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CLINICAL AND THERAPEUTIC STUDIES ON PARASITIC GASTROENTERITIS IN SHEEP

By

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INTRODUCTION

Parasitic gostroenteritis is considered as one of the major threats for sheep production in Egypt. (Zaki,1960). More than fifteen helminths species inhabit the abomasum and intestines of sheep were incriminated by many workers as the main cause of the disease. Among them, *Haemonchus contortus*, *Trichostrongylus* spp, Ostertagia spp. *Strongyloides Papillosus*, Bunstomum spp, *Oesophagostomum venulosum* and *Trichuris ovis* were the common contributors, (Petrovic et al., 1960, Tawfik and Hassan, 1979 and Deghedy, 1981).

Although, biological control may represents the ultimate goal in minimizing the detrimental effects of parasites, practical control today requires the use of anthelmintics. Benzimidazole derivatives have been recorded by many workers as an ideal anthelmintics with a wide spectrum activity aganist mature and immature stages of gastrointestinal nematodes of sheep. Thiabendazole, fenbendazole and oxfendazole have been used with more than 96 percent efficacy against almost species of Trichostrongylids except *Trichus ovis* , (Gordon, 1962, Ross, 1975, Bezubic et al., 1978, Michael et al., 1979, Ibrahim et al., 1986 and Herbert and Probert, 1987). Moreover, ivermectin either orally or parenterally reduced the faecal egg count and parasites burden with more than 99 percent activity including the benzimidazole

resistant species, (Lindseg and Bulter, 1983, and Dorchils et al., 1986).

Therefore, the present work was carried out to investigate the prevalence of parasitic gastroenteritis among sheep, the clinical aspects and to evaluate the antiparasitic activity of some anthelmintics as well as the haemogram and some serum constituents before and after therapy.

MATERIALS AND METHODS

A total of 600 sheep of different breeds*, ages and sexes were examined clinically and parasitologically for gastrointestinal nematodes. Faecal samples were collected individually from the rectum or immediately after defaecation in clean plastic containers and examined as soon as possible. Each sample was examined macroscopically for any gross parasites as well as microscopically for nematodes eggs using the concentration floatation technique. The degree of infestation has been determined by egg counting using the modified McMaster technique according to Solusby, 1982.

Faecal culture and larval differentiation: were carried out according to the method of Exkert, 1960 and Abdel-Gawad, 1972

Therapeutic trials: Twenty five sheep naturally infested with mixed gastrointestinal nematodes were used. Animals were divided into five groups five each, as follow:

Group I: Given fenbendazole bolus (Panacur, Hochest U. K. Ltd. Milton Keynes, Bucks, England) at 5 mg/kg of body weight as a single oral dose.

Group II: Treated orally with thiabendazole (Thiabenzole, Merck sharp & Dome. B.N. Haalem, Holand) at 66 mg/kg as a single dose.

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* Native breeds, belonging to Giza governorate and examined during the period extending from January to December 1988.

Group III: Injected subcutaenously with ivermectin (Ivomec, Merck sharp & Dome B.N. Haalem, Holand) 1 % solution as a single dose of 0.2 mg/kg.

Group IV: Administered oxfendazole (Synanthic, syntox Co. Poland) orally at 4.5 mg/kg as a single dose.

Group V: Represented non-infested and non-treated control animals.

Sheep were kept under observation during the treatment period on a concrete floor. Faecal egg counts, faecal culture and larval differentiation were done 2 days before and then weekly until the 8th week after treatment.

Evaluation of the haemogram and some serum constituents:

One hundred blood samples were collected from 25 infested sheep two days before and 4 weeks after treatment through jugular venepuncture.

Two samples were obtained from each animal. The first one was used to obtain serum for determination of total proteins (Weichselbaum, 1946) and albumin (Bartholmew and Delaney, 1966). The second heparinized blood sample was used for determination of erythrocytic count, total and differential leucocytic count, haemoglobin content and packed cell volume according to Cartwright, 1960 and Wintrobe et al. (1976).

RESULTS AND DISCUSSION

In this limited survey, 600 faecal samples collected from sheep and monitored for gastrointestinal nematodes revealed that 395 were harbouring nematodes ova with an overall incidence of 65.83 percent. Table (1) and Fig. (1-5) clearly denote that eggs of Trichostrongylides spp. were the predominant ova passed by the infected animals followed by *Strongyloides papillosus*, *Trichuris* and Nematodirus spp. with an infestation rate of 10.0,

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Table (1): Relationship between age and rate of gastro-intestinal infestation in sheep.

age group	Number of examined animal	Infested animals		Infestation rate (egg count/gm faeces)								Trichuris				Strongyloides				Neratodirus				Other strongyle			
		Total	% of infestation	100 - 500		500-2000		2000-5000		< 5000		Pure	Mixed *	Total	%	Pure	Mixed *	Total	%	Pure	Mixed *	Total	%	Pure	Mixed *	Total	%
				No.	%	No.	%	No.	%	No.	%																
3 months up to one year	230	165	71.74	66	40	38	23	50	30	11	6.6	2	13	15	6.52	3	20	23	10	2	7	9	3.9	118	40	158	68.69
1-2 years	180	110	61.11	34	30.9	29	26.3	20	18.2	27	24.5	2	3	5	2.77	1	11	12	6.66	1	3	4	2.22	89	17	106	58.88
over 2 years	190	120	63.15	29	24.1	40	33.3	24	20	27	22.5	2	5	7	3.68	-	25	25	13.15	1	3	4	2.1	84	33	117	61.57
Total	600	395	65.83	129	32.6	107	27.8	94	23.4	65	16.4	6	21	27	4.5	4	56	60	10.0	4	13	17	2.83	291	90	381	63.5

Pure = Number of infested animal with the corresponding worm only.

* = Mixed infestation with other strongyle.

** = Mixed infestation with other gastrointestinal nematods.

% = In relation to total examined animal in the same age group.

N.B.: = Total number of infested animal equal to summation of pure infestation plus mixed infestation with strongyle.

Table (2): Seasonal Variation of gastrointestinal nematodes among sheep.

Season	Total animal examined	Infested animals	%	Trichuris				Strongyloides				Nematodirus				Other Strongyle			
				Pure	Mixed*	total	%	Pure	Mixed*	total	%	Pure	Mixed*	total	%	Pure	Mixed**	total	%
Winter	135	97	71.85	1	6	7	5.18	-	18	18	13.33	1	6	7	5.18	65	30	95	70.37
Spring	140	90	64.28	2	4	6	4.28	3	15	18	12.85	2	1	3	2.14	62	21	83	59.28
Summer	160	85	53.12	-	2	2	1.25	1	5	6	3.75	-	1	1	0.62	76	8	84	52.5
Autumn	165	123	74.54	3	9	12	7.27	-	17	17	10.30	1	5	6	3.63	88	31	119	72.12
Total	600	395	65.83	6	21	27	4.5	4	56	60	10	4	13	17	2.83	219	90	381	63.5

* Mixed infestation with other strongyle

** Mixed infestation with other gastrointestinal nematodes.

N.B. The total number of infested animal equal to summation of Pure infestation of all plus Mixed infestation of other Strongyle.

% in Relation to the number of examined animal in each season.

4.5, and 2.8 percent respectively. Similar infection rate and incidence have been reported in Egypt by Ezzat and Tadros (1962). Hassona (1979) and Deghedy (1981). The data obtained in Table (1), show that sheep aged 3-12 month were more susceptable for nematode infestation (71.74 %) followed by animal over 2 years old (63.15 %). Our results are supported by the findings of Tawfik and Hassan (1979). The higher susceptability among the aforementioned groups might attributed to lack of previous exposure to parasites in lambs while relaxation of immunity in ewes and/or elder animals due to stress, hormonal effect of pregnancy, parturition and lactation or malnutrition induced by teeth falling, Taylor (1935) and Reid and Armour (1975).

Regarding the intensity of infection, examined animals could be distributed according to the results of Table (1) into low (100-500 epg), moderate (500-2000 epg), high (2000-5000 epg) and severe (< 5000) representing a total precentage of 32.6, 27.8, 23.7 and 16.44 % respectively. So, the high parasitic index of such animals might reflects the heavy helminth burdens and is considered to be the limit of parasitism where economic losses are utilerable. Culturing of faecal samples revealed that nematode species representing ten genera could be identified. The predominant species were *Haemonchus contortus*, Trichostrongylus spp., Ostertagia spp., Bunstomum spp., Nematodirus spp., *Chabertia ovina* (Fig. 7-8), ophagostomum spp. (Fig. 6), *Strongyloides papillosus* and *Trichuris ovis*. Our findings clearly denote that Trichostrongylides spp. were the main contributors of parasitic gastroenteritis among sheep at Giza governorate. However, a significant damage to the host could be expected as the knowing pathogenic *H.contortus* and Ostertagia spp. sharing the members of this genus. Similar species were previously identified from sheep by Petrovic et al. , (1960), Kinght et al. (1972) and Lopes et al. (1976).

From the epidemiological point of view, results illustrated in Table (2) showed that, the highest rate of

Table (3): Results of therapeutics against gastrointestinal nematodes of sheep using different anthelmintics

Treated groups	Gastrointestinal nematodes	Faecal egg count /gram faeces (M.V. ± S.E.) /week before and after treatment								
		0	1	2	3	4	5	6	7	8
Fenbendazole	Strongyle H.C. 50 % Tr. 20 % Ost. 20 % Co. 10 %	4080 ± 1273 ab	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
	Strongyloides papillosus	214 ± 102 a	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
Oxfendazole	Strongyle H.C. 40 % Tr. 30 % Oes. 30 %	1860±338 a	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
	Nematodirus	100 ± 44.7 a	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
Thiabendazole	Strongyle H.C. 60 % Tr. 30 % Bunst. 10 %	3210±2246 a	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
	Trichuris	240±65.4	230±62.4	170±8.9	220±60.4	180±51.4	140±50.9	110±45.8	110±50.9	110±45.8
Ivermectin	Strongyle H.C. 40 % Tr. 40 % Ch. 20 %	1340±256 ab	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b
	Strongyloides papillosus	140±62.1 ab	20±9.4 b	15 ± 10 b	20±12.3 b	10±10 b	10±10 b	10±10 b	10±10 b	10±10 b
	Trichuris	210±67.8 a	0 b	0 b	0 b	0 b	0 b	0 b	0 b	0 b

a = Significant difference between samples of different groups within each week ($P < 0.05$)
b = Significant difference between samples of each group at different weeks ($P < 0.05$)
H.C. = Homonchus contortus Tr. = Trichostrongylus spp. Co. = Cooperia spp. Ost. = Ostertagia spp.
Bunst. = Bunostomum triganocephalum. Ch. = Chabertia ovina

infestation was in autumn and winter with a percentage of 74.54 and 71.85 respectively. Moderate drop was observed during Spring (64.28 %) and Summer seasons (53.12 %). Therefore, in Egypt autumn and winter seasons may provide a favourable conditions for development of strongyl eggs while summer season not drastically affects the survival or devlopment of larval stages. It was interesting to note that most nematode species had the same seasonal variation, except *Strongyloides papillosus* and nematodirus spp. Both were peaked during winter (13.33 % & 5.18 %) and were declined during spring in the former (12.85 %) and autumn in the latter (3.63 %). A comparable seasonal incidence had been recorded in Egypt by Tawfik and Hassan(1979).

The common clinical features observed in naturally infested sheep were anorexia, unthrifty, lethargy and diarrhoea. In pure haemonchosis, the frank signs were pallor of the mucous membranes, constipation, hyperpnea, tachycardia as well as oedema of the inter-mandibular space. Animals infected with mixed strongyles showed intermittent dark coloured diarrhoea, opened and brittle fleece, recombency and death in some neglected cases. Signs were more severe in grazing lambs and in ewes around the periparturent period. Mild or subclinical cases were mainly seen in adults. High faecal egg counts were frequently coincided with clinical signs. Similar clinical signs were previously described by Horak and Clark (1966), Coop et al.(1976) and Allonby and Urquhart (1975).

In a trial to evaluate the anthelmintic efficacy of ivermectin, fenbendazole, thiabendazole and oxfendazole table (3) indicates that all drugs had a 100 % cure rate against most Trichostrongylides spp. Faecal egg counts reduced up to zero, 7 days post-treatment. *Trichuris ovis* infested group was highly refractory to thiabendazole while, ivermectin removed the parasite completely after single dose. The efficacy of fenbendazole on *Strongyloides papillosus* was 90.6 and 100% respectively. Similar antiparasitic activity using

Table (4): Effect of gastrointestinal nematodes infestation and treatment with different anthelmintics on haemogram and some serum proteins of sheep.

Parameters (M.V. ± S.E.)	Normal control	Infested nontreated	Fenbendazole		Oxfendazole		Thiabendazole		Ivermectin	
			Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
RBCs count ($X10^6$/ul)	*10.81±0.78	6.31±0.33^a	7.28±0.28	9.09±0.45^{ab}	8.39±0.56	9.27±0.45^b	5.94±0.23	7.33±0.26^b	7.96±0.41	8.49±0.56^b
Haemoglobin content (gm/100 ml)	10.74±0.47	8.32±0.49^a	8.18±0.44	10.03±0.30^a	9.86±0.27	10.7±0.54	8.14±0.44	9.56±0.33	9.19±0.24	10.46±0.32
Packed cell volume PCV (%)	32.2±1.11	23.8±0.66^a	27.0±0.71	31.2±1.12^a	26.6±0.89	29.1±1.29^a	25.1±2.24	28.0±0.88^a	27.6±0.51	29.3±0.54^a
WBCs count ($X10^3$/ul)	9.7±0.82	10.28±0.36^a	10.43±0.76	9.56±0.66^a	11.3±0.44	9.67±0.26^a	8.42±0.33	7.81±0.25^a	7.86±0.35	7.8±0.54^a
Eosinophils (%)	1.65±0.27	6.0±1.25^a	3.8±2.24	1.7±0.15^a	5.25±0.75	1.65±0.19^a	4.65±0.61	2.4±0.33^{ab}	5.45±0.65	2.1±0.43^a
Neutrophils (%)	30.6±0.87	39.85±2.24^a	35.1±1.58	34.5±3.66	39.19±2.24	37.85±4.78^b	44.7±3.53	42.25±4.37^b	34.55±2.24	32.2±2.24
Immature Neutrophils (%)	0.20±0.09	0.45±0.23^{ab}	0.70±0.23	0.55±0.17	0.55±0.09	0.50±0.14	0.70±0.17	0.66±0.17	0.65±0.17	0.50±0.18
Monocytes (%)	2.2±0.46	3.4±0.75^a	31.±0.61	2.6±0.51^a	2.95±0.18	2.4±2.24^a	2.75±0.61	1.8±0.37^a	3.39±0.39	2.8±0.37^{ab}
Lymphocytes (%)	66.15±1.81	49.7±5.09^a	57.7±2.04	60.65±3.58	52.1±36.7	57.6±4.88	47.3±2.75	52.95±3.47^b	55.9±1.72	62.4±2.62
Serum total proteins (gm/100 ml)	7.0±0.70	6.47±0.24^a	6.46±0.11	6.53±0.12^{ab}	6.61±0.18	6.64±0.17^b	6.34±0.22	6.42±0.21^{ab}	6.36±0.08	6.46±0.06^{ab}
Serum albumin (gm/100 ml)	2.4±0.05	1.37±0.14^a	1.45±0.08	2.24±0.10^{ab}	1.19±0.06	2.2±0.14^{ab}	1.61±0.13	1.98±0.07^{ab}	1.56±0.09	2.24±0.09^{ab}
Serum globulin (gm/100 ml)	4.59±0.09	5.09±0.16^a	5.01±0.07	4.29±0.09	5.42±0.13	4.44±0.08^a	4.73±0.11	4.44±0.18	4.8±0.07	4.22±0.06

* = Each value represent the mean of the obtained samples.
a = Significant difference between normal and infested or between before and after treatment ($P < 0.05$).
b = Significant difference between treated groups ($P < 0.05$).

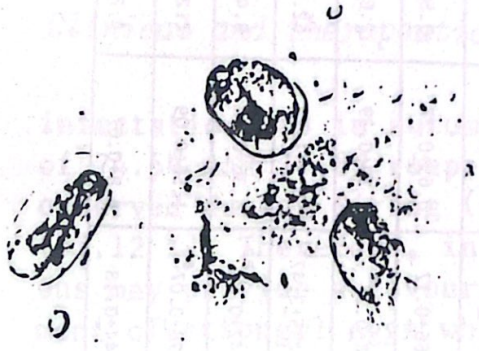

Fig. (1): Embryonated ova of Strongyloides papillosus. X 410.

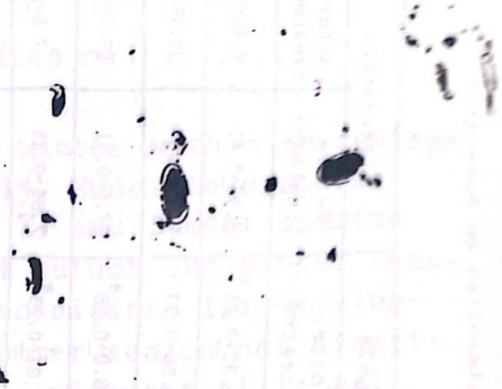

Fig. (2): Mixed eggs of Strongyl spp. and Strongyloides papillosus. X 100.

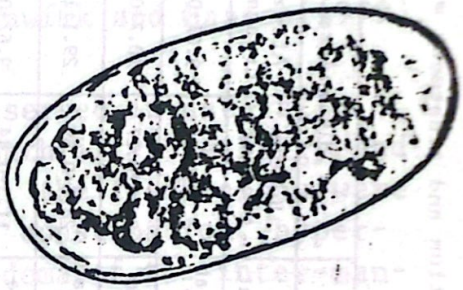

Fig. (3): Morphologically distnict strongyl ova. X 400.

Fig. (4): Trichuris ovis egg. X400.

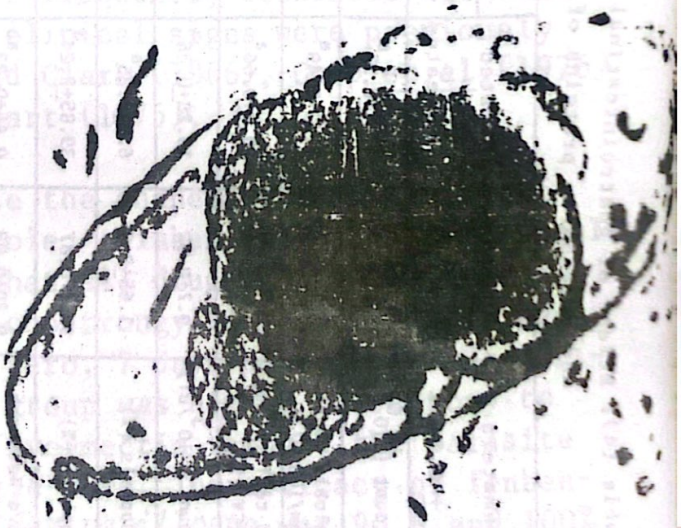

Fig. (5): Nematodirus egg. X 400.

such drugs were reported by Ross (1975), Baker and Frisk (1977), Kettle et al.,(1981) and Kutzer and Prosl (1985).

The haematological investigation reveald significant decrease ($P < 0.05$) of erythrocytic count, haemoglobin content and packed cell volume percent in sheep naturally parasitized with mixed gastro-intestinal nematodes. (Table 4). These changes were more obvious in sheep haemonchosis as confirmed by faecal culture and reflected clinically be severe anaemia. The obtained results are in agreement with these of Shumara and Eveleth (1955), Puchalag et al., (1943) and Albers and Legambre (1983). After the end of treatment trial, haemoglobin content and erythrocytic count displayed statistically insignificant increase except in fenbendazole treated group while the packed cell volume was significantly increase ($P < 0.05$). A significant differences in erythrocytic count ($P < 0.05$) were seen between all treated groups.

The total leucocytic count showed also significant increase ($P < 0.05$)among infected sheep which decreased significantly ($P < 0.05$) to reach the normal values at the end of medication. Similar data were obtained by Baratanov (1946) and Deghady (1981). Sigificant increase ($P < 0.05$) in oesinophils, nentrophils, immature neutrophils and monocytes were observed in infested animals Eosinophilia could be attributed to the reaction and sensitivity of the host against the secretory products of the parasite (Schalm et al., 1975). Moreover the eosinophils may phagocytose antigen antibody complexes playing important role in the defense mechanism of the host against parasite (Subesin 1965). After therapy with different anthelmintics, significant drop ($P < 0.05$) in eosinophils and monocytes and non significant decrease in neutrophils and immature neutrophils were resulted. Similar findings were mentioned by Gibson (1954), Stankiewiez (1969) and Schalm et al., and Schalm et al.,(1975). In contrary the

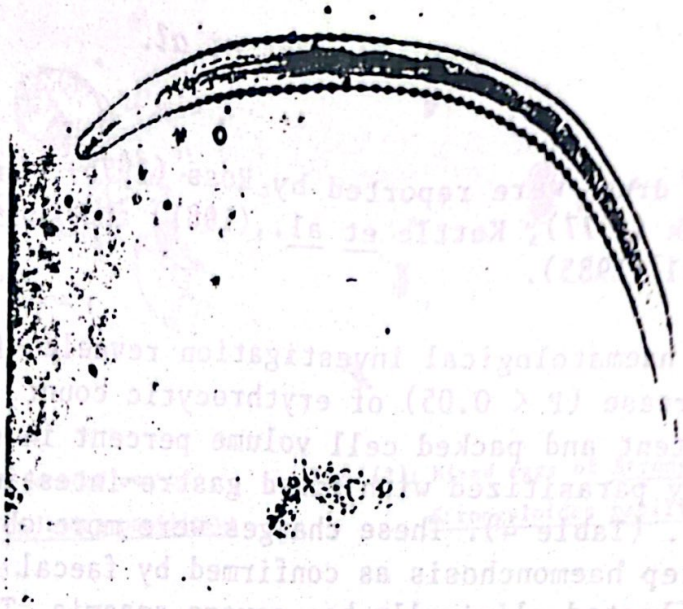

Fig. (6): Third stage larva of Oesophagostomum spp. X 100.

Fig. (7): Posterior end of Chabertia ovina 3rd stage larva·X 400·

Fig. (8): Anterior end of 3rd stage larva of Chabertia ovina·X 400·

lymphocyte percent was significantly decreased ($P < 0.05$) in infested sheep which returned to the normal value post medication.

The serum total proteins and serum albumin showed signicant drop ($P < 0.05$) in infested sheep compared with normal control group. On the other hand, significant rise ($P < 0.05$) in serum globulins was noticed. These values were returned to the normal levels after medication with different anthelmintics. Our results are in agreement with that of kutler and Marble (1966) who found a significant change in serum proteins and protein fractions in lambs infested with gastro-intestinal nematodes. Drop of serum albumin and increase of serum globulins were previously mentioned by Horach and Clark (1966) and Dobson (1967).

It is concluded that, parasitic gastro-enteritis in Giza constitutes a serious problem on the health of sheep. However, strategic treatment for controlling the disease by using suitable anthelmintic is mandatory and in turn will leads to improvement in general economy of sheep industry.

SUMMARY

Screening of 600 sheep for gastro-intestinal helminths revealed that 395 were harbouring nematodes eggs with an overall incidence of 65.83 percent. Lambs aged 3-12 month were more susceptible for parasitic infestation (71.74 %) followed by animals over 2 years old (63.15%). The highest rate of infection was noticed during autumn and winter while moderate drop was obwerved during spring and summer seasons. *Haemonchus contortus*, *Trichostronylus* spp., Ostertagia spp., Bunstomum spp., *Chabertia ovina*, *Stronyloides papillosus*, Nematodirus spp. Oesophogostomum spp. and *Trichuris ovis* were identified through faecal culture. The anthelmintic efficacies of ivermectin, fenbendazole, oxfendazole and

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