

## Efficacy of Moxidectin Against Gastrointestinal Nematodes in Naturally Infected Lambs and Calves

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**Abstract:** In this trial based on the reduction of the egg output and on the evaluation of results from larval/egg differentiation, moxidectin (Cydectin, 1% injectable moxidectin) administered subcutaneously at a dose of 0.2 mg kgbw<sup>-1</sup> was found effective on the gastrointestinal nematodes in naturally infected lambs (8 female and 7 male treatment; 8 female and 7 male control) harbored *Haemonchus spp.*, *Ostertagia spp.*, *Trichostrongylus spp.* and *Nematodirus spp.* and in naturally infected female calves (20 treatment and 10 control) harbored *Haemonchus spp.*, *Ostertagia spp.*, *Trichostrongylus spp.*, *Bunostomum spp.* and *Cooperia spp.* The efficacy was 100% on day +7, 99.9% on day +14 and 100% on day +28 in lambs and 100% on day +7, 99.9% on day +14 and 98.9% on day +28 in calves. No side effect of the drug was observed.

**Key Words:** Moxidectin, treatment, gastrointestinal nematodes, sheep, cattle

### Moxidectin'in Doğal Olarak Enfekte Kuzu ve Danalarda Gastrointestinal Nematodlara Karşı Etkisi

**Özet:** Yumurta çıkışındaki azalmayı ve larva/yumurta ayrımının değerlendirilmesini temel alan bu çalışmada merada otlayan ve gastro intestinal nematodlarla doğal olarak enfekte 2,5-3,5 aylık 30 kıvrıcık kuzu (8 dişi 7 erkek tedavi ve 8 dişi 7 erkek kontrol) ve 6-10 aylık 30 holştayn dişi dana (20 tedavi ve 10 kontrol) kullanıldı. Tedavi ve Kontrol Grupları, hayvanların ağırlıklarına ve EPG'lerine göre belirlendi. Tedavi grubu hayvanlara 0.2 mg.kg<sup>-1</sup> dozda moxidectin (Cydectin, 1% injectable moxidectin) deri altı yolla verildi. Hayvanlardan tedaviden bir gün önce ve tedaviden sonra 7'inci, 14'üncü ve 28'inci günlerde rektal yolla dışkı alındı. Bu dışkılarda gram dışkıdaki yumurta sayımları ve tedavi öncesi ve tedaviden 28 gün sonrası alınan dışkılarda larva kültürleri yapıldı.

Larva ve yumurta ayrımı sonuçları, kuzularda *Haemonchus*, *Ostertagia*, *Trichostrongylus*, *Nematodirus*, sığırlarda *Haemonchus*, *Ostertagia*, *Trichostrongylus*, *Bunostomum*, *Cooperia* cin.eline bağlı türler olduğunu ortaya koydu. İlacın etkisi kuzularda 7'inci günde %100, 14'üncü günde %99.9 ve 28'inci günde %100, danalarda 7'inci günde %100, 14'üncü günde %99.9 ve 28'inci günde %98.9 olarak belirlendi. İlaça bağlı yan etki gözlenmedi.

**Anahtar Sözcükler:** Moxidectin, tedavi, midebağırsak nematodları, koyun, sığır

### Introduction

Moxidectin is a macrocyclic lactone endectocit. It was shown by the manufacturer that a single subcutaneous injection of moxidectin as a 1% formulation at 0.2 mg kgbw<sup>-1</sup> was highly effective in removing the most of adult and immature stages of gastrointestinal nematodes of lambs and calves.

The purpose of the present work was to confirm the recommended dose of 0.2 mg kgbw<sup>-1</sup> against a broad spectrum of naturally acquired nematode infections of lambs and calves under management practices in Turkey.

### Materials and Methods

#### Animals:

**Lambs:** The trial on lambs was conducted on a farm near İstanbul during June and July of 1992. All lambs in this farm were of the "Kıvrıcık" breed and naturally infected with gastrointestinal (GI) nematodes. These lambs were first grazing animals aged 2.5 to 3.5 months. Sixteen female and fourteen male lambs were selected. The animals were divided into two equal groups (8 female and 7 male treatment, 8 female and 7 male control) on the basis of the body weight and EPG from the fecal samples taken on days -7 and -1.

**Calves:** The trial on calves was carried out on a farm near İstanbul in September and November of 1992. All

calves in this farm were of the Holstein breed and naturally infected with GI-nematodes. These calves were first grazing animals aged 6 to 10 months and female. Thirty calves were selected and divided into two groups (20 treatment and 10 control) on the basis of the body weight and EPG from the fecal samples taken on days -6 and -1.

**Study Design:**

Treatment groups of lambs and calves received 0.2 mg kgbw<sup>-1</sup> moxidectin (Cydectin, 1% injectable moxidectin, Cyanamid New Zealand) subcutaneously.

One pretreatment (on day -1) and 3 posttreatment (on days +7, +14, +28) rectal fecal samples were collected from each animal for EPG.

To determine the GI-nematode fauna in animals, the morphological peculiarities of egg and L<sub>3</sub> were taken into consideration (1-4). For this purpose, a larval culture for each group was performed from feces taken on days -1 and +28 (4).

The EPG values were determined by using Special Modification of McMaster Method for calves and Modified McMaster Method for lambs (4).

The animals were weighed on day -1 and on day +28 to compare the weight gains of both groups.

The animals had been observed from the point of view of adverse signs for 7 days after treatment.

**Measure of efficacy and Statistical analysis:**

For the evaluation of efficacy of moxidectin, the

geometric mean of EPG's were used. They were logarithmically calculated by using the following equation since there were zero values in the EPG's of the treatment group.

$$\text{Geo.Mean of EPG's} = \text{antilog} [(\sum \log (\text{EPG}+1)) / n]-1$$

The measure of the efficacy of moxidectin against GI-nematodes was based on the percentage reduction of the geometric mean of fecal egg counts of treatment group in comparison with that of control group. In the beginning of the study there was a slight difference between the means of egg counts of control and treatment groups. Taking into consideration of this difference, it needed to be made a correction on the equation by the correcting factor (EPG<sub>CB</sub> / EPG<sub>TB</sub>). The following equation was used to measure the percentage efficacy.

$$\text{Efficacy (\%)} \text{ of drug against GI-nematodes} = 100 \times [1 - (\text{EPG}_{TA} / \text{EPG}_{CA}) \times (\text{EPG}_{CB} / \text{EPG}_{TB})]$$

The differences of weights and weight gains between control and treatment groups on day 28 were evaluated statistically by using T-test. The measure of the effects (%) of treatment on weight gain was based on the subtraction of average weight gain of control group for 100 kgbw from that of treatment group for 100 kgbw. The effects (%) of treatment on weight gain were evaluated the following equation.

$$\text{Effect (\%)} \text{ of treatment on weight gain} = 100 \times [(WT_A / WT_B) - (WC_A / WC_B)]$$

(Abbrs. in equations: (EPG) Geometric mean of

	Lambs				Calves			
	Day -1		Day +28		Day -1		Day +28	
	C	T	C	T	C	T	C	T
Average of EPG's	477	477	267	0	162	158	106	3
Genera	%	%	%	%	%	%	%	%
Haemonchus*	26	30	16	0	32	58	36	0
Ostertagia*	56	50	56	0	22	10	2	8
Trichostrongylus*	10	16	8	0	4	2	0	0
Cooperia onchophora*	0	0	4	0	12	22	22	36
Other Cooperia spp*	0	0	4	0	10	4	20	20
Nematodirus**	8	4	16	0	0	0	0	0
Bunostomum*	0	0	0	0	20	4	10	16
Oesophagostomum*	0	0	4	0	0	0	10	20

Table 1. GI-nematode fauna in the control (C) and treatment (T) groups

Identified from (\*) L<sub>3</sub>, from (\*\*) egg.

Groups	D -1	D +7	D +14	D +28	D -1	D +28	
CONTR.	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>W(Kg)*</u>	<u>W(Kg)*</u>	<u>WG*</u>
GeoMean	413	315	280	250	-	-	-
Average	477	350	313	267	27.2	27.47	0.267
SD	258	152	155	91.9	4.2	5.04	2.89
Min	150	150	150	100	22	20	-3
Max	1050	550	600	400	39	40	6
IR**	15/15	15/15	15/15	15/15	n=15	n=15	n=15
TREATM.	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>W(Kg)*</u>	<u>W(Kg)*</u>	<u>WG*</u>
GeoMean	398	0	0.3	0	-	-	-
Average	477	0	3.33	0	27.47	28.4	0.933
SD	317	0	12.9	0	5.22	6.95	3.15
Min	150	0	0	0	21	19	-3
Max	1350	0	50	0	37	40	6
IR**	15/15	0/15	1/15	0/15	n=15	n=15	n=15
Efficacy (%) of drug		100	99.9	100			
Effect (%) of treatment on weight gain							2.4

SD= Standard deviation

\* No significant difference ( $P>0.05$ ) between both groups

\*\*No of infected animals / no of total animals (n) in the group

Table 2. *Lambs*: Infection rates (IR); statistical results of egg counts (EPG), body weights (W) and weight gains (WG); efficacy of drug and effect of treatment

Groups	D -1	D +7	D +14	D +28	D -1	D +28	
CONTR.	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>W(Kg)*</u>	<u>W(Kg)*</u>	<u>WG*</u>
GeoMean	153	137	126	101	-	-	-
Average	162	147	141	106	223.5	246.3	22.8
SD	62	60.2	82.9	37.5	42.5	46.9	18.9
Min	100	70	70	70	154	166	-6
Max	280	250	360	190	285	306	47
IR**	10/10	10/10	10/10	10/10	n=10	n=10	n=10
TREATM.	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>EPG</u>	<u>W(Kg)*</u>	<u>W(Kg)*</u>	<u>WG*</u>
GeoMean	150	0	0.13	1.05	-	-	-
Average	158	0	0.5	3	224.5	248.4	23.9
SD	55.3	0	2.24	4.70	42.6	49.5	12.7
Min	100	0	0	0	135	149	4
Max	270	0	10	10	292	318	46
IR**	20/20	0/20	1/20	6/20	n=20	n=20	n=20
Efficacy (%) of drug		100	99.9	98.9			
Effect (%) of treatment on weight gain							0.445

SD= Standard deviation

\* No significant difference ( $P>0.05$ ) between both groups

\*\*No of infected animals / no of total animals (n) in the group

Table 3. *Calves*: Infection rates (IR); statistical results of egg counts (EPG), body weights (W) and weight gains (WG); efficacy of drug and effect of treatment

EPG's; (W) Average of weights; (C) Control and (T) Treatment groups; (B) Before and (A) After treatment)

## Results

Treatments of lambs and calves with moxidectin using the injectable formulation did not cause any clinically detectable side effects, neither as a systemic nor as a local reaction at site of application.

Other results are shown in Table 1, 2 and 3.

## Discussion

This paper reports the results of an efficacy trial with injectable formulation of moxidectin at a dose of 0.2 mg

Kgbw<sup>1</sup>, which based on the percentage reduction of EPG and larval/egg differentiation.

In our study, moxidectin was found to be highly effective (98.9–100%) against GI-nematodes of sheep and cattle. Similar results have been obtained from the studies on sheep (5–7) and cattle (8–11). But in contrast, the efficacy of this drug in a study (12) conducted in Ireland was reported to be low (52.4% on day 28) against *Cooperia*.

Weight gains of treatment groups of both calves and lambs were slightly more than those of both control groups. But, the differences between weight gains of treatment and control groups on day +28 were not of importance statistically ( $P>0.05$ ). This situation may be attributed to the light infections occurring in animals.

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