STUDIES ON PREVALENCE OF EXTERNAL AND GASTRO-INTESTINAL PARASITIC INFECTIONS IN LABORATORY ANIMALS WITH SPECIAL REFERENCE TO COCCIDIOSIS IN RABBITS

By

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Mr. P. MALAKONDAIAH has satisfactorily prosecuted the course of research and that the thesis entitled "STUDIES ON PREVALENCE OF EXTERNAL PARASITES AND GASTRO-INTESTINAL PARASITIC INFECTIONS IN LABORATORY ANIMALS WITH SPECIAL REFERENCE TO COCCIDIOSIS IN RABBITS" submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any University.

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C E R T I F I C A T E

This is to certify that the thesis entitled "STUDIES ON PREVALENCE OF EXTERNAL PARASITES AND GASTRO-INTESTINAL PARASITIC INFECTIONS IN LABORATORY ANIMALS WITH SPECIAL REFERENCE TO COCCIDIOSIS IN RABBITS" submitted in partial fulfilment of the requirements for the degree of MASTER OF VETERINARY SCIENCE of the Andhra Pradesh Agricultural University, Hyderabad, is a record of the bonafide research work carried out by Mr.P. MALAKONDAIAH under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee.

No part of the thesis has been submitted for any other degree or diploma. The published part has been fully acknowledged. All assistance and help received during the course of the investigations have been duly acknowledged by the author of the thesis.

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Fig	=	Figure
ml	=	milli litre
L	=	Litre
%	=	percentage
mg	=	milli gram
viz.	=	namely
No.	=	number
Spp.	=	species
Ave	=	average
u	=	microns
g	=	gram
mm	=	milli metre

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A B S T R A C T

The prevalence of external and gastro-intestinal parasitic infections in laboratory animals such as rabbits including broiler rabbits, rats, mice and guinea pigs in and around Tirupati was studied. The total number of rabbits, rats, mice and guinea pigs screened were 527, 269, 85 and 50 respectively and the over all incidence of ecto and gastro-intestinal parasitic infections were 43.64, 60.96, 55.23 and 12.00 per cent respectively.

In rabbits, a total incidence of cestode (*Cittotaenia ctenoides*) infection recorded was 1.70% and the nematode (*Obeliscoides cuniculi*) was 0.75 and the prevalence of

coccidiosis was 32.06%. A total of eight species of coccidia were recorded viz., Eimeria magna, E.media, E.perforans, E.coecicola, E.elongata, E.irresidua, E.piriformis and E.steidae. It was observed that coccidiosis was more prevalent in the age groups between 12-24 weeks (56.12%) than the other age groups below 12 weeks and above 24 weeks (41.41 and 35.53% respectively). It was noted that the prevalence of coccidiosis was higher in female rabbits (60.95%) than in male rabbits (35.50%) and it was further observed that the Newzealand breed of rabbits was more prone to coccidiosis (55.40%) than the other breeds such as Soviet Chinchilla, Grey giant and Albino (39.06, 40.81, and 31.48% respectively).

In Albino rats, a total incidence of 44.40% of cestode infections was recorded in and around Tirupati. Hymenolepis nana was recorded in 70.83%, H.diminuta in 17.5% as single infections and mixed infections of H.nana and H.diminuta was recorded in 11.67%.

A total incidence of 5.20% of nematode infections was recorded in rats. The prevalence rate of Syphacia muris and Aspicularis tetraptera recorded was 3.34 and 1.85% respectively and the incidence of intestinal protozoa (Giardia muris) recorded was 3.34%.

In mice, the prevalence of cestode infections of Hymenolepis diminuta and H.nana as single and mixed infections occurred in 52.94, 26.47 and 20.58% respectively. The incidence rate of nematode Syphacia obvelata recorded was 4.10% and the intestinal protozoa Giardia muris as 4.70%.

In guinea pigs, the total prevalence rate of ciliate (Balantidium caviae)recorded was 2.0%.

The flea Ctenocephalides felis and the tick Rhiphicephalus sanguineus were recorded from rabbits in the present study. Infestation with Psoroptes cuniculi and Notoedres cuniculi mites was recorded in 7.96% rabbits.

In rats, polyplax spinulosa louse was recorded in 4.34% whereas the mite infestations with Ornithonyssus bacoti and Notoedres muris were 1.85% and 1.48% respectively.

In mice, the infestation with louse Polyplax serrata was recorded as 1.17% where as the mite, Ornithonyssus bacoti infestation was present in 3.5%.

In guinea pigs, the prevalence rate of louse Gyropus ovalis infestation was recorded to be 2.0%.

Treatment trials were undertaken with a herbal product, Zycox in 30 rabbits against coccidiosis (mixed infections) at two different dose levels (0.3 and 0.45 ml per animal per day orally).

Rabbits treated with 0.3 ml dose levels of Zycox revealed a decrease in oocyst per gram of faeces and symptoms of diarrhoea reduced by 7th day post treatment and it was also observed that the body weight increased in the treated rabbits than in the infected non-treated controls. Similarly, in those rabbits treated with 0.45 ml of Zycox there was reduction in the oocyst per gram of faeces and an increase in the body weight by 5th day post-treatment. It was noticed that the recovery rate was quicker (5 days) with the dosage of 0.45 ml Zycox compared to the rabbits treated with 0.3 ml dose of Zycox (6 days).

Similarly, those rabbits treated with Supercox (Sulfaquinoxalene and diaverdin combination) count of coccidial oocysts and the symptoms of diarrhoea and dullness were reduced by 7th day post-treatment and further there was an increase in the body weight of treated rabbits when compared with the infected untreated controls.

Treatment trials were conducted in rabbits, infested with Psoroptes cuniculi and Notoedres cuniculi with Butox, (deltamethrin) at the rate of 50 ppm (4 ml in 1 litre of

water) in three applications at weekly intervals for three consecutive weeks and the product showed an efficacy of 95.29%. A herbal product, Dermux was also evaluated to assess its efficacy against mange in rabbits. In those rabbits treated with Dermux once a day for 7 days externall in an ointment form, the percent efficacy was 83.34%. The present observation, indicated that deltamethrin (Butox) seemed to be more efficacious than the herbal drug Dermux.

INTRODUCTION

CHAPTER - I

1. INTRODUCTION

Scientists in India are striving to take every care in various fields of research to be on par with the developed countries so that the directions of the research will be on line with those of developed. The various fields of research and related fields of applied sciences like Immunology, Vaccinology, Bio-technology etc., which will direct the survival of human beings and livestock in a prosperous way require a thorough knowledge of the laboratory procedures. The laboratory animals are utilized in experimental studies and also invaluable in research work. The laboratory animal is initially required to demonstrate the effect of any scientific observation before trial on the actual animal host or human being.

The laboratory animals are utilised (a) to conduct pure research into fundamental biological processes and the etiology of diseases, (b) to investigate the etiology, prevention and treatment of cancer, (c) to test a new product and to ensure that no harmful effects will arise, prior to the release of the product into market, (d) to diagnose the pregnancy and diseases by inoculation of material from the suspected individuals, (e) to test new substances which are administered to human beings and livestock for prophylactic or therapeutic purposes often as a legal requirement before offered for use and (f) to detect the adulteration of food

by artificial substances which is a common feature in this evergrowing world population (Peter and Pearson, 1971).

The importance and convenience of small laboratory animals like rabbit, rat, mouse and guinea pigs as experimental models was realised by McNeil (1959) who also mentioned the hazards associated with the large animals as experimental models.

Laboratory animals are prone to external and internal parasitism (Henry, 1971), which may interfere with research studies leading to altered results. It is also an established fact that certain laboratory animals act as hosts for many parasites.

Rabbits have traditionally been raised by some farmers in many countries as pets and also to provide meat for their family and to supplement their income to some extent. There is an enormous demand for rabbit meat in the market now a days due to their dietary characteristics of low cholesterol and high content of proteins. The skin of rabbits is of high commercial value in the manufacture of coats, hats and other luxury garments.

Rabbit is a common experimental model chosen among the laboratory animals. Rabbits suffer from a variety of parasitic diseases among which coccidiosis is one of the common and important protozoan diseases which causes heavy morbidity and mortality in rabbits especially in young ones and inturn causes severe economic losses to farmers.

Laboratory animal science is comparatively a new subject. Problems of naturally occurring parasitic diseases in laboratory animals were given little attention in our country in the past. Since the last decade, some attention has been focussed on the parasitic diseases of laboratory animals which are highly essential for experimental studies. In Bihar, Meitei et al. (1988) observed the coccidial fauna in rabbits. Coccidiosis in rabbits was studied by Placid et al. (1993) in Bangalore, Karnataka and they also observed the gastro-intestinal parasites in certain laboratory animals like rabbits, rats, hamsters, mice and monkeysin 1994. Isolat reports are available on laboratory animal parasites in Andhra Pradesh. Bhaskara Rao (1978) studied the prevalence of helminth parasites in rodents. In Hyderabad, Yadagiri (1989) conducted research on coccidiosis in rabbits. Shobhamani (1992) studied few aspects of mange in rabbits at Hyderabad, Andhra Pradesh.

Chemoprophylaxis of coccidiosis in rabbits was successfully achieved by Ponomorenko (1976). Efficacy of Amprolium and Sulfadimidine against coccidiosis was evaluated by Yadagiri (1989). Placid et al. (1993) evaluated the efficacy of Amprolium in the treatment of coccidiosis in rabbits and also tried other allopathic drugs.

Since detailed and systematic studies on laboratory animal parasites are lacking in Andhra Pradesh in particular

and in India in general, the present study on "STUDIES ON PREVALENCE OF EXTERNAL PARASITES AND GASTRO-INTESTINAL PARASITIC INFECTIONS IN LABORATORY ANIMALS WITH SPECIAL REFERENCE TO COCCIDIOSIS IN RABBITS" was designed to provide a consolidated knowledge on the prevalence of external parasites and gastro-intestinal parasitic infections of laboratory animals in and around Tirupati, Andhra Pradesh with the following objectives:

1. To record the prevalence of external parasites and gastro-intestinal parasitic infections in laboratory animals such as laboratory and broiler rabbits (Oryctolagus cuniculus), rats (Rattus norvegicus), mice (Mus musculus) and guinea pigs (Cavia porcellus) in and around Tirupati.

2. To record the common species of Eimeria which cause coccidiosis in rabbits.

3. To study the efficacy of certain drugs (including certain indigenous drug/s) against few commonly occurring parasitic infections in rabbits.

REVIEW OF LITERATURE

CHAPTER - II

REVIEW OF LITERATURE

The available literature on ectoparasites and gastro-intestinal parasitic infections in laboratory animals with particular emphasis on coccidiosis in rabbits is reviewed hereunder.

Smetana (1933) studied coccidiosis of the liver in rabbits and identified the nature of oocysts of Eimeria steidae and excysted them by the action of the trypsin-kinase in pancreatic juice and also studied the life cycle of Eimeria steidae by inducing the infection experimentally in rabbits.

Maplestone and Bhaduri (1942) made a collection of helminths from rats and recorded Hymenolepis diminuta, H.nana, Raillietina cesticellus, Heterakis spumosa and Syphacia baylisi.

Lund (1950) reported an average incidence of 17 per cent mixed coccidial infection in rabbits and observed that there was reduction in incidence of infection due to improved managemental practices when compared to the previous year.

Commiade (1951) observed the prevalence of insect and arachnid parasites like fleas, lice, ticks and mange mites in laboratory animals and also suggested control measures against them.

Oxyurid infections in rats were reported by Cavier (1956) and treated the infected rats with n-butyl cinnamate at the dose rate of 100 mg/kg body weight with satisfactory results.

Cook (1956) reported an outbreak of ear mange in two mice colonies caused by Psorergates simplex and treated the affected mice colony with Dibutyl pthalate with desirable results.

Barke and Gierschik (1957) evaluated the anthelmintic activity of piperazine citrate in mice by injecting 10 per cent solution at the dose rate of 2 g/kg body weight but the treated animals died within ten minutes after injection.

Boch (1957) experimentally infected rabbits with coccidia and evaluated the efficacy of 'Furacin-W' at the dose rate of 0.5 to 1.0 g/kg body weight as a prophylactic and reported that doses of 1.5 to 2.0 g/kg body weight decreased losses in already infected rabbits.

Cole et al. (1957) described some protozoan diseases like babesiosis, toxoplasmosis in man and laboratory animals and also discussed the diagnosis, treatment and prevention of those diseases.

Habermann and Williams (1957) observed an outbreak of pin worm infection in mice and rats and reported that piperazine adepate and piperazine citrate expelled 99.1 per cent and 86.7 per cent pin worms respectively.

Levine (1957) reviewed the protozoan diseases like amoebiasis, coccidiosis and giardiasis in laboratory animals like rat, mice, rabbits, guinea pigs and hamsters and also discussed the diagnosis and treatment.

Stalker and McLean (1957) studied a disease of young guinea pigs which was characterised by liver damage and edema but specific diagnosis could not be made.

Voge (1957) described the helminth infections in small laboratory mammals like rats, mice and guinea pigs and he also mentioned the directions for the establishment of helminth free laboratory animal colonies.

Bube (1958) described the mode of infection, pathological, anatomical signs and diagnosis of coccidiosis in rabbits and also suggested treatment with resochin diphosphate.

Fratta and Slanetz (1958) reported an outbreak of oxyurid infections in mice particularly with Syphacia obvelata and Aspicularis tetraptera and also suggested treatment with piperazine citrate at the dose rate of 60 mg daily for 10 days and achieved desirable results.

Habermann and Williams (1958) identified helminths in laboratory animals like mice, rat, guinea pig, hamsters and rabbits by adopting proper laboratory diagnostic procedures and also suggested control measures.

Keleman (1958) reviewed the spontaneous infections in the ear of laboratory animals like rats, rabbits and guinea pigs and described the inflammatory changes associated with the infections.

Oelkers (1958) observed an outbreak of Oxyuris infections in laboratory mice and treated with various drugs and reported that 100 per cent cure was achieved by 3 doses of tartaric acid at the dose rate of 150 mg/kg body weight as a 3 per cent solution.

Semellini (1958) reported an outbreak of intestinal and hepatic forms of coccidiosis and mixed infection in rabbits and also suggested treatment with sulfaquinoxalene at a dose rate of 0.3 per cent in drinking water and observed that all the animals including their progeny remained as carriers of coccidia.

Breza and Jurasek (1959) observed an outbreak of coccidiosis in laboratory mice caused by Eimeria falciformis and also reported its transmission by field mice and they also suggested treatment with Atebrin mixed in drinking water for good results.

Burrows et al. (1959) described the prevalence of Syphacia obvelata infection in mice colony and also evaluated the efficacy of piperazine citrate against the existing infection and reported that the drug eliminated both mature and immature stages of parasite from the mice colony.

Flynn (1959) described follicular acariasis in mice caused by Isoergates simplex and suggested treatment with an aqueous solution of Aramite (2-P-terbutyl Isoprophyl 2-chloroethyl sulfate) combined with wetting agent which was effective against follicular acariasis.

Glattli (1959) observed the prevalence of coccidiosis in rabbits and suggested treatment with Formo-cibazol and justified that the anticoccidial activity of the drug was due to its poor solubility and minute absorption in the intestine.

Herrlein (1959) reported an outbreak of oxyurid infections in laboratory mice colony and achieved desirable results with piperazine compounds than the phenothiazine compounds in the treatment trials.

Lynch and Nelson (1959) reported an outbreak of Nematospiroides dubius infection in mice colony and also evaluated the efficacy of anthelmintic against persistant infection.

McNeil (1959) described the hazards associated with the use of farm animals as experimental models and also realised the importance of small laboratory animals as experimental models to study the scientific knowledge.

Schacher and Cheong (1960) studied the parasites harboured by three common species of rats at Malaysia, Kaulalampur and recorded Trichosmoides crassicauda, Eucoleus hepaticus, Trichuris muris, Strongyloides ratti, Syphacia sp. Nippostrongylus muris, Gongylonema neoplasticum and Rictularia tani.

Ostler (1961) recorded four species of coccidia in the gut of broiler rabbits namely Eimeria media, Eimeria magna, Eimeria perforans and Eimeria irresidua.

Takeda (1961) reported an outbreak of endoparasites and estimated the parasitism at 72.7 per cent in Rattus rattus and 84.4 per cent in Rattus norvegicus and recorded Echinostoma cinetorchis, Hymenolepis nana, H.diminuta, Cysticercus fasciolaris, Syphacia obvelata and Aspicularis tetraptera.

Mykytowycz (1962) observed that out of 2326 rabbits faecal samples examined, only 84 (3.6%) were free from oocysts of coccidia.

Patwardhan (1962) investigated parasites of Rattus rattus refescens and Bandicota bengalensis in Bombay and recorded Hymenolepis nana, H.diminuta, Cysticercus fasciolaris, Heterakis spumosa and Syphacia obvelata.

Durr and Pellerdy (1969) studied the succeptibility of suckling rabbits to infection with coccidia and reported that the resistance of suckling rabbits to all species of rabbits coccidia was stronger at birth.

Dovos et al. (1970) found 59 (27.9%) cases of coccidiosis in rabbits out of 211 faecal samples examined.

Bascher and Haley (1971) conducted parasitological survey in urban and rural areas of Punjab region in West Pakistan in Rattus rattus and found 6 nematodes, 4 cestodes and 1 acanthocephalan and reported that Aspicularis pakisthanica, Hymenolepis diminuta and larval Taenia taeniaeformis were fairly common in all the localities and further reported that frequent occurrence of helminths was found only in urban areas than the rural areas.

Stodart (1971) examined 2881 rabbits from four sites representing different climatic regions in Eastern Australia and identified seven species of Eimeria viz., Eimeria steidae, E.media, E.perforans, E.irresidua, E.magna, E.piriformis and E.exigua and also observed that a decrease in oocyst out put in coccidiosis with an increase in the age of rabbits.

Eaten (1972) studied the intestinal helminths of inbred mice by means of cellopnane tape technique, faecal egg concentration and autopsy and found that the Syphacia obvelata was the most common parasite and further noted that male mice were heavily parasitized than female mice of same age and strain.

Fitzgerald (1972) studied the efficacy of Amprolium in the prevention of hepatic coccidiosis in rabbits and opined that Amprolium did not prevent the establishment of Eimeria steidae infection because, it was probably due to the changes brought about in Amprolium by pelleting of the ration.

Piccinini et al. (1972) in a parasitological investigation of Rattus rattus and Rattus rattus alexandrinus from the campus of Federal Rural University of Rio de janeria, Brazil encountered, Gangutelerakis spumosa, Nippostrongylus muris, Gongylonema neoplasticum, Hymenolepis sp. Strongyloides ratti and Syphacia obvelata.

Dovos et al. (1973) conducted post-mortem of 548 rabbits and examined 3000 live animals and recorded an incidence of 14 per cent coccidiosis.

Kolabskii et al. (1973) reported an outbreak of coccidiosis caused by Eimeria steidae in rabbits at Moscow and tried sulphachloropyrazine at the dose rate of 50 mg/kg feed to rabbits in both natural and experimental infections with good results.

In Spain, Rodriguez and Romero (1973) identified thirteen species of Eimeria viz., Eimeria steidae, E.exigua, E.perforans, E.nagpurensis, E.intestinalis, E.piriformis, E.matsubayashi, E.neoleporis, E.coecicola, E.irresidua, E.magna, E.media and E.sculpta and provided key to identify the oocysts.

Jagannath et al. (1974) reported the heavy infestation with the mite, Ornithonyssus bursa on white rats and also observed infestation of lice of Gyropus ovalis and Gliricola porcelli on 15 guinea pigs and found that 2-Isopropoxyphenyl-N-Methyl carbamate (Half dust) was useful in its control.

Raja (1974) made a parasitological investigation in 9 species of rodents at Madras. Apart from ectoparasites, he also described 7 cestodes, 1 trematode, 4 nematodes and 1 Acanthocephalid, i.e., Raillietina sp., Raillietina celebensis Hymenolepis diminuta, H.nana, Cysticercus cellulosae, Cysticercus fasciolaris, Coenurus sp., Echinostome species and Moniliformis moniliformis.

Cooper (1976) made a survey of laboratory animal diseases in Kenya, Egypt and reported the prevalence of clinical coccidiosis in rabbits.

Hafeez and Rao (1976-77) infected rabbits, guinea pigs and mice with irradiated and normal amphistome metacercariae (C.indicae XXVI) and failed to establish amphistomes in the above laboratory animals.

Muller (1976) in his study of parasitic fauna of white rat (Rattus rattus var norvegicus) found Syphacia muris, Aspicularis tetraptera and also observed that Syphacia obvelata was the commonest parasite parasitizing the white rat.

Ponomorenko and Kartashev (1976) advised that chemoprophylaxis in rabbits can be achieved by giving sulfapyridazine and sulfamethaxone at the dose rate of 1 g/kg feed for a period of 10 days alone or with an antibiotic and also reported that mortality rate was reduced to an average of 1.6 per cent in all age groups.

Ribbeck (1976) described the development of the ear mite, Psoroptes cuniculi and advised that diagnosis must be confirmed by microscopic examination of scab material from the affected ear and also reported that this ear mite of rabbits was not harmful to human beings.

Seshappa and Hiregoudar (1977) reported the seasonal incidence of mange mites together with Cheyletiella parasitivorax in laboratory rabbits and observed that Notoedres cuniculi was the most common mange mite of laboratory rabbits and also noted that sporadic outbreaks do occur resulting in many deaths.

Taniguchi et al. (1977) surveyed the incidence of helminths of house rodents (Rattus norvegicus, Rattus rattus) in Setagaya, Tokyo and recorded Echinostoma nortense, Paragonimus sp., Cysticercus fasciolaris, Hymenolepis nana, H.diminuta, Strongyloides ratti, Heterakis spumosa and Syphacia muris and further observed that the number of species increased with the body weight of the host.

Whitney (1977) described the prevalence of coccidiosis in commercial rabbits and also suggested the treatment with sulphaguinoxaline and sulphadimidine for good results.

Balachander and Kande (1978) recorded seasonal incidence of Trichuris trichura, Hymenolepis nana and Syphacia obvelata in rats at Pune, Maharastra.

Seshappa and Hiregoudar (1978) conducted treatment trials against Notoedres cuniculi infection in laboratory rabbits with Neguvon 10 per cent ointment, Ascabiol 25 per cent oil in water emulsion, Himax (Ayurvedic ointment), Lorexane 0.1 per cent and sumithion 0.5 per cent as spray and reported that Neguvon, Ascabiol, Lorexane and Himax were good in controlling the infection effectively and neguvon was the most effective drug.

Sugur (1978) reported coccidiosis in 24 per cent of 50 rabbits examined.

In Britain, Catchpole and Norton (1979) examined the faecal samples of rabbits which were meant for meat production and recorded the prevalence of Eimeria sp. at the 96 per cent level of infection.

In Netherlands, Dorrestein and Van Bronswijk (1979) described the clinical symptoms of infestation with Trixacarus caviae in guinea pigs and observed large areas of thickened, denuded skin with secondary bacterial infection

and suggested several washings with 0.15 per cent trichlorophon or 0.07 per cent lindane solution for better results.

A mild infection of coccidiosis in female breeding rabbits was reported by Manzhos (1979).

Norton et al. (1979) reported that Eimeria flaviscens was very pathogenic and caused severe enteritis with high morbidity and mortality in young dutch rabbits.

Peeters and Halen (1979) studied the efficacy of amprolium and ethopabate against experimental coccidiosis in rabbits and reported that the above two drugs caused better feed conversion by improving the digestion rather than anticoccidial effect.

Suman Gupta et al. (1979) studied the efficacy of niclosamide, sulphoxides, sulphones (certain anticestodial drugs) in experimentally induced Hymenolepis nana in laboratory animals and reported that 4-bromo-1-hydroxy-2-napthanilide was found to be effective against the H.nana infection in laboratory animals.

Aruna Singhvi and Sylvester Johnson (1980) described the ecological aspects of helminthic parasites of house rat and also reported that Syphacia muris infection was more prevalent in young rats and Aspicularis ratti was also encountered in rats of all ages.

Gupta and Johri (1980) studied the prevalence of Nematospiroides dubius infection in mice and reported that mebendazole at the dose rate of 1.56 g/kg body weight yielded satisfactory results.

Mittal (1980) screened 147 rats and 19 mice in Meerut division, Uttar Pradesh and reported an incidence of 80 and 73 per cent helminths in rats and mice respectively. The nematodes observed were Ascardia dwarfi which was reported for the first time in rats and Aspicularis and Syphacia at 80 and 90 per cent of total nematodes in rats and mice respectively.

Vyas and Johri (1980) made an attempt to study the cross reactions between Ancylostoma caninum and Hymenolepis nana and observed that the primary infection with Ancylostoma caninum was detrimental to the establishment of a subsequent infection of Hymenolepis nana.

Akinboade et al. (1981) screened 157 faecal samples of rats in 5 localities of Ibedan, Nigeria and reported Hymenolepis diminuta (17 per cent), Trichostrongylus colubriformis (25 per cent), Strongyloides ratti (15 per cent) and Ascaris sp. (10 per cent).

Alonbo et al. (1981) found coccidiosis to be prevalent in 94 per cent of 210 rabbits examined.

Hymendepis diminuta, Vampirolepis fraterna, Matherotaenia symmetrica, Cysts of Taenia taeniforms and Moniliformis moniliformis and reported that cholesterol levels rose significantly in these infections.

Joyner et al. (1983) reported an outbreak of coccidiosis in rabbits due to Eimeria steidae and also suggested sulphaquinoxaline was the drug of choice against coccidiosis.

Novinskaya et al. (1983) reported the highest intensity and prevalence of coccidiosis in young rabbits and observed that the prevalence rose to 100 per cent at one month of age and remained at this level until 3 months.

Dhirendra Singh (1986) screened the faecal samples of rabbits which were heavily infected with Eimeria steidae infection and noted hepatomegaly, dilated bileducts containing yellowish exudate and coccidial oocysts during post-mortem examination.

At Bangalore, Placid et al. (1986) reported the occurrence Notoedres cati (Cuniculi) from guinea pigs and established a new host record.

Sanyal and Srivatsava (1986) reported the prevalence of coccidiosis in 48 faecal samples out of 92 faecal samples examined with the prevalence rate of 52.17 per cent and also observed that among the rabbits examined 54.05 and 48.93 per cent rate of coccidiosis was encountered in females and

males respectively. They also reported the prevalence of 38.8, 100.0 and 86.5 per cent coccidiosis in age groups of 24 weeks and above, 12 to 24 and 6 to 12 weeks respectively.

The breed wise prevalence was 84.0, 35.07, 69.2, 80.0 and 25.7 per cent of coccidiosis in Newzealand white, Soviet Chinchilla, Grey Giant, White Giant and Angora breeds respectively. The species of Eimera observed in decreasing order were viz., Eimeria media (47.9%), E.perforans (43.7%), E.magna (14.6%), E.irresidua (10.4%), E.elongata (6.2%), E.nagpurensis (6.2%), E.piriformis and E.intestinalis (4.2%).

Sherkov et al. (1986) opined that rabbits of all age groups were succeptible to coccidial infection especially the weaned rabbits and the young ones aged 2 to 3 months.

Wiethe (1986) observed small laboratory animals maintained under barrier, semi-open and conventional conditions at a number of research institutes and laboratories in and around Munich, for the presence of helminth infections. Mice were infected with Aspicularis tetraptera, Syphacia obvelata, Hymenolepis nana and the ectoparasites of Myobia musculi (on males) and Mycoptes musculinus (on females); rats were infected with Syphacia obvelata and Demodex criceti. The prevalence in conventionally kept stock was 90 per cent for oxyurids and Hymenolepis nana. No parasite were found in barrier maintained animals. It was shown that ivomec added

to water cleared Aspicularis tetraptera infection at a dose rate of 1 mg/kg for male mice and 1.6 mg/kg in female mice but was not effective against Syphacia obvelata. Ectoparasites were cleared in mice stocks by applications of 4 g of Atgarel (Pelleted Dichlorovos) in 1 litre for 4 consecutive weeks.

Ajayi et al. (1987) screened the faecal samples of Newzealand white rabbits at Nigeria and reported the incidence of Eimeria media, E.magna, E.perforans, and E.steidae as mixed infection and also observed that E.magna was the most predominant species.

Dincer (1987) identified Myobia musculi and Mycoptes musculinus on mice and Radfordia ensifera on rats and this was reported for the first time in Turkey. Application of 0.2 per cent trichlorofon or 250 ppm amitraz to affected areas produced rapid recovery.

Dousek et al. (1987a)described coccidiosis in 1567 rabbits in 58 per cent out of 2700 rabbits examined during autopsy.

Dousek et al. (1987b)reported an outbreak of coccidiosis in small rabbit farms and suggested its treatment with sulphadimidine and Diaverdine against coccidiosis.

French (1987) found that a colony of laboratory mice were found to be infested with Ornithonyssus bacoti. This infestation was eliminated over several days by way of a vigorous regime of repeated rack and cage changes, room sanitation, placing dichlorovos resin strips and improved personal hygiene of the workers.

Kasim and Shawa (1987) screened 203 faecal samples of rabbits at SaudiArabia and reported the prevalence rate of 73 per cent of Eimeria sp.

Zanger (1987) conducted an investigation of the parasitic status of domestic rabbits under different rearing conditions and reported an incidence of 99.2 per cent coccidiosis.

Das et al. (1988) studied the effect of extracts of Boophilus microplus by inoculation through intra-dermal and intra-peritoneal route in Albino rats and observed the toxic reactions like loss of appetite, restlessness, erythema and hardness at the site of inoculation.

Feinstein and Rehbinder (1988) observed white yellowish nodules on the surface of liver and edema of intestinal mucosa, abnormally shaped strophic villi and infiltration of leukocytes in intestinal coccidiosis in rabbits.

In rabbits, Khar et al. (1988) described the symptoms of sarcoptic mange like pruritis, scratching, erythema, scaling of skin and also suggested treatment with Neocidal with good results.

Meitei et al. (1988) described the incidence of Eimeria infections in domestic rabbits in and around Ranchi, Bihar and reported 54.35 per cent animals infected with intestinal protozoa and also reported that seasonal incidence of this infection was 66.35 and 50.84 per cent during the rainy, summer and winter weather respectively and also reported that the intensity of coccidial infection was more in younger rabbits than the adults.

Mimbanga and Gemperl (1988) reported that a single subcutaneous dose of ivermectin at the dose rate of 200 ug/kg body weight was effective against sarcoptic mange in rabbits.

Peeters et al. (1988) studied the coccidial fauna in commercial rabbitries at Belgium and observed that the prevalence of Eimeria magna, E.media and E.perforans and reported that there was decrease in the prevalence of rate in the same rabbitries after treatment with sulphaquinoxaline and pyrimethamine.

In USSR, Ponomarenko and Lapshin (1988) studied the epidemiological aspects of hepatic and intestinal coccidiosis and reported the incidence rate of 13.6 and 68.2 per cent respectively.

Rai (1988) observed the prevalence of ear canker at the level of 11.10 per cent and scabies at 8.03 per cent level in rabbits and also suggested treatment with Ivermectin with desirable results.

Samnat Ray et al. (1988) made an attempt to induce resistance in rabbits through the repeated feeding of tick, Rhipicephalus naemaphysaloides and the results provided evidence of resistance in rabbits to subsequent tick attachment which increased progressively after each subsequent tick application but resistance waned out once the rabbits were free from ticks.

Sanyal and Srivatsava (1988) described the clinicopathological studies in rabbits experimentally inoculated with different doses of sporulated oocysts and observed the lesions like congestion and destruction of villar epithelium.

Aruna Singhvi and Sylvester Jonnson (1989) studied the population dynamics of Aspicularis ratti in house rat and reported the prevalence rate of 18.3 per cent.

Bhat and Jithendran (1989) studied the prevalence of Eimeria sp. in Angora rabbits and reported that 64.20 per cent of infection as hepatic coccidiosis caused by Eimeria steidae.

Chandra Sakhimathur (1989) studied the effect of helminth parasites like Aspicutaris ratti , Syphacia muris and reported that total leucocyte count was significantly raised in the infected rat.

Gopal Singh et al. (1989) described the prevalence of coccidiosis in laboratory rabbits caused by Eimeria magna,

E.perforans and E.media and treated the rabbits with monensin at the dose rate of 300 mg/kg body weight in drinking water for 7 days and obtained good results.

Hafeez (1989) reviewed the common parasitic infections in rabbits and reported that Taenia pisiformis, Passalurus ambiguus, Cutarebra larvae, Encephalizoon infection and Eimeria steidae and Psoroptes cuniculi as commonly occurring and also suggested control measures against them.

Ectoparasites of laboratory animals at the Institute for Medical Research, Kuala Lampur were collected by Ismail and ho (1989) and observed Listrophoroides cucullatus, Radfordia ensifera and Laelaps nuttalli on white rats; Cheyletiella parasitivorax and Leporacarus sp. on rabbits; Chirodiscoides caviae, Gliricola porcelli and Gyropus ovalis on guinea pigs; Mycoptes musculinus and Myobia musculi on white mice.

Jasmer Singh and Gill (1989) reported an outbreak of mange in rabbit colony with Psoroptes cuniculi and Notoedres cati with the typical symptoms. Treatment with 1 per cent Ivermectin at the dose rate of 400 ug/kg body weight at 7 days intervals showed complete relief from the mange and it was observed that hair growing started immediately.

Askhedikar et al. (1989) reported an outbreak of Hymenolepis nana infection in mice and also evaluated the efficacy of mebendazole against persistant infection with good results at the minimum dose rate of 30 mg/kg.

Mahmoud et al. (1989) conducted a survey on the helminths in different species of rodents and observed the prevalence of 4 nematodes, 3 cestodes and one acanthocephalan, viz., Trichuris muris, Aspicularis tetraptera, Syphacia obvelata, Toxocara sp., Hymenolepis diminuta, H. nana, Taenia taeniae formis (larval form) and Moniliformis moniliformis respectively.

At Sikkim, Mishra (1989) described the morbidity and mortality pattern in laboratory rabbits and observed that coccidiosis alone caused 4.09 per cent of mortality apart from other ailments.

In Kerala, Rajamohan and Joy (1989) reported mange in rabbits caused by Notoedres cati and also evaluated the efficacy of ivermectin against mange.

Sharma and Srivatsava (1989) described the prevalence of hepatic and intestinal coccidial infections in rabbits of Jammu region and also suggested the line of treatment against the same with the dose rate of 8 mg/kg sulfadimidine for hepatic coccidiosis and sulphadimidine orally at the rate of 0.3 ml for intestinal coccidiosis.

Boll (1989) studied the efficacy of ivermectin against various nematodes and arthropods affecting laboratory rodents, rabbits and ferrets and in other pet exotic animals.

Subramanian et al. (1989) studied the efficacy of anticestodal drugs like niclosamide, albendazole and fenbendozole at the dose rate of 150, 15, and 10 mg per kg body weight respectively against Hymenolepis diminuta infection in rats and observed that niclosamide was found to be more effective than the others.

Vanajakshi et al. (1989) reported an outbreak of Hymenolepis nana infection in rats and also isolated the parasitic stages.

In Hyderabad, Andhra Pradesh, Yadagiri (1989) reported an incidence 78.09 per cent of coccidiosis in rabbits and identified nine species of coccidia as the causative agents viz., Eimeria media, E.perforans, E.magna, E.irresidua, E.flaviscens, E.piriformis, E.intestinalis, E.coccicoal and E.steidae and evaluated the efficacy of amprolium and sulfadimidine 33.13 per cent at the dose rate of 50 mg/kg body weight and 0.5 ml respectively and reported that sulfadimidine was more efficacious than amprolium.

Bhatti et al. (1990) observed hepatic lesions in guinea pigs infected with Entamoeba histolytica and also noted pin point abscesses in liver.

At North Eastern hilley regions of Shillong, Chandra and Ghosh (1990) reported an outbreak of coccidiosis in rabbits aged about 1 to 2 months at a prevalence rate of 53.0 per cent and identified three species of coccidia viz., Eimeria media, E.irresidua and E.perforans.

Pathak and Kapoor (1990) studied the efficacy of ivermectin at the rate of 200 ug/kg body weight subcutaneously against mange in rabbits caused by Psoroptes sp. and obtained satisfactory results.

Padmavathi (1990) reviewed the common ecto and endo parasitic infections in rabbits and also reported the incidence of 78.09 and 11.0 per cent of intestinal coccidiosis and hepatic coccidiosis respectively at Hyderabad and suggested treatment for coccidiosis with sulfadimidine 33.13 per cent orally at the rate of 5 ml per rabbit for 3 days.

Sanyal and Sharma (1990) studied the clinico-pathology of hepatic coccidiosis in rabbits which were infected experimentally with Eimeria steidae sporulated oocysts and reported hypoproteinaemia in the infected animals.

Espaine and Damidio (1991) observed Noteodres cati var cuniculi on adult rabbits at Cuba and reported mange like symptoms, with lesions around the eyes, nose, toes and ears.

Fang et al. (1991) reported the ectoparasitic mites Cheyletiella parasitivorax and Listotrophus gibbus from rabbits at the laboratory animal centre, Shanghai for the first time in China and also reported that the amitraz and pyrethroid were effective in clearing the mite infestation on rabbits.

Maske et al. (1991) studied the efficacy of Amitraz against mange in rabbits caused by Isoroptes cuniculi and observed good results at 0.03 per cent concentration of Amitraz with topical application.

Sanyal (1991) described the histopathology in domestic rabbits inoculated with oocysts of Eimeria steidae and reported that the liver increased ten times the normal size and white nodules occurred on the surface of liver.

Shyamlal (1991) described Toxocara canis infection in experimental animals like mice and rabbits and conducted histopathological studies and noted that there was decrease in haemoglobin content and also observed granulomatous lesions on liver of infected animals.

The prevalence of Hymenolepis nana infection in mice was reported by Kaskhedikar and Johri (1992) who also evaluated the efficacy of mebendozole against the persistant H.nana infection.

In Bangalore, Placid et al. (1992) observed the prevalence of coccidiosis in laboratory rabbits caused by Eimeria magna, E.intestinalis, E.perforans and E.steidae and also observed that coccidiosis was more common during months of July to February and found that 37.5 per cent of deaths were due to coccidiosis and drugs like sulfadimidine 500 mg/kg body weight, sodium sulfamethyl pyrimidine as 12.5 per cent solution, Trimethoprim (100 mg) and sulfamethaxozole (500 mg) combination and Monensin 30 mg/kg body weight were effective against coccidiosis in rabbits.

Rahman et al. (1992) evaluated the efficacy of Butox at the dose rate of 50 ppm against mange in rabbits caused by Psoroptes cuniculi and Notoedres cuniculi and reported that the Butox shown 90 per cent efficacy against mange in rabbits.

Ziomko & Cencek (1992) reported that an exammination of 1550 guinea pigs from 4 laboratories at Poland, 1500 in 3 were infested by lice and the most prevalent was Gliricola porcelli followed by Gyropus ovalis (90%) and Trimenopon hispidum (40%) and reported that Biocid 0.1 per cent, insection 0.5 per cent (both used as aerosal or bath), Pularyl 1 per cent, Ivomec in subcutaneous injections at the rate of 400 ug/kg were showed 99 to 100 per cent effective against lice when used twice at 15 days interval.

Bhattacharya and Basu (1993) described haematological changes associated with Sarcoptes scabiei in rabbits and observed that there was decrease in haemoglobin percentage, neutrophilia, eosinophilia, lymphocytopaenia but monocytes and basophilis percentage remained normal.

Christenson (1993) reviewed the factors which may play a role in the host-parasite relationship in experimental infections by helminth, protozoa and arthropod parasites and it was concluded that the strains used and parasitic status of laboratory animals examined should be reported in addition to health monitoring of barrier and non-barrier animals should include for parasitological examination.

Mishra (1993) studied the significance of intestinal and hepatic disorders in a rabbit colony in Sikkim and found 29.6 per cent infection and identified five Eimeria species viz., Eimeria intestinalis (43.6%), E.magna (24.0%), E.media (12.3%), E.perforans (16.7%) and E.steidae(3.4%). He also observed mixed infections with more than two species of Eimeria (64.6%) and further noted that maximum infection (39.4%) with coccidiosis was prevalent in the age group of 2 to 4 months with the oocyst count range from 20,000 to 80,000 per gram of faeces.

Placid et al. (1993) reported the prevalence of coccidiosis in rabbits at Bangalore, and identified 4 species of coccidia responsible for coccidiosis in rabbits and obtained

satisfactory results with the treatment by the combination of sulfadiazine with trimethoprim and emphasized the importance of managemental practices in controlling the coccidiosis.

At Sikkim, Mishra (1993) observed ear mite infestation with Psoroptes cuniculi in laboratory rabbits in 52 out of 57 examined (91.2%) showing clinical manifestations and controlled effectively with topical application of Ascabiol as an emulsion, antibacterial therapy with chloromycetin ear drops and along with hygienic conditions.

At Lucknow, Rajani et al. (1993) reported the occurrence of the louse infestation Gliricola porcelli in guinea pigs and observed the symptoms like general loss of condition with rough hair coat, scratching, dermatitis and alopecia and they achieved very effective erradication and control of the louse by the use of Notix and 5 per cent w/w rubbed thoroughly at weekly intervals after 2 to 3 applications.

Peethe et al. (1994) described Trichinella spirallis infection in guinea pigs and also treated the infected animals with albendazole at the dose rate of 30 mg/kg with satisfactory results.

Peper (1994) found Dermatophagoides farinae mites in faecal floatations and skin scrapings performed on a small laboratory colony of fuzzy rats (A hypotrichotic strain

originating from Wistar Furth Rattus norvegicus) and also discussed differential diagnosis from ectoparasitic mites.

Placid et al. (1994) described the prevalence of gastro-intestinal parasitic infections in laboratory animals viz., rabbits, rats, mice, guinea pigs and hamsters and reported that persistance of Hymenolepis infection and coccidiosis in rats and rabbits at 40 per cent and 45 per cent respectively. They also reported the prevalence of Oblescoides cuniculi, Cittotaenia sphenoides, and ciliates in guinea pigs at the percentage of 5.0, 4.0 and 3.0 respectively. They also reported the Aspicularis tetraptera, Syphacia obvelata in rats at 2.0 and 4.0 per cent respectively and recorded the Hymenolepis nana, H.diminuta, Aspicularis tetraptera and Syphacia species in mice at 16.7, 9.0, 6.0 and 1.6 per cent respectively.

Rajeswari et al. (1994) described the prevalence of Hymenolepis infection in rats and also suggested its treatment with praziquantel at the dose rate of 5 mg/kg as a single dose.

Jamuna et al. (1995) observed the mortality pattern in rabbits in Bangalore and noted that the death rate of 30.78 per cent was due to coccidiosis and also observed that death in young animals due to coccidiosis was 69.44 per cent.

Rajani et al. (1995) studied the occurrence of mite, Myobia musculi in laboratory mice colony and also reported 20 per cent morbidity and mortality rate.

Sandeep et al. (1995) studied the population dynamics of rodent nematodes at Allahabad and reported 5.26 to 44.4 per cent incidence of Trichuris muris infection in rats.

Srivatsava and Rathore (1995) studied the factors affecting the parasitic contamination in feed of laboratory animals and discussed the role during the processing of diet and mentioned the possibility of contamination with rodents and wild birds.

Tiwari and Dey (1995) described clinical mange in rabbits and observed the symptoms like intense pruritis and alopecia and suggested control with ivermectin and delta-methrin at the concentration rate of 200 ug and 0.02 per cent respectively.

Upadhyay et al. (1995) described the pathological lesions like inflammation, haemorrhages, cysts and nodules in laboratory animals suffering from parasitism in the visceral organs and reported that the severity of the lesion was in accordance with the burden and pathogenic status of the parasite, site of predilliction and health status of the host.

MATERIALS AND METHODS

CHAPTER - III

3. MATERIALS AND METHODS

3.1 INCIDENCE

Faecal samples and skin scrapings were collected from rabbits (Oryctolagus cuniculus), albino rats (Rattus norvegicus), mice (Mus musculus) and guinea pigs (Cavia porcellus) maintained as laboratory animals from various educational Institutions in and around Tirupati, Chittoor district. The laboratory animals maintained in different departments of the College of Veterinary Science, Tirupati including the Rabbitry of the Department of Meat Science and Technology, Sri Venkateswara University, Sri Venkateswara Medical College, Tirupati and Sri Padmavathi Mahila University were screened for gastro-intestinal and external parasites. Apart from the educational Institutions, the faecal samples and skin scrapings of rabbits including broiler rabbits were collected from rabbit farm(s) and from ten selected villages around Tirupati.

A total of 527 rabbits, 269 rats, 85 mice and 50 guinea pigs were screened and the faecal samples were thoroughly examined.

3.1.1 Selection of Animals

Rabbits from laboratory animal houses and some villages around Tirupati were screened for the presence of

gastro-intestinal parasitic infections and external parasites. Age, sex and breed of the rabbits were noted. Faecal samples were collected in a clean glass containers which were labelled and brought to the laboratory for processing and examination.

Two hundred and sixty nine (269) rats from various educational institutions in and around Tirupati were screened for the presence of any parasitic infections. Faecal samples were collected in sterile glass containers which were labelled and carried to laboratory for the diagnosis of parasitic infections. Similarly, 285 and 50 faecal samples of mice and guinea pigs respectively were screened for the presence of parasitic infections.

3.1.2 Methods of Examination of Faecal samples for the Parasitic Infections

Gross examination of the faecal material was made to detect any tape worm segments, adult and larval forms of nematode parasites.

The faecal samples collected were examined by direct method followed by the sedimentation technique. The samples were also screened by floatation techniques using standard Sheather's sugar solution and saturated Sodium chloride solution.

Composition of Sheather's sugar solution:

(**Margaret** W. Sloss et al., 1994)

Sucrose	...	454 g
Distilled water	...	355 ml
Formaldehyde	...	6 ml

3.2 EXAMINATION FOR EXTERNAL PARASITES

The rabbits, rats, mice and guinea pigs were thoroughly examined morphologically for the presence of any manifestations of skin diseases. Skin scrapings were collected from the affected part using a scalpe in a clean sterile glass container and brought to laboratory for the examination. The standard procedure of Soulsby (1982) was followed in the processing of skin scrapings. The skin scrapings were taken into test tube to which 10 per cent KOH was added and boiled over a spirit lamp till uniform suspension was achieved. Then, this uniform suspension was transferred to a centrifuge tube, allowed to cool and centrifugation was carried out at the rate of 1500 rpm for 3 minutes. Supernatant fluid was removed and the sediment taken on to a glass slide was examined under the coverslip in a microscope.

The body of the laboratory animals were examined thoroughly for the presence of ectoparasites if any by brushing with a comb to recover lice or other ectoparasites. The ectoparasites collected were preserved in 70 per cent alcohol and brought to laboratory for specific identification.

3.2.1 Identification of parasitic eggs/oocysts/ectoparasites

Identification of coccidial oocysts, cysts and ectoparasites was based on the description of Flynn (1973), Georgi and Georgi (1990), Joan Colville (1991) and Margaret W. Sloss et al. (1994).

3.3 Speciation of coccidia in rabbits

Positive samples of rabbits were labelled and kept in a petridish containing 2.5 per cent potassium dichromate solution for sporulation. The faecal samples were examined at four hourly intervals for the assessment of sporulation. Speciation of coccidia was done based on morphology, sporulation time and micrometry.

3.3.1 TREATMENT TRIALS AGAINST COCCIDIOSIS IN RABBITS

Trials with a herbal (Indigenous) product, Zycox**

A herbal (Indigenous) product, Zycox (M/s INDIAN HERBS, Saharanpur, Uttar Pradesh) which is recommended for use against poultry coccidiosis was tried in rabbit coccidiosis at two different dose levels as detailed below. The details of the protocol is shown in table 9.

** A herbal (indigenous) product of M/s. INDIAN HERBS, Saharanpur, Uttar Pradesh.

Forty rabbits which were naturally infected with coccidial infections (mixed) were grouped as follows for undertaking treatment trials.

Group A : 15 rabbits were treated with Zycox at the dose rate of 0.3 ml per animal for 7 days.

Group B : 15 rabbits were treated with Zycox at the dose rate of 0.45 ml per animal for 5 days.

Group C : 10 rabbits were kept as infected untreated controls.

Group D : 5 rabbits which were not infected were kept as uninfected untreated (healthy) controls.

Coccidial oocysts per gram of faeces was estimated by the McMasters technique before treatment with Zycox and also continuously for seven days during, after treatment. Body weights of all the individual rabbits were also recorded before, during and after treatment.

The efficacy of Zycox against coccidiosis in rabbits was determined based on the reduction in the number of oocysts and improvement in body weight during and after treatment.

3.3.1.1 TREATMENT TRIALS WITH SUPERCOX* AGAINST COCCIDIOSIS IN RABBITS

In the second experimental study an allopathic drug (Supercox-Wockhardt, Bombay) used in poultry coccidiosis was tried in rabbit coccidiosis.

Twenty rabbits naturally infected with coccidiosis were selected and divided into two groups, each consisting of 10 rabbits. The rabbits were housed in individual cages and were provided with pelleted commercial rabbit feed ad libitum.

The ten rabbits of group 'A' were given Supercox powder by dissolving in water at the dose rate of 1 g in 1 litre of water continuously for three days. Then Supercox dissolved water was again provided to rabbits at the same dose after a gap of two days for another three days.

Ten rabbits in group 'B' were not treated with Supercox and were kept as infected control group and five rabbits in group 'C' were kept as healthy non-infected control.

Oocyst counts were made before starting the treatment with Supercox, during and after treatment with Supercox to evaluate the efficacy of the drug. The body weights were also taken before, during and after treatment.

* A product of Wockhardt, Bombay, containing Sulfaquinoxalene and Diaverdine at the level of 18.7% and 3.3% respectively.

3.4 TREATMENT TRIALS AGAINST MANGE IN RABBITS

3.4.1 Treatment of Mange in Rabbits with 'Butox'

Twelve rabbits with mixed infestation of Notoedres cuniculi and Psoroptes cuniculi mites were included in trial with Butox*.

A pyrethroid compound containing deltamethrin (Butox) was tried against body mange in rabbits. Butox was diluted at the rate of 4 ml in 1 litre of water and applied as a spray. Ten rabbits were treated with Butox and two rabbits were kept as un-treated control. Skin scrapings were examined before treatment and every day after treatment and thereafter weekly once for three consecutive weeks. The efficacy of the Butox was based on the clinical improvement and disappearance of mange mites from the affected areas. When live mites were noticed in sprayed rabbits after the first application, the animals were sprayed again after one week and one more spraying was done after the second week if live mites were noticed in the skin scrapings. The treated rabbits were observed one month after completion of treatment with Butox for recurrence of infestation.

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* A product of Hoechst India Ltd., Bombay, containing 12.5 mg deltamethrin per ml.

3.4.2 Treatment of Mange in Rabbits with Dermux*

Dermux, a herbal (indigenous) product, each 10 g containing:

Yellow opriment	...	0.025 g
Semi carpus Anacardium	...	0.100 g
Sesame oil	...	2.500 g
Pungam oil	...	3.500 g
Neem oil	...	2.500 g
Base	...	1.375 g

was also evaluated against mange in rabbits. Five rabbits infested with Notoedres cuniculi and Psoroptes cuniculi mites were treated by applying the ointment Dermux to the areas once a day for seven days where lesions of mange were noticed and remaining two rabbits were kept as infested non-treated controls.

Skin scrapings were examined before and after treatment with Dermux. The efficacy of the Dermux was based on clinical improvement and disappearance of mange mites from the affected area.

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* A product of M/s Agasthiar Pharmaceuticals, Salem.

The per cent efficacy of drug was calculated by using the formula:

$$\text{Per cent efficacy} = \frac{\text{No. of mites pre-treatment} - \text{No. of mites post-treatment}}{\text{No. of mites pre-treatment}} \times 100$$

RESULTS

CHAPTER - IV

4. RESULTS

The present investigation on the prevalence of external parasites and gastro-intestinal parasitic infections of laboratory animals revealed the prevalence of 4 ectoparasites and 9 gastro intestinal parasitic infections in rabbits including coccidial infection, 3 ectoparasites and 5 gastrointestinal parasitic infections in rats, 2 ectoparasites and 4 gastrointestinal parasitic infections in mice and 1 ectoparasite and 1 gastro intestinal parasitic infection in guinea pigs. The details of percentage infection/infestation at different places are presented in tables 2, 6, 7 and 8. The overall incidence of ecto and gastro-intestinal parasitic infections in four laboratory animals were shown in table 1 and Fig.1.

The tick, Rhipicephalus sanguineus, the mites Notoedres cuniculi and Psoroptes cunuculi and the flea Ctenocephalides felis were the ectoparasites encountered in rabbits. Cittotaenia ctenoides and Obliscoides cuniculi and species of Eimeria oocysts were the gastro-intestinal infections recorded in rabbits.

In rats, the mites Notoedres muris and Ornithonyssus bacoti were found and the louse Polyplax spinulosa was also observed. The gastro-intestinal parasitic infections in rats included Hymenolepis nana, H.diminuta, Syphacia muris, Aspicularis tetraptera and Giardia muris.

In mice the ectoparasites recorded were Ornithonyssus bacoti and Polyplax serrata Hymenolepis diminuta, H.nana, Syphacia obvelata and Giardia muris were the gastro-intestinal parasitic infections observed.

Guinea pigs were found infested with lice, Gyropus ovalis and infected with the ciliate, Balantidium caviae.

4.1 INCIDENCE OF ENDO PARASITES IN RABBITS

4.1.1 INCIDENCE OF TREMATODE INFECTIONS IN RABBITS

No trematode infections were recorded in rabbits in and around Tirupati.

4.1.2 INCIDENCE OF CESTODE INFECTIONS IN RABBITS

In the present investigation, the cestode encountered in rabbits was Cittotaenia ctenoides. The cestode infection was recorded in nine rabbits out of 527 screened with 1.70 per cent. The highest incidence was recorded at Rabbit farm, Kalur 16.6 per cent followed by Bhakarapet, Srikalahasti and S.V.University with 11.12 per cent and the lowest recorded was 1.92 per cent at S.V.Medical College. In other places it varied from 0 to 1.96 per cent (Table 2).

4.1.3 INCIDENCE OF NEMATODE INFECTIONS IN RABBITS

The nematode infection observed in rabbits was Obeliscoides cuniculi. This nematode infection was observed in four rabbits out of 527 examined with 0.75 per cent. The highest incidence was recorded at S.V.University (5.8%) and the lowest incidence was at S.V.Medical College (1.92%). In other places it varied from 0 to 1.96 per cent (Table 2)

4.1.4 INCIDENCE OF INTESTINAL PROTOZOA INFECTIONS (COCCIDIAL OOCYSTS) IN RABBITS

A total of 169 rabbits were found to be positive for intestinal protozoa out of 527 examined with 32.06 per cent. The coccidial oocysts identified in the present study were

Eimeria magna

E.media

E.piriformis

E.perforans

E.elongata

E.steidae

E.irresidua and

E.coecicola

The highest incidence was recorded at Chandragiri with 55,56 per cent and the lowest at Srikalahasti with 12.50 per cent. In other places it varied from 20.00 to 40.90 per cent.

Of the total 527 faecal samples screened from different places, mixed infections with Eimeria sp. was found to be more common. In mixed infections, the combination of Eimeria magna, E.media and E.elongata was predominant.

Usually two to four species occurred as mixed infections viz., E.magna and E.media. E.magna and E.elongata were most common mixed infection followed by E.magna, E.perforans and E.irresidua or E.coecicola and E.magna. E.media, E.coecicola and E.steidae or E.perforans.

Only one case of hepatic coccidiosis was observed out of 19 post-mortem cases conducted with an incidence of 5.26 per cent in the Veterinary College rabbitry.

SEX WISE INCIDENCE OF COCCIDIOSIS IN RABBITS

The total number of male and female rabbits screened in the present study were 276 and 251 respectively. Of the total 276 male rabbits screened, 98 were found to be positive for coccidiosis constituting 35.50 per cent infections. Out of 251 female rabbits screened, 153 were found infected with coccidiosis constituting 60.95 per cent (Fig. 2 and Table 4).

AGE WISE INCIDENCE OF COCCIDIOSIS IN RABBITS

The rabbits below 12 weeks of age examined were 198 and 82 of them were found to be positive for coccidiosis (41.41%). The rabbits of age group between 12 and 24 weeks screened were 253 and coccidiosis was prevalent in 142 animals (56.12%) and out of 76 rabbits of age group above 24 weeks examined coccidiosis was found in 27 rabbits (35.52%) (Table 3 and Fig.4).

BREED WISE INCIDENCE OF COCCIDIOSIS IN RABBITS

The rabbits of Newzealand white, Soviet Chinchilla, Grey giant and albino breeds screened were 296, 128, 49 and 54 respectively in different places in and around Tirupati. The percentage prevalence of coccidial infections in different breeds of rabbits were 55.40, 39.06, 40.81 and 31.48 per cent respectively in Newzealand White, Soviet Chinchilla, Grey Giant and Albino breeds of rabbits (Table 5 and Fig.3).

4.2 INCIDENCE OF ENDO PARASITES IN RATS

4.2.1 INCIDENCE OF TREMATODE INFECTIONS IN RATS

No trematode infections were recorded in rats in and around Tirupati.

4.2.2 INCIDENCE OF CESTODE INFECTIONS IN RATS

In the present investigation Hymenolepis nana and H.diminuta were commonly encountered. Out of 269 rats examined, 120 rats were found to be infected (44.40%). Hymenolepis nana as single infection was observed in 85 rats (70.83%); similarly, H.diminuta as a single infection was observed in 21 rats (17.5%) and a mixed infection of H.nana and H.diminuta was observed in 14 rats (11.67%). The highest incidence was recorded at S.V.University/with 50.0 per cent followed by S.P.Mahila University College with 46.87 per cent and the lowest incidence recorded was 26.08 per cent at the Veterinary College (Table 6). /zoology

4.2.3 INCIDENCE OF NEMATODE INFECTIONS IN RATS

Out of 269 rats screened, the namatode infections were recorded in 14 rats with 5.20 per cent. The infections encountered in this present investigation were Syphacia muris and Aspicularis tetraptera. S.muris was recorded in nine rats with 3.34 per cent. Similarly, A.tetraptera was recorded in five cases with 1.85 per cent. The highest incidence of nematode infections were recorded at Veterinary College (13.04%) followed by S.V.University/(11.12%) and the lowest incidence recorded was at S.P.Mahila University College (1.56%) (Table 6). /Home Science

4.2.4 INCIDENCE OF INTESTINAL PROTOZOAN INFECTIONS IN RATS

Of the total 269 rats examined, nine rats were positive for intestinal protozoan infections with 3.34 per cent. The intestinal protozoa encountered in the present investigation was Giardia muris. The highest incidence was recorded at S.P.Mahila University College with 6.25 per cent followed by 4.34 per cent at Veterinary College and the lowest incidence recorded was at S.V. University zoology with 1.81 per cent (Table 6).

4.3 INCIDENCE OF ENDO PARASITES IN MICE

4.3.1 INCIDENCE OF CESTODE INFECTIONS IN MICE

In this present investigation, the cestode infections were found in 34 mice out of 85 screened in and aroung Tirupati with 40.0 per cent. The cestodes encountered in this present study were Hymenolepis diminuta and Hymenolepis nana. Among these cestodes H.diminuta was predominant in 18 mice with 52.94 per cent as a single infection. Similarly, single infection with H.nana was observed in nine mice with the incidence of 26.47 per cent and mixed infection with H.diminuta and H.nana was recorded in seven mice with 20.58 per cent of incidence. The highest incidence of cestode infections were recorded as S.V.University/ with 41.17 per cent followed by 40.74 per cent at Veterinary College (Table 7). /zoology

4.3.2 INCIDENCE OF NEMATODE INFECTIONS IN MICE

Out of 85 mice screened, the nematode infections were encountered in five mice with 5.88 per cent. The only nematode observed in this present investigation was Syphacia obvelata. The lowest incidence was recorded at S.V.University/with 4.16 per cent and the highestincidence at Veterinary College with 14.81per cent (Table 7).
/(Home Science)

4.3.3 INCIDENCE OF TREMATODE INFECTIONS IN MICE

No trematode infections were observed in mice during the present study in and around Tirupati.

4.3.4 INCIDENCE OF INTESTINAL PROTOZOAN INFECTIONS IN MICE

Out of 85 mice screened, the intestinal protozoan parasitic infections encountered in this present study was Giardia muris in 5 mice which constituted 4.70 per cent. The highest incidence was recorded at S.V.University/with 8.34 per cent and the lowest recorded was 7.40 per cent at Veterinary College. /(Home Science)

4.4 INCIDENCE OF ENDO PARASITES IN GUINEA PIGS

4.4.1 INCIDENCE OF HELMINTHIC INFECTIONS IN GUINEA PIGS

No helminthic infections were recorded in guinea pigs screened in and around Tirupati.

4.4.2 INCIDENCE OF CILIATES INFECTIONS IN GUINEA PIGS

Of the total 50 guinea pigs screened, the intestinal protozoan infection was recorded in four guinea pigs with 8.0 per cent. The intestinal protozoa encountered in this present study was Balantidium caviae. The highest incidence recorded was 11.12 per cent at S.V.Medical College and lowest (5.0%) at S.V. University (Table 8).

4.5 INCIDENCE OF ECTOPARASITES

4.5.1 INCIDENCE OF ECTOPARASITES IN RABBITS

Of the total 527 rabbits examined, 52 rabbits were found to be positive for ectoparasitic infestations in and around Tirupati.

Flea infestation was recorded in three rabbits out of 527 examined with 0.56 per cent. The flea encountered in this present investigation was Ctenocephalides felis. The highest incidence was recorded at rabbit farm, Tirupati with 4.54 per cent and the lowest incidence at Veterinary College with 0.53 per cent (Table 2).

Tick infestation was found in seven (7) rabbits out of 527 examined with 1.32 per cent. The tick encountered in this present investigation was Rhipicephalus sanguineus. The highest incidence recorded was at Bhakarapet with 6.25 per cent followed by 5.88 per cent at S.V.University. The lowest incidence was recorded at S.V.Medical College with 0.96 per cent (Table 2).

The incidence of mite infestation was recorded in 42 rabbits with 7.96 per cent out of 527 examined in and around Tirupati. The mites encountered in the present study were Psoroptes cuniculi and Notoedres cuniculi. The mite N.cuniculi was found more frequently than the other one. The highest incidence of mite infestation was recorded at S.V.University (Home Science) with 16.67 per cent and in other places it varied from 2.38 to 13.63 per cent (Table 2).

4.5.2 INCIDENCE OF ECTOPARASITIES IN RATS

Of the total 269 rats examined the ectoparasitic infestation was recorded in 11 rats with 4.08 per cent.

The louse infestation was recorded in two rats out of 269 with 0.74 per cent. The louse encountered in the present study was Polyplax spinulosa. The highest incidence was recorded at Vetrinary College with 4.34 per cent and the lowest incidence recorded was 1.56 per cent at S.P. Mahila University.

In the present investigation, no flea and tick infestations were encountered in rats in and around Tirupati.

The mite infestation was recorded in nine rats with 3.34 per cent out of 269 examined. The mites encountered in this present study was Notoedres muris and Ornithonyssus

bacoti. O.bacoti infestation was recorded in five and N.muris infestation was recorded in four rats out of 269 examined with 1.85 and 1.48 per cent respectively. The highest incidence was recorded at Veterinary College with 8.69 per cent followed by 1.38 per cent at S.V.University (Home Science).

4.5.3 INCIDENCE OF ECTOPARASITES IN MICE

Out of 85 mice examined four mice were found to be positive for ectoparasitic infestation (4.70%). The ectoparasite encountered in this present study was a species of louse and a mite.

The louse infestation was observed in one mouse out of 85 examined with 1.17 per cent. The louse encountered in the present study was Polyplax serrata. The incidence of of louse infestation was observed at S.V.University.

The mite infestation was observed in three mice out of 85 examined with 3.5 per cent. The mite encountered in this present study was Ornithonyssus bacoti. The highest incidence was 7.4 per cent at Veterinary College followed by 2.94 per cent at S.V.University (Zoology).(Table 7).

4.5.4 INCIDENCE OF ECTOPARASITES IN GUINEA PIGS

Of the total 50 guinea pigs examined, the ectoparasitic infestation was recorded in one guinea pig with 2.0 per cent. The ectoparasite encountered in the present study was the louse viz., Gyropus ovalis at S.V.Medical College (Table 8).

4.6 BRIEF DESCRIPTION OF THE PARASITIC OVA/CYSTS/ OOCYSTS AND EXTERNAL PARASITES RECORDED INCLUDING THE COCCIDIA OF RABBITS

Eimeria magna

Oocyst was ovoidal or ellipsoidal and measured about 27-41 μ/17-19 μ with an average of 34 μ/23 μ. Has a large micropyle but no polar granule and an oocyst residuum. Sporocysts were ovoid and has a steidae body and a sporocyst residuum was noticed. Sporulation time was 48 to 70 hours (Fig. 5a to 5b).

E.elongata

Oocyst was elongate and ellipsoidal with almost straight edges and measures about 35-40 μ/17-20 μ with an average of 37.5 μ/18.5 μ. It has a thin wall and broad micropyle but polar granule and residuum were absent. Sporocysts are elongate and have a residuum (Fig.6).

E.media

Oocyst was ovoid, smooth and measured about 19-33 μ/ 13-21 μ with an average of 26 μ/17 u. Has a micropyle and residuum but no polar granule. Sporocysts are ovoid and contain a steidae body and a residuum. Sporulation time was 40-70 hours (Fig. 7).

E.perforans

Oocyst was ovoid, smooth and colourless to pink and measured about 24-30 μ/14-20 μ with an average of 27 μ/ 17 μ. Had oocyst residuum but no micropyle. Sporocysts are ovoid and contain a steidae body and a residuum. Sporulation time was 40 to 70 hours (Fig. 8).

E.piriformis

Oocyst was pyriform to oval in shape, smooth and measured about 25-31 μ/17-20 μ with an average of 36.0 μ/ 18.5 μ and has a micropyle but without polar granule or residuum. Sporulation time was 48 hours (Fig. 10).

E.irresidua

Oocysts were ovoid and measured about 30.5-38.0 μ/ 21.0-26.5 μ with an average of 34.2 μ/27.7 μ. Has a micropyle sporocyst residuum present. On an average, the sporulation time was 48 to 51 hours (Fig. 12).

E.steidae:

Oocyst was ovoid or ellipsoidal and measures about 28-60 µ/16-25 µ with an average of 44.0 µ/20.5 µ. The micropylar end is flat and has micropyle but without polar granule and residuum. Sporocyst is ovoid and have a prominent steidae body and sporocyst residuum. Sporulation time was 50 to 72 hours (Fig. 9).

E.coecicola:

Oocyst was ovoid, smooth and measures about 25-40 µ/15-21 µ with an average of 32.5 µ/18.0 µ. Has a micropyle and residuum. The oocyst wall is thickened slightly at the micropyle region. Sporulation time was 50 to 72 hours (Fig. 11).

Hymenolepis nana

The egg was oval and measures about 42-61 µ/30-52 µ with an average of 51.5 µ/41.0 µ. The embryo measures about 20-29 µ/15-22 µ with an average of 24.5 u/18.5 µ and possesses three pairs of small hooks (Fig 13).

H.diminuta

The egg was almost spherical, measures about 60-80 µ/49.81 µ with an average of 73 µ/65 u and contains embryo which measures 24-30 µ/16-24 µ with an average of 27 u/20 µ and the embyro possesses three pairs of small hooks (Fig.14).

Cittotaenia ctenoides

Egg was roughly triangular and possess a pyriform apparatus and measured 61 μ in diameter.

Syphacia muris

The egg was slightly flattened to one side and measures about 70-81 μ/22-36 μ with an average of 75.5 μ/29.0 μ.

S.obvelata

The egg was flat on one side and measures about 110-152 μ/30-54 μ with an average of 131 u/37.5 μ.

Aspicularis tetraptera

The egg was symmetrically ellipsoidal and has a thin wall and measures about 89-93 μ/36-40 μ.

Obeliscoides cuniculi

Eggs were elliptical in shape and measured about 74-82 μ/42-43 μ with an average of 78.0 μ/42.5 μ (Fig.15).

Giardia muris (Cyst)

Cyst was ovoid rounded and measures about 8-11 μ/7-9 u and contain nuclei.

Balantidium caviae

Cysts were slightly ovoid or spherical and measured about 40-50 μ in diameter with an average of 45 μ.

Psoroptes cuniculi

Female: Relatively large, long rounded and a translucent brownish white. The idiosoma was striated and has a small rectangular antero dorsal shield, pair of long lateral setae and the genital opening was a slit resembling an inverted U, located between the second pair of legs. The anus was simple terminal slit (Fig. 16).

Male: Long and the idiosoma was bilobed posteriorly. A small antero dorsal plate similar to that of female is present. The heavily sclorotized genitalia are located ventrally between the apodemes of the fourth pair of legs. The anus was a ventroterminal slit which has a large copulatory sucker on either side (Fig. 17).

Notoedres cuniculi

Female: The mite measured about 275 μ/230 μ. It has a scale like, mid dorsal integumental striations, single pair of paragenital setae and large perional setae, oval position was dorsal and absence of heavy dorsal spines and triangular scales.

Male: It was relatively smaller in size, presence of scalerotized bell-shaped genital opening between the fourth pair of legs (Fig. 18).

Ornithonyssus bacoti

Body plates were well developed and include an elongate, narrow dorsal shield which does not cover the entire dorsum. A rectangular sternal plate with setae. The chelicerae were well developed and chelate. A hole ventral plate covers the inter coxal area which is usually fused with the oval shield. (Fig. 19).

Ctenocephalides felis

Dark brown in colour and possess genal and pronatal combs. It has an elongated head and are wingless with laterally compressed body. Chitinous covering was thick and dark brown. Segmented abdomen and short and clubbed antennae (Fig. 20).

Gyropus ovalis

This louse was oval, 1.2 mm long, the head is wider than long and the antennae are club shaped. Each leg has tarsal clow. Abdomen was broad at the middle and has short fine hairs.

Rhipicephalus sanguineus (Male)

Male was 2.2-3.2 mm in length with an average of 2.7 mm. It has an inornate, eyes and festoons present. Hypostome and palpi short. Inner margin of adanal shield is straight. Usually with adanal and also two accessory adanal shields. 1st Coxae with two strong spurs. Basis capituli was hexagonal dorsally (Fig. 21).

4.7 DRUG TRIALS AGAINST COCCIDIOSIS IN RABBITS

4.7.1 DRUG TRIALS WITH 'ZYCOX' AGAINST COCCIDIOSIS IN RABBITS

The results of the drug trials with Zycox at different dose levels of 0.3 ml and 0.45 ml was tabulated in table 9.

TRIAL WITH 0.3 ml:

It was observed from the present study that the pretreatment average oocyst per gram of faeces with Zycox at the dose rate of 0.3 ml orally was 53,600 in group A infected rabbits had come down to 1,000 oocysts per gram of faeces by the 7th post-treatment day and it was observed that the oocyst count reduced drastically from 3rd day of post treatment onwards. Further, the symptoms of diarrhoea had ceased and there was an increase in body weight in the treated rabbits compared to the infected untreated rabbits.

The average body weight before treatment was 843.0 g in group A rabbits and it increased to 854.6 g after treatment with Zycox at the dose rate of 0.3 ml orally.

In the infected untreated rabbits (group C),the average oocyst per gram of faeces and body weight was 62,800 and 924.4 g respectively before treatment and it was observed that the oocyst per gram of faeces and body weights were 68,200 and 933.6 g respectively at the end of the treatment trials.

In the healthy control group rabbits (Group D),the body weight before treatment was 914.9 g which had increased to 985.3 g on the 7th day post treatment.

TRIAL WITH 0.45 ml:

The results of the treatment trials with Zycox at the dose rate of 0.45 ml was tabulated in table 9.

It was observed from the present study (table 9) that the average oocyst per gram of faeces in the infected rabbits (group B) before treatment was 66,400 which was decreased to 900 oocysts per gram of faeces by the 5th day post treatment with Zycox at the dose rate of 0.45 ml orally. It was also observed that the average body weight was increased from an average of 935.1 g to 957.2 g on 5th day post-treatment.

In the healthy control stock (Group D), the average body weight was increased to 985.3 g from 914.9 g at the end of trials. It was noticed that the recovery rate was quicker (5 days) at higher dosage of 0.45 ml of Zycox compared to the rabbits treated at 0.3 ml dose rate (7 days)

4.7.2 DRUG TRIALS WITH 'SUPERCOX' AGAINST COCCIDIOSIS IN RABBITS

The results of the drug trials with 'Supercox' was tabulated in table 10. It was observed that the average oocyst count was 80,800 before treatment which was reduced to 10,300 oocysts per gram of faeces on 7th day post treatment. It was observed that the reduction of oocysts per gram of faeces occurred gradually from 3rd day post treatment onwards effectively. It was further noted that the average body weight of 823.8 g before treatment was increased to 849.9 g at the end of treatment trials.

In the infected untreated control group, the average oocyst per gram of faeces was 80,800 and which was 84,100 oocysts per gram of faeces after 7 days and the average body weight was increased to 835.2 g from 827.7 g at the end of trial.

In healthy control group of rabbits the average body weight was increased from 857.2 g to 959.1 g at the end of trial.

4.8 TREATMENT OF MANGE IN RABBITS

4.8.1 TREATMENT OF MANGE IN RABBITS WITH 'BUTOX'

The results of the treatment trials with Butox against body mange in rabbits is shown in table 11.

The rabbits in the study were infested with the Psoroptes cuniculi and Notoedres cuniculi mites. It was observed that N.cuniculi was found to be predominant than the other mite. A significant improvement was observed in those rabbits treated with Butox after three external applications and it was noted that the per cent of efficacy of Butox was 95.29 against body mange in rabbits. In the infested untreated control group of rabbits, the number of mites did not decrease.

4.8.2 TREATMENT OF MANGE IN RABBITS WITH 'DERMUX'

The results of the treatment trials with Dermux against mange in rabbits is shown in table 12.

Rabbits infested with mange mites were applied with Dermux externally on the affected areas once a day for 7 days. A clinical improvement and the disappearance of mites from the infested area in the treated rabbits was observed. In the infested but untreated control group of rabbits, the mange mites and lesions of mange did not undergo any change and were observed continuously. It was observed that Dermux showed 83.34 per cent efficacy against mange in rabbits.

Table 1: Overall incidence of ecto and Gastro-intestinal parasitic infections in laboratory animals in and around Tirupati, Andhra Pradesh.

Sl. No.	Species of laboratory animal	Number of animals examined	Number of animals positive for ecto and G.I. parasitic infections	Percentage (%)
1.	Rabbits	527	230	43.64
2.	Rats	269	164	60.96
3.	Mice	85	47	55.23
4.	Guinea pigs	50	6	12.00

Table 2: The incidence of Gastro-intestinal parasitic infections and ectoparasites in rabbits.

Sl. No.	Place	No. of rabbits examined	No. of rabbits positive	No.of rabbits positive for G.I.parasitic infections					No.of rabbits positive for ecto-parasitic infestation				
				Trematode	Cestode	Nematode	Intestinal protozoa (coccidia)	Ciliates	Insects			Arachnids	
									Flies	Louse	Fleas	Ticks	Mite
			(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1. Tirupati													
a)	S.V.Medical College	104	54 (51.92)	-	1 (1.92)	1 (1.92)	40 (38.46)	-	-	-	1 (0.96)	1 (0.96)	10 (9.65)
b)	Veterinary College	187	85 (45.45)	-	2 (1.96)	2 (1.96)	68 (36.37)	-	-	-	1 (0.53)	-	12 (6.41)
c)	S.V.University Home Science	18	9 (50.00)	-	1 (11.12)	-	4 (22.23)	-	-	-	-	1 (5.56)	3 (16.67
d)	S.V.University Virology	17	8 (47.05)	-	-	1 (5.88)	4 (23.52)	-	-	-	-	1 (5.88)	2 (11.76
e)	S.V.Zoological park	42	17 (40.47)	-	2 (4.76)	-	14 (33.34)	-	-	-	-	-	1 (2.38)
f)	Rabbit Farm	22	14 (63.63)	-	-	-	9 (40.90)	-	-	-	1 (4.54)	1 (4.54)	3 (13.63
2. Perumallapalle		8	3 (37.50)	-	-	-	2 (25.00)	-	-	-	-	-	1 (12.57

Contd....

Table 2: (Contd.....)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3.	Tiruchanur	4	1 (25.0)	-	-	-	1 (25.0)	-	-	-	-	-	-
4.	Pudipatla	7	2 (28.57)	-	-	-	2 (28.57)	-	-	-	-	-	-
5.	Rabit farm, Kalur	20	7 (35.00)	-	1 (16.60)	-	4 (20.00)	-	-	-	-	-	2 (10.00
6.	Chandragiri	9	5 (55.56)	-	-	-	5 (55.56)	-	-	-	-	-	-
7.	Srikalahasti	24	9 (37.50)	-	1 (11.12)	-	3 (12.50)	-	-	-	-	1 (4.16)	4 (16.67
8.	Mamandur	18	6 (33.34)	-	-	-	4 (22.23)	-	-	-	-	1 (5.56)	1 (5.56)
9.	Bhakarapet	16	8 (50.05)	-	1 (11.12)	-	4 (25.00)	-	-	-	-	1 (6.25)	2 (12.5)
10.	Mangalam	10	4 (40.00)	-	-	-	3 (30.00)	-	-	-	-	-	1 (10.0)
11.	M.R.Palli	7	2 (28.57)	-	-	-	2 (28.57)	-	-	-	-	-	-
	TOTAL	527	234 (44.40)	-	9 (1.70)	4 (0.75)	169 (32.06)	-	-	-	3 (0.56)	7 (1.32)	42 (7.96)

Table 3: Age wise incidence of coccidiosis in rabbits.

Age	No. of rabbits examined	No. of rabbits positive	Percentage
<12 weeks	198	82	41.41
Between 12 - 24 weeks	253	142	56.12
>24 weeks	76	27	35.52
TOTAL:	527	251	47.62

Table 4: Sex wise incidence of coccidiosis in rabbits.

Sex	No. of rabbits examined	No. of rabbits positive	Percentage
Males	276	98	35.50
Females	251	153	60.95
TOTAL:	527	251	47.62

Table 5: Breed wise incidence of coccidiosis in rabbits.

Sl. No.	Breed	No. of rabbits examined	No. of rabbits positive	Percentage
1.	Newzealand White	296	164	55.40
2.	Soviet Chinchilla	128	50	39.06
3.	Grey giant	49	20	40.81
4.	Albino	54	17	31.48
	TOTAL:	527	251	47.62

Table 6: The incidence of Gastro-intestinal and ectoparasitic infections in rats.

Sl. No.	Place	No.of rats examined	No.of rats positive (%)	No.of rats positive for G.I. parasitic infections(%)			No.of rats positive for ecto-parasitic infestations	
				Cestodes	Nematodes	Intestinal protozoa	Insects	Arachrids
							Louse	Mites
1.	Veterinary College	23	13 (56.52)	6 (26.08)	3 (13.04)	1 (4.34)	1 (4.34)	2 (8.69)
2.	S.V.University Home Science	72	40 (55.56)	29 (40.27)	8 (11.12)	2 (2.78)	-	1 (1.38)
3.	S.V.University Zoology	110	63 (57.27)	55 (50.00)	2 (1.81)	2 (1.81)	-	4 (3.60)
4.	S.P.Mahila University College	64	38 (59.37)	30 (46.87)	1 (1.56)	4 (6.25)	1 (1.56)	2 (3.12)
	TOTAL :	269	154 (57.24)	120 (44.6)	14 (5.20)	9 (3.34)	2 (0.74)	9 (3.34)

Table 7: The incidence of gastro-intestinal and ectoparasitic infections in mice.

Sl. No.	Place	No.of mice examined	No.of mice positive (%)	Positive for G.I. parasitic infections (%)			Positive for ectoparasitic infestations (%)	
				Cestode	Nematode	Intestinal protozoa	Insects	Arachrids
							Louse	Mites
1.	Veterinary College	27	18 (66.67)	11 (40.74)	4 (14.81)	2 (7.40)	-	2 (7.40)
2.	S.V.University Home Science	24	13 (54.16)	9 (37.50)	1 (4.16)	2 (8.34)	1 (4.16)	-
3.	S.V.University Zoology	34	15 (44.17)	14 (41.17)	-	-	-	1 (2.94)
	TOTAL :	85	46 (54.11)	34 (40.00)	5 (5.88)	4 (4.70)	1 (1.17)	3 (3.52)

Table 8: The incidence of gastro-intestinal and ectoparasitic infections in guinea pigs.

Sl. No.	Place	No.of guinea pigs exam-inéd	No.of posi-tive cases (%)	Positive for G.I. parasitic infections (%)	Positive for ectoparasitic infestations (%)
				Ciliate	Insects
					Louse
1.	S.V.University Home Science	20	1 (5.00)	1 (5.00)	-
2.	S.V.University Zoology	12	1 (8.34)	1 (8.34)	-
3.	S.V.Medical College	18	3 (16.67)	2 (11.12)	1 (5.56)
	TOTAL :	50	5 (10.00)	4 (8.00)	1 (2.00)

Table 9: Efficacy of 'ZYCOX' in the treatment of coccidiosis in rabbits.

Group	No.of rabbits	Oocysts per gram of faeces									Body weight (g)						
		Pre-treatment (days)		Post-treatment (days)							Pre-treatment(days)		Post-treatment (days)				
		1	2	1	2	3	4	5	6	7	1	2	1	2	3	4	5	6
A	15	54000 (Ave:53600)	53200	48400	33000	15800	14200	2000	1200	1000	847.0 (Ave: 843.0)	839.0	842.8	844.0	845.4	848.5	849.6	852.4
B	15	68400 (Ave:66400)	64400	44000	43400	15300	7500	900	-	-	934.0 (Ave:935.1)	936.2	936.3	937.2	940.0	945.6	957.2	-
C	10	62300 (Ave:62800)	63300	63400	65100	65400	66100	66700	68000	68200	927.5 (Ave:928.4)	929.3	928.4	929.5	930.2	933.1	931.7	932.4
D	5	-	-	-	-	-	-	-	-	-	914.2 (Ave:914.9)	915.0	916.3	928.8	939.2	947.8	959.3	974.4

A = Infected treated with 0.3 ml dose.

B = Infected treated with 0.45 ml dose.

C = Infected untreated controls.

D = Uninfected untreated healthy control.

Table 1: Efficacy of 'SUPERCOX' against coccidiosis in rabbits

Group	No. of rabbits	Oocysts per gram of faeces: Pre-treatment (days) 1	2	Post-treatment (days) 1	2	3	4	5	6	7	Body weight (g): Pre-treatment (days) 1	2	Post-treatment (days) 1	2	3	4	5	6
A	10	30400 (Ave: 30800)	81200	76300	67000	38400	29300	22500	15700	10300	324.0 (Ave:323.8g)	323.6	329.2	330.6	331.4	333.8	337.4	341.6
B	10	81300 (Ave: 80800)	80300	81000	81400	82100	82700	83100	83800	84100	328.2 (Ave:327.7g)	327.3	328.4	329.3	331.2	332.3	333.1	334.6
C	5	-	-	-	-	-	-	-	-	-	356.8 (Ave:357.2g)	357.6	367.3	376.0	887.3	898.4	923.6	947.2

A = Infected treated with 'Supercox'.

B = Infected but not treated controls.

C = Uninfected non-treated healthy controls.

Table 11: Efficacy of 'Butox' against mange in rabbits.

Animal species	Infested with	No.of animals	Dilution of Butox	Total No.of applications at weekly intervals	Percent efficacy
Rabbits Group-I	Psoroptes cuniculi Notoedres cuniculi	10	4 ml in 1 L of water	3	95.29
Rabbits Group-II Infested but not treated control.	Psoroptes cuniculi Notoedres cuniculi	2	-	-	-

Table 12: Efficacy of 'Dermux' against mange in rabbits.

Animal species	Infested with	No. of animals	No. of applications	No.of days applied	Percent efficacy
Rabbits Group-I	Psoroptes cuniculi Notoedres cuniculi	5	Once a day	7	83.34
Rabbits Group-II infested but not treated control.	Psoroptes cuniculi Notoedres cuniculi	2	-	-	-

ɜ 1: The overall incidence of ecto and gastro-intestinal Parasitic fections in four laboratory animals in and around Tirupati (A.P)

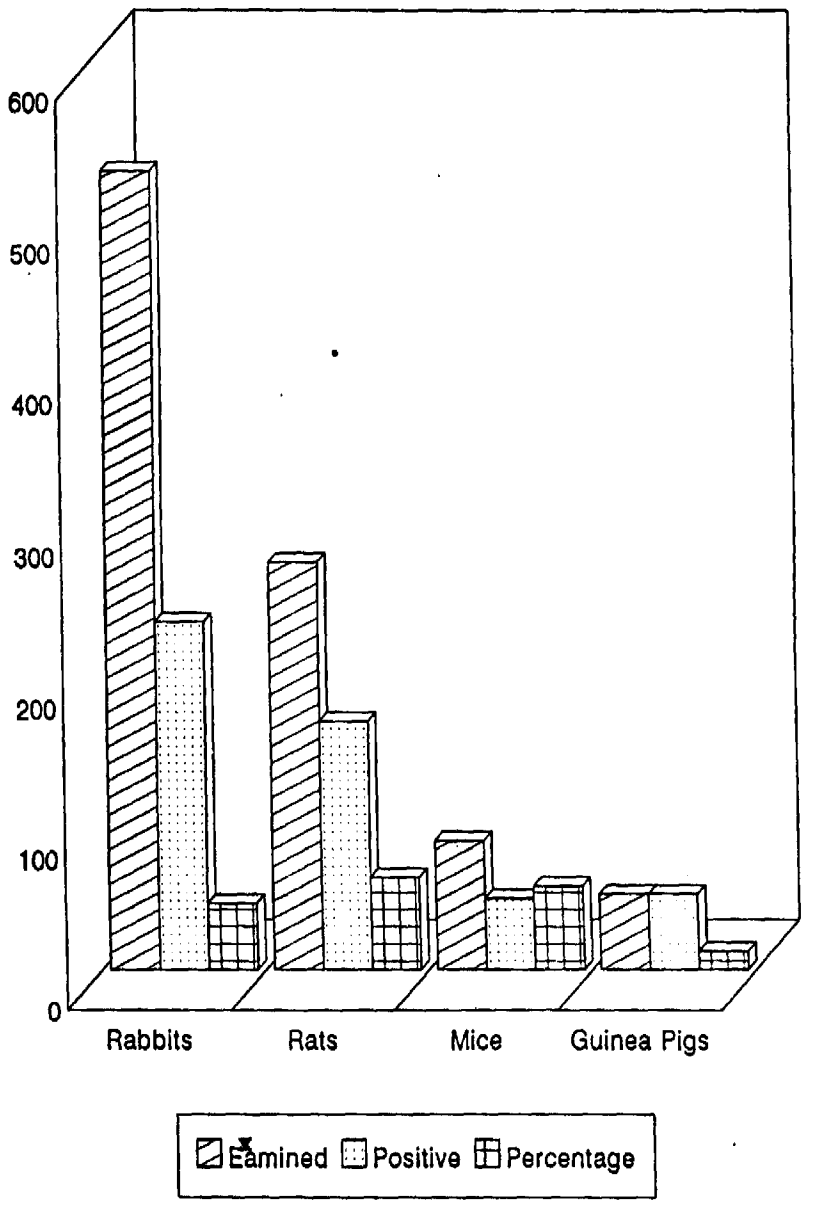


FIG 2: Sex wise incidence of Coccidiosis in rabbits in and around Tirupati (A.P)

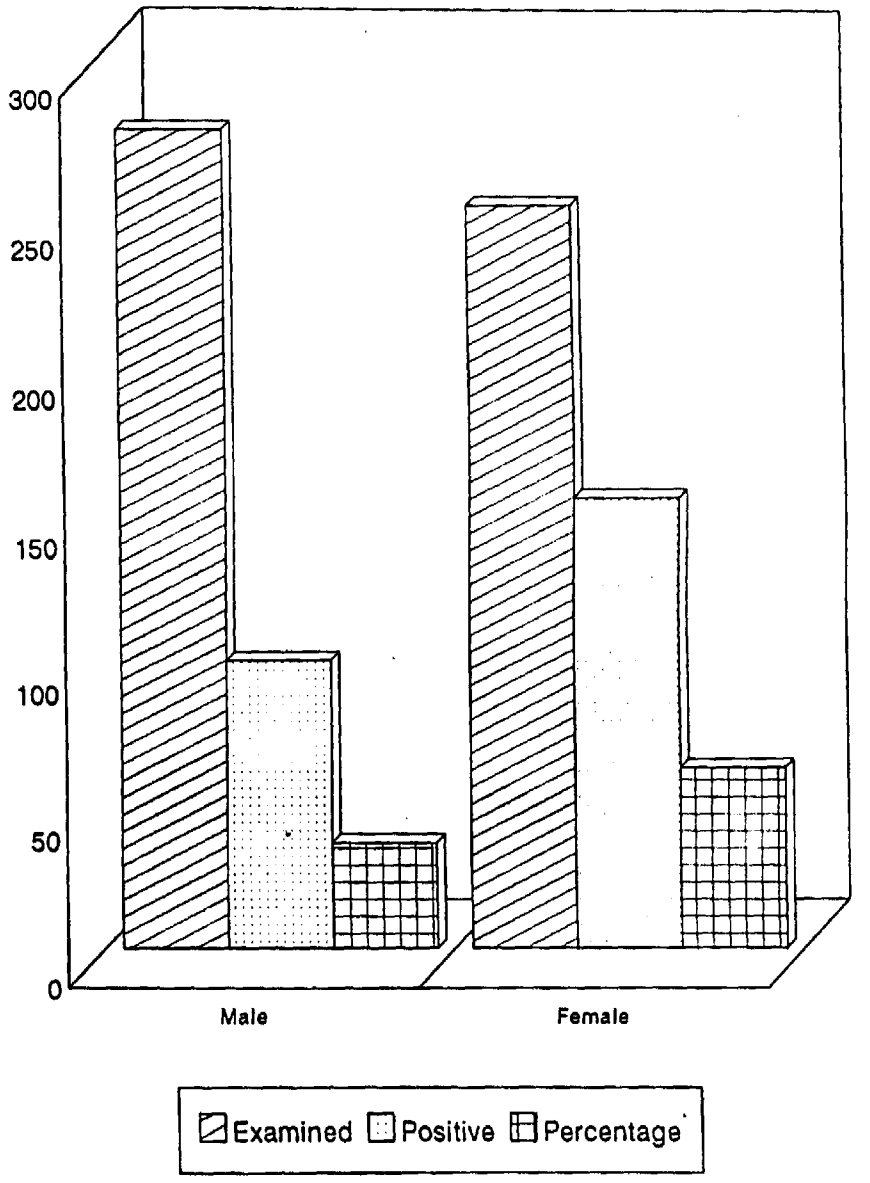


FIG 3: Breed wise incidence of coccidosis in rabbits in and around Tirupati (A.P.)

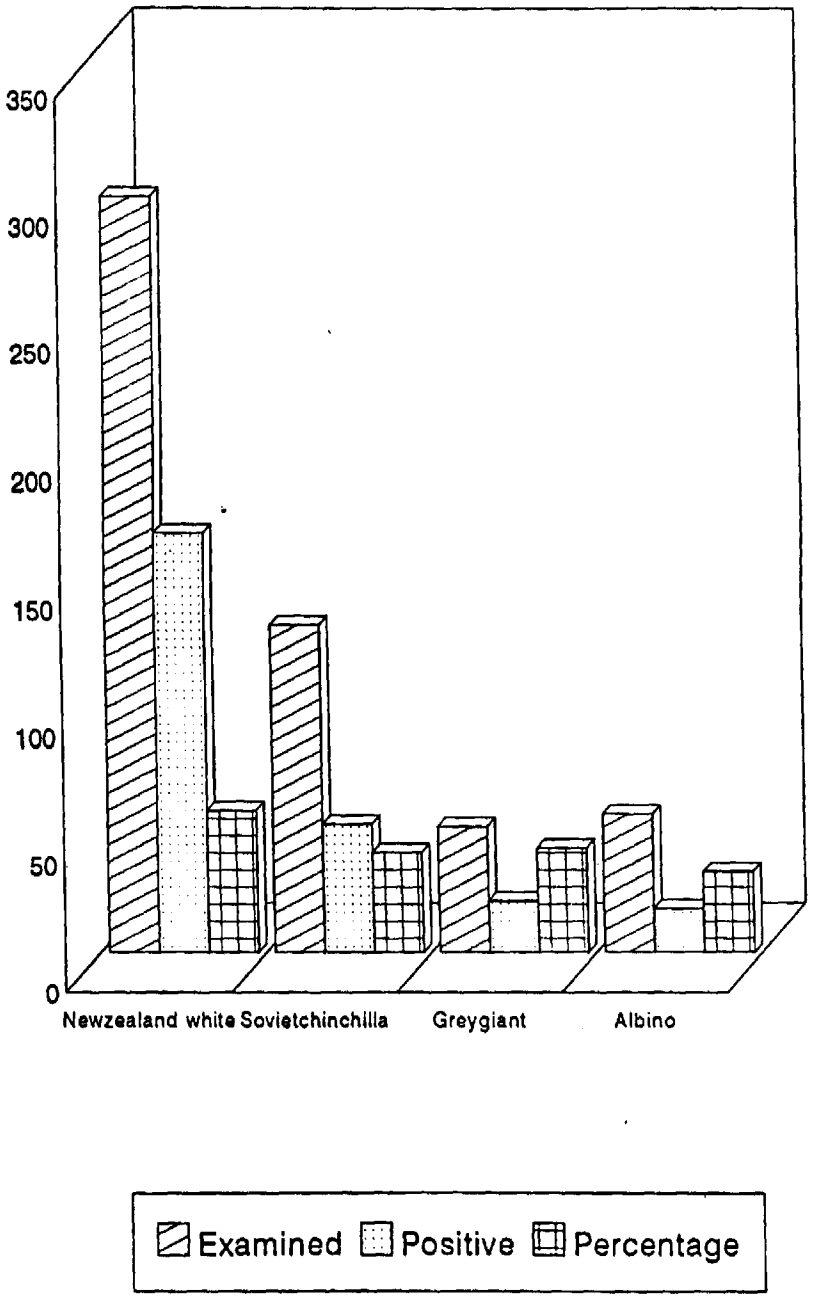
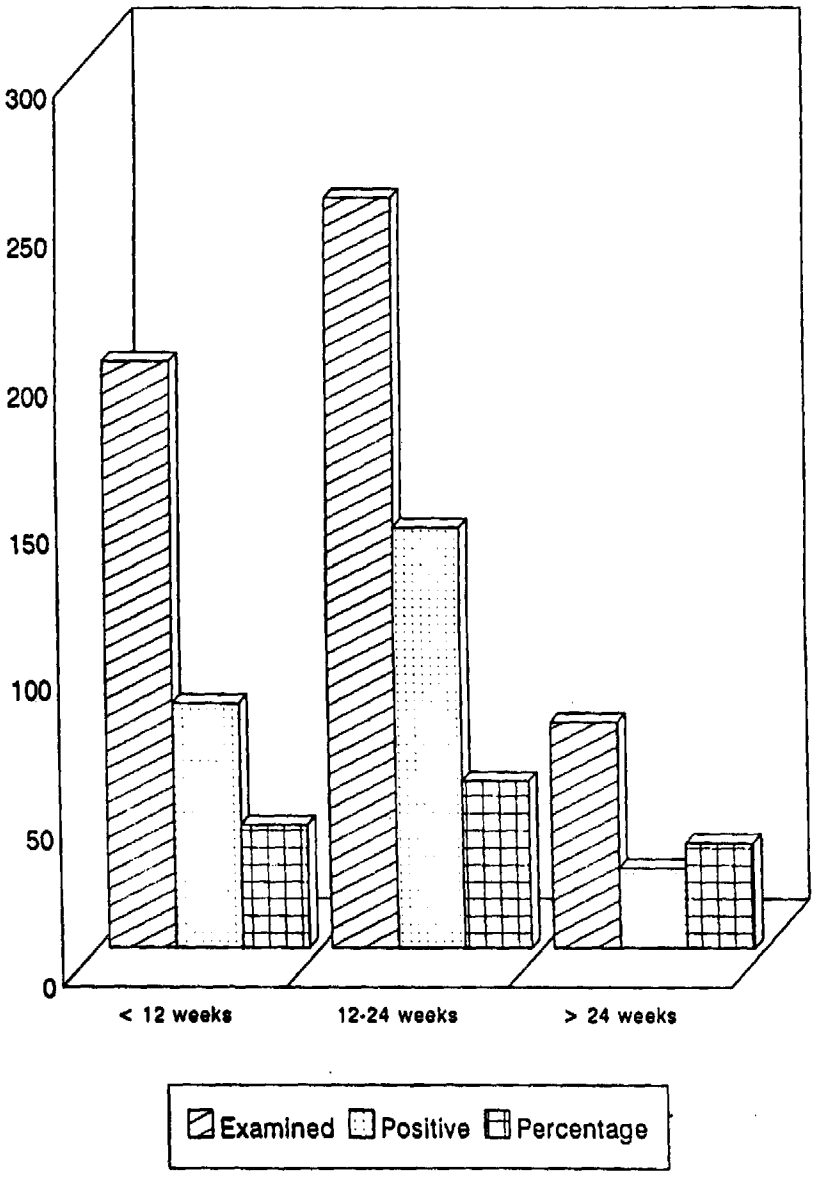


FIG 4: Age wise incidence of coccidosis in rabbits in and around Tirupati (A.P.)



3

igure 5a:Unsporulated oocyst of Eimeria magna

(2.5 X 45)

Figure 5b : Sporulated oocyst of Eimeria magna

(2.5 x 45)

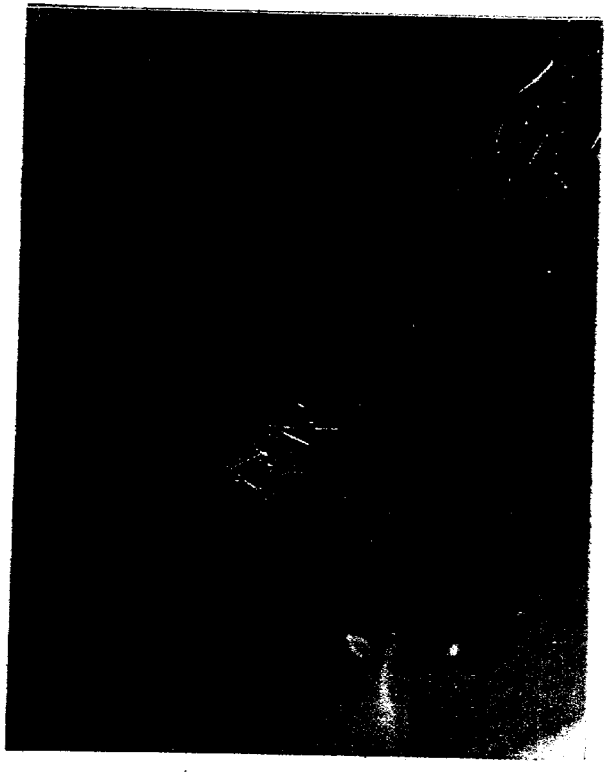


Figure 6: Unsporulated oocyst of Eimeria elongata

(2.5 X 45)

Figure 7: Sporulated oocyst of Eimeria media

(2.5 X 45)

Figure 8: Sporulated oocyst of Eimeria perforans (2.5 X 45)

Figure 9: Sporulated oocyst of Eimeria steidae (2.5 X 45)

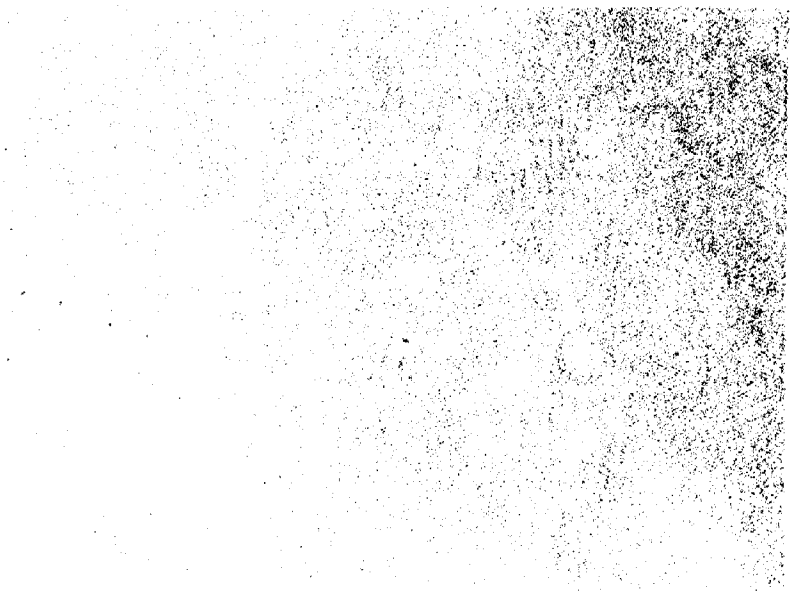


Figure 10: Sporulated oocyst of Eimeria piriformis (2.5 X 45)

Figure 11: Sporulated oocyst of Eimeria coecicola (2.5 X 45)

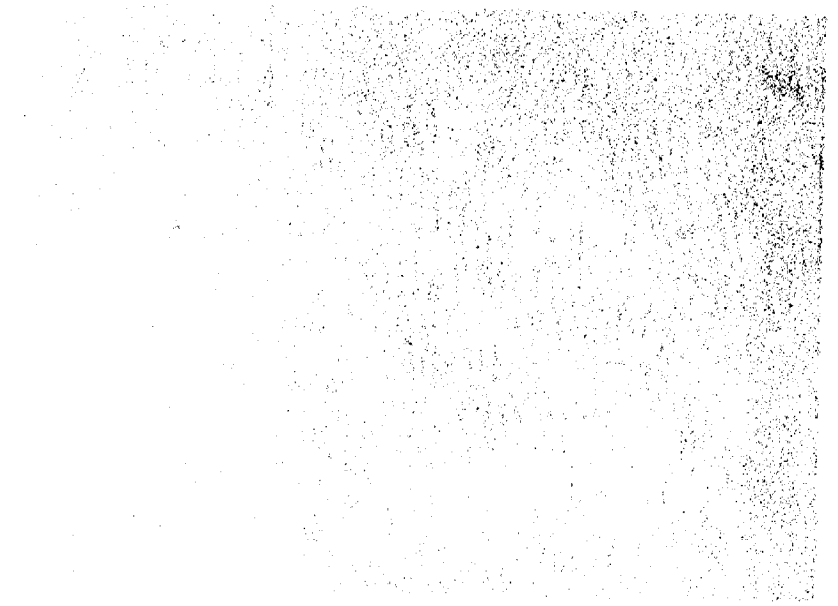


Figure 12: Sporulated oocyst of Eimeria irresidua (2.5 X 45)

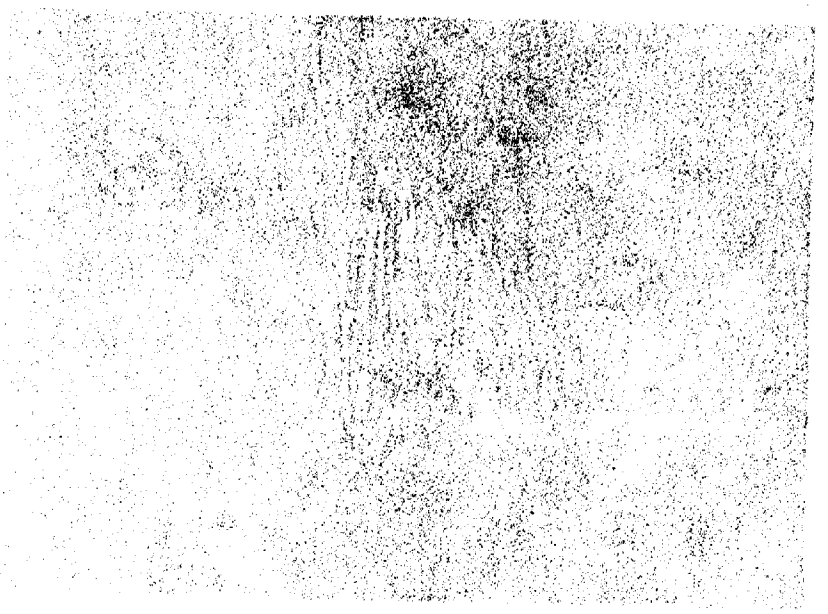
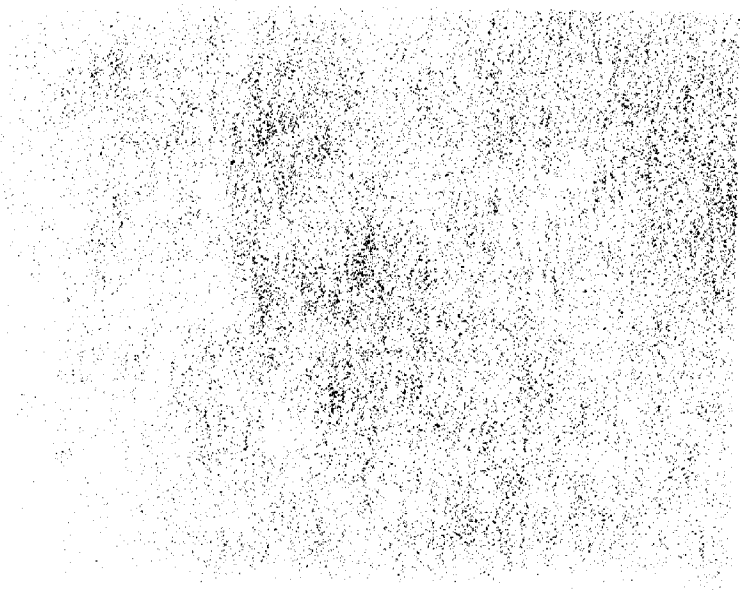


Figure 13: Egg of Hymenolepis nana

(2.4 X 45)

Figure 14: Egg of Hymenolepis diminuta

(2.5 X 45)



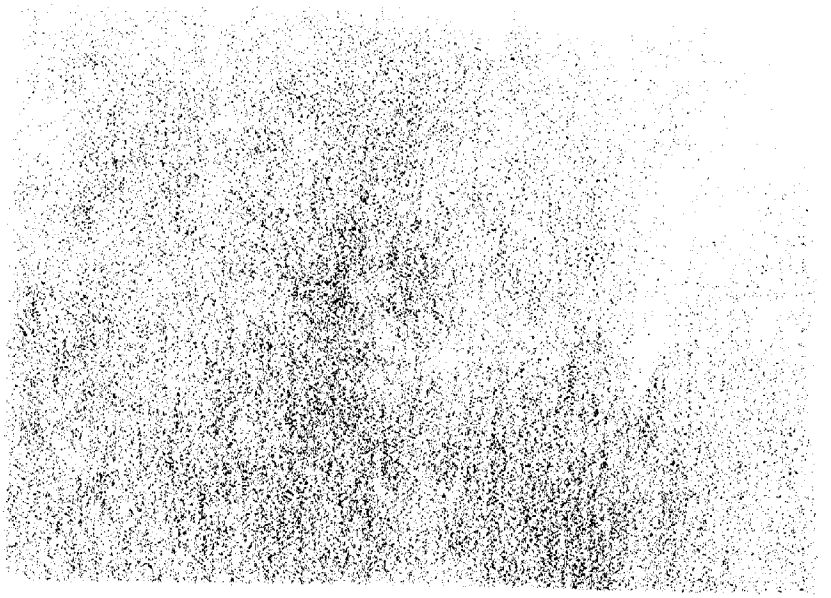


Figure 15: Egg of Oblescoides cuniculi

(2.5 X 45)

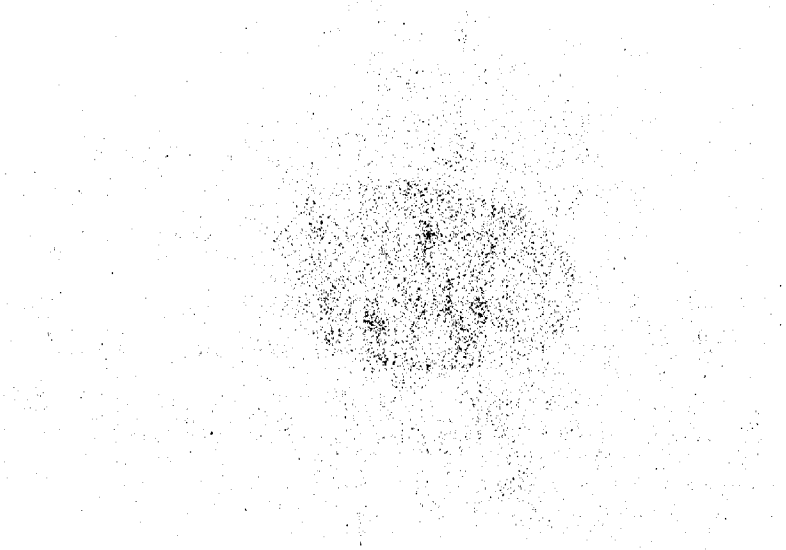


Figure 16: Adult female Psoroptes cuniculi

(2.5 X 3.5)

Figure 17: Adult male Psoroptes cuniculi

(2.5 X 3.5)

Figure 18: Adult male Notoedres cuniculi

(2.5 X 3.5)

Figure 19: Adult Ornithonyssus bacoti

(2.5 X 3.5)

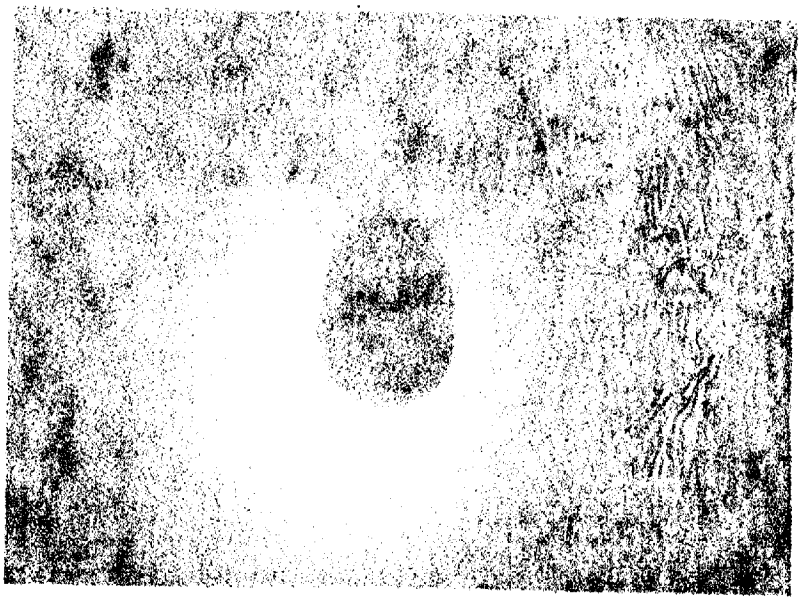
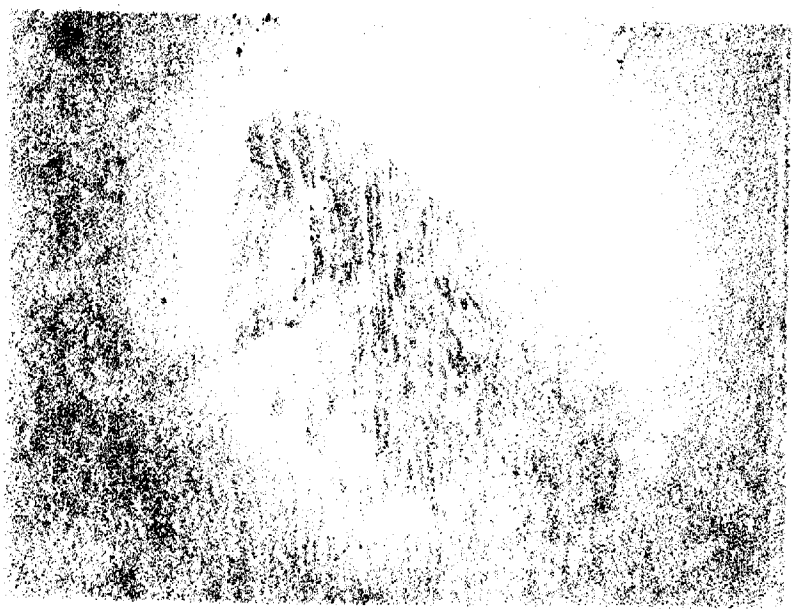


Figure 20: Adult Ctenocephalides felis

(2.5 X 3.5)

Figure 21: Adult male tick Rhipicephalus sanguineus

(2.5 X 3.5)



DISCUSSION

CHAPTER - V

5. DISCUSSION

In the present investigation the overall incidence of external and gastro-intestinal parasitic infections in laboratory animals such as rabbits, rats, mice and guinea pigs in and around Tirupati and the efficacy of drugs against coccidiosis and mange in rabbits were undertaken and the results obtained are discussed hereunder.

The overall incidence of external and gastro-intestinal parasitic infections in rabbits, rats, mice and guinea pigs in and around Tirupati were 43.64, 60.96, 55.23 and 12.0 per cent respectively.

In the present investigation the cestode infections (Cittotaenia ctenoides) were recorded in nine (9) rabbits (1.70%) out of 527 rabbits examined. The highest incidence being at Rabbit farm, Kalur and the lowest recorded was 1.92 per cent at S.V.Medical College. It was observed that the prevalence rate of cestode infections at 16.60 per cent was more in Rabbit Farm, Kalur.

In other places it varied from '0' to 11.12 per cent. The variations in the prevalence rate of cestode infections in and around Tirupati could be due to the methods of rearing the rabbits, the hygienic and managemental practices. Placid et al. (1994) reported the prevalence of 5.0 per cent of cestode infections with Cittotaenia ctenoides

in rabbits at Bangalore, Karnataka. The present observations of the incidence of cestode infections in rabbits was comparatively lower than that of Placid et al. (1994) which might be due to the variation in the geographical distribution, climate, whether and diffirence in the managemental practices.

In the present investigation the nematode infections with Oblescoides cuniculi were observed in four rabbits with 0.75 per cent. The highest incidence being at S.V.University (5.88%)followed by Veterinary College (1.96%) and the lowest being at S.V.Medical College (1.92%). The variations in the prevalence rate of nematode infections could be due to the managemental practices including the hygienic practices and the methods of rearing the rabbits. Placid et al. (1993) had recorded 4.0 per cent infection in laboratory rabbits and also in 5.0 per cent guinea pigs. The variation could be due to the geographical conditions, contamination of feed and methods of rearing.

Out of 527 rabbits screened, the oocysts of mixed Eimeria species were recorded in 169 rabbits with 12.06 per cent. The highest incidence was recorded at Chandragiri (55.56%) followed by Rabbit farm, Tirupati (40.90%) and the lowest incidence was recorded at Srikalahasti (12.50%). It was observed that the prevalence was more (24.23%) in rabbit farm and Chandragiri than that of Srikalahasti. The variations in the prevalence of coccidiosis in other

places varied from 22.23 to 38.46 per cent. The variations in the prevalence could be due to managemental practices and other predisposing factors. Lund (1950) reported the prevalence of 17.0 per cent mixed coccidial infection in rabbits at California, USA. Dovos et al. (1970) recorded on outbreak of 27.9 per cent of coccidiosis in rabbits. Dousek et al. (1987) reported an incidence of 58.0 per cent coccidiosis in rabbits. At Saudi Arabia, Kasim and Shawa (1987) reported the prevalence of 73.0 per cent coccidiosis in rabbits. Meitei et al. (1988) from Ranchi, Bihar reported the prevalence of 54.35 per cent of mixed coccidial infection in rabbits. Chandra and Ghosh (1990) reported 53.0 per cent incidence of coccidiosis in Shillong, Meghalaya. Padmavathi (1990) from Hyderabad, Andhra Pradesh reported the prevalence of 78.09 per cent of intestinal coccidiosis and 11.10 per cent of hepatic coccidiosis in rabbits. Placid et al.(1992) reported the prevalence of 37.5 per cent of coccidiosis in rabbits. In Bangalore, Jamuna et al. (1995) reported 30.78 per cent of coccidiosis in rabbits. In the present study, the prevalence of coccidiosis is lower than those of Chandra and Ghosh (1990) and Padmavathi (1990) but could be comparable with the findings of Jamuna et al. (1995) and Placid et al. (1992). The variations in the incidence levels

of coccidiosis in rabbits could be due to the type of feed, method of feeding and watering management practices and the hygienic conditions prevailing in different regions. In the present study the species of coccidia recorded were Eimeria magna, E.media, E.elongata, E.perforans, E.piriformis, E.steidae, E.irresidua and E.coecicola. Usually two to four species occurred as mixed infections as E.magna E.media and E.elongata were most common mixed infections followed by E.magna, E.perforans, E.irresidua and E.elongata and E.magna, E.media, E.elongata and E.steidae. Sanyal and Srivatsava (1986) had recorded eight species of coccidia in domestic rabbit in Rajasthan in decreasing order of prevalence as E.media, E.perforans, E.magna, E.irresidua, E.elongata, E.nagpurensis, E.piriformis and E.intestinatis. Mono infection of E.media and E.perforans only and mixed infections of the combination of E.magna and E.media or E.perforans predominated. However, in the present study only mixed infections were recorded and one mono infection with E.steidae was noticed during post-mortem and all the species recorded by them were also recorded in the present study except E.intestinalis and E.nagpurensis but E.steidae was not recorded by Sanyal and Srivatsava (1986) which was found in the present study. Studies conducted by Chandra and Ghosh (1990) on the incidence of diarrhoeal infections in rabbits in North Eastern hilly regions of Shillong, Meghalaya had revealed three species of coccidia Viz., E.media, E.irresidua and E.perforans and 53.0 per cent infection was recorded.

In the present study, these species of coccidia were also found in addition to other species. Yadagiri (1989) had reported ten species of Eimeria in coccidial infections in and around Hyderabad and the species of E.flaviscens and E.exigua were also recorded in addition to the eight species of Eimeria found in the present study and this could be due to difference in geographical location in Andhra Pradesh and existing of these species in that area. Placid et al. (1993) reported four species of coccidia from natural infections in rabbits in Bangalore viz., E.magna, E.intestinalis, E.perforans and E.steidae. However E.media, E.elongata and E.irresidua were also found in the present study except E.intestinalis. The description of the individual oocysts of Eimeria are similar to (Flynn, 1973) descriptions.

In the present investigation hepatic coccidiosis was observed in one rabbit (0.18%) during the post-mortem. In USSR, Ponomorenko and Lapshin (1988) observed hepatic coccidiosis in rabbits (13.6%). At the Jammu region, Sharma and Srivatsava (1989) reported the prevalence of hepatic coccidiosis in rabbits but did not indicate the percentage. Padmavathi (1990) reported the prevalence of hepatic coccidiosis (11.1%) at Hyderabad, Andhra Pradesh, and Placid et al. (1993) had recorded E.steidae from Bangalore and subsequently Mishra (1993a&b) had reported an incidence of 3.4 per cent of this species. The variations in the prevalence of hepatic

coccidiosis could be due to the feeding and watering habits and type of feed, environmental and hygienic practices.

In the present study, it was observed that coccidiosis was more common in the age group between 12 and 24 weeks (56.12%) than the other age groups of below 12 weeks and above 24 weeks of age (41.41 and 35.52% respectively). The variation in the prevalence of coccidiosis in different age groups of rabbits could be due to increased susceptibility and less resistance in younger animals. Jiang-Jin-Shu (1981) found that the young rabbits aged about 6 weeks got infected with coccidiosis than the other age groups. Sanyal and Srivatsava (1986) observed that the coccidial infection was 100 per cent in 12 to 24 weeks age group of rabbits and also observed that the rabbits of the age group of 6 to 12 weeks and above 24 weeks of age were infected with 87.5 and 38.8 per cent of coccidiosis respectively. Meitei et al. (1988) observed that the intensity of coccidial infection was more in younger rabbits than the adults. In the present observations, the rabbits of age group below 12 weeks were infected with coccidiosis (41.41%) In the present observations, the incidence of coccidiosis in different age groups was less than that the reports of the above scientists. The variations in the infected age groups of rabbits could be due to breed susceptibility, variation in breeds, managemental

practices, hygienic conditions and methods of rearing. In the present study the rabbits of the age group 12 to 24 weeks were infected with coccidiosis as 56.12 per cent and this considerably low incidence in young rabbits could be due to better managemental conditions. In the present observations the rabbits aged above 24 weeks were infected with coccidiosis at the prevalence rate of 35.52 per cent. Sanyal and Srivatsava (1986) reported that the rabbits of the age group above 24 weeks were infected at the incidence level of 38.8 per cent. The present observations are in agreement with these workers. Mishra (1993_b) found maximum infection with coccidiosis in rabbits of the age group of 2 to 4 months (8 to 16 weeks) which is in contrast to the present observations (12 to 24 weeks).

In the present study, it was observed that the female rabbits were infected with coccidiosis at 60.95 per cent in and around Tirupati and the male rabbits at 35.50 per cent. Sanyal and Srivatsava (1986) reported 48.93 and 54.05 per cent coccidiosis in rabbits in male and female rabbits respectively. In the present observations, the percentage of coccidiosis infections in male and female rabbits were 35.50 and 60.95 per cent respectively which were comparable to the observations of Sanyal and Srivatsava (1986) indicating a similar pattern of succeptibility on sexwise.

In the present investigation it was observed that the incidence of coccidiosis was more in Newzealand White breed (55.40%) followed by 40.81 per cent in Greygiant breed of rabbits and the lowest incidence was recorded in Albino breed of rabbits (31.48%). Sanyal and Srivatsava (1986) reported the prevalence of coccidiosis in different breeds of rabbits as 84.0, 80.0,35.7 and 25.7 per cent respectively in Newzealand White, Grey giant, Sovient Chinchilla and White giant respectively. The slight variations in the incidence levels in different breeds could be due to the breed susceptibility,environmental conditions, managemental and hygienic practices and feeding habits prevalent in that region. This observation is in agreement with that of Sanyal and Srivatsava (1986). It has been observed that the prevalence of coccidiosis is more common in Newzealand White breed than the other breeds of rabbits.

In the present study, 44.40 per cent (120 rats out of 269 screened) of cestode infections H.nana and H.diminuta were found in rats in and around Tirupati. The highest incidence was recorded at S.V.University (50.0%) followed by 46.87 per cent at S.P.Mahila University and the lowest incidence recorded was 26.08 per cent at Veterinary College. The highest incidence being at S.P.Mahila University College was 20.79 per cent more than that of Veterinary College. The variations in the incidence levels could be due to the prevalence of intermediate hosts, methods of rearing,

managemental and hygienic conditions prevailing in those areas. Hymenolepis nana and H.diminuta as a single infection was recorded as 70.83 and 17.5 per cent respectively and the incidence of mixed infections with H.nana and H.diminuta was 11.67 per cent. Akinboade et al. (1981) recorded H.nana infection at 17.0 per cent from Nigeria. Wiethe (1986) from Germany reported the prevalence of H.nana at 90.0 per cent. Balachander and Rande (1978) observed the prevalence of H.nana in rats at Pune, Maharastra. In Kerala, Subramanian et al. (1989) reported an outbreak of H.diminuta infection in rats. Vanajakshi et al. (1989) reported an outbreak of H.nana infection in rats but the percentage incidence was not mentioned. Placid et al. (1992) reported the prevalence of H.nana infection in rats at 48.0 per cent. The present observations showed different levels of incidence and seemed to be quite high but were comparable with the observations of Placid et al. (1992) from Karnataka, the neighbouring state. The present observations of mixed infections with H.nana and H.diminuta could not be compared due to lack of available literature on the mixed infections with H.nana and H.diminuta.

In this present investigation, the nematode infections were observed in 14 rats with 4.20 per cent. The highest percentage of incidence was 13.04 per cent at Veterinary College and the lowest incidence at S.V.University (1.81%). In other places of survey its incidence varied from 1.56 to

11.12 per cent. The nematode infections in rats were observed to be 9.86 per cent was more in veterinary college than S.V.University. The variations in the incidence of nematode infections in rats could be due to the feeding habits, type of feed, managemental and hygienic conditions prevailing in those areas. The incidence of Syphacia muris recorded in this present study was 3.34 per cent and the incidence of the nematode Aspicularis tetraptera was found to be 1.85 per cent. Aruna Singhvi and Sylvester Johnson (1980) observed the prevalence of Syphacia muris in rats but did not mention the percentage level. Mittal (1980) found the prevalence of Aspicularis in rats at 80 per cent level. Wiethe (1986) reported the prevalence of nematodes Aspicularis tetraptera and Syphacia muris at 90 per cent level in rats at Germany. Placid et al. (1994) reported the prevalence of Aspicularis tetraptera (2.0%) and Syphacia muris (4.0%) from Bangalore. The present observations were lower when compared with Wiethe (1986) and Mittal (1980) but are in agreement with those of Placid et al. (1994) from the neighbouring state Karnataka.

In the present study, the incidence of intestinal protozoa observed was Giardia muris at 3.34 per cent level. The highest incidence recorded was 6.25 per cent at S.P. Mahila University college and the lowest incidence recorded was 1.81 per cent at S.V.University. In other places its

infection varied from 4.34 to 2.78 per cent. The highest incidence of intestinal protozoan infections in rats being at S.P. Mahila University (which) was 4.44 per cent more than that of S.V. University. In the present investigation, the incidence of intestinal protozoan infections in rats could not be compared due to lack of published reports and is the first report from Andhra Pradesh.

In the present investigation, the recorded incidence of cestode infections in mice in and around Tirupati was 40.0 per cent. The highest incidence recorded was at S.V. University (41.17%) followed by 40.74 per cent at Veterinary College. The incidence of H.diminuta as a single infection was recorded as 52.94 per cent and the incidence of H.nana was 26.47 per cent. Wiethe (1986) reported an incidence of H.nana in mice at 90.0 per cent level in mice. Kaskhedikar and Johri (1992) reported the occurrence of H.nana in mice but not indicated the percentage levels. Placid et al.(1994) reported the prevalence of H.nana and H.diminuta as 16.70 and 9.0 per cent respectively in mice. In the present observations the incidence of H.diminuta was less to that of Wiethe (1986) reports and found to be higher than that of Placid et al. (1994). The incidence of H.nana observed in this present study was 26.47 per cent. Wiethe (1986) from Germany reported the prevalence of H.nana in mice at 90.0 per cent level. Placid et al. (1994) reported the prevalence

of 16.70 per cent level at Bangalore. The present observations on the incidence of H.nana in mice was higher than the reports of Placid et al. (1994) and Wiethe (1986). The variations in the prevalence of H.nana incidence in mice could be due to the existance of intermediate hosts, feed supplied, environmental conditions, hygienic and managemental practices. In the present study, the incidence of mixed infections with H.nana and H.diminuta observed in mice was 20.58 per cent. The incidence of the mixed infections in mice could not compared due to lack of published reports on the incidence of mixed infections in mice with H.nana and H.diminuta.

The incidence of nematode infections (Syphacia obvelata) recorded was 5.88 per cent in mice in and around Tirupati. The highest incidence recorded was 14.81 per cent at Veterinary College and the lowest incidence being at S.V. University (4.16%). The incidence of nematode infections in mice 10.65 per cent was more in Veterinary College than S.V. University. At Germany, Wiethe (1986) reported 90.0 per cent prevalence of Syphacia obvelata in mice. Placid et al. (1994) found the prevalence 1.60 per cent of Syphacia species in mice at Bangalore. It was observed that the present observations were found to be higher than the reports of Wiethe (1986) and Placid et al. (1986). The variations in the incidence level of nematode infections in mice could be due to the difference in the feed supplied, environmental conditions and other predisposing factors.

The recorded incidence of intestinal protozoan infection (Giardia muris) in mice was 4.70 per cent in and around Tirupati. The incidence levels of intestinal protozoan infections in mice could not be compared due to non-availability of published data.

The incidence of ciliate Balantidium caviae infections recorded in guinea pigs was 8.0 per cent. The highest incidence recorded was at S.V.Medical College (11.12%) and the lowest was (5.0%) at S.V.University. The highest incidence of intestinal protozoan infections in guinea pigs being at S.V.Medical College/which/was observed to be 6.12 per cent more than S.V.University. Placid et al. (1994) reported the prevalence of 3.0 per cent Ciliate infections in guinea pigs at Bangalore, but the actual species of ciliate was not named. The present observations were found to be higher than the reports of Placid et al. (1994). The variations in the incidence levels could be due to the environmental conditions and hygienic and managemental practices prevailing in the particular region.

In the present study, the incidence of ectoparasites in rabbits particularly fleas (Ctenocephalides felis) ranged from 0.53 to 4.54 per cent. The highest prevalence being at Rabbit Farm, Tirupati (4.54%) and the lowest incidence level was 0.53 per cent at Veterinary College and an incidence of 0.96 per cent of flea infestation was also recorded at

S.V.Medical College. The variations in the percentage of flea infestation in rabbits could be due to managemental and hygienic practices prevailing. The occurrence of fleas (Ctenocephalides felis) on rabbits seems to be unusual since they are commonly found only on cats and dogs (Flynn, 1973) however Jagannath et al. (1972) reported the occurrence of this flea species on poultry. The occurrence of Ctenocephalides felis on rabbits was probably due to the prevalence of infested dogs or cats close to rabbit houses and also because fleas are semi-permanent parasites and survive outside the host for quite some time and attack other hosts when the prefered usual hosts such as dogs and cats are not available.

In the present investigation, the overall incidence of tick infestation (Rhipicephalus sanguineus) recorded was 1.32 per cent.

The prevalence of the common dog tick (Rhipicephalus sanguineus) of rabbits in the present study indicated the possibility of the animals being infested from dogs which were found near the laboratory animal units. This tick species is not unusual to rabbits since they are used successfully as experimental hosts for studies. However, the risk of rabbits getting infested from dogs should

be taken care of to avoid ectoparasitism by ticks. The present prevalence rate of the tick, Rhipicephalus sanguineus in rabbits could not be compared due to lack of published reports.

The overall incidence of mite infestation (Psoroptes cuniculi and Notoedres cuniculi) recorded in this present study was 7.96 per cent in and around Tirupati. The highest incidence of mite infestations being at 16.67 per cent at S.V.University/ followed by 13.63 per cent at rabbit farm, Tirupati. Rai (1988) reported the prevalence of 8.03 per cent mange in rabbits caused by mites. From Kerala, Rajamohan and Joy (1989) reported mange in rabbits without the percentage level. Jasmer Singh and Gill (1989) in their survey observed the prevalence of mite infestation in rabbits. At Cuba, Espaine and Damadio (1991) reported the prevalence of mite infestation in rabbits but not percentage levels. Shobhamani (1992) had reported 27.53 per cent of mange infestation in rabbits at Hyderabad. The present observations on the incidence of mite infestations were compared and are in agreement with the incidence levels of Rai (1988) who had recorded 8.03 percent of mange in rabbits. The variation in the percent incidence of mange is largely influenced by managemental practices and regular screening and treatment. /(Home Science)

The overall incidence of ectoparasitic infestation in rats recorded was 4.08 per cent in and around Tirupati. The incidence of louse infestation (Polyplax spinulosa) was recorded as 0.74 per cent in rats in and around Tirupati. The highest incidence being at Veterinary College (4.34%) followed by 1.56 per cent at S.P. Mahila University. The Prevalence rate of louse infestation was more in Veterinary College than at S.P.Mahila University. In other places no louse infestation was noticed. No reports of infestation with this species of louse were available in India, however (Flynn, 1973) had observed that this louse had a world wide distribution. The present prevalence of louse infestation in rats could not be compared due to lack of published reports.

The infestation with Notoedres muris and Ornithonyssus bacoti) was observed in nine rats (3.34%). The incidence of O.bacoti infestation recorded in five rats (1.85%) and N.muris incidence was in four rats (1.48%). The highest incidence of mite infestation was observed at Veterinary College (8.69%) and the lowest incidence at S.V.University (1.38%). It was observed that the prevalence rate of 7.31 per cent was less at S.V.University than Veterinary College. There seems to be no documented reports of Notoedres muris on rats and hence it is presumed to be the first report in laboratory rats. However, Jagannath et al. (1974) had reported the prevalence of the mite Ornitronyssus bursa on white rats in an laboratory animal house.

The incidence of ectoparasites recorded in mice in this present study was 4.70 per cent. Polyplax serrata infestation was observed at S.V.University laboratory animal Unit (4.16%). In other places no incidence of this louse infestation was recorded in mice. Since there appears to be no report of this louse in literature from India, this constitutes the first record. The infestation with Ornithonyssus bacoti in mice during the present investigation was 3.5 per cent. The highest incidence was at the Veterinary College (7.40%) followed by (3.94%) at S.V.University. It was observed that the prevalence rate of 4.46 per cent was less at S.V.University than that of Veterinary College. The variations in the prevalence rate of this mite infestation could be due to the managemental practices and hygienic conditions prevailing. Sasa et al.(1962) had reported that this mite is common in conventional colonies. French (1987) reported the prevalence of the mite Ornithonyssus bacoti in a colony of laboratory mice and Placid (1995) had found a heavy infestation of this species in the colony of laboratory mice maintained at Mysore for experimental purposes. The prevalence of this species of mite during the present investigation might have been introduced into the laboratory colonies through infested wild rodents.

In the present investigation, the ectoparasitic infestations recorded in one guinea pig infested with the louse, Gyropus ovalis out of 50 guinea pigs examined with 2.0 per cent at S.V.Medical College. In other educational institutions no ectoparasitic infestations was recorded in guinea pigs. Jagannath et al. (1974) had also reported the prevalence of the louse, Gyropus ovalis in guinea pigs at Karnataka and Rajani et al. (1993) from Lucknow, reported the heavy infestation of guinea pigs with the louse, Gyropus ovalis but not mentioned the percentage. The morphological characters of the ectoparasites recorded are similar to those described by Joancolvillie (1994) and Flynn (1973).

In the rabbits of group 'A' treated with 0.3 ml of Zycox the oocyst was reduced to 98.13 per cent by 7 days post-treatment and the body weight gain after treatment was 11.6 g. In the rabbits treated with 0.45 ml of Zycox, the oocyst count was reduced to 98.64 per cent 5 days post-treatment and the body weight gain was 22.1 g. It was observed that the oocyst count per gram of faeces was reduced with the dose of 0.45 ml for 5 days and with 0.3 ml dose the reduction was observed after 7 days. It was observed that the recovery rate was quicker (5 days) at higher dosage of 0.45 ml Zycox compared to the rabbits treated with 0.3 ml dose rate (7 days). In both dose levels

the oocyst count reduced considerably after the period of treatment indicating the efficacy of the treatment. The present observations on the treatment trials with Zycox could not be compared due to lack of published literature on the effect of Zycox in the treatment of rabbit coccidiosis. This is the first report of this herbal product which was originally used for poultry coccidiosis. The efficacy of Zycox, a herbal product in rabbits has indicated its usefulness in the treatment of coccidiosis in rabbits in the trials conducted.

In the present study, the oocyst per gram of faeces was reduced to 87.25 per cent with Supercox (Sulphaquinoxalene and diaverdin combination) 7 days post treatment and similarly the body weight gain 7 days post treatment is 26.10 g in the treatment with Supercox (Sulfaquinoxalene and diaverdin combination) treated rabbits which is 14.7 g more than the infected untreated control rabbits. Semellini (1958) treated coccidiosis in rabbits with sulfaquinoxalene at 0.3 per cent concentration in drinking water and achieved good results but not indicated the per cent efficacy of the same. Whitney (1977) observed satisfactory results with sulfaquinoxalene in the treatment of rabbit coccidiosis. Joyner et al. (1983) found desirable results with Sulfaquinoxalene against coccidiosis in rabbits. Placid et al.(1992) reported the efficacy of sulfaquinoxalene against coccidiosis

at 0.05 per cent concentration in drinking water. The efficacy of sulfaquinoxalene, sulfadimethoxine and diaveridine in the control of rabbit coccidiosis was indicated by Heinz Mehlhorn (1988) and in the present study the (combination of Sulfaquinoxalene diaverdine) Supercox which is administered to rabbits affected with coccidiosis proved effective. This combination is commonly used against poultry coccidiosis and was effective against rabbit coccidiosis also.

In the treatment of psoroptic and notoedric mange in rabbits the efficacy observed with Butox (deltamethrin) is 95.29 per cent after three applications at weekly intervals. Rahman et al. (1992) reported that deltamethrin is 95.29 per cent effective against mange in rabbits. Shobhamani (1992) reported cent per cent efficacy of deltamethrin against psoroptic mange in rabbits in three topical applications at weekly intervals. The present findings were in agreement with Rahman et al. (1992).

The per cent efficacy of the herbal preparation, Dermux against mange in the present study is 83.34 per cent. The present observations on the efficacy of Dermux could not be compared due to lack of available literature on the Dermux in the treatment of mange in rabbits. Treatment trials against Notoedric mange in laboratory rabbits

with Neguvon, Ascabiol, Loraxene and Himax (a herbal product) were reported by Seshappa and Hiregoudar (1978). Himax an other herbal product was found to result an improvement in the recovery of lesions after 3 to 5 applications in ointment form. In the present study, the herbal ointment Dermux was moderately effective (83.34%) against Notoedric and Psoroptic mange in rabbits.

SUMMARY

CHAPTER - VI

6. SUMMARY

The present study was undertaken to record the prevalence of external parasites and gastro-intestinal parasitic infections in laboratory animals such as rabbits, rats, mice and guinea pigs with particular emphasis on coccidiosis in rabbits in and around Tirupati, Andhra Pradesh. The faecal samples were examined for gastro-intestinal parasitic infections and skin scrapings and brushings for external parasites.

A total of 527 rabbits including broiler rabbits, 269 rats, 85 mice and 50 guinea pigs were screened from different places in and around Tirupati. The overall prevalence of gastro-intestinal parasitic infections noted was 34.53, 57.24, 54.11 and 8.00 and of the external parasitic infestation it was 9.86, 3.71, 4.70 and 2.00 per cent from rabbits, rats, mice and guinea pigs respectively.

The gastro-intestinal parasitic infections encountered in the present study included Cittotaenia ctenoides (1.70%) Obeliscoides cuniculi (0.75%) and species of Eimeria from rabbits (32.06%). Coccidiosis was the most common gastro-intestinal parasitic infection in rabbits. Eight species of Eimeria were recorded in this present study viz., Eimeria magna, E.media, E.irresidua, E.perforans, E.periformis, E.coecicola, E.elongata and E.steidae. E.magna was the most

predominant species of coccidia and mixed infections with three or more species was common. However, oocysts of E.steidae was found in bileducts during post-mortem conducted.

Among the different age groups of rabbits, coccidiosis was more prevalent in the age group between 12-24 weeks (56.12 per cent) than the other age groups below 12 weeks and above 24 weeks (41.41 and 35.52% respectively). It was also observed that the prevalence of coccidiosis was more in female rabbits (60.95%) than in the male rabbits (35.50%) and also noted that the incidence of coccidiosis was more in Newzealand breed of rabbits than the other breeds. In rats, the gastro-intestinal parasitic infections encountered included Hymenolepis nana, H.diminuta, Syphacia muris, Aspicularis tetraptera and Giardia muris.

H.nana and H.diminuta were recorded as a single infection and mixed infections of 70.83, 17.5 and 11.67 per cent respectively. The nematode infections with Syphacia muris and Aspicularis tetraptera recorded were 3.34 and 1.85 per cent respectively. It was found that Hymenolepis infection occurred frequently in rats.

In mice, the gastro-intestinal parasitic infections recorded were Hymenolepis diminuta, H.nana, Syphacia obvelata and Giardia muris at the prevalence rate of 52.94, 26.47, 4.16 and 4.70 per cent respectively. Mixed infections with

H.diminuta and H.nana was observed to be 20.58 per cent. It was observed that Hymenolepis infection commonly occurred in mice.

In guinea pigs, the Ciliate (Balantidium caviae) infections were recorded at 2.0 per cent.

Ctenocephalides felis and Rhipicephalus sanguineus were recorded as 0.56 and 1.32 per cent respectively from rabbits, and the mite infestation (Notoedres cuniculi and Psoroptes cuniculi) recorded was 7.96 per cent in and around Tirupati.

In rats, the incidence of louse, Polyplax spinulosa was recorded to be 4.34 per cent and the mites Ornithonyssus bacoti and Notoedres muris infestation recorded were in 1.85 and 1.48 per cent respectively.

In mice, the louse (Polyplax serrata) infestation was recorded as 1.17 per cent and the mite(Ornithonyssus bacoti) infestation was 3.50 per cent.

In guinea pigs the prevalence rate of louse, Gyropus ovalis was found to be 2.0 per cent.

Treatment trials were undertaken in rabbits naturally infected with coccidiosis. The animals included in the study had mixed infections with three or more species of intestinal coccidia. Two drugs were tried in the affected animals.

Zycox, a herbal drug recommended for poultry coccidiosis was tried at two dose rates of 0.3 and 0.45 ml orally per day for 7 and 5 days respectively. It was observed that Zycox at 0.3 ml dosage effected a significant reduction in the oocyst counts by 7th day and treated animals showed increase in body weight. At dose rate of 0.45 ml the oocyst counts declined by 5th day and symptoms of diarrhoea abated and there was an improvement in body weight gain also, when compared to the infected non-treated controls.

Supercox (A combination of sulfaquinoxalene and diaverdin) an anticoccidial drug for poultry also tried in rabbit coccidiosis at the dose rate of 1 g in 1 litre of drinking water for 3 days and administered the same dosage for 2 days at a gap of 2 days. It was observed that this drug was also effective in controlling coccidiosis based on the decline in the oocysts counts, disappearance of symptoms of diarrhoea and dullness and also improvement in body weight in treated rabbits.

Rabbits with mixed infestations of mange mites Psoroptes cuniculi and Notoedres cuniculi were included in the treatment trials with a pyrethroid viz.,Butox (Deltamethrin) and a herbal drug, Dermux. The infested rabbits were sprayed with Butox (50 ppm - 4 ml in 1 litre of water) and three applications at weekly intervals

resulted in 95.29 per cent efficacy in controlling the mange mites. Application of Dermux as an ointment daily for 7 days brought about 83.34 per cent reduction in mange.

No adverse side effects due to any of the drugs employed in the treatment trials against coccidiosis or mange were noticed.

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