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## PREVALENCE OF FASCIOLIASIS AMONG MAN AND ANIMALS IN ISMAILIA PROVINCE (With 5 Tables)

By

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### انتشار الإصابة بالدودة الكبدية فى الإنسان والحيوانات فى محافظة الإسماعيلية

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فى مسح لتحديد نسبة الإصابة بالدودة الكبدية (الفاشيولا) فى الإنسان والحيوانات (الأبقار والجاموس والأغنام والماعز) فى محافظة الإسماعيلية وذلك باستخدام اختبار الترسيب لعينات البراز والاختبار السيرولوجى (التلازن الدموى الغير مباشر) لعينات المصل للإنسان والحيوانات و فحص الحويصلات المرارية للحيوانات. وجد أن نسبة الإصابة الكلية بالفاشيولا كانت ٧.٨% ، ١٤.٩٩% ، ٢٠.٩% من إجمالي عدد ١٣٦٨ حيوان وذلك بفحص عينات البراز والحويصلات المرارية واختبار التلازن الدموى الغير مباشر على التوالى. وكانت أعلى نسبة إصابة بالفاشيولا ، باستخدام الاختبارات السابقة على التوالى ، فى الأغنام ( ١٢.٤% ، ٢٢.٩% ، ٢٦.٧% ) والماعز ( ٩.٩% ، ١٦.٩% ، ٢٢.٧% ) ثم الأبقار ( ٥.٣% ، ١٠.٩% ، ١٨.٨% ) بينما كانت أقل نسبة إصابة بالفاشيولا فى ( ٣.٧% ، ٩.١% ، ١٥.٢% ). وعلى الجانب الآخر كانت نسبة الإصابة بالفاشيولا فى الإنسان ٠.٤% و ٤.٩% وذلك بفحص عينات البراز واختبار التلازن الدموى الغير مباشر على التوالى. وأن العمر والجنس ليس لهما تأثير على نسبة الإصابة بالفاشيولا. كما أوضحت الدراسة أن اختبار التلازن الدموى الغير مباشر أكثر حساسية من فحص عينات البراز للتعرف على الإصابة فى الإنسان والحيوانات. وأستنتج من هذه الدراسة أن الحيوانات المصابة تعتبر مصدر مستمر دائم لتلوث البيئة وخصوصا المياه العذبة حول الإنسان ببويضات دودة الفاشيولا وتعتمد نسبة الإصابة على عادات التغذية والإجراءات الصحية العامة وأن فحص البراز لم يكن كافيا لتشخيص داء الفاشيولا وأن اختبار المناعة السيرولوجى يعتبر مكمل لتشخيص المرض فى الإنسان والحيوانات.

## SUMMARY

In a survey on fascioliasis in man and animals in Ismailia Province, the overall infestation rates were 107(7.8%), 205(14.99%) and 286(20.9%) out of 1368 animals as diagnosed by faecal, gall bladder examinations and Indirect haemagglutination test (IHAT), respectively. The *Fasciola* infestation rates as indicated by the previous tests respectively, were higher in sheep (12.4%, 22.9% and 26.7%) and goats (9.9%, 16.3% and 22.7%) followed by Cattle (5.3%, 10.9% and 18.8%). While the lowest prevalence rates were reported in buffaloes (3.7%, 9.1% and 15.2%). On the other hand, the human *Fasciola* infestation rates were 2 (0.4%) and 26 (4.9%) out of 533 human samples by stool examination and Indirect haemagglutination test, respectively. There was no significant difference in *Fasciola* infestation rate between male (3.9%) and female (5.9%). It was clearly that all ages were susceptible to *Fasciola* infestation. The serodiagnosis (IHAT) was more sensitive than faecal examination for detection of fascioliasis. These findings indicated that the infested animals are considered as a continuous contaminating source for the fresh water by *Fasciola* eggs. The infestation rate depends mainly on feeding habit of the people and their general hygienic measures. Faecal examination was not enough for diagnosis of this disease. On the other hand, the immunological diagnosis of fascioliasis based on detection of antibodies has proved to be a useful method to achieve this goal.

**Key words:** *Prevalence of fascioliasis among man and animals in Ismailia Province.*

## INTRODUCTION

Fascioliasis in animals is of special interest during the last several years in the Nile Delta region, Egypt. This mainly is due to increase in the percentage of human infestation (Farid *et al.*, 1988 and Hassan *et al.*, 1995). Humans are infested accidentally by ingestion of raw aquatic vegetables or water contaminated with metacercariae (Han *et al.*, 1996). Human fascioliasis is one of the causes of hepatic disorders (Makled *et al.*, 1988). On the other hand, fascioliasis causes great economic losses to the livestock industries due to both direct effects, actual liver condemnation at slaughter and indirect effects such as decrease in feed efficiency, weight gains, milk production and

reproductive performance (Black and Froyd, 1972, Cawdery, 1977, El-Seify *et al.*, 1985 and Malone, 1986). The prevalence of human fascioliasis in Egypt is believed to be higher than reported cases (Shaker *et al.*, 1994). Conventional parasitological examination based on coprologic techniques are usually employed for diagnosis of fascioliasis. The disadvantage of this approach is that while pathology and disease occur as early as 3 weeks after infestation, parasitological diagnosis is only possible at 10 weeks when eggs begin to appear in feces (Fagbemi *et al.*, 1995). The immunodiagnostic approach for detection of fascioliasis, which makes early diagnosis possible has been used for years (Zimmerman *et al.*, 1982, Swarup *et al.*, 1987, Santiago and Hillyer, 1988 and Fagbemi and Oberisiaghen, 1990). These immunological tests were focused on antibody detection and revealed both recent and current infestation.

Although considerable literature exist pertaining to fascioliasis in some areas in Egypt (Ali *et al.*, 1974; Farag *et al.*, 1979; Fayek *et al.*, 1988; Makled *et al.*, 1988; Samaha, 1989; El-Shazly *et al.*, 1991; Hassan *et al.*, 1995 and El Bahy, 1997), there is a paucity of information regarding fascioliasis in Suez Canal area. Therefore, the purpose of this investigation was to determine the prevalence rates of *Fasciola* infestation in animals and man in Ismailia Province. Moreover, evaluation of diagnostic tests is the other aim.

## MATERIALS and METHODS

During the period extended from January, 1997 to July 1998 a total of 1368 animals (340 cattle, 375 buffaloes, 420 sheep and 233 goats) from Ismailia abattoir were subjected to examination for fascioliasis. Faecal, blood and gall bladder samples were collected from each animal with regarding to species, age and sex.

On the other hand, blood and stool samples were collected from 533 patients of out-patient clinic in Ismailia hospital and the transported health units from different villages in Ismailia Province. Age, Sex of each patient were recorded. The collected samples of animals and man were immediately transported to parasitology laboratory in the Faculty of Veterinary Medicine, Suez Canal University and examined for the presence of *Fasciola* infestation.

Animal gall bladder were firstly inspected for presence of adult flukes of *Fasciola* sp. Faecal samples and gall bladder scrapings of

examined animals and human stool samples were microscopically examined for the presence of *Fasciola* sp. Eggs by both direct and concentration sedimentation techniques according to Soulsby (1982).

Indirect haemagglutination test was carried out on the sera of animals and man for detection of *Fasciola* antibodies using Distomiasis Fumouze Kits which were commercially supplied from laboratories Fumouse, France. *Fasciola* antibody titer equal or above to 1:320 was considered positive as reported in the kit's instruction.

The sensitivity and specificity of the tests used for detection of *Fasciola* infestation in animals were calculated according to O'Reilly (1995).

The chi-square ( $\chi^2$ ) was used to study the effect of sex on the rate of *Fasciola* infestation in human beings.

## RESULTS

Table (1) summarized the prevalence of *Fasciola* sp. Infestation in different animal species in Ismailia Province. The overall infestation rates were 107(7.8%), 205(14.99%) and 286 (20.9%) out of 1368 animals as analyzed by feces, gall bladder examination and indirect haemagglutination test (IHAT) respectively. The highest *Fasciola* infestation rates as analyzed by the previous tests respectively, were reported in sheep (12.4%; 22.9% and 26.7%) and goats (9.9%, 16.3% and 22.7%) followed by cattle (5.3 %, 10.9% and 18.8%). The lowest prevalence rates were reported in buffaloes (3.7%, 9.1% and 15.2%).

The prevalence of *Fasciola* sp. infestation among the examined human beings, in Ismailia Province was summarized in Table (2). It was found that the overall infestation rate with *Fasciola* was 0.4 and 4.9% by stool examination and IHAT respectively.

Table(3) Showed the effect of both sex and age on the prevalence of *Fasciola* sp. infestation among the examined human beings by IHAT. The infestation rate was slightly higher in female (5.9%) than male (3.9%). However, statistically there was no significant difference ( $P>0.05$ ). The age group between 20 – 30 years was the most susceptible age for *Fasciola* sp. infestation in which the prevalence was 8.1% followed by age group, 30 to 40 years (5.9%). The infestation rates among the age groups; Less than 10 years, 10-20 years and 40 to 50 years ,were nearly similar (3.97% , 3.4% and 3.03% respectively). While the age group over 50 years was less susceptible to *Fasciola* infestation in which the prevalence was 1.9%.

Table (4) Clarified the antibody titers against *Fasciola* sp. infestation in different examined hosts by IHAT. Twenty six of human sera showed IHA *Fasciola* antibodies. Two of them (one had *Fasciola* antibody titer of 1: 640 and other had titer of 1:1280) harbored *Fasciola* sp. Eggs in their stools. *Fasciola* antibody titers among the examined human sera revealed that 80.8% of the positive human sera had low titers (1:320) , 7.7 % had mild titer (1:640) and 11.5 % had higher titer (1:1280). IHA-*Fasciola* antibody titers among the examined positive cattle, buffaloes, sheep and goats respectively revealed that 25% , 36.8% 25.9% . 28.3% had lower titers (1:320), 15.6%, 7.02%, 16.1 % and 16.98% had mild *Fasciola* antibody titer (1:640), and 48.4%, 45.6%, 44.6% and 47.2% had higher titers (1:1280 -1520).

The sensitivity and specificity of both faecal examination and IHAT, for detection of *Fasciola* sp. infestation in different examined animal species, were summarized in Table (5). Generally, specificity of faecal examination for detection of *Fasciola* in examined animals was 100%. While the specificity of IHAT was 91.7%, 93.5%, 95.4% and 92.3% in cattle, buffaloes, sheep, and goats respectively. The sensitivity of faecal examination in detection of *Fasciola* sp. Infestation was 48.6%, 41.2%, 45.8% and 60.5% in cattle, buffaloes, sheep and goats respectively. While the sensitivity of IHAT was 94.9%, 96.9%, 99.1% and 100% in cattle, buffaloes, sheep and goats respectively. The specificity of IHAT among the total examined animals was 93.4%. The sensitivity of both faecal and IHAT among the total examined animals was 52.2% and 97.9% respectively.

**Table 1:** Prevalence of *Fasciola* infestation among the examined slaughtered animals in Ismailia Province.

Animal species	No. of examined Animals	No. of positive animals for <i>Fasciola</i> sp. Infestation					
		Faecal		Gall bladder		IHAT	
		No.	%	No.	%	No.	%
Cattle	340	18	5.3	37	10.9	64	18.8
Buffaloes	375	14	3.7	34	9.1	57	15.2
Sheep	420	52	12.4	96	22.9	112	26.7
Goats	233	23	9.9	38	16.3	53	22.7
Total	1368	107	7.8	205	14.99	286	20.9

**Table 2:** Stool examination and IHAT for detection of *Fasciola* infestation among Human beings in Ismailia Province.

Test	No. of examined samples	Positive cases	
		No.	%
Stool exam	533	2	0.4
IHAT	533	26	4.9

**Table (3):** Prevalence of *Fasciola* infestation among human beings according to age and sex using IHAT.

Age (years)	Female		Male		Total	
	No.	positive(%)	No.	Positive(%)	No.	Positive(%)
Up to10	15	1(6.7)	18	0(0.0)	33	1(3.03)
11 – 20	52	3(5.8)	74	2(2.7)*	126	5(3.97)
21 – 30	55	4(7.3)	44	4(9.1)*	99	8(8.1)
31 – 40	82	5(6.1)	54	3(5.6)	136	8(5.9)
41 – 50	35	2(5.7)	52	1(1.9)	87	3(3.4)
over 50	14	0.0(0.0)	38	1(2.6)	52	1(1.9)
Total	253	15(5.9)	280	11(3.9)	533	26(4.9)

<sup>2</sup> = 1.2 (P > 0.05)

\*One of them had *Fasciola* sp. Eggs in his stool

**Table 4:** Prevalence of *Fasciola* infestation among different examined hosts according to IHA antibody titers.

Examined Hosts	No. Examined	Positive No.	IHA titers				
			1/320(%)	1/640(%)	1/1280(%)	1/2560(%)	1/5120(%)
Human	533	26	21(80.8)	2(7.7)*	3(11.5)*	0(0.0)	0(0.0)
Cattle	340	64	16(25)	10(15.6)	7(10.9)	15(23.4)	16(25)
Buffaloes	375	57	21(36.8)	4(7.02)	6(10.5)	14(24.6)	12(21.05)
Sheep	420	112	29(25.9)	18(16.07)	15(13.4)	21(18.8)	29(25.9)
Goats	233	53	15(28.3)	9(16.98)	4(7.6)	10(18.9)	15(28.3)

\*One of them had *Fasciola* sp. Eggs in his stool.

**Table 5:** Sensitivity and specificity of faecal examination and IHAT for detection of *Fasciola* infestation among examined animals in comparison with gall bladder examination.

Animal Species	Test	Positive	False positive	False negative	Sensitivity	Specificity
Cattle	Faecal	18	0	19	48.6%	100%
	IHAT	64	25	2	94.9%	91.7%
Buffaloes	Faecal	14	0	20	41.2%	100%
	IHAT	57	21	2	96.9%	93.5%
Sheep	Faecal	52	0	44	45.8%	100%
	IHAT	112	15	1	99.1%	95.4%
Goats	Faecal	23	0	15	60.5%	100%
	IHAT	53	15	0	100%	92.3%
Total	Faecal	107	0	98	52.2%	100%
	IHAT	286	76	6	97.9%	93.4%

## DISCUSSION

Fascioliasis as a parasitic disease of zoonotic importance, is found in areas where sheep, cattle and other herbivorous animals are raised. This study revealed that the prevalence of *Fasciola* infestation in the examined animals were generally low in comparison with the findings of Ayoub (1983) in Gharbia (30.7%); Mahmoud (1984) in Behera (68.9%); Samaha (1989) in Alexandria (68.8%) and Salem *et al.* (1990) in Beni-Suef (29.7%). This result was nearly similar with that reported by Mansour (1994) who found that 8.44% of slaughtered buffalo in Cairo abattoir were infested with *Fasciola*. This variation may be attributed to the difference in the study locality, the technique used for detection of *Fasciola* infestation and the chemotherapeutics used against fascioliasis for animals. The results of this work indicated that the higher infestation rates were found in sheep and goats followed by cattle and buffaloes. These findings were in line with that reported by Magada Amin *et al.* (1992) who reported that the higher infestation rate was in sheep followed by cattle and buffaloes. The higher *Fasciola* infestation rate in sheep and goats may be due to that these animals usually graze in low level than cattle and buffaloes and they usually transmit from place to place (Salem *et al.*, 1990 and El-Bahy, 1997).

In Egypt, in the last few years human fascioliasis recorded in different localities in Delta region (Makled *et al.*, 1988; Ismaiel *et al.*, 1988; Samaha, 1989; Abou-Basha *et al.*, 1990; El-Shazly *et al.*, 1991; Magda Amin *et al.*, 1992 and Hassan *et al.*, 1995). In the present work, the prevalence of human fascioliasis was 0.4% and 4.9% as indicated by faecal examination and serodiagnosis respectively. This seroprevalence rate was lower than that recorded by Makled *et al.* (1988) and Hassan *et al.* (1995) who reported that the infestation rates were 8.7% and 10.9% respectively. The present results showed that the stool was positive for *Fasciola* sp. eggs in only two out of 26 seropositive patients. These results were slightly lower than that reported by Magda Amin *et al.* (1992) who found that three out of 250 stool specimens were positive for *Fasciola* sp. Eggs and these positive stool cases were out of 7 *Fasciola* seropositive patients. This variations may be due to the prevalent environmental conditions and density of infested animals in Sharkia Province.

This study showed that the females were more susceptible to *Fasciola* infestation than males. However Statistically there was no significant difference ( $P>0.05$ ). Zaki (1979) stated that the incidence of human fascioliasis was found to be 1.7%. and it was higher in male (1.4%) than in female (0.3%). Regarding the age of human beings in this study, it was clearly that all ages were susceptible to *Fasciola* infestation, the mostly affected age group was 20 to 30 years. These results were in agreement with those recorded by Farag *et al.* (1979) and Samaha (1989). In the present study, the *Fasciola* antibody titers were higher among the examined animals in comparison with the low human *Fasciola* antibody titers. This may be attributed to the lesser susceptibility of human beings to Fascioliasis.

Regarding the methods used for detection of *Fasciola* infestation in the present work. The specificity and sensitivity of both faecal examination and IHAT among the total examined animals were 100% and 93.4%, and 52.2% and 97.9%, respectively. These results indicated that the serodiagnosis (IHAT) was more sensitive than faecal examination for detection of fascioliasis. This was in agreement with those reported by De Weil *et al.* (1984) who attributed the low sensitivity of faecal examination to the difficulty in finding *Fasciola* eggs during the acute and chronic fascioliasis. The sole dependence on faecal examination will miss many cases of fascioliasis (Makled *et al.*, 1988). Moreover, the uniqueness of serodiagnosis as a good diagnostic assay for the detection of early prepatent and active infections. Whereas



diagnosis by faecal examination was not possible until 9 –10 weeks after infestation , during that time a lot of damage would have been done to the animal. Detection of early infection is very important because it encourage early chemotherapy (Guobadia and fagbeni, 1996).

*Fasciola* sp. That was detected in this study was *Fasciola gigantica* depending upon the morphological criteria of the adult flukes which extracted from the gall bladder of the examined slaughtered animals. However, the species of *Fasciola* in the examined human beings could not be identified depending on the size of the eggs (El-Bahy, 1997).

This survey indicated that a significant number of cases of fascioliasis were indigenous to Ismailia Province and the infested animals are considered as a continuous source contaminating the nature especially fresh water around human by *Fasciola* eggs. The infestation rate has no sex or age limit but it depends mainly on the feeding habit of the people and their general hygienic measure (Bendezu *et al.*, 1982 and El-Bahy, 1997). It could be concluded that fascioliasis, as a zoonotic disease constituted a real hazard to man, and its control depends on eradication of the disease among different species of animals and thorough cleaning and washing of the vegetables. Faecal examinations were not enough for diagnosis of this disease and the immunological diagnosis of fascioliasis in man and animals, based on the detection of antibodies, has proved to be very useful as complement to the usual coprological methods.

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### REFERENCES

- Abou-Basha, L.M.; Salem, A.Z. and Fadali, G.H. (1990):* Human fascioliasis. Ultrastructure study of liver before and after bithional treatment. *J. Egypt. Soc. Parasitol.*, 20 (2): 541-547.
- Ali, M.E.; El-Kannishy, M.H.; El-kholy, E.S. ; Hegazi, M.M.; Khashaba, M.R.; Rifaay, M.R.; El-Bassousy, E.M.M.; Sheir, Z. M. and Rifaat, M.A. (1974):* Clinical and Laboratory studies on human fascioliasis in Egypt. *Mansoura Med. Bull.*, 3&4: 295-230.

- Ayoub, A.A. (1983):* The interpretation of different tests used for estimation of parasitic states of *Fasciola gigantica* in Gharbia Governorate. Thesis, M.V.Sc. Faculty of Vet. Med., Cairo Univ.
- Bendezu, P.; Frame, A. and Hillyer, G.V. (1982):* Human fascioliasis in Corozal, Puerto Rico. *J. Parasitol.*, 68(2), pp.297-299.
- Black, N.M. and Froyd, G. (1972):* The possible influence of liver fluke infestation on milk quality. *Vet. Record*, 90 (3): 71-72.
- Cawdery, M.J.H. (1997):* The effect of fascioliasis on ewe fertility. *British Vet. J.*, 132 : 568-575.
- De Weil, N.S.; Hillyer, G.V. and Phacheco, E. (1984):* Isolation of *Fasciola hepatica* genus specific antigens. *Int. J. Parasitol.*, 14(2): 197-206.
- El-Bahy. M.M. (1977):* Fascioliasis among animal, snail and human hosts in Kafr El-Sheikh Governorate with special reference to species infecting humans. *Vet. Med. J.*, Giza, 45 (2): 187-209.
- El-Seify, M.A.; Aboul-Ela, A.; Ibrahim, S.S. and Soliman, F.A. (1985):* The effect of treatment with some fasciolicidal drugs on gonadotrophins in buffaloe bulls. *Vet. Med. J.*, 33 (1): 211-218.
- El-Shazly, A.M.; Handousa, A.E. ;Yossef, M.E. ;Rizk, H. and hamouda, M. (1991):* Human fascioliasis: A parasitic health problem in Dakahlia. *J. Egypt. Soc. Parasitol.*, 21 (2): 553-559.
- El-Zayat, E.A. (1989):* Sensitivity of crude and purified *Fasciola* Antigens in Immunological Diagnosis of human fascioliasis. *J. Egypt. Soc. Parasitol.*, 19 (2): 395-402.
- Fagbemi, B.O.; Obarisiagbon, I.D. and Mbuh, J.V. (1995):* Detection of circulating antigen in sera of *Fasciola gigantica*-infected cattle with antibodies reactive with *Fasciola*-specific 88-Kda antigen. *Vet. Parasitol.* 58: 235-246.
- Fagbemi, B.O. and Obarisiagbon, I.O. (1990):* Comparative evaluation of the enzyme linked immunosorbent assay in the diagnosis of natural *Fasciola gigantica* infection in cattle. *Vet. Q.*, 12: 35-38.

- Farag, H.G.; Barakat, R.M.R.; Ragab, M. and Omar, E. (1979): A focus of human fascioliasis in the Nile Delta, Egypt. J. Trop. Med. Hyg., 82: 188-190.
- Farid, Z.; Kamal, M. and Woody, J. (1988): Treatment of acute toxæmic fascioliasis. Trans. Roy. Soc. Trop. Med. and Hyg., 82 : 299.
- Fayek, S.A.; Hiekal, F.A. and El-Sakkary, M.Y. (1988): Some studies on *Fasciola gigantica* among naturally infected rabbits in Behera Governorate, Egypt. Alex. Vet. Sci. 4(1): 253-259.
- Guobadia, E.E. and Fagbemi, B.O. (1996): Detection of circulating *Fasciola gigantica* antigen in experimental and natural infections of sheep with fascioliasis. Vet. Parasitol., 65: 29-39.
- Han, J.K.; Han, D.; Choi, B. I. And M.C. (1996): MR findings in human fascioliasis. Trop. Med. Inter. Health 1 (3): 367-372.
- Hassan, M.M.; Moustafa, N.E.; Mahmoud, L.A.; Abbaza, B.E. and Hegab, M.H. (1995): Prevalence of *Fasciola* infection among school children in Sharkia Governorate, Egypt. J. Egypt. Soc. Parasitol. 25 (2): 542-549.
- Ismail, M.M.; Bruce, J.J.; Rassmussen, S.I.; Attia, M. and Salama, M. (1988): Schistosomiasis and other helminthic infections in Kafr Soliman village, Sharkia Governorate. Egypt. J. Egypt. Soc. Parasitol., 18 (1):47-62.
- Magda Amin ;Mowafy, L. ;Marzouk, M.A. ; Fayek, S.A. and Mohamed, A.A. (1992): Fascioliasis in man and animals. Zag. Vet. J. 20 (3): 404-411.
- Mahmoud, A. (1984): Some studies on fascioliasis as animal problem. Ph.D. Thesis, Fac. Vet. Med. Alex. Univ.
- Makled, M. Kh. I.; Khalil, H.M.; El-Sibae, M.M. ; Abdalla, H.M. and El-Zayat, E.A. (1988): Fascioliasis and hepatic affection. J.Egypt. Soc. Parasitol., 18 (1): 1-10.
- Malone, J.B. (1986): Fascioliasis and cestodiasis in cattle. In Food Animal Practice. Vet. Clin. North Am., 2 : 261-275.
- Mansour, N.K. (1994): Incidence of some zoonotic agents and tuberculosis in slaughtered buffaloes (*Bubalus bubalis*). Vet. Med. J., Giza, 43 (2): 231-239.

- O'Reilly, L.M. (1995): Tuberculin skin tests: Sensitivity and specificity. In *Mycobacterium bovis* infection in animals and humans. 1<sup>st</sup> Edition by Charles O. Thoen and James H. Steele, Iowa State university Press/Ames, pp. 86-87.
- Salem, A.A.; Shawkat, M.E.; El-Seify, M.A. and Kahateib, A. (1990): Incidence and seasonal prevalence of fascioliasis in Beni-Suef, Egypt. Assiut Vet. Med. J., 22(44): 62-67.
- Samaha, H. (1989): The zoonotic importance of fascioliasis in Abbis, Alexandria Governorate. Assiut Vet. Med. J. 21 (42): 118-123.
- Santiago, N. and Hillyer, G.V. (1988): Antibody profile by EITB and ELISA of cattle and sheep infected with *Fasciola hepatica*. J. parasitol., 74 ; 810-818.
- Shaker, Z.A. ; Demerdash, Z.A.; Mansour, W.A.; Hassanein, H.I.; El-Baz, H.G. and El-Gindy, H.I. (1994): Evaluation of specific *Fasciola* antigen in the immunodiagnosis of human fascioliasis in Egypt. J. Egypt. Soc. Parasitol. 24(3): 463-470.
- Soulsby, E.J. (1982): Helminths Arthropods and Protozoa of Domesticated Animals. Seven Edition. Baillera, Tindall and Casell Ltd, London, Philadelphia toronto, pp. 765-774.
- Swarup, D.; Pachauri, S.P. ; Sharma, B. and Bandhopadhyay, S.K. (1987): Serodiagnosis of *Fasciola gigantica* infection in buffaloes. Vet. Parasitol., 24: 67-74.
- Zaki, M. (1979): A study of fascioliasis in farm animals and man. Cited in Smaha, H. (1989) The zoonotic importance of fascioliasis in Abbis Alexandria Governorate. Assiut Vet. Med. 21 (42): 118-123.
- Zimmerman, G.L. and Hje, L.W.; Cerro, J.W.; Farasworth, B.S. and Wescott, R.B. (1982): Diagnosis of *Fasciola hepatica* infections in sheep by an enzyme-linked immunosorbent assay. Am. J. Vet. Res., 43: 2097-2100.