THERAPEUTIC EFFECT OF ZANIDE, PARABENZOLE AND GENESIS ON GASTROINTESTINAL NEMATODIASIS IN SHEEP

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SUMMARY

Gastrointestinal nematodiasis in sheep has economic importance in Egypt. It reduces body weight gain and leads to death of young lambs. In this study, we evaluated the efficacy of three anthelmintic drugs namely Zanide (Oxyclozanide + Levamisole), Parabenzole (Albendazole) and Genesis (Abamectin). Therefore, 4 groups (n=10) of adult sheep (50-100 average BW) were used. Group 1 had natural infestation with nematodes and treated with Zanide (15 mg Oxyclozanide / kg and 7.5 mg Levamisole /kg BW, orally). Group 2 had natural infestation with nematodes and treated with Parabenzole (5 mg Albendazole / kg BW, orally). Group 3 had natural infestation with nematodes and treated with Genesis (200 μg Abamectin / kg BW, subcutaneously). Group 4 included ten non-infested sheep and used as a control. The number of egg per gram (EPG) faeces was quantified by McMaster technique daily for 7 days post-treatment. Blood samples were collected before treatment and on the 1st, 2nd, and 3rd week post-treatment to determine RBCs counts, Hb concentration, PCV%, and differential leucocytic counts. Additionally, serum samples were collected for determination of total serum protein, albumin and globulin. Clinical signs included loss of appetite, anemia, emaciation, diarrhea and submandibular edema. The excretion of egg in faeces was completely disappeared on the 3rd, 4th, and 5th day post-treatment with Genesis, Zanide and Parabenzole, respectively. The RBCs count, Hb concentration and PCV% were significantly decreased ($P<0.05$) in the 3 groups before treatment compared to control but were gradually increased on the 1st, 2nd and 3rd week post-treatment. The total WBCs count, eosinophil % and neutrophil % were significantly increased before treatment but gradually decreased post-treatment in the 3 groups. On the other hand, lymphocytes were significantly decreased ($P<0.05$) pre-treatment and gradually increase post-treatment in the 3 groups. Serum total protein, albumin and globulin were significantly reduced ($P<0.05$) pre-treatment but gradually increased post-treatment. In conclusion, the changes in blood and serum parameters due to sheep nematodiasis were efficiently restored after the third week of treatment with Zanide, Parabenzole and Genesis. However, Genesis (subcutaneous) was faster and more effective than Parabenzole

(oral) and Zanide (oral) in reducing the excretion of gastrointestinal nematode eggs in sheep.

INTRODUCTION

Gastrointestinal nematodiasis in sheep is among the commonest disease with economic concern **(Perry *et al.,* 2002)** as they are one of the main destructive factors of animal health in Egypt **(Hashem, 1997).** It leads to reduction in live weight gain and wool growth and death of young lambs **(Kimberling, 1988).** There are many species of nematodes affecting sheep flocks producing productivity loss; some of them are localized in abomasum such as Trichostrongylus, Haemonchus, and Ostertagia **(El-Azazy, 1990)**. Others live in large intestine, such as Trichuris, Chabertia and Oesophagostomum **(Torina *et al.,* 2004**). Others live in small intestine, such as Capillaria, Bunastomum and Nematodirus (**Vlassoff and McKenna, 1994)**.

The adverse effect of some worms may be induced by their feeding of blood (Haemonchus) leading to anemia **(Fontenot *et al.,* 2003**), destruction of intestinal epithelial cells with leaking plasma protein leading to hypoproteinaemia and subsequently emaciation and edema **(Coop, 1989)** or interference with reticulo-ruminal motility leading to off food and weight loss **(Armour *et al.,* 1966)**. The end result of nematodiasis is production loss represented by reduction in body weight, milk production and impairing wool growth and inducing mortalities of young lambs.

Because of this economic importance, several anthelmintic drugs have been employed to control nematodiasis on regular basis. Anthelmintic drugs affect on nematodes either by acting as agonist of acetylcholine esterase receptor with induction of spastic paralysis, such as Levamisole **(Martin, 1997**), or by inhibition of tubulin polymerization, such as parabendazole (**Valdez, 2002**) or potentiation of inhibitory transmitters, such as Abamectin **(Bloomquist, 1993)**.

The objective of this study was to delineate the clinical and hematological changes associated with sheep nematodiasis. Further objective was to evaluate the efficacy of three anthelmintic drugs - commonly used in Egypt- to control gastrointestinal nematodes in sheep. These drugs are Zanide, Parabenzole and Genesis. The efficacy was mainly evaluated by the reduction in the number of egg per gram (EPG) faeces. Other evaluating parameters included changes in the RBCs count, Hb concentration, PCV %, total and differential leucocytic counts, total protein, albumin and globulin.

MATERIALS AND METHODS

Animals

Forty native breed lambs with average weight of 75 kg and age of 1 year, from different flocks at Moshtohor area, Kalubia province, Egypt were used in this study. Thirty lambs were examined for the presence of gastrointestinal nematodes. In addition to the demonstration of a mixture of nematode eggs in faeces of these lambs, they also showed signs of diarrhea, off food, emaciation, anemia and submandibular edema. The infested sheep were allocated into 3 groups, each received a different treatment administered at the manufacturer's recommended dose rate. Another ten non-infested apparently healthy lambs were kept on parasitic-free area and used as a control (Table 1).

Table 1: Study design

	Treatment	Active principle	Dose	Route	EPG faeces
Group 1 (n=10)	Zanide	Oxyclozanide Levamisole	15 mg/kg BW 7.5 mg/kg BW	Oral	1630
Group 2 (n=10)	Parabenzole	albendazole	5 mg/kg BW	Oral	760
Group 3 (n=10)	Genesis	Abamectin	200 µg/kg BW	subcutaneous	700
Group 4 (n=10)	Control	-	-	-	0

Parasitological Examination and egg counting

Fecal samples were directly collected from rectum daily for 7 days after treatment and examined qualitatively for nematode eggs as soon as possible in the same day according to **Soulsby (1986)**. The degree of infestation was determined by counting the number of eggs per gram (EPG) faeces using McMaster technique according to **Soulsby (1986**). The efficacy of the anthelmintic drug was calculated as follow

$$\text{Efficacy \%} = \frac{\text{Mean EPG before treatment} - \text{Mean EPG after treatment}}{\text{Mean EPG before treatment}} \times 100$$

Faecal Culture

Since some nematode eggs are morphologically confused together, fecal culture was used to identify the different species of nematodes in infested groups through examination of their larvae (**Georgi and Georgi, 1990**). This was followed

by collection the larvae from the culture and their staining by Lugol's iodine according to a modified Baermann's technique (**Thomas *et al.*, 1970).**

Blood and Serum Examination

Two Blood samples were collected from all sheep before treatment and on the 1st, 2nd and 3rd week post-treatment. The first blood sample was collected on potassium EDTA for haematological examination including determination of total leucocytic (WBCs) and erythrocytic count **(Schalm *et al.*, 1975)**, PCV % (**Coles, 1986**), and Hb content (**Wintrobe *et al.*, 1976**). The second blood sample was collected without anticoagulant to separate serum. Collected sera were used to determine the total proteins (**Doumas *et al.*, 1981)**, albumin and globulin (**Doumas and Biggs, 1972**).

Statistical Analysis

All data were represented by means ± standard error of the mean (SEM). All tests were carried out by using Sigma Stat 3.1, a statistical software for data analysis (SPSS Inc., Chicago, IL, USA). A one-way analysis of variance (ANOVA) with Holm-Sidak posthoc test was used to determine the significant changes between experimental groups and control. All differences were considered statistically different at $P < 0.05$ or $P < 0.001$.

RESULTS

Clinical Signs

Infested animals showed varying degrees of diarrhea, loss of appetite, paleness of mucous membranes, emaciation, poor wool growth and submandibular edema. There were no mortalities among infested lambs.

The Types of Nematode Infesting Sheep

From fecal examination, *Nematodirus* and *Trichuris* species were identified from their characteristic egg. After fecal culture of positive sample of infested groups, at least six species of gastrointestinal nematodes were identified from their larvae. These include: *Trichostrongylus* (short length of caudal sheath extension), *Homonchus* (sheath kinked at the tip of tail), *Ostertagia* (distinct round tail), *Cooperia* (medium length of caudal sheath extension), *Chabertia* (long length of caudal sheath and medium sized larva) and *Oesophagostomun* (long length of caudal sheath) (Figure 1).

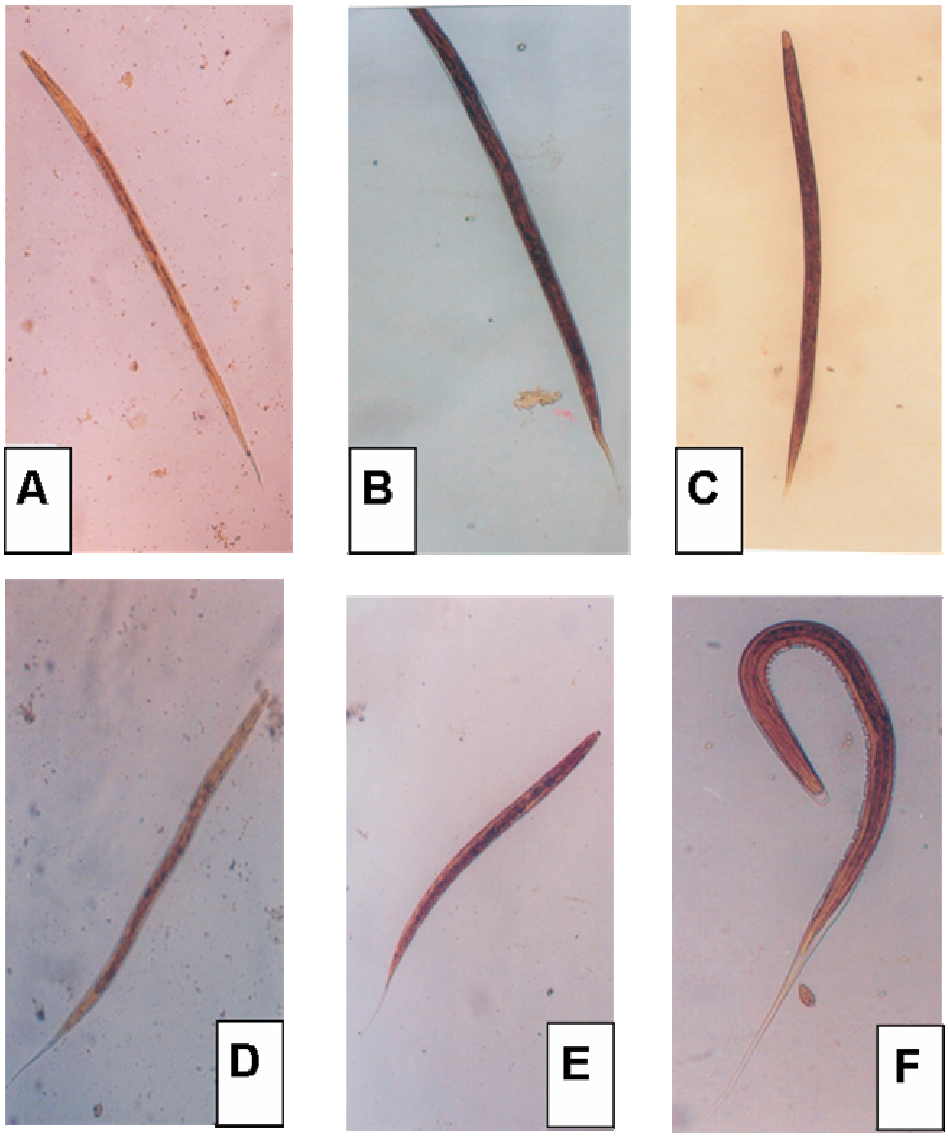

Figure 1: The third stage larvae (stained with Logul's iodine) of nematodes infesting sheep in experimental groups. A**:** Trichostrongylus species (short length of caudal sheath extension). B: Homonchus species (sheath kinked at the tip of tail). C: Ostertagia (distinct round tail). D: Cooperia (medium length of caudal sheath extension). E: Chabertia (long length of caudal sheath and medium sized larva). F: Oesophagostomum (long length of caudal sheath)**.** Magnification is 100 X**.**

Effect of Treatment on EPG of Faeces

The mean value of EPG of faeces in sheep treated with Zanide was 1630 before treatment which completely disappeared on the 4th day post-treatment. The mean value of EPG of faeces in sheep treated with Parabenzole was 760 before treatment which completely disappeared on the 5th day post-treatment. While in the 3rd group which was treated with Genesis, the mean value of EPG of faeces was 700 before treatment and completely disappeared on the 3rd day post- treatment (Table 2). The efficacy %

of Genesis was higher than Zanide and Parabenzole starting from the first day post-treatment (Figure 2).

Table 2. Anthemintic efficacy (%) of Zanide, Parabenzole and Genesis.

Groups / Day	Zanide-treated		Parabenzole-treated		Genesis-treated	
	EPG	**Efficacy %**	**EPG**	**Efficacy %**	**EPG**	**Efficacy %**
Day 0	1630	0	760	0	700	0
1st day	540	66.9	400	47.4	160	77.1
2nd day	120	92.6	320	57.9	40	94.3
3rd day	20	98.8	120	84.2	**0**	**100**
4th day	**0**	**100**	20	97.4	0	100
5th day	0	100	**0**	**100**	0	100
6th day	0	100	0	100	0	100
7th day	0	100	0	100	0	100

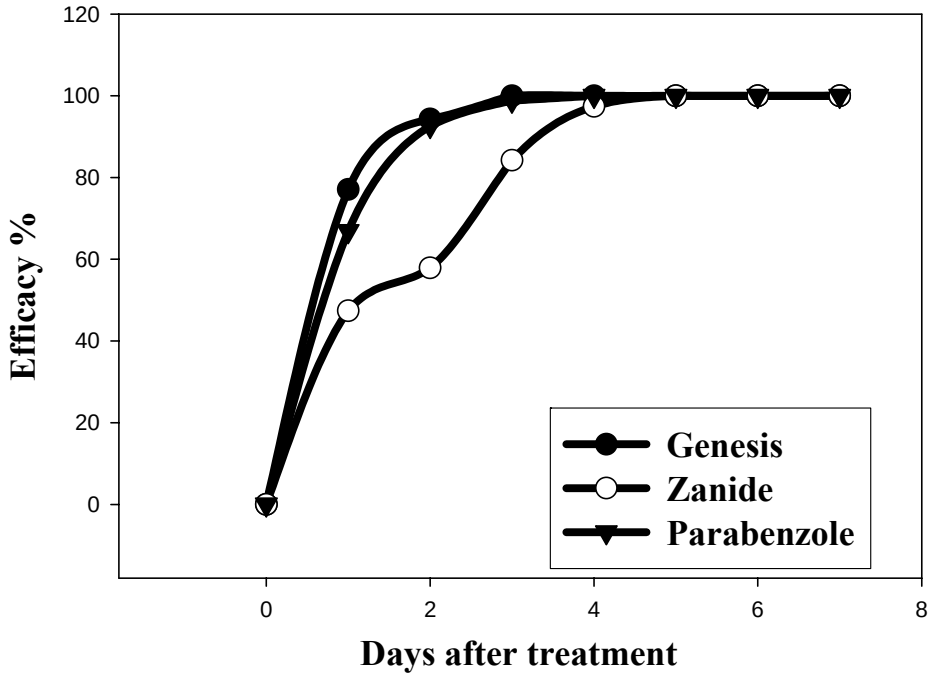

Figure 2. Efficacy of Zanide, Parabenzole and Genesis on reduction of EPG of faeces in sheep with natural nematodiasis. The efficiency of Genesis is higher than Parabenzole, which is higher than Zanide.

Effect of Treatment on Haematological and Serological Parameters

A- RBCs Count, Hb Concentration and PCV%

The total RBCs count was highly significantly decreased ($P < 0.001$) and the PCV % and Hb were significantly reduced ($P < 0.05$) in infested groups compared to control non-infested. These parameters were gradually increased after treatment with Zanide, Parabenzole and Genesis (Table 3, Figure 3).

B- WBCs and Differential Leucocytic Count

The total WBCs count, eosinophil and neutrophil percentage were highly significantly increased ($P < 0.001$) and the lymphocyte % was highly significantly reduced ($P < 0.001$) in infested groups compared to control non-infested. These parameters were changed gradually after the 1st, 2nd and 3rd week toward the control values after treatment with Zanide, Parabenzole and Genesis. The monocyte % and basophile % were not significantly increased in infested groups (Table 4, Figure 4).

C- Serum Total Protein, Albumin and Globulin.

The serum total protein, albumin and globulin were highly significantly decreased ($P < 0.001$) in infested groups compared to control. These parameters were gradually increased toward the normal values after treatment. (Table 5, Figure 5).

Comparison between the 3 treatment groups at any particular time point did not reveal significant difference for any hematological or serological parameters measured.

Table 3. Haematological parameters in infested and control groups before treatment and on the 1st, 2nd and 3rd week post-treatment.

Group / Parameter	Control (non infested)	Zanide-treated group				Parabenzole-treated group				Genesis-treated group			
		Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3
PCV (%)	31.1 ± 0.737	27.15 ± 0.691*	28 ± 0.422*	29.1 ± 0.795	31.3 ± 0.989	28.5 ± 0.401*	32.2 ± 0.611	35.1 ± 0.971*	35.5 ± 0.872*	28.4 ± 0.499*	29.4 ± 0.909	31.1 ± 0.849	30.4 ± 0.581
Hb (mg/dl)	8.14 ± 0.136	7.15 ± 0.168*	7.31 ± 0.125*	7.84 ± 0.119	8.04 ± 0.122	7.02 ± 0.0964*	7.64 ± 0.12*	7.96 ± 0.154	8.02 ± 0.182	7.378 ± 0.102*	7.43 ± 0.117*	7.53 ± 0.0943*	7.93 ± 0.196
RBCs (x 10^6)	9.632 ± 0. 256	7.065 ± 0.763**	8.064 ± 0.256*	9.495 ± 0.498	10.054 ± 0.555	**5.5998 ± 0.579****	**6.607 ± 0.115****	9.500 ± 0.352	9.607 ± 0.414	7.479 ± 0.311**	7.895 ± 0.471**	8.001 ± 0.164*	8.465 ± 0.359*

- Results are represented by means ± standard error (SE)
- * Indicates significant difference compared to control group at $P < 0.05$.
- ** Indicates highly significant difference compared to control group at $P < 0.001$

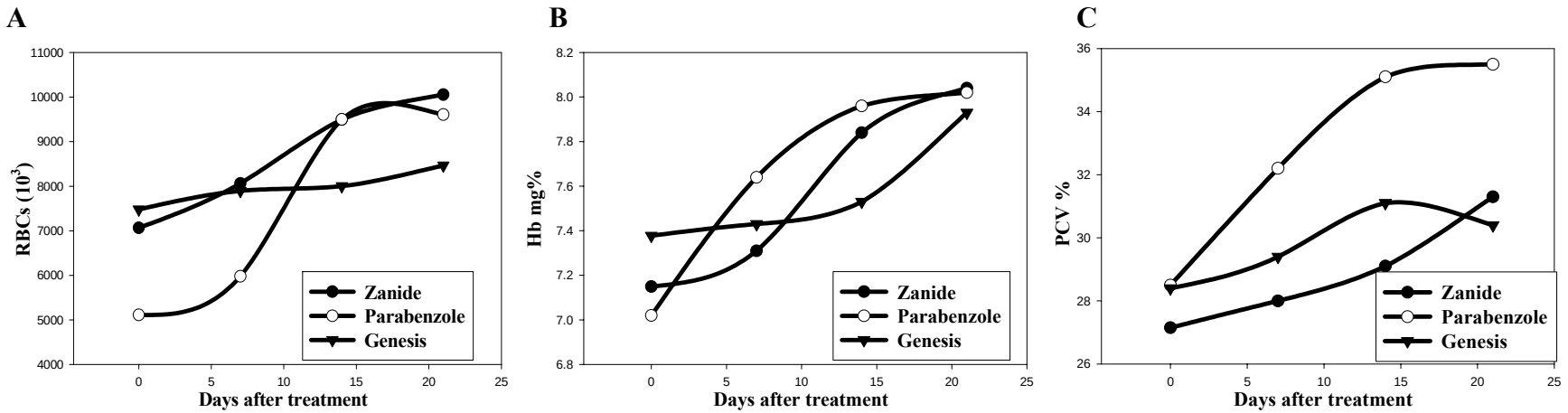

Figure 3. The RBCs count (A), Hb concentration (B) and PCV% (A), are gradually increased after treatment with Zanide, Parabenzole and Genesis.

Table 4: Total and differential leucocytic count in infested and control groups before treatment and on the 1st, 2nd and 3rd week post-treatment.

Group / Parameter	Control (non infested)	Zanide-treated group				Parabenzole-treated group				Genesis-treated group			
		Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3
WBCs ($10^3/mm^3$)	5.66 ± 0.445	11.482 ± 0.579**	11.171 ± 0.688**	8.890 ± 0.523**	8.235 ± 0.246**	13.549 ± 0.752**	12.693 ± 0.624**	11.483 ± 0.421**	8.794 ± 0.416**	11.530 ± 0.451**	11.250 ± 0.477**	11.070 ± 337.738**	7.800 ± 263.498**
Monocyte %	0.68 ± 0.15	0.96 ± 0.244	0.88 ± 0.228	0.92 ± 0.24	0.76 ± 0.196	1.02 ± 0.364	1 ± 0.353	0.9 ± 0.313	0.86 ± 0.294	0.54 ± 0.263	0.53 ± 0.264	0.5 ± 0.239	0.45 ± 0.222
Lymphocyte %	63.1 ± 1.12	51.17 ± 1.083**	53.3 ± 1.028**	55.32 ± 0.94**	57 ± 1.164**	50.24 ± 1.323**	52.73 ± 1.464**	55.2 ± 1.168**	56.2 ± 1.298**	52.5 ± 1.36**	53.7 ± 2.279*	55.26 ± 1.11**	59.93 ± 0.902*
Eosinophil %	1.99 ± 0.158	5.85 ± 0.0872**	5.24 ± 0.119**	4.49 ± 0.196**	2.59 ± 0.169*	6.14 ± 0.555**	4.43 ± 0.355**	3.36 ± 0.215**	2.68 ± 0.244*	6.2 ± 0.295**	4.15 ± 0.275*	3.32 ± 0.198*	3.2 ± 0.327*
Basophil %	0.29 ± 0.148	0.4 ± 0.221	0.4 ± 0.221	0.37 ± 0.207	0.34 ± 0.188	0.63 ± 0.277	0.62 ± 0.274	0.65 ± 0.288	0.7 ± 0.335	0.25 ± 0.134	0.3 ± 0.159	0.43 ± 0.227	0.5 ± 0.269
Neutrophil %	33.34 ± 0.832	41.02 ± 1.022**	39.96 ± 1.033**	39 ± 1.114**	39.21 ± 1.123**	42.09 ± 1.791**	40.57 ± 1.249**	40.24 ± 1.065**	39.66 ± 1.373**	40.56 ± 1.208**	40.04 ± 1.898*	39.49 ± 0.802**	36.3 ± 0.989*

- Results are represented by means ± standard error (SE).
- * Indicates significant difference compared to control group at $P < 0.05$.
- ** Indicates highly significant difference compared to control group at $P < 0.001$.

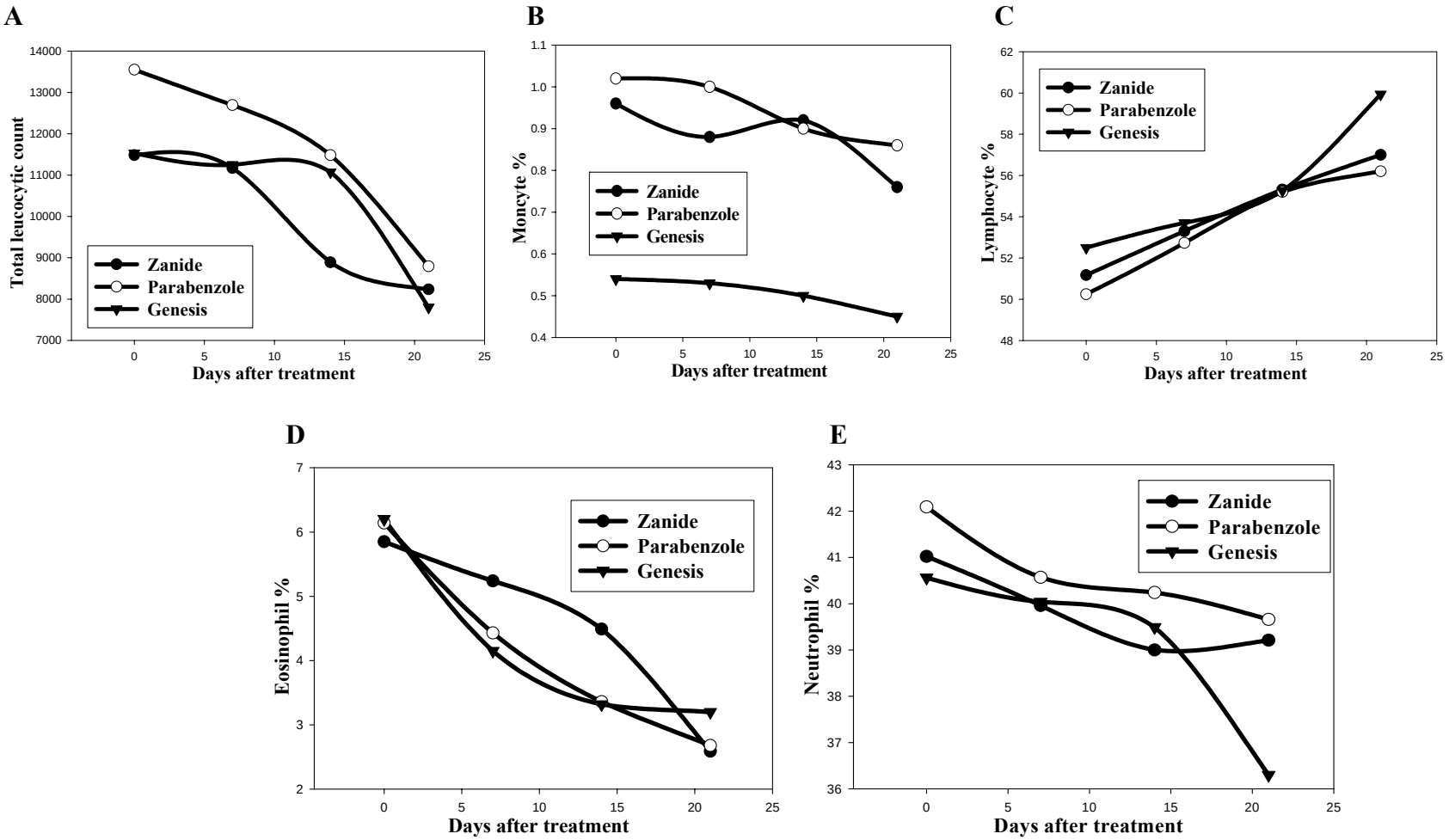

Figure 4. The total leucocytic count (A), the percentage of monocyte (B), eosinophil (C) and neutrophil (D) are gradually increasing while the lymphocyte % (E) is gradually increasing after treatment with Zanide, Parabenzole and Genesis.

Table 5. The total protein, albumin and globulin in infested and control groups before treatment and on the 1st, 2nd and 3rd week post-treatment.

Group / Parameter	Control (non infested)	Zanide-treated group				Parabenzole-treated group				Genesis-treated group			
		Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3	Pre-treatment	Week 1	Week 2	Week 3
Total protein (gm/dl)	7.884 ± 0.168	4.791 ± 0.214**	5.444 ± 0.228**	6.355 ± 0.278**	6.919 ± 0.284*	5.492 ± 0.323 *	5.929 ± 0.275**	6.608 ± 0.288**	7.21 ± 0.282	5.473 ± 0.144**	5.543 ± 0.211**	6.599 ± 0.288**	7.306 ± 0.207*
Albumin (gm/dl)	2.698 ± 0.16	1.594 ± 0.127**	1.807 ± 0.158**	2.324 ± 0.201	2.363 ± 0.155	1.747 ± 0.144**	1.916 ± 0.163*	2.397 ± 0.205	2.583 ± 0.122	1.419 ± 0.136**	1.672 ± 0.164*	2.251 ± 0.144	2.39 ± 0.135
Globulin (gm/dl)	5.186 ± 0.286	3.196 ± 0.199*	3.637 ± 0.324*	4.001 ± 0.236*	4.656 ± 0.337	3.745 ± 0.401*	4.113 ± 0.365*	4.221 ± 0.324*	4.627 ± 0.335	4.054 ± 0.195*	3.871 ± 0.202*	4.448 ± 0.257	5.022 ± 0.293
Albumin /Globulin ratio	0.546 ± 0.0689	0.517 ± 0.0567	0.561 ± 0.215	0.603 ± 0.0705	0.532 ± 0.0695	0.545 ± 0.0947	0.488 ± 0.0684	0.616 ± 0.0854	0.610 ± 0.0726	0.364 ± 0.0572	0.443 ± 0.0537	0.518 ± 0.0482	0.530 ± 0.0530

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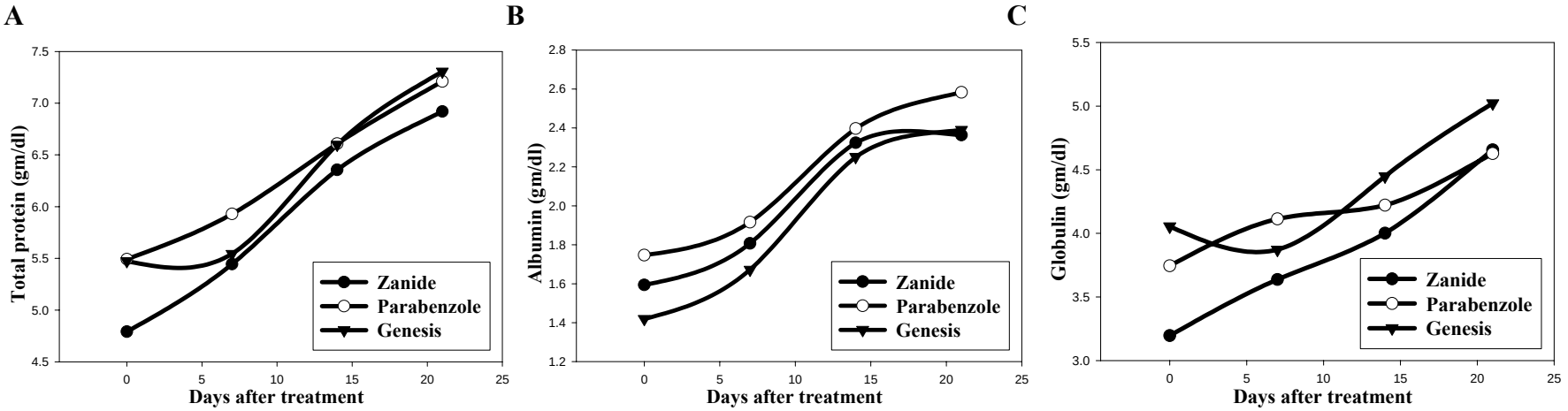

Figure 5. The total plasma protein, albumin and globulin are gradually increasing in lambs with gastrointestinal nematodiasis after treatment with Zanide, Parabenzole and Genesis.

DISCUSSION

Parasitic gastroenteritis is one of the major causes of productivity loss in sheep (**Torina *et al.,* 2004**). The clinical signs observed in infested groups were gradual loss of condition, decreased food intake, varying degrees of diarrhea, emaciation, pale mucous membranes, and submandibular edema**.**

The loss of appetite and indigestion observed in infested groups were explained by a number of investigators. Developing larvae within the gastric glands of the abomasum produce distension of the lumen of these glands with subsequent stretching of the cellular lining. As a result, the mature functional parietal and peptic cells are replaced by undifferentiated cells and indigestion results (**Armour *et al.,* 1966**). Additionally**,** abomasal nematodes, such as trichostrongylus, homonchus and chabertia, elevate gastrin level in infestation that impairs reticulo-ruminal motility and slows abomasal emptying leading to stasis of ingesta and hence reduction in feed intake (**Armour *et al.,* 1966**).

The intestinal nematodes infestation are associated with inflammatory changes, thickening of the mucosa and stunting or flattening of the villi, reduction of enzyme activity and poor retention and utilization of nitrogen. These lead to production losses, hypoalbuminemia and edema (**Radostits *et al.,* 2000**). This may explain the submandibular edema observed in infested sheep.

The occurrence of anemia in infested groups, which was manifested clinically by paleness of mucous membrane, was attributed to the presence of Haemonchus infestation. Haemonchus contortus is described as a blood feeder worm that may lead to anemia **(Fontenot *et al.,* 2003**). In addition, it contains a detergent soluble factor (as pore-forming agent) that haemolyses sheep red blood cells and consequently leading to anemia. Haemonchosis also results in a general wasting condition, with sheep becoming unthrifty and emaciated, which resembles a state of malnutrition. It also decreases growth rates and the fleece may be open and dull **(Armour and Coop, 1991**).

The reduction in the PCV%, Hb concentration and RBCs count in infested groups indicated that gastrointestinal nematodiasis, particularly haemonchosis, induces blood loss followed by anemia in infested lambs. This result was recently confirmed by **Chen *et al.,* (2005)**.

Although mortalities were observed with gastrointestinal nematodiasis in some previous studies (**Johnston *et al.,* 1980**; **Handayani and Gatenby, 1988**; **Reinecke,**

1994; and **Waller *et al.*, 1999**), there were no mortalities recorded within infested groups during this experiment. This may be attributed to the short period of experiment (3 weeks), which decreases the chance of observing mortalities among infested lambs.

The total protein, albumin and globulin were significantly reduced in infested lambs compared to control, suggesting loss of plasma proteins, liver or kidney diseases. Developing larvae and adult worms burrow just beneath the surface epithelium of the small intestine causing sloughing and disruption of cells and leakage of plasma protein into the lumen of the small intestine leading to hypoproteinaemia **(Coop, 1989**), which in turn leading to submandibular edema.

The leucocytosis observed in infested groups was mainly attributed to the reaction of the host against the invading parasite or may be due to a sensitivity of the host against the secretory products of the parasite as reported by ***Schalm et al.* (1975**). These results agreed with those revealed by **EI-Fauomy (1989)**, **Mottelib *et al.*, (1992), and Salem (2004).**

Because of the economic importance of gastrointestinal nematodiasis, three commonly used anthelmintics in Egyptian market namely Zanide, Parabenzole and Genesis were used for control and treatment of this disease. These three drugs possess different mechanisms as being anthelmintics. Levamisole (in Zanide) exerts its therapeutic effect by acting as a full agonist of the nicotinic receptor of acetylcholine of nematode muscle leading to depolarization of the somatic muscle of nematodes causing spastic paralysis (**Martin, 1997** and **Rayes *et al.*, 2004).** Albendazole (in Parabenzole) binds selectively to beta-tubulin of nematodes and inhibits microtubule formation and therefore preventing cell division (**Martin, 1997**). Abamectin (in Genesis) acts by inhibiting transmission of nerve impulses across the neuromuscular synapse by activation and opening of chloride channel leading to paralysis and death of nematodes **(Bloomquist, 1993).**

The excretion of nematode eggs in faeces was completely disappeared on the 3rd day post-treatment in Genesis-treated lambs, while in Zanide, it stopped on the 4th day and in Parabenzole on the 5th day. This result suggested that Genesis had a higher anthelmintic efficiency than Zanide and Parabenzole. Moreover, the efficiency was higher in the first (77.1%) and second (94.3%) day after treatment in Genesis-treated group than Zanide- (66.1%, 92.6%) and Parabenzole- (47.4%, 57.9%) treated groups.

This indicates that Genesis induced higher efficiency from the first day of subcutaneous administration.

The total erythrocytic and leucocytic counts as well as the differential leucocytic count were gradually changed toward the control value after treatment with Zanide, Parabenzole and Genesis. This result might be attributed to the anthelmintic effect of the three drugs that result in death of the worms, thereby reducing their harmful effects. Because there were no significant differences in all measured parameters between the three treatment groups at any time point, it is suggested that three products are effective in elimination of gastrointestinal nematodiasis in sheep. However, Genesis (Abamectin) was superior in suppression of egg excretion than Zanide and Parabenzole. This result is consistent with the finding of **Alka *et al.* (2004)** who found that Abamectin (oral) was more efficient in controlling Trichostrongylus than ivermectin.

In conclusion, nematodiasis induced anemia in sheep (expressed as a reduction in RBCs count, Hb concentration and PCV %), leucocytosis, eosinophilia, neutrophilia, lymphocytopenia, hypoproteinaemia, hypoalbuminemia, and hypoglobulinemia. These parameters were efficiently restored after the third week of treatment with Zanide, Parabenzole and Genesis. However, Genesis (subcutaneous) was faster and more efficacious than Parabenzole (oral) and Zanide (oral) in ameliorating the excretion of gastrointestinal nematode eggs in sheep.

REFERENCES

1. **Alka, Gopal R.M., Sandhu, K.S. and Sidhu, P.K. (2004**). Efficacy of abamectin against ivermectin-resistant strain of Trichostrongylus colubriformis in sheep. Vet Parasitol.121(3-4): 277-83.
2. **Armour, J., Jarrett, W.F.H. and Jennings, F.W. (1966).** Experimental Ostertagia circumcincta infections in sheep: development and pathogenesis of a single infection. Am. J. Vet. Res. 27: 1267–1278.
3. **Armour, J. and Coop, R.L. (1991).** Pathogenesis and Control of Gastrointestinal Helminthiasis. In: Diseases of Sheep. 2nd edition. Ed. W. B. Martin and I. D. Aitken. pp. 122-130. Blackwell Scientific Publications, Oxford.
4. **Bloomquist, J.R. (1993).** Toxicology, mode of action and target site-mediated resistance to insecticides acting on chloride channels. Comp. Biochem. Physiol. C. 106(2): 301-14.
5. **Chen, Y., Donald, D., Savin, K., Presidente, P.J. and Hartman, D. (2005).** Haemonchus contortus: molecular cloning, sequencing, and expression analysis of the gene coding for the small subunit of ribonucleotide reductase. Exp. Parasitol. 111(4): 250-254.
6. **Coles, E.H. (1986).** Veterinary Clinical Pathology**.** 4th Ed. W.B. Saunders Comp., Philadelphia, London, Toronto, Tokyo, Sydney, Hong Kong.
7. **Coop, R.L. (1989).** Roundworms and Fluke Infections in Sheep. Animal Diseases Research Association. News Sheet 4.
8. **Doumas, B.T. and Biggs, H.T. (1972).** Determination of serum albumin. Standard Methods in Clinical Chemistry 7: 175–188.
9. **Doumas, B.T., Bayse, D.D., Carter, R.J., Leters, T. and Schaffer, R. (1981).** A candidate reference method for determination of total protein in serum. I. Development and validation. Clin. Chem. 27: 1642-1650.
10. **El-Azazy, O.M. (1990).** Absence of hypobiosis in abomasal nematodes of sheep and goats in Egypt. Vet Parasitol. 37(1): 55-60.
11. **El-Fauomy, O.M.E. (1989).** Some studies on parasitic gastroenteritis in sheep. M.V.Sc. Thesis, Fac. Vet. Med., Cairo Univ., Egypt.

12. **Fontenot, M.E., Miller, L.E., Pena, T., Larsen, M. and Gillespie, A. (2003).** Efficiency of feeding Duddingtonia Flagrans chlamydospores to grazing ewes on reducing availability on parasitic nematode larvae on pasture. Vet. Parasitol. 118: 203-213.

13. **Georgi, J.R. and Georgi, M.E. (1990)**. Parasitology for Veterinarians. 5th Ed. W.B. Saunders Comp. Philadelphia, London, Toronto, Montreal, Sydney, Tokyo.

14. **Handayani, S.W. and Gatenby, R.M. (1988).** Effects of management system, legume feeding and anthelmintic treatment on the performance of lambs in North Sumatra. Trop. Anim. Health Prod. 20(2): 122-128.

15. **Hashem, M.E. (1997).** Helminth parasite of sheep in Dakahlia Province – Egypt. Assiut. Vet. Med. J. 38(75): 48-54.

16. **Johnston, W.S., Maclachlan, G.K. and Murray, I.S. (1980).** A survey of sheep losses and their causes on commercial farms in the north of Scotland. Vet. Rec. 106: 238-240.

17. **Kimberling, C.V. (1988).** Jensen and Swift's Diseases of Sheep. 3rd Ed. Lea & Febiger, Philadephia, USA.

18. **Martin, R.J. (1997).** Modes of action of anthelmintic drugs. Vet J. 154(1): 11-34. Review

19. **Mottileb, A.A., Haroun, E.M., Magzoub, M. and El-Basheer, E. (1992).** The effect of gastrointestinal parasites on blood picture in sheep and goats at Al-Gassim. Assiut Vet. Med. J. 28(55): 215-223.

20. **Perry, R.D., Randolph, T.F., Mc Dermott, J.J., Sones, K.R. and Tornton, P.K. (2002).** Investing in animal Health Research to alleviate Poverty. International livestock Research Institute (ILRI), Nairobi, Kenya, pp 148.

21. **Radostits, D.M., Gay, C.C., Blood, D.C. and Hinchlift, K.W. (2000):** "Veterinary Medicine". A textbook of the disease of cattle, sheep, pigs, goats and horses". 9th Ed. Bailleire Tindal, London, Great Britain.

22. **Rayes, D, De Rosa, M.J., Bartos, M. and Bouzat, C. (2004).** Molecular basis of the differential sensitivity of nematode and mammalian muscle to the anthelmintic agent levamisole. J. Biol. Chem. 279(35): 36372-81.

23. **Reinecke R.K. (1994).** Parasitic control in intensive vs. non-intensive systems - ruminants. Vet. Parasitol. 54: 49-67.

24. **Salem, F.F.M. (2004)**. Studies on parasitic gastroenteritis in sheep. M.V.Sc. Thesis. Fac. Vet. Med. Ismailia, Suez Canal Univ.

25. **Schalm, O.W, Jain, N.C. and Carroll, E. J. (1975):** Veterinary Haematology. 3rd ed. Lea and Febiger. Philadelphia. pp: 421-538.

26. **Sharma, R.K., Singh, K. and Saxena, K.K. (1987).** Effect of parabendazole and piperazine adipate on the activity of some enzymes of *Ascaridia gall*i and *Heterakis gallinae*. Vet Parasitol. 24(3-4): 211-20.

27. **Soulsby, E.J.L. (1986).** Helminth, arthropods and protozoa of domesticated animals. 6th Ed. Baillere, Tindall and Cassell, London.

28. **Thomas, R.J., Nunns, V.J. and Boag, B. (1970).** The incidence of lungworm infection in sheep in North-East England. Vet. Rec. 87(3):70-75.

29. **Torina, A., Dara, S., Marino, A.M., Sparagano, O.A., Vitale, F., Reale, S. and Caracappa, S. (2004).** Study of gastrointestinal nematodes in Sicilian sheep and goats. Ann. NY Acad. Sci. 1026: 187-94

30. **Valdez, J., Cedillo, R., Hernandez-Campos, A., Yepez, L., Hernandez-Luis, F., Navarrete-Vazquez, G., Tapia, A., Cortes, R., Hernandez, M. and Castillo, R. (2002).** Synthesis and antiparasitic activity of 1H-benzimidazole derivatives. Bioorg. Med. Chem. Lett. 12(16):2221-4.

31. **Vlassoff, A. and Mckenna P. B. (1994).** Nematode parasites of economic importance in sheep in New Zealand. New Zealand Journal of Zoology 21: 1-8.

32. **Waller, P.J., Mahon, R.J. and Wardhaugh, K.G. (1993)**. Regional and temporal use of avermectins for ruminants in Australia. Vet. Parasitol. 48 (1-4): 29-43.

33. **Wintrobe, M.M., Lee, G.R., Boggs, D.R., Bitheli, T.C., Athens, I.W. and Foerster J. (1976).** Clinical hematology. 7th Ed. Lea & Febiger Philadelphia.

التاثير العلاجى للزانيد والبارابينزول والجينيزيز على الديدان الاسطوانية فى معى وامعاء الاغنام

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ان اصابة معى وامعاء الاغنام بالديدان الاسطوانية لها اهمية اقتصادية فى مصر لانها تؤدي الى نقص الوزن وموت الحملان. ولذلك تم تقييم فاعلية ثلاث ادوية مضادة للديدان فى هذه الدراسة باستخدام الزانيد (اوكسيكلوزانيد + ليفاميزول) والبارابينزول (البندازول) و الجينيزيز (اباماكتين). استخدمت 4 مجموعات (عدد 10 اغنام لكل مجموعة). المجموعة الاولى كانت مصابة طبيعيا بالديدان الاسطوانية وعولجت بالزانيد (15 مجم /كجم) عن طريق الفم. المجموعة الثانية كانت مصابة طبيعيا بالديدان الاسطوانية وعولجت بالبارابينزول (5 مجم /كجم) عن طريق الفم. المجموعة الثالثة كانت مصابة طبيعيا بالديدان الاسطوانية وعولجت بالجينيزيز (20 مجم /كجم) عن طريق الحقن تحت الجلد. احتوت المجموعة الرابعة على 10 اغنام غير مصابة واستخدمت كمجموعة ضابطة. تم عد البويضات لكل جم من البراز باستخدام طريقة الماكماستريوميا لمدة 7 ايام بعد العلاج. تم تجميع عينات دم قبل العلاج وبعد اسبوع واسبوعين وثلاثة اسابيع بعد العلاج لتحديد عدد كرات الدم الحمراء وتركيز الهيموجلوبين ونسبة PCV والعد التميزى لخلايا الدم البيضاء. هذا بالاضافة الى تجميع عينات سيرم لتحديد مستوى البروتين الكلى والالبيومين والجلوبيولين. تضمنت الاعراض فقدان الشهية وانيميا ونحافة واسهال وتجمع مائى تحت الفك. لوحظ اختفاء بويضات الديدان الاسطوانية فى اليوم الثالث والرابع والخامس بعد العلاج بالجينيزيز والزانيد والبارابينزول على التوالى. وجد نقص معنوى فى عدد كرات الدم الحمراء وتركيز الهيموجلوبين ونسبة PCV والعد التميزى فى الثلاث مجموعات المصابة مقارنة بالمجموعة الضابطة و زادت هذه القياسات بالتدريج بعد الاسبوع الاول والثانى والثالث من العلاج. وجد ايضا زيادة معنوية فى العدد الكلى لخلايا الدم البيضاء ونسبة الازينوفيل والنيتروفيل قبل العلاج وزادت هذه القياسات بالتدريج فى المجموعات المصابة بعد العلاج. على الجانب الاخر نقصت اخلايا الليمفاوية قبل العلاج وزادت بالتدريج فى المجموعات المصابة بعد العلاج. وجد نقص معنوى فى مستوى البروتين الكلى والالبيومين والجلوبيولين قبل العلاج وزادت بالتدريج فى المجموعات المصابة بعد العلاج.خلصت النتائج الى ان التغيرات التى تحدث فى الدم والسيرم تحسنت بكفاءة بعد الاسبوع الثالث من العلاج بالجينيزيز والزانيد والبارابينزول ولكن كانت كفاءة الجينيزيز اسرع من الزانيد والبارابينزول فى تقليل عدد بويضات الديدان الاسطوانية فى الاغنام.