



## Comparative study of rabbit ear mange treatment and epizootic aspects in medicinal prevention

**T. Donkó**

Pannon University of Agriculture, Faculty of Animal Science Kaposvár, H-7400 Guba S. u. 40.

### ABSTRACT

*Natural cases of ear mange in rabbits caused by *Psoroptes cuniculi* were examined by otoscope. The evaluation of the severity of symptoms was based on scores 0-10 (where 0 indicates asymptomatic and 10 the most serious ear mange in the whole ear). The medicines used for the treatments were ivermectin [Ivomec injection (MSD AgVet)], tetrametrin [Neostomosan (Sanofi PHYLAXIA)] and diazinon [Neocidol (NOVARTIS)]. Change in symptoms (i.e., efficacy) and the relationship between symptoms (infestations) in does and in their offspring, and also the efficacy of single and repeated treatment, were evaluated in the course of the experiment. Infestations in offspring 1, 3 and 5 months after the ivermectin injection treatment of does were also studied. The ivermectin injection proved to be the most efficient, and Neocidol was higher in efficacy than Neostomosan. The repeated treatments were more effective than the single ones. The degree of infestation of does proved to determine to a degree of 70% probability that occurring in their offspring ( $R^2=0.74$ ). As time passed after the ivermectin injection treatment of the does, symptoms in their offspring became increasingly serious. Cost analysis of the various treatments was also performed. Mainly based on the conclusions drawn from the experiment, and also on theoretical and practical consideration, the author recommends that does be treated by ivermectin injection in a programme (200 µg/bw kg) 4x2 times per year. Where necessary local treatment of offspring with Neocidol (diazinon) is recommended.*

(Keywords: rabbit, *Psoroptes cuniculi*, ivermectin, diazinon, tetrametrin )

### ÖSSZEFOGLALÁS

#### **A nyúl fülruhósság kezelésének összehasonlító vizsgálata és a gyógyszeres megelőzésben érvényesülő járványtani szempontok**

Donkó T.

Pannon Agrártudományi Egyetem Állattenyésztési Kar, Kaposvár, 7400 Guba S. u. 40.

*Fülruh atkákkal (*Psoroptes cuniculi*) természetesen fertőzött nyúlállományban egyszeri, ill. kétszeri kezelés esetén vizsgáltam az ivermectin [Ivomec inj. (MSD AgVet)], tetrametrin [Neostomosan (Sanofi PHYLAXIA)] és a diazinon [Neocidol (NOVARTIS)] készítmény hatékonyságát. A fertőzöttség mértékét az otoszkóppal és szabadszemmel látható fül belső felületének pörkös elváltozása alapján becsültem meg és 0-10-ig terjedő szubjektív skálán értékeltem. A kísérlet során vizsgáltam a*

növendékek testtömeggyarapodása és a kezelések közötti összefüggést, az anyák kezelésének hatását az utódjaik fertőzöttségére, továbbá a kezelések költséghatékonyságát és gyakorlati alkalmazhatóságuk szempontjait. Az ivermectin inj. bizonyult a leghatékonyabbnak, a külsőleges szerek közül pedig a Neocidolt találtam jobbnak a fülruhösség kezelésére. Az ismételt alkalmazás hatékonyabb volt az egyszerűnél. Az anyák fertőzöttségi értékeiből 70%-os biztonsággal becsülhető az utódok állapota ( $R^2=0,74$ ). Az anyák állományszintű kezelését követően az 1, 3 és 5 hónap múlva vizsgált növendékek egyre magasabb fertőzöttségi értékeket mutattak. A kísérleti eredmények, valamint elméleti, gyakorlati és ökonómiai megfontolás alapján ajánlatos az anyák ivermectin injekciós (200 µg/ttkg) kezelése programszerűen évi 4x2 alkalommal a fertőzési lánc megszakítása érdekében.

(Kulcsszavak: nyúl, Psoroptes cuniculi, ivermectin, diazinon, tetrametrin)

## INTRODUCTION

Ear mange in rabbits caused by the *Psoroptes cuniculi* mite is of significance with respect, equally, to general animal health and hygiene, economic concerns (Papp *et al.*, 1990), animal health and hygiene administration (*Animal Health and Hygiene Act 41/1997. (V.28.) Ministry of Agriculture directive.*) and the protection of animals (*Act XXVIII 1998 on the protection of, and care for, animals.*) Such infection, together with the secondary pathogens (*Pasteurella*, *Bordetella* and *Staphylococcus*), leads to decreased weight gain and less favourable feed conversion rates (Papp *et al.*, 1990).

The comparative investigation referred to in brief in the title is justified by, in addition to the points outlined above, the apparent lack in the relevant Hungarian literature of reports based on experiments performed to verify or disprove the efficacy and efficiency of the various forms of treatment for ear mange. At the same time, in a search of literature published in other countries not a single reference to studies comparing treatment with ivermectin, diazinon and tetrametrin.

On assessing the occurrence in Hungary of parasitic disorders *Kassai* and *Békési* (1993) came across a striking number of rabbits with ear mange which in no small proportion of cases displayed serious symptoms of the disease. This can be attributed to several factors, the main one being inadequate treatment. In this country traditional methods are often the ones applied in practice, involving cleaning followed by external application of vegetable oil; the efficacy of such treatment is, naturally, unsatisfactory in most cases. With respect to more modern methods of treatment, the efficacy of the widely used acaricides and of synthetic pyrethroids has been verified by several researchers (Vörös, 1992; Kamboj *et al.*, 1995), while injection with ivermectin has also been proven suitable for the treatment of ear mange (Varga, 1990; Curtis, 1992; Okerman, 1994). It is also recommended in some quarters that antibiotics be administered in simultaneously with the two above methods, in the interest of eliminating any possible secondary infection (Cutler, 1998).

In the practical implementation of this programme of treatment care also had to be taken to ensure that none of the preparations used exerted any effect on the phase of development in progress in the zygote (Vörös, 1992). It was also necessary to provide for the possibility of mites occurring not only in the ear and its surroundings but also in other parts of the body (Vörös, 1992; Yeates, 1994; Stein and Walshaw, 1996), and to consider that mites removed from the host organism may remain infective for a further 4 to 21 days (Arlian, 1981), or even for a number of weeks (Stein and Walshaw, 1996).

The following aspects were examined in this investigation:

- the efficacy against ear mange of various antiparasitic agents: ivermectin [Ivomec injection (MSD AgVet)] and two externally administered treatments, tetrametrin [Neostomosan (Sanofi PHYLAXIA)] and diazinon [Neocidol (NOVARTIS)]
- the relation between weight gain in the growing rabbits during the experimental period and the treatments applied
- epizootic disease examinations
- how ivermectin injection treatment of the does affected the degree of infestation occurring in the offspring in relation to time elapsed since treatment
- cost-effectiveness of the treatments, and other aspects related to their practical application

### **MATERIALS AND METHODS**

These experiments were performed with growing Pannon white rabbits on a large-scale site, from September 1997 to March 1998.

In cases of naturally occurring ear mange the author examined the scrapings of scabs taken from the ear under the microscope to ascertain the presence of the ear mange pathogen (*Psoroptes cuniculi*); the severity of infestation was then evaluated from the extent of these lesions, direct examination of the ear being performed via otoscope. For the purpose of establishing this a subjective scale ranging from zero to 10 was created, zero representing cases free of symptoms and 10 denoting severe infection of the entire external auditory canal, dependent upon what percentage of the internal surface of the ear visible by means of an otoscope or with the naked eye was covered in scabs.

The antiparasitic agents were administered in the following dosages in this experiment:

- Ivomec inj. (*MSD AgVet*): 0.02 ml/kg, 200 µg ivermectin per kg body weight
- Neostomosan 0.5% (*Sanofi PHYLAXIA*): the concentration recommended by the manufacturer
- Neocidol 0.01% (*NOVARTIS*): the concentration recommended by the manufacturer
- In addition to the three experimental groups an untreated control group was also designated.

The externally administered treatments were applied dissolved in water, then sprayed into the ear by means of a commercially available 1-litre atomiser. Ivermectin injection was administered under the skin of the neck.

The first experiment, in which naturally infected growing rabbits were examined, involved an observation period extending between the ages of 6 and 10 weeks. The injection treatment was administered to the growing rabbits at the age of 6 weeks and the external local treatments were applied at 6 and 8 weeks.

It was not possible to administer a repeat injection due to the mandatory 28-day withdrawal time with respect to food hygiene. Changes in the degree of infestation were monitored in the 6<sup>th</sup>, 8<sup>th</sup> and 10<sup>th</sup> week, while weight gain was measured at the ages of 6 and 10 weeks.

In the second experiment the treatments were administered at the ages of 5 and 7 weeks, the respective subsequent monitoring times being 9 and 11 weeks of age. It was necessary to initiate the experiment earlier due to the delay period required in the case of

ivermectin with respect to food hygiene (28 days); that is, the effect of treatment administered at a later stage would have ruled out the possibility of sale, in accordance with site practice.

The relation between the number of treatments applied and their efficacy was also examined. For this the treated groups were each divided into two, one half being treated only once and one repeat treatment being administered to the other half. Data relating to the total number of ears examined are given in *Table 1*.

**Table 1**

**Number of ears examined**

Treatment (1)	Experiment 1 (2)	Experiment 2 (2)		
		Non Treated (3)	Treated 1x (4)	Treated 2x (5)
Control (6)	146	74		
Ivomec inj. s.c. 200 µg/kg bw*	132		24	26
Neostomosan 0,5%	140		16	28
Neocidol 0,01%	144		26	28

\*200 µg/kg body-weight (*testtömeg kilogramm*)

*1. táblázat: A vizsgált fülek száma*

*Kezelés(1), Kísérlet(2), Kezeletlen(3), 1x kezelt(4), 2x kezelt(5), Kontroll(6)*

The degree of severity of the symptoms detectable in the does (n=32) and in their progeny (n=136) was monitored at the beginning of the second experiment, when the young were 5 weeks old, on the basis of visible changes in the ear.

Subsequent to treatment (ivermectin 200 µg/kg) of the total stock of does, after 1, 3 and 5 months had elapsed the degree of infestation in all progeny of exactly 6 weeks of age originating from the does treated was examined (n<sub>1</sub>=285, n<sub>2</sub>=281, n<sub>3</sub>=110). In each case the number of animals examined was determined by the number of progeny available.

Inter-group differences in the values obtained with respect to weight gain were checked for significance by means of LSD test. Linear regression was applied in the testing of data for any relation between does and offspring in terms of degree of infestation. The analyses performed were facilitated by the 7.5 version of the SPSS (1996) statistics programme package running on Windows.

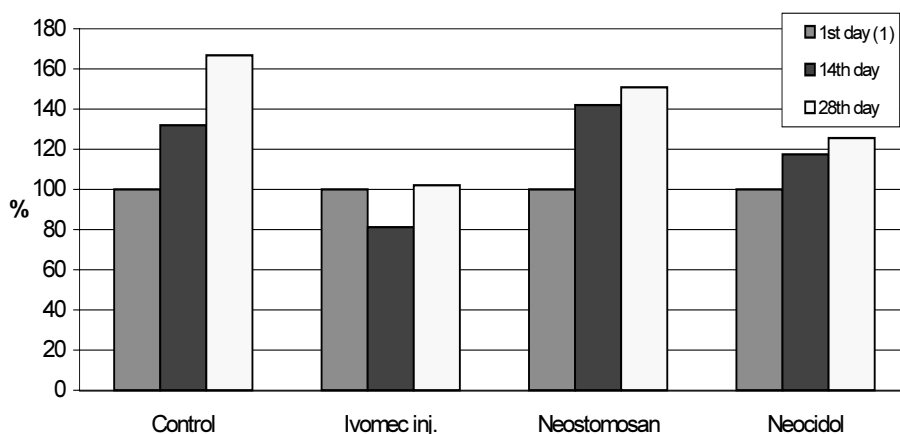
**RESULTS AND DISCUSSION**

In the first experiment the highest increase in degree of infestation was observed in the untreated control group. Of the treatment preparations applied externally Neocidol (0.01%) proved more effective than Neostomosan (0.5%). Subsequent to the second administration of external treatment, for both treatments lower degrees of increase in the values obtained were ascertained than those for the first two weeks of the experiment. With respect to the treatment preparations used the ivermectin injection resulted in a more pronounced the values expressing degree of infestation; however,

due to eggs emerging in the meantime the level of infection began to rise from the second week, but it was not possible to repeat the treatment. In the interest of providing a clearer comparison, changes have been displayed with the initial values taken as 100% (Figure 1).

**Figure 1**

**Change in infestation (efficacy of treatments) in the course of the experiment, expressed in percentages (experiment 1)**



1. ábra: A csoportok fertőzöttségi értékeinek változásai (hatékonyság) a kísérlet időtartama alatt, százalékban kifejezve (1. kísérlet)

*Nap(1)*

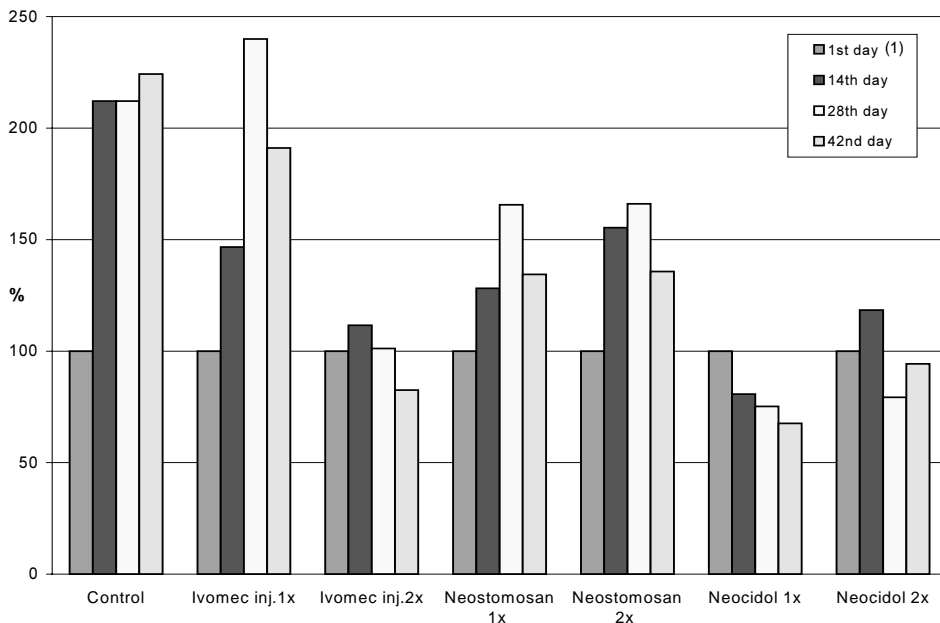
The second experiment also showed the most pronounced rise in the degree of infestation in the control group. With respect to the three treatment preparations used Neocidol (0.01%) and ivermectin injection proved effective. Neostomosan (0.5%) produced results scarcely more favourable than those obtained for the control group.

In the group treated twice with ivermectin injection considerably more favourable changes in the degree of infestation present were observed than in the group treated only once. In a similar comparison Neostomosan (0.5%) showed no substantially difference in the results obtained. Neocidol (0.01%) proved effective when administered only once, but repeat injection did not, in contrast with the results anticipated, lead to any further improvement in the degree of success achieved (Figure 2).

The linear regression calculations performed indicate that the degree of infestation present in does determines to a level of approximately 70% the degree of infestation from which their offspring will suffer ( $R^2=0.74$ ). It was also the case that infected does and those suffering lower degrees of infestation were placed in cages adjacent to each other, thus giving rise to the possibility for cross-infection.

**Figure 2**

**Change in infestation (efficacy of treatments) in the course of the experiment, expressed in percentages (experiment 2)**



2. ábra: A csoportok fertőzöttségi értékeinek változásai (hatékonyság) a kísérlet időtartama alatt, százalékban kifejezve (2. kísérlet)

*Nap(1)*

During the 4-week observation period no statistically verifiable differences were ascertained between the groups with respect to weight gain (Table 2).

**Table 2**

**Changes in daily weight gain during the experimental period (experiment 1)**

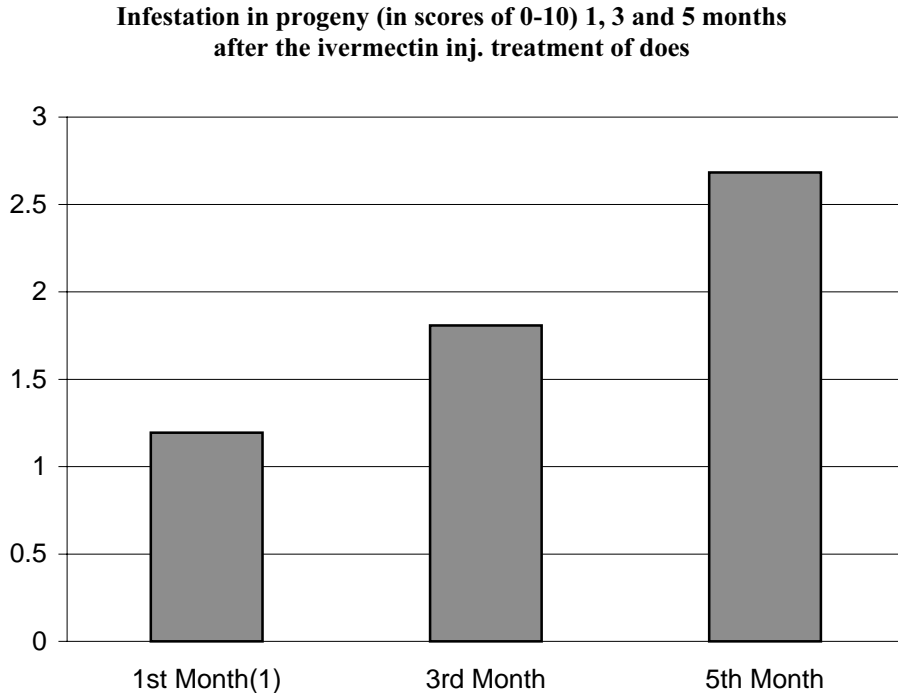
Treatment(1)	n	Daily weight gain, g (2)	
		Mean (3)	SD (4)
Control (5)	73	37,7	8,9
Ivomec inj.	66	39,5	9,1
Neostomosan	70	35,9	9,1
Neocidol	72	34,7	10,2

2. táblázat: A napi testtömeggyarapodás alakulása a kísérlet időtartama alatt

*Kezelés(1), Napi testtömeggyarapodás(2), Átlag(3), Szórás(4), Kontroll(5)*

As time progressed after the treatment of the does with ivermectin injection the degree of infestation measured in the offspring increased (Figure 3).

Figure 3



3. ábra: Az utódok fertőzöttségi szintje az anyák ivermectin injekciós kezelése után 1, 3 és 5 hónappal (0-10-es skálán)

Hónap(1)

### CONCLUSIONS

On the basis of the two experiments performed by the author, of the treatment preparations tested ivermectin injection was found to be the most effective for the treatment of ear mange. Neocidol proved the better of the externally applied antiparasitic agents applied.

In contrast with other authors (Papp *et al.*, 1990), the author ascertained no relation between the severity of changes in the ear and gain in body weight. A possible reason for this is the brief observation period (4 weeks), and the relatively mild changes observed (with a mean value below 3 on the scale of 0 to of 10 - see Figure 3).

The close relation ascertained between the degree of infestation present in does and that of their progeny indicates, without scope for doubt, that the extent of ear mange suffered by suckling rabbits is primarily dependent upon the degree of infestation reached in their mothers. In the sense of the study of epizootic disease, vertical

transmission of infection (from doe to offspring) plays a more determinant role than horizontal transmission (between individual animals).

Repeated treatment proved undoubtedly more effective than that administered only once, since none of the agents applied proved effective against mite eggs; thus, repeated treatment is by all means necessary. If this is not performed the degree of infestation may even relapse to its original level in the course of the 2-to-3-week development cycle (Varga, 1990). While being treated with such preparations, and where such treatment is administered in accordance with a set programme, rabbits do not become infected with ear mange mites; thus, in the resulting environment pathogens stand less chance of survival.

On the basis of the experimental results obtained, and also with respect to theoretical, practical and economic considerations, it is recommended that, for the purpose of breaking the chain of infection, does would be treated 4x2 times annually with ivermectin injection (200 µg/kg body weight). If this treatment is not performed the degree of infestation occurring in the offspring will be higher, added to which treatment in such cases is more time-consuming, and the costs incurred are ten times as much as the cost of total stock preventive treatment against ear mange in the form of ivermectin injection administered to does (Table 3). Treatment in line with a set programme, generally neglected in practice, is justified unambiguously by the four highly significant aspects outlined in the introduction to this paper.

On the basis of the examinations performed the author therefore recommends that does be treated four times a year, according to a set programme, by means of ivermectin injection (200 µg/kg); in justified cases it is expedient to treat the offspring with externally administered Neocidol (0.01%).

**Table 3**

**Cost analysis**

Treatment(1)	Package(2)	Cost of treatment, Ft(3)		Withdrawal time, days (4)
		40 growing rabbits(5) 2x treatments(6)	1 doe(7) 4x2 treatments/year	
Ivomec inj.	50 ml	270	90	28
Neostomosan	5x5 ml	14	1,4	0
0,5%	1000 ml	5	0,5	
Neocidol 0,01%	3x5 ml	6,4	0,64	14

*3. táblázat: Költségelemzés*

*Készítmény(1), Kiszerezés(2), Kezelési gyógyszerköltség, Ft(3), Élelmezés egészségügyi várakozási idő, nap(4), Növendék(5), Kezelés(6), Anya(7)*

**REFERENCES**

1998. évi XXVIII. Törvény az állatok védelméről és kíméletéről.  
 Állategészségügyi szabályzat 41/1997. (V.28.) FM rendelet.  
 Arlian, L.G., Kaiser, S., Estes, S.A., Kummel, B. (1981). Infestivity of *Psoroptes cuniculi* in rabbits. *American Journal of Veterinary Research*, 42. 10. 1782-1784.



- Curtis, S.K. (1992). Diagnostic exercise: moist dermatitis on the hind quarters of a rabbit. *Laboratory Animal Science*, 41. 6. 623-624.
- Cutler, S. L. (1998). Ectopic *Psoroptes cuniculi* infestation in a pet rabbit. *Journal of Small Animal Practice*, 39. 86-87.
- Kamboj, D.S., Khahra, S.S., Singh, P.J., Nauriyal, D.C. (1995). Comparative efficacy of various acaricides against psoroptic mange in rabbits. *Indian Journal of Veterinary Medicine*, 15 (1) 53.
- Kassai T., Békési L. (1993). Felmérés az állati parazitózisok magyarországi elterjedtségéről. *Magyar Állatorvosok Lapja*, 12. 721-730.
- Okerman, L. (1994). Diseases of the skin. *Diseases of Domestic Rabbits*. Oxford Blackwell Scientific, 52-53.
- Papp Z., Rafai P., Vetési F., Takács Gy., Dobrosi Gy. (1990). A nyulak középfülgyulladására és az egyes termelési mutatók alakulása közötti összefüggés tanulmányozása. 2. Nyúltenyésztési Tudományos Nap, Kaposvár.
- SPSS® FOR WINDOWS™ (1996). Version 7.5, Copyright SPSS Inc.
- Stein, S., Walshaw, S. (1996). Rabbits. *Handbook of Rabbit and Rodent Medicine*. Oxford Pergamon, 183-217.
- Varga I. (1990). Paraziták okozta betegségek. *Házinyúl-egészségtan*. Szerk. Vetési F. Mezőgazdasági Kiadó, Budapest, 227-229.
- Vörös G. (1992). A nyulak rühessége. *Kistermelők Lapja*, 36. 12. 27.
- Yeates, J.W.G. (1994). Rabbit mite infestation. *Veterinary Record*, 134. 359-360.

Corresponding author (*levelezési cím*):

**Tamás Donkó**

Pannon University of Agriculture, Faculty of Animal Science

H-7401 Kaposvár P.O.Box 16.

*Pannon Agrártudományi Egyetem, Állattenyésztési Kar*

*7401 Kaposvár, Pf.: 16.*

Tel.: 36-82-314-155, Fax: 36-82-320-175

e-mail: tdonko@atk.kaposvar.pate.hu