addition of 50 ppm of lasalocid (Hoffmann—La Roche). The fourth group was used as a control. The experiment was started immediately after weaning. The groups fed with pellets containing lasalocid and salinomycin included 20 animals each, the remaining ones included 19 animals. The animals of all groups were placed in runs consisting of a roofed part with wooden floor and a free part, the bottom of which was covered with a wire-netting at the height of about 1 m above the ground. The weight gains and OPG values (number of oocysts in 1 g of faeces) were recorded in all animals at the beginning of the experiment and than on days 13, 33 and 47. With the exception of 5 purebred Californian white rabbits, all animals were killed on day 47 of the experiment. Four days before killing the feeding with medicated pellets was stopped. The results were statistically evaluated on the basis of analysis of variance at $P \leq 0.05$.

RESULTS

The oocysts of *Eimeria* were present in all rabbits during the whole course of the experiment. In most samples of all groups *E. magna* markedly prevailed at the beginning of the experiment, whereas *E. media* prevailed after 13 days and *E. intestinalis* together with *E. coecicola* after 33 days. After killing, *E. coecicola* was most abundant, but also

E. intestinalis and *E. stiedai* coccidia were present in high numbers. *E. perforans* occurred during the whole course of the experiment, but it prevailed only rarely. There appeared also other species, i.e. *E. flavescens*, *E. irresidua* and *E. piriformis*, but only in small numbers.

Table 1. OPG values in rabbits during the experiment

Group	Days after beginning of experiment			
	0	13	33	47
C	20 350	85 593 (L, S, M)	86 600 (L, S, M)	157 925 (L, S, M)
L	22 118	25 260 (C, S, M)	26 982 (C, S)	942 (C)
S	17 557	1 140 (C, L)	7 737 (C, L, M)	493 (C, M)
M	17 769	3 681 (C, L)	31 050 (C, S)	2 543 (C, S)

Groups from which the value significantly differed at $P < 0.05$ are given in parentheses (L = lasalocid, S = salinomycin, M = monensin, C = control)

Table 2. Weight gains and deaths of rabbits during the experiment

	Days after beginning of experiment			
	0	13	33	47
Group C				
Mean weight	1036	1519	1870 (S)	2091 (S)
Mean weight gain	0	483	834	1055 (S, M)
No. deaths	0	1	8	9
Group L				
Mean weight	1114	1385	1950	2162
Mean weight gain	0	271	836 (S)	1048 (S, M)
No. deaths	0	0	0	0
Group S				
Mean weight	1171	1477	2117 (C, M)	2350 (C)
Mean weight gain	0	306	946 (C, L, M)	1179 (C, L)
No. deaths	0	0	1	2
Group M				
Mean weight	985	1441	1783 (S)	2165
Mean weight gain	0	456	798 (S)	1180 (C, L)
No. deaths	0	0	0	0

The OPG values and weight gains are summarized in Tables 1 and 2. Five purebred Californian white rabbits were left for further breeding. After termination of the experiment, they were fed with non-medicated pellets and the OPG values were recorded for another 14 and 19 days. Clinical symptoms of coccidiosis appeared in all of them and two animals died. The OPG values are shown in Table 3.

DISCUSSION

All the three drugs tested in our experiment markedly decreased the production of oocysts in the experimental rabbits (see Table 1). Salinomycin and monensin were found to be more effective than lasalocid. Table 2 shows that the mortality was limited by all of the drugs. Pathological and parasitological examinations of dead animals revealed that coccidiosis was not the cause of death in the group treated with salinomycin, in contrast to the control group. The weight gain in the group treated with salinomycin was significantly higher than in other groups after 33 days. On day 47, however, the weight gain was almost identical in the groups treated with salinomycin and monensin and significantly differed from that in the control group and in the group treated with lasalocid.

Table 3. OPG values in Californian white rabbits after termination of the treatment

Rabbit No.	Drug used	OPG values on day 14 after treatment	OPG values on day 19 after treatment
1	L	326 500 (dead)	
2	L	128 000	99 700
3	S	115 500	239 000
4	S	963 000	184 000
5	M	2 031 000 (dead)	

Table 3 shows that the rabbits treated immediately after weaning and not exposed to coccidia infections exhibited a lower resistance to the infection. After the termination of treatment, the intensity of infection was very high, as it is indicated by the extremely high values of OPG. Although the results shown in Table 3 serve only for the orientation, due to the small number of animals, they suggest that after the termination of treatment a strong infection with coccidia may occur.

Salinomycin has already been tested against intestinal and liver coccidiosis in rabbits (Lämler and Hein 1980, Sambeth and Raether 1980, Kutzer et al. 1981, Varga 1982), always with good results. Monensin has been tested against liver coccidiosis by Gwyther and Dick (1976) and Fitzgerald (1972) and in both cases the effect was very good. The effects of lasalocid and monensin against intestinal coccidiosis have been only little studied. Sambeth and Raether (1980) compared salinomycin, monensin and lasalocid and found salinomycin and monensin to be of almost the same value, whereas lasalocid was not quite satisfactory. This corresponds to our results. On the other hand, Coudert (1978) considers monensin to be almost ineffective against pure infections with the most pathogenic species of rabbit coccidia, *E. flavescens* and *E. intestinalis*.

In our experiments, *E. intestinalis* prevailed on day 33, but the number of its oocysts was decreased by monensin to the same degree as in other species.

Since all of the tested drugs decreased the production of oocysts, salinomycin and monensin being better than lasalocid, and affected similarly also the weight gain, it may be recommended to use salinomycin and monensin for the prevention of rabbit coccidiosis in the practice.

ВОЗДЕЙСТВИЕ САЛИНОМИЦИНА, МОНЕНСИНА И ЛАСАЛОЦИДА
ПРОТИВ СПОНТАННОГО ЗАРАЖЕНИЯ КРОЛИКОВ КОКЦИДИЯМИ
РОДА *EIMERIA*

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Резюме. Кроликов, спонтанно зараженных кокцидиями рода *Eimeria* лечили салиномицином, ласалоцидом и моненсином. Лекарства применяли в пилюлях в дозах 50 ppm. Прибавка в весе у кроликов леченных салиномицином и моненсином была выше, чем у кроликов леченных ласалоцидом и на 22,6 % выше, чем у контрольных животных. Прибавка в весе у кроликов леченных ласалоцидом была почти одинакова как у контрольных животных. Образование оопист подавлялось больше всего салиномицином.

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The last volume of this non-periodical collection of papers edited by the Moscow Society of Naturalists (see *Folia parasitol.* 31: 382, 1984) contains six papers three of them being of interest for specialists dealing with problems of natural focus diseases. Yu. Z. Rivkus et al. discuss the peculiarities of the development of plague epizootics among rodents in the Kyzylkumy desert, Yu. V. Ananyina considers the interrelationships between pathogenic leptospires and wild rodents under experiment conditions, and A. S. Burdelov and S. B. Pole refer to the influence of human activities on the natural foci of plague of the gerbil type in Central Asia and Kazakhstan. The remaining three papers are devoted to rodents of irrigated lands in Central Asia, to the ecology of *Microtus carruthersi*, and to characteristics of population maps of small mammals in Soviet literature.

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