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Editorial

A review of our past 30 years effort in the livestock development is a clear indicator of our failure story. Many experiments carried out to establish exotic breeds in this country had failed because of the disease problem and our poor health coverage. In the sixties with hard struggle we could remove rinderpest, a great killer disease of ruminants. Because of our poor vigilance system we faced episodes of the disease during early seventies and again in early eighties.

Uncontrolled importation of livestock and livestock products has brought several new exotic diseases which are becoming a great threat to our growing livestock and poultry industry. Propagation of exotic cross breed animals without control of food and mouth disease can bring disaster and frustration in farmers.

Farmers of Nepal had experienced the threats of such diseases and are also well convinced that the disease can be controlled. There is always demands for Veterinary Hospitals from the farmers and their representative. In a country, where from centuries people had been keeping animals and above 90 percent of the people living with agriculture profession, livestock can not be unnecessary element of the society. For several, especially landless or subsistence farmers, livestock is the sole property and a means of livelihood.

Based on the demand from the people HMG established one veterinary hospital in each of the 75 districts of the country during the 6th five year plan period, and initiated training selected farmers on the first aid. This is indeed a very timely effort. In the sixth five year plan period efforts were made to strengthen the infrastructure in the animal health sector.

Most of the Veterinary hospitals were provided with clinical diagnostic kits, wireless network, refrigerators and necessary equipments. The Biological Products Laboratory was upgraded with modern equipments for better quality and bulk produc-

tion of vaccines. Central Diagnostic and Research Laboratory was equipped with most modern equipments and appropriate buildings. Similarly, Rabies vaccine production and diagnostic facilities were updated with its own buildings and accessories. A building is under construction for FMD Laboratory. Some of the staffs were also trained in different specialities. If this whole establishment functions in right way it can have significant impact on the improvement of livestock. In the infrastructure we are no way inferior to many of the developed countries.

Inspite of all these development what is the basis of the problem ? A look at the existing veterinary manpower will clearly indicate which is the real bottle neck ?

Inspite of good scope for self employment as the professional, scientist, and opportunities in private and public sectors for employment, the growth of veterinary manpower is negative in this country.

There is demand for veterinarians in the Dept. of wild life, Dept. of Health Services, Royal Nepal Army, national and international drug manufacturing companies etc. Utmost, all the veterinary institutions, livestock farms and other activities under the Dept. of Livestock Development and Animal Health, are suffering because of the scarcity of manpower, as a result the establishment are either in low production or difunct in most instances.

According to 1978 statistics one Vet in this country is serving 300000 heads of animals. There is no improvement in this state of affairs. It would be clear from following statistics: Out of total Vets numbering 110, the Vets under taking their own private activities 10, Vets, working in TU and other organization like Dept of wild life, Dept. of Health services, Royal Nepal Army, Dairy Development Corporation, GRS, APROSC, RONAST etc. 16 and remaing Vets have to shoulder different activities under the Dept. of Livestock Development & Animal Health such as administration, livestock extension, breeding, Livestock farm management, vaccine production, quality control, Rabies vaccine production, Disease diagnosis & control programme, Parasite control, infectious diseases control, service in District Hospitals, and regional Directorate.

In this reality it is not possible to gain more from our livestock sector. If some *unbiased* decision to improve the manpower situation is not taken, this sector will remain unproductive inspite of great potentialities of growth.

There is no problem of unemployment to Vets, as farmers are willing to spend money to safe-guard or maintain productivity of their animals. It is grossly unfair to leave the livestock farmers at the hands of the destiny in this modern age of science. There can be no other way of motivating farmers for better livestock production than convincing them that their property is secured.

For a country like Nepal the aim should be to get maximum from what we have. If the resources and manpower available under Dept of Livestock Development & Animal Health & Tribhuvan University could be integrated and mobilized, We can produce Veterinary graduates who can fulfill the requirements of animal health and production from our own internal resources. As in all the Asian or several industrialized countries of the world, Vets have been involved in all the sectors of Livestock Development, there is no reason that a Vet in this country should be confined to animal health sector alone.

In our own situation the choice should go for one person who is equally capable to handle the Livestock health and production activities.

We appeal to H. M. G. in general and to Ministry of Agriculture in particular to take necessary steps to improve Veterinary manpower in the interest of national development.



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INVESTIGATION OF BOVINE REDWATER IN THE KOSHI HILLS OF NEPAL

N.C.G. Hopkins and S.N. Mahato

Introduction

Redwater in cattle has been recognized as a problem in the hills of Eastern Nepal for many years. The local name is 'lomute'. It has previously been thought to be due to *Babesia bigemina* of *B. bovis*. Initial investigation of the epidemiology of the condition made babesiosis appear to be unlikely. There was no acute phase and cattle were commonly affected for several years before becoming progressively thinner and dying. Affected cattle were mostly in the older age group. Accordingly, blood and urine samples were collected from cattle affected with redwater and from unaffected cattle.

The main alternative disease condition to babesiosis which causes redwater in cattle is Enzootic Bovine Haematuria (EBH). Both conditions may occur in the hills of Nepal and diagnosis may only be made after laboratory examination of blood and urine samples.

The history and clinical signs of the two conditions are different. Indigenous cattle are usually infected by *Babesia species* as calves, when infection is frequently inapparent. This leads to the development of a premune state; the animal tolerating infection with no adverse effect. The resistance during the premune state may break down under stress. An acute, often fatal, disease condition may then ensue, characterized by pyrexia, increased pulse and respiratory rate, haemoglobinuria (not haematuria), anaemia and

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jaundice. The cerebrum may also be involved leading to nervous signs. EBH, on the other hand, is a chronic condition of insidious onset. Animals exhibit an intermittent, mild clinical haematuria or persistent subclinical haematuria. There is gradual weight loss over months or years and animals become anaemic. Secondary bacterial urinary infection may lead to cystitis and pyelonephritis.

Post mortem examination reveals the presence of pedunculated tumours in the bladder mucosa. Mahato (1983) reported the presence of bladder tumours and thickened bladder mucosa in the post mortem examination of 20 cattle which had died from redwater in the Koshi Hills.

Materials and Methods

Blood samples were collected from 10 cattle affected with redwater and 10 unaffected cattle for 12 consecutive months (January to December 1983) at 1,500 metres above sea level in Dhankuta district, of Koshi zone. These were collected by vacutainer and EDTA was used as anticoagulant. Smears were made, fixed and stained with Giemsa and examined microscopically.

Urine samples were also collected from the same animals in sterile containers and transported on ice to the laboratory. They were subjected to routine urinalysis and bacteriology.

Results

Microscopic examination, using high power and oil immersion, of blood smears from affected cattle failed to demonstrate the presence of *Babesia* sp. within red blood cells (rbcs). Urinalysis demonstrated the presence of rbcs in 61% of affected and 9% unaffected cattle, as shown in Table 1.

Table 1 *Result of Urinalysis.*

Month	Number of urine samples containing rbcs	
	Affected	Unaffected
January	7	2
February	6	-
March	10	-
April	7	1
May	7	1
June	-	-
July	5	2
August	6	2
September	7	-
October	4	-
November	4	-
December	4	2
	67 (61%)	10 (9%)

Discussion

The fact that *Babesia* sp. has not been demonstrated in blood smears taken from cattle affected with redwater in the hills of Nepal and that a large number of cattle (61%) had haematuria as opposed to heamoglobinuria makes it unlikely that babesiosis exists as a clinical entity.

The reason why only 61% cattle exhibited haematuria is that the condition is intermittent in cattle with EBH. The reason why 9% apparently normal cattle had haematuria is not clear; they were possibly in the initial stage of EBH.

The disease condition, Enzootic Bovine Haematuria, is thus considered to be responsible for redwater found in cattle in the Koshi Hills.

Investigation of the history and clinical signs in affected cattle as well as simple laboratory tests make a diagnosis possible. Blood smears should be fixed, stained with

Giemsa and examined microscopically under oil immersion for the presence of *Babesia* sp. protozoal parasites. Mid-stream urine samples should be collected and left to stand. Within 15-30 minutes a sediment will reveal the presence of rbc's and thus haematuria. If haemoglobinuria is present, no sedimentation will occur and the urine sample will remain a uniform brown colour. Alternatively, the sample may be centrifuged and the sediment examined for the presence of rbc's.

Summary and Conclusion

Simple laboratory tests may be used to differentiate between haematuria and haemoglobinuria in cattle with redwater. Results from the Koshi Hills indicate that haematuria is the prevailing condition. No *Babesia* sp. parasites have been found. The results demonstrate that Enzootic Bovine Haematuria is the disease condition responsible for bovine redwater and make it unlikely that babesiosis is a disease problem. Cattle presented with redwater should be examined as described and a confident diagnosis made.

Acknowledgments

The authors would like to thank staff at Pakhribas Agricultural Centre, Dhankuta and Sgt. A. Lawson, British Military Hospital, Dharan for their invaluable assistance. The work was carried out as part of the Koshi Hills Area Rural Development Programme (KHARDEP), funded by the Overseas Development Administration (ODA) of the United Kingdom Government.

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ECHINOCOCCOSIS / HYDATIDOSIS INFECTION IN ANIMALS OF KATHMANDU.

D.D. Joshi.*

Introduction

Echinococcosis (Hydatidosis) is a disease that results from the embryonic stage of a dog tape worm belonging to genus *Echinococcus*. Some times, it is a serious health problem of men and animals. The disease as it exists in the form of cyst of varying size in the internal organ of man and other domestic animals was known ever since the time of HIPPOCRATES (460 - 379 B.C.). It is a global problem. Dog as the final host is responsible to disseminate the disease to noncanidae species of animals including man. Highest prevalence of the disease is seen in Asian countries like Iran, India, Pakistan and Nepal. In South America like Argentina, Chile, Uruguay, Peru, Bolivia and Southern Brazil have heavy infestation rate (Gemmell 1984).

In the year 1972, for the first time parasitological survey in slaughter places around Kathmandu was under taken. In this study 13% of buffaloes slaughtered for meat were found positive for hydatid cyst (Joshi 1973). The situation of hydatidosis in human patients has been documented in reports of three prominent hospitals** of Kathmandu valley. The incidence of the disease in human is alarmingly high.

Life cycle and Epidemiology

Adult tape worm lives in small intestine of dogs and other canidae. The larval stage in the cyst form are found in a wide range of mammals. Sheep, goat, buffalo,

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pig and human get infected by consuming the viable ova of this tapeworm which are found in the stool of an infected dog.

In the small intestine of mammals (intermediate host) the external coat or the shell of the ova gets digested and embryo is freed. With the help of the hooks the embryo moves actively into the intestinal mucosa and enters into the blood vessel. It is then carried passively by the blood until it is arrested at some place and embryo develops into cyst causing considerable damage. These cysts are known as hydatid or echinococcus cyst. A healthy dog or other susceptible (final) host acquired infection by consuming the live hydatid cysts while eating the infected raw meat.

Objective of the investigation

- to study the prevalence of hydatid among slaughtered animals in Kathmandu.
- to study the size of the cysts and their common location in the body of the intermediated host.

Materials and methods

Study was carried out from July to October 1983 covering seven slaughtering places* around Kathmandu Town Panchayat. Number of buffalo, sheep, goat and pig slaughtered daily were recorded. The team started examining liver and lungs of every carcass. Liver and lungs showing hydatid cyst (s) were collected in sterile plastic bags for further laboratory diagnosis. Age and sex of slaughtered animals were recorded daily. The dogs in those localities were caught and autopsied for adult parasite in the intestine. Stool samples were examined to detect Echinococcus ova.

Results

A total of 14490 animals were slaughtered during the survey period. Of the total, 3232 were buffaloes, 10,839 sheep and goats and 419 pigs. Out of 3232 buffalo carcasses 601 were hydatid positive thus the prevalence rate was 18.60%, among sheep and goat 645 were found positive with prevalence rate 5.95% and 65 pigs were positive

* Kangeswari, Dhokatole, Damaitole, Bimsensthan, Khichapokhari, Dharhara and Ranmukteswar

showing 15.51% infestation (table 1). Prevalence of hydatid cysts in different age group of buffalo is given in Table 2. In this group 2000 were male calves, 180 male adults and 1052 female adults. The prevalence rate of hydatidosis is highest in female adult buffalo (38.3%) then followed male adult buffalo (23.8%) and lastly the male buffalo calves (7.75%). Hydatid percentage in liver (70.22%) is slightly lower than in lungs (72.55%).

Prevalence of hydatid cyst in sheep, she and he goat is shown in table 3. The highest percentage is in sheep (7.54%), followed by she goat (6.96%) and lowest in male goat (3.89%).

Discussion

Animal offals containing viable hydatid cysts are dangerous source of tape worm infestation in dogs. Several dogs consume cysts with meat scrapes. A single cyst containing hundreds of echinococcus tape worm embryos can infect a dog heavily. Infected dog stool invariably contains thousands of live ova. Such dogs contaminate the pasture. Large number of stray dogs and several pet dogs which never get treatment for the tape worm remain a potential source of infective ova. Animal easily get infected by ingesting these ova while grazing. Epidemiology of the disease is based on the dog to animal and vice versa. Nonavailability of meat inspection services further aggravate the situation in this country. Man becomes victim by ingesting food or water contaminated with echinococcus ova.

Recommendations:

Based on the observations made in this study, the following recommendations for the effective control and elimination of hydatidosis in men and animals are prescribed here.

1. Elimination of stray dogs
2. Public awareness through education and audiovisual aids.
3. Regular check up of the infection in dogs through regular stool examination.
4. Effective treatment of the infected dogs.

Table 1 *Total Animal Slaughtered Found Positive For Hydatidosis*

S. N.	Animals	No. of Animals slaughtered	Hydatid positive animals	Prevalence rate
1	Buffaloes	3232	606	18.60%
2	Sheep and Goat	10839	645	5.95%
3	Pigs	419	65	15.51%
	Total	14490	1316	9.08

Table 2 *Prevalence of Hydatid Cysts in Different Age Groups of Buffaloes*

S. N.	Buffaloes	Total Sla- ughtered	Hydatid Positive	Liver Positive	% in Liver	Lungs Positive	% in Lungs	Preva- lence rate
1	Male calves	2000	155	98	63.23	110	70.97	7.75
2	Male adults	180	43	25	58.14	38	88.37	23.89
3	Female adults	1052	403	299	74.19	288	71.46	38.31
	Total	3232	601	422	70.22	436	72.55	18.60

Table 3 *Prevalence of Hydatid Cysts in Sheep and Goats*

S. N.	Animals	Total Sla- ughtered	Hydatid Positive	Liver positive	% in Liver	Lungs Positive	% in Lungs	Prevalence rate
1	Sheep	2334	176	104	59.02	110	62.50	7.54
2	He goats	4008	156	99	63.46	100	64.10	3.89
3	She goats	4497	313	158	50.48	193	61.66	6.96
	Total	10839	645	361	55.97	403	62.48	5.95

5. Scientific methods of meat handling and provision of meat inspection services.
6. Proper disposal of offals to prevent dogs gaining access to the raw offals.
7. Safe garbage disposal to minimize the possibility of water and food contamination.

Summary

The carcasses of 14,490 animals slaughtered for meat purpose in Kathmandu valley were examined for hydatid cysts. The prevalence rate was highest in buffalo (18.60%) followed by pigs (15.51%) and sheep and goat (5.95%). The average prevalence rate of hydatid was found to be 9.08%. The hydatid percentage in liver (70.22% in buffalo and 55.97% in sheep and goat) was lower than in lungs (72.55% in buffalo and 62.48% in sheep and goat). Measures for effective control and elimination of hydatidosis in Nepal is suggested:

Acknowledgement

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CLINICAL EVALUATION OF NON-PROTEIN AND PROTEIN SUPPLEMENTED HAEMATINICS IN DOG.

L. L. Dass* P. N. Sahay,* D. K. Thakur,** and B. Singh***

Introduction

Occurrence of anaemia in the dogs is not infrequent. Parasitic infestations, post-operative phase and pregnancy are some of the situations when animals suffer from anaemias of variable magnitude. In the management of anaemias not only iron but proteins also play a vital role because the deficiency of either iron or protein or both has been found responsible for the development of anaemia (Shabaki, 1972). Further, the importance of dietary protein in red blood cell generation has been recognised (Hahn and Whipple, 1979). Though some haematinics contain protein as an important constituent, most of the commonly used haematinics in veterinary practice are devoid of protein. The present investigation furnishes an account of comparative clinical efficacy of non-protein and protein supplemented haematinics in the management of anaemias arising from different situations in 24 dogs of both the sexes.

Materials and methods

24 dogs of both the sexes and age group of 4 to 5 years were selected for this trial. Patients with haemoglobin level less than 10 gm% were considered for the treatment. On the basis of stool examination, appropriate anthelmintics were given for correcting parasitic infestation immediately before the treatment. Two haematinics-Vitcofol, and Probofex were used, the former containing the routine haematinic factors (iron, folic acid, vit. B₁₂) while the latter contained protein hydrolysate in addition.

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One teaspoonful of the haematinic was given daily in the empty stomach in the morning. No food was allowed for 2 hours after the medication in order to avoid variability in absorption due to food. Each haematinic was used in 12 animals and the results of treatment were compared. Haemoglobin (gm/100 ml), P.C.V. (%) and R.B.C. (million/c mm) count were studied in all the patients before the treatment commenced and for the four subsequent weeks at weekly intervals following therapy. The gain in the body weight during this period was also recorded in each case.

Results and Discussion

The changes brought about in the average values of different parameters subsequent to the treatment by the two haematinics have been presented in Table 1. As is evident that the improvement in the levels of haemoglobin, PCV and T.E.C. in response to therapy by the haematinic containing protein fraction was greater at each stage when compared with those of non-protein haematinic therapy. The rise in the haemoglobin in the former group was considerably higher at the end of 4 weeks treatment when compared with base value.

Table 2 reveals the sex distribution of anaemic patients and the gain in body weight. It was observed that the gain in weight after 4 weeks of vitcofol therapy was 0.46 kg and that after probofex was 1.11 kg.

The rise in the level of Hb (3.6 gm%), PCV (7.8%) and RBC (2 million/C mm) after four weeks of therapy with protein supplemented haematinic in comparison to non-protein haematinic (Hb - 2.2 g%, PCV - 4.9% and RBC 1.2 million/C mm) is suggestive of the fact that combination of proteins (as amino acids) serves as a better haematinic than a haematinic devoid of protein. It has been found in human patients that unless serum proteins are corrected, anaemias resist iron therapy alone, suggesting that protein patterns on therapy would alleviate the anaemia without accumulation of iron (Shabaki, 1972). Probably the same interpretation can be extrapolated to canine subjects as well. Further, it has been evidenced that high protein diet causes an increase in the haemoglobin levels on young ones (Kamalanathan, 1970) and as such it is likely that proteins would result into a better rise in haemoglobin levels when combined with haematinics in the treatment of anaemia (Koti and Dabholkar, 1982). The appreciable gain in the average body weight of protein supplement haematinic group (1.11 kg) over

non-protein haematinic group (0.46 kg) after 4 weeks of treatment in this study points towards the rationale of proteins in building up body tissue while combating anaemia.

Hence, on the basis of this study, it is concluded that protein supplemented haematinics are more efficaceous and better suited for satisfactorily combating anaemias as compared to non-protein haematinics in the dogs.

Table: 1. *Effect of the haematinics on the average values of different parameters.*

Type of haematinic	Parameters	Before treatment	After treatment			
			First week	Second week	Third week	Fourth week
Non-protein haematinic	Hb gm%	8.2 (5.5-10)	8.1	8.6	9.3	10.4
	P.C.V. %	21.5 (17-29)	22.2	22.2	24.6	26.4
	R.B.C. millions per C mm	5.4 (4.2-7.1)	5.4	5.8	6.0	6.6
Protein supplemented haematinic	Hb gm%	8.0 (5.8-9.5)	8.4	9.1	10.2	11.6
	P.C.V. %	20.4 (16-30)	21.6	23.2	26.2	28.2
	R.B.C. million/Cmm	5.2 (4.1-6.9)	5.7	6.0	6.4	7.2

Table: 2. *Sex distribution of anaemic patients and changes in average weight after therapy.*

Haematinic	Sex		Average weight before treatment (kg)	Average weight after treatment (kg)
	Male	Female		
Non-protein	2	10	12.40	12.86
Protein supplemented	3	9	13.30	14.41

Summary

Comparative clinical efficacy of non-protein and protein supplemented haematinics in the management of anaemia carried out in 24 dogs of both the sexes. Haemoglobin, PCV and RBC count were studied in all the dogs before and after the therapy. Improvement in the levels of different parameters in response to therapy by the haematinic containing protein fraction was greater at each stage when compared with those of nonprotein haematinic therapy.

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Short Communication

MYCOFLORA IN SOIL OF CATTLE SHEDS AND MILK OF COWS
SUFFERING FROM MASTITIS

V. D. Tamhankar,* D. K. Thakur** and S. K. Misra*

Reports of Monga and Kalra (1972) and Jand and Dhillon (1975) indicate that frequent use of antibiotics increases the incidence and severity of fungal mastitis in bovines. The present work reports the isolation of fungi from milk of cows suffering from mastitis and from the sheds where they were housed.

A total of 17 milk samples from 11 cows suffering from chronic mastitis were obtained from private herds in and around Ludhiana (Punjab). They were treated with different brands of intramammary tubes and did not respond to the treatment even after a month. Important changes noticed in the cow included reduction in milk yield. Presence of flakes in milk was observed in 7 cows. Blood tinged milk was observed in one cow while watery milk was observed in others. The udders were swollen. In majority of cases varying degree of fibrosis of udder was noticed. Systemic disturbances were not observed in any of the affected cows. All the animals had the history of previous intramammary antibiotic treatment.

After thorough examination and cleaning of udder and teats, milk samples were collected from affected quarter and were processed for cultural examination. Samples were thoroughly mixed by rotating the container between the palms of both hands and

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loopful of the content was inoculated on two Sabouraud's Dextrose Agar (SDA) slants containing 0.05 mg/ml chloramphenicol having a pH of 5.6 (SDAC) as indicated by Ajello *et al.* (1966). One slant was incubated at 25 - 28° C and another at 37° C. Microscopic examination of milk was also done. All inoculated slants were observed daily for 4 weeks before discarding as negative. In case of growth, the colonies were transferred to another slants for examination of cultural characteristics and identification.

A total of 7 samples was found to be positive for the fungi. The details are shown in Table 1.

Table 1. Fungal isolates of milk collected from cows suffering from mastitis.

S. N.	Species of fungus	Number of isolates
1.	<i>Candida albicans</i>	1
2.	<i>C. kruei</i>	1
3.	<i>C. parapsilosis</i>	2
4.	<i>Aspergillus fumigatus</i>	2
5.	<i>Sphaeridium</i>	1

The clinical symptoms observed were not distinctly different from those of bacterial infection. Similar observations have been made by Ainsworth and Austwick (1973). It could be stated that the diagnosis of mycotic mastitis in bovine could only be based on repeated isolation of fungus from the milk of affected quarter.

Reduction in milk yield and the presence of flakes and clots were observed to be a common feature in cases of mycotic mastitis in cattle. Similar observations were also reported by Eugebretsen *et al.* (1972)

Species of genus *Candida* were most frequent in causing mastitis (Table 1). Monga and Kalra, (1971), Jand and Dhillon, (1975) and Sharma *et al.* (1977) have also reported that *Candida* species are the main cause of mycotic mastitis. Isolation of *Aspergillus fumigatus* from milk has been reported by Monga and Kalra (1971), Jand and Dhillon (1975) and Walsar and Kleinschroth (1979). Out of 18 samples examined from healthy cows, none was found to contain fungi indicating that fungi are not the normal inhabitant of the udder.

Twenty one samples of superficial soil were collected randomly from the sheds where these cows were housed. The samples were triturated in sterile pestle and Mortar to fine powder. About one gram of the sample was mixed by shaking in about 5 ml of sterile distilled water and 0.5 ml of this suspension was overlaid in petriplate containing SDAC. It was incubated at 25 - 28° C for 4 weeks, examined for fungal growth daily and was transferred to SDAC slant for isolation and identification if found positive. The types of fungi isolated were shown in Table - 2.

Table 2: Isolation of different fungi from soil samples collected from the bovine shed and dairy premises.

S. N.	Name of the fungus	Number of samples
1.	<i>Aspergillus</i>	2
2.	<i>Aspergillus and Penicillium</i>	2
3.	<i>Aspergillus and Mucor</i>	9
4.	<i>Aspergillus, C. tropicalis and Mucor</i>	1
5.	<i>Mucor and Penicillium</i>	2
6.	<i>Aspergillus, Candida albicans and Penicillium</i>	1
7.	<i>Aspergillus, Rhizopus and Penicillium</i>	4
Total:		21

Investigation on soil samples from different bovine sheds and premises revealed that most of the samples contained moulds like *Aspergillus*, *Penicillium*, *Mucor* and *Rhizopus* as compared to the yeasts like *Candida albicans* and *Candida tropicalis*. Above mentioned moulds were predominant in all the soil samples examined. Earlier worker was also of the view that moulds were in predominance in soil microflora (Ainsworth and Austwick (1973).

C. albicans and *C. tropicalis* were isolated from only one soil sample each. The evidence that yeasts are present in soil is well documented (Ghosh *et al.*, 1976). The findings of this study indicate the presence of *C. tropicalis* in soil of dairy premises which may have been from the faecal material of dairy animals. The source of *C. albicans* could be the sputum of human beings visiting the dairy farms since it

has been reported to be a normal saprophyte from 30% in the oral cavities of human beings (Baum, 1960) or from excreta of varieties of animals including pigeons (Hesenclever and Kocan, 1975).

Present finding could be of significance as far as the epidemiology of mycotic mastitis in bovine is concerned. For the production of mycotic mastitis it seems that introduction of infection from exterior to the interior of the udder either from the environment or from within the body is necessary since the fungi isolated from clinical cases were not the normal flora of the healthy udder.

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DETECTION OF FASCIOLA EGGS IN FAECES - A COMPARISON OF METHODS.*

A. M. Morel**

The Prevalence rates of liverfluke infestation in cattle as detected by faecal egg output were found to vary greatly in two different years in which they were studied. The variation was greater than could be explained by climatic changes. The obvious difference was in the technique used for faecal examination - in the one case the differential flotation method described by Sewell and Hammond (1972) and in the other, the flotation method described in the Ministry of Agriculture, Fisheries and Food, Technical Bulletin No 18 (1977).

This disparity was studied in the following trial.

Materials and Methods

489 faecal samples collected from cattle were analysed by both flotation methods. 39 samples were analysed by the differential flotation method and the sedimentation technique (Macleod, *et al* 1981). 32 samples were subjected to replicate tests using the differential flotation method. The number of samples positive to each test and the number of eggs per gram (e.p.g.) were recorded.

For both flotation methods, 3 grams of faeces was macerated in 45 mls water and passed through a coffee strainer. 15 ml aliquots were then centrifuged briefly at 1500 r.p.m. and the supernatant discarded.

* Experiment conducted at PAC, Pakhribash, Dhankuta

** Pakhribash Agricultural centre, Pakhribash, Dhankuta

In the differential flotation method, saturated salt was added to the sediment, stirred, and the tube recentrifuged. The supernatant was again discarded and the tube filled with zinc sulphate solution (specific gravity 1.3) and topped off to form a meniscus. Transparent adhesive tape was applied and the tube again centrifuged. Finally, the adhesive tape was removed vertically, placed on a microscope slide and the fluke eggs counted.

In the flotation method, after decanting the water, saturated zinc sulphate (sp. g. 1.5) was added to the tube, stirred and topped off to form a meniscus. Adhesive tape (in place of the glass cover-slip described in Technical Bulletin No 18) was applied and the tube centrifuged. The tape was mounted on a microscope slide and the fluke eggs counted.

For the sedimentation technique, 3 grams faeces was macerated with water and passed through a coffee strainer into a 100 ml cylinder. This was filled with water and allowed to stand for 30 minutes. The supernatant was discarded and the sedimentation repeated twice more. The sediment was finally poured into petri dishes and all the eggs counted under a binocular microscope.

Results

The flotation technique was qualitatively and quantitatively 44.8% and 24% as sensitive as the differential flotation technique, the latter being 74% as sensitive qualitatively and 89% as sensitive quantitatively as the sedimentation technique. Variation within the differential flotation technique was low for both detection of positive samples (4.1%) and faecal egg count (6.0%). The comparison of the different techniques are shown in Table 1.

Table 1 - Comparison of liverfluke egg counting techniques for cattle faeces.

Number of samples	: 489 :	Number of samples	: 35 :	Number of samples	: 32 :
Percentage (%) positive using differential flotation.	: 51.3 :	Percentage positive using differential flotation	: 48.6 :	Percentage positive using differential flotation	: 71.9 :
Percentage positive using flotation	: 23.0 :	Percentage positive using sedimentation	: 65.7 :	Percentage positive using differential flotation (replicate)	: 75.0 :
Number of samples positive using flotation as % of number positive using differential flotation	: 44.8 :	Number of samples positive using differential flotation as % of number positive using sedimentation	: 74.0 :	Variation within test (%)	: 4.1 :
Mean number e.p.g. using differential flotation	: 9.6 :	Mean number e.p.g. using differential flotation	: 6.5 :	Mean number e.p.g. using differential flotation	: 9.4 :
Mean number e.p.g. using flotation	: 2.3 :	Mean number e.p.g. using sedimentation	: 7.3 :	Mean number e.p.g. using differential flotation (replicate)	: 10.0 :
Mean number e.p.g. using flotation as % number positive using differential flotation	: 24.0 :	Mean number e.p.g. using differential flotation as % of number positive using sedimentation	: 89.0 :	Variation of egg count within test (%)	: 6.0 :

Discussion

The disparity in results comparing the differential flotation technique with the flotation technique may be explained by considering the specific gravity (sp. g.) of *Fasciola* eggs and the test solutions. *Fasciola* eggs have a sp. g. of greater than 1.18 and will sink in saturated salt solution (sp. g. 1.18). *Fasciola* eggs will float in saturated zinc sulphate solution (sp. g. 1.5), but as the *Fasciola* shell is semi-permeable and weak, liquid leaves the egg by osmosis and the resulting negative pressure within

the egg causes it to collapse, thus raising the sp. g. of the egg which eventually sinks. Using zinc sulphate sp. g. 1.3 this process takes longer. If the eggs are washed first in saturated salt solution, they swell slightly and float for a maximum amount of time in zinc sulphate solution sp. g. 1:3 and are thus most readily caught on adhesive tape.

Less faecal debris adheres to the adhesive tape using the differential flotation technique.

Although the sedimentation technique is the most accurate of the three tests, it is laborious to perform and the differential flotation method is preferred for rapid screening, especially as the same samples can be used in the Modified McMaster egg counting technique for the quantitative estimation of nematode eggs. This is not so for the flotation technique which is, moreover, the least sensitive of the three tests.

Summary

Differential flotation, flotation and sedimentation techniques for the detection of liverfluke eggs in cattle faeces were assessed.

The sedimentation technique was found to be the most sensitive, both qualitatively and quantitatively and the flotation technique the least sensitive.

Owing to the laborious nature of the sedimentation technique the differential flotation method is preferred for rapid screening.

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SALMONELLOSIS IN RABBITS

Adarsh Pradhan*

Disease caused by different Serotypes of *Salmonella* species is known as Salmonellosis. Typhoid, Paratyphoid, several types of food poisoning and gastroenteritis are outcome of salmonella species in man and animals. As several salmonella species are common to man and vertebrate animals it is one of the major zoonotic problem.

Several species of salmonella organisms has been recovered from the intestinal tract of both healthy and clinically sick animals and birds. Human, animal and poultry excreta are the dangerous source of salmonella. The poor sanitation in developing countries is of a great epidemiological significance (Buxton 1957). Control or elimination of the disease in man, mostly depend upon adequate control and prevention of infection in animal reservoir. Salmonellosis is a major food and water borne infection. Meat, milk, eggs and other food contaminated with excreta is an important source of infection in man and animals.

Salmonella typhimurium at time has been found associated with serious disease problem in ducks, poultry and rodents (Buxton 1957). The disease takes fatal course in animals (Hunter *et al* 1976). These organism can survive in drinking water for several days. Stored feed contaminated by rodent droppings can lead to outbreak of *S. Typhimurium* (Hunter *et al* 1976). *S. typhimurium* can live in soil for more than 12 months (Lerche 1939).

Materials and Methods

In July 1984, 14 rabbits died within a month in Laboratory animal Unit of Biological Products Division, Tripureswar. Postmortem examination of these rabbits

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were conducted in Central Diagnostic Laboratory, Tripureswar. On postmortem, moderate congestion of Liver and Lungs were noticed. Coccidial oocysts were also recovered in the intestines. Liver, spleen, Lungs and heart blood samples were collected aseptically for bacteriological examination.

Different selective medias such as Brilliant Green Agar (BGA), Bismuth sulphite Agar (BSA) and Desoxycholate Citrate Agar (DCA) along with routine Blood Agar, and Macconkey Agar were used for isolation of the bacterial organism.

Inoculated media were incubated at 37°C for 18 hours and the isolates from different culture plate were examined for morphological features and biochemical activities. Culture of organism from salmonella suspected colony on Triple Sugar Iron (TSI) Agar slant was sent to the public health laboratory, Teku, for slide agglutination test which is the available confirmation test for salmonella.

For pathogenicity test a few colony from the pure culture of the isolate obtained were emulsified in 3 ml sterile normal saline. 0.2 ml of the emulsion was inoculated intraperitoneally in 4 mice aged 4 weeks and one mice was inoculated with 0.2 ml of normal saline as control.

To study the drug sensitivity pattern of the organism antibiotic disc method was applied. The sensitivity of the organism was read from the zone of inhibition of growth around the disc after incubation at 37°C for 18 hrs.

Results

Microscopic observation of primary slides of liver emulsion revealed gram negative rods. Growth of bacterial colony observed on general media as well as selective media such as BGA, DCA and BSA.

On BGA, the organism turned the medium bright pink and the colonies of the organism were pale pink about 2 mm in diameter, shining and having sharply defined edge. On BSA, Colonies were black with a distinct metallic shine. The colonies were about 2 mm in diameter. On DCA, Colonies were about 1 mm in size. Suspected colonies when transferred to TSI Agar slant and incubated for 18 hours produced hydrogen sulphide. The organism was gram negative rod, aerobic, citrate positive and motile.

Slide agglutination test was positive for *S. typhimurium* E. Three test mice were found dead next morning and the control was alive. The isolate was sensitive to chloramphenicol, moderate sensitive to tetracycline and oxytetracycline and resistant to penicillin.

Discussions

The disease which caused death of several rabbits proved to be *S. typhimurium* E. The organism was highly pathogenic to mice. Antibiotic therapy controlled the disease in rabbit colony.

Several factors can be considered in transmission of the disease. Man can also act as carrier and the disease can be transmitted from attendant to the rabbit.

Rats have free access to the animal house. Droppings of rats are potential source of infection. Risk of contamination of feed with dropping of rats can not be ruled out. To minimise the risk of the disease there is a need to improve the management.

Summary

In the present study, potentially pathogenic strain of *Salmonella typhimurium* was recovered from clinically sick rabbits. Some of these rabbits on postmortem were found infected with coccidiosis. The gross lesions observed were moderate congestion of liver and lungs. The isolates were highly pathogenic to laboratory mice. The organism were identified on the basis of morphology, biochemical properties, pathogenicity and serological characters. The isolates were highly sensitive to chloramphenicol.

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A STUDY ON THE IMMUNOLOGICAL ASPECT OF FOWL POX VACCINE IN NEPAL

T. N. Vaidya*

Fowl Pox Vaccine is being used in Nepal since the last two decades. The major source of Fowl Pox Vaccine are Biological Products Division (BPD), Kathmandu and Indian Veterinary Research Institute (IVRI) Izatnagar.

Both the institutes produce egg adopted fowl pox vaccine which protects the birds 15 days after the vaccination and can be given safely to the birds of age 5 weeks and above, (Nilakantan *et al* 1960). The vaccine strain of Fowl Pox virus is practically harmless even at 100 times the protective field dose (Bengelsdorff *et al* 1962).

The severity of cutaneous lesion in chicks affected by Fowl pox virus is directly related to the virulence of the FP virus strain. Hundred percent mortality may occur in young chicks with cutaneous lesion of warty growth on face, legs, claws and beaks (Prasad *et al* 1967). Outbreaks of F.P. with cutaneous lesions and marked reduction in egg production was reported in 12 vaccinated flocks 3-4 months post vaccination (Dhaneswar 1976).

In the year 1976, severe outbreak of FP occurred in different parts of Nepal including Kathmandu valley with significant drop down in egg production and cutaneous lesion even among vaccinated birds. In the same period, day old pure line White leg horn and New hampshire chicks arrived in Kathmandu from Israel and USA respectively.

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Rao *et al* (1958) studied the effect of fowl pox and pegion pox strains as vaccine in day old chicks. To protect these chicks from virulent fowl pox virus, a special vaccine using pegion pox strain was freshly prepared in BPD and the chicks were vaccinated. Again at the age of 8 weeks these birds were vaccinated with FP vaccine. Several of these chicks died due to omphalitis and coccidiosis. Soon after many birds also developed fowl pox and within a period of 6 months nearly 50% of the birds died. This experiment was carried out to study the immunogenicity of the vaccines. Attempts were also made to compare the immunogenicity of local vaccine (BPD) with that of Indian vaccine (IVRI).

Materials and methods:

The study was carried out in two parts.

Part 1. : Pegion pox virus strain vaccine as alternate to Fowl pox vaccine during outbreak of fowl pox.

A. Testing of vaccine:

Twelve days old embryonated eggs were candled and 30 eggs with viable embryo were selected for the experiment. These eggs were grouped in three groups of 10 each.

Two ampules of fowl pox vaccine, one from each source IVRI and BPD were reconstituted in chilled distilled water containing antibiotic in the routine way. Each of the 10 embryos in one group were inoculated with 0.1 ml of IVRI vaccine through chorioallantoic membrane (CAM) route in the same manner, other two groups of 10 embryos each were inoculated with BPD vaccine and virus material (prepared from scabs) from field outbreaks respectively. All 30 eggs were incubated at 37° C for 96 hours with periodic observation.

B. Biological test in live chicks:

Thirty, 3 weeks old chicks were selected from a flock which was vaccinated with pegion pox strain virus vaccine (at 2 day old) and separated in three groups of 10 each.

Groups one, two and three were inoculated with IVRI, BPD vaccines and reconstituted virus material (Scab) from outbreak cases respectively through wing web route.

The results of the experiment part one (A and B) are presented in table 1.

Part 2. Comparison of immune response of FP vaccines produced at IVRI and BPD respectively.

Fifty, 7 weeks old male commercial chicks were procured for the experiment and arranged in 5 groups of 10 chicks each. First and second groups were vaccinated with IVRI vaccine. third and forth with BPD vaccine through wing web route. The last group was left unvaccinated as control.

At the age of four months, group 1 and 3 were revaccinated with IVRI and BPD vaccines respectively. All five group of birds at the age of 10 months were challenged with virulent fowl pox virus strains from field outbreak. The observations are tabulated in the table 2.

Results and discussion

Both IVRI and BPD vaccines showed nearly similar reaction (50% and 40% mortality respectively) where as outbreak strain of virus proved to be highly virulent (100% mortality) in chick embryos. In the live chicks which were previously vaccinated with pegion pox strain virus vaccine the result with IVRI and BPD were immunologically identical. No takes formation, may be because of residual antibody level. In the third group which was challenged with field strain of virus, 3 out of 10 birds exhibited pox lesions indicating that the level of protective antibody is not enough to provide 100% protection to a challenge by virulent virus strains. Results of this experiment is in confirmity with Rao *et al* (1958). Major death in the Govt. farm could be the result of combined effect of omphalitis and coccidiosis as well as these diseases can also lead to the stress condition and supression of the immune system. The interaction of these complication and the age factor, most probably could have adversely affected the immunity in chicks leading to the development of pox lesion in the farm condition inspite of the vaccination with pegion pox virus vaccine. Non development of lesions in majority of birds in the same flock is suggestive of the existence of immune activity in rest of the vaccinated chickens.

This experiment shows that pegion pox virus vaccine can be an alternative to fowl pox vaccine in event of emergency.

Table 1. *Effect of Fowl Pox Vaccine Strain and field Strain virus on the chick embryos and three weeks old chicks vaccinated with Pegion Pox Vaccine.*

	Experiment A		Experiment B	
	In Embryonated eggs		In 3 weeks old chick	
	Number of eggs survived/Number of eggs inoculated in 96 Hours	Description of the average Pock lesion on CAM	No of chickens inoculated.	Reaction Post inoculation.
IVRI Fowl Pox Vaccine	5/10	Diffuse and discrete; thick pock lesion at the site of inoculation, size 3x2 cm.	10	No takes
BPD Fowl Pox Vaccine	6/10	Discrete and confluent Pock lesion at the site of inoculation, size 4x4 cm.	10	No takes
Local field strain of fowl pox virus (Khumaltar material)	0/10	No lesion as all embryos found dead.	10	No takes, but 3 developed pock lesion at the beak from 7th day of inoculation

Table 2. *Effect of Fowl Pox Virulent Virus on vaccinated and control birds.*

	:	Fowl Pox vaccine	:	Fowl Pox vaccine	:	Control
	:	from IVRI.	:	from BPD.	:	
	:		:		:	
No of chicken	:	10	:	10	:	10
At 7 weeks	:	vaccinated	:	vaccinated	:	vaccinated
	:	by w/w	:	by w/w	:	by w/w
	:	puncture	:	puncture	:	puncture
Description of	:	red to	:	red to	:	red to
vaccination reaction	:	yellow	:	yellow	:	yellow
	:	swelling as	:	swelling as	:	swelling as
	:	takes	:	takes	:	takes
At 4 months	:	revaccinated	:	—	:	—
Description of	:		:		:	
vaccination reaction	:	no takes	:	—	:	—
At 10 month challenged	:		:		:	
all with fowl pox	:	challenged	:	challenged	:	challenged
virulent virus	:		:		:	
Site of challenge	:	faint	:	reddish	:	Slight
	:	reddish	:	swelling but	:	reddish
	:	swelling	:	no takes	:	reddish
	:	but no	:		:	swelling as
	:	takes	:	but no	:	takes
	:		:	takes.	:	generalised
	:		:		:	infection
	:		:		:	with promi-
	:		:		:	nant
	:		:		:	swelling
Beak	:	no lesion	:	few erup-	:	pox eruption
	:		:	tion	:	and scab for-
	:		:		:	mation.
Wattle	:	no lesion	:	few	:	scab
	:		:	eruption	:	eruption
	:		:		:	formation
comb	:	no lesion	:	few	:	reddish
	:		:	eruption	:	swelling and
	:		:		:	scab
	:		:		:	formation.

Experiment part two showed identical immunogenic properties between IVRI and BPD vaccines. No takes developed when revaccinated at 4 months indicating good level of antibody in both IVRI and BPD groups. When challenged at 10 months of age also group 1 and 3 did not exhibit takes. Further group 1 and 3 which were revaccinated with IVRI and BPD vaccines at 4 months were free from the lesion. Where as group 2 and 4 developed few eruptions, control developed full clinical pox lesions. This observation clearly indicaties the fading trend in immune response with the time. The need of revaccination for better protection was illustrated through this experiment. These findings are in full agreement with the finding of Rao *et al* (1958) and Tripathy *et al* (1978).

Conclusion & Summary.

Some level of immunity to fowl pox was detected in chicks vaccinated with pegion pox virus vaccine. The vaccine from IVRI and BPD had identical immunogenic properties. Revaccination of the chickens was found to be more effective in maintaining high level of immune response.

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LIVESTOCK AND ENVIRONMENTAL ISSUES AND SUGGESTED TOPIC FOR FUTURE RESEARCH.

Tulsi Prasad Shrestha.*

I. A Review of The Existing Livestock Situation In The Country

1. Role of Livestock in Rural Life

Livestock farming is an integral part of the socio-economic life of the Nepalese people. Livestock, mainly cattle and buffaloes, and to a lesser extent sheep, goats, pigs and poultry are raised by most farm families for milk, meat, draught power, wool, eggs and manure. Bullocks, male buffaloes and horses are used as transportation in the terai, whereas mules, chauries and even sheep are used as pack animals in the hills.

Fertility of soil is traditionally maintained by the use of organic residues from the arable land supplemented by animal manures and compost. Dung is also used as a source of energy in place of firewood mostly in terai.

The sale of live animals for slaughter and/or draught power together with their products, primarily milk and ghee provides farmers with a major source of cash income.

As a whole, livestock has a significant impact on the household economy. There is an important economic flow from livestock: to crop production as manure, farm power and transport; to household as milk and milk products, meat, eggs, cash income and employment; and to market and industries as surplus milk and milk products, live animals, meat, eggs, wool, hides, skins and bones. There are inputs received to maintain the economic flow to livestock: from crops as grains and crop residues; from pasture as grasses and grazing; from forest as fodder and grasses; and finally

* Agricultural Projects Services centre (APROSC), Kathmandu (Nepal).

from the household as capital inputs and labour. Hence, livestock farming is closely interdependent with various related components and is responsible for causing major interactions between them.

2. Relationship Between Livestock and Environment

In the past, when human and livestock populations were not competing for arable land, adequate cultivated lands were available for crop production, and sufficient greens, fodder and roughages were available for livestock. During that period these components were supporting each other: livestock providing manure to the farms and the farms providing greens and crop residues to livestock. As the populations of both human and livestock started increasing tremendously, they began relentlessly destroying the pastures and forests for survival. Consequently, an environmental imbalance was created resulting in soil erosion, shortage of fodder and firewood supply and a reduction in food production.

The supply of pasture, forage and fodder is critical in Nepal as it is not uniform throughout the year. Animals closer to forest areas can graze for longer period than animals from other regions. Under present conditions, pastures are just sufficient enough to feed animals during the rainy season from July to September, and during October and November the coarse grasses, which have been previously neglected, will be eaten. The most critical period lies between January to June when there is no grass available except sub-minimal supplies of fodder leaves, straws and other roughages.

No cultivated land is devoted to, nor could it be spared for, forage production. However, in the southern terai border, where irrigation facilities exist, winter forage is sometimes grown in small amounts due to the positive influence of northern India. Berseem (*Trifolium alexandrinum*), cow pea (*Vigna sinensis*) and bajra (*Pennisetum typhoides*) are mostly grown to feed lactating and working animals during winter.

In the hills, most farm holdings have their own fodder trees to supply feed for animals during the winter. The number usually varies according to the availability and proximity of forest fodder. An adult cattle receives fodder leaves from about 3.2 trees in small land holding, 3.7 trees in medium land holding and 5.3 trees in large land

holding (Dutta, 1979). This indicates that small and medium size farmers fetch forest fodder more often than large farmers in the hill regions. In terai, fodder trees are not grown, so animals must survive without green feed during the critical period.

Crop residues in the form of straw, mostly rice and to a lesser extent wheat, are fed to animals. The lactating and working animals receive chopped straw, maize mixed with bran from rice, wheat, oilseeds and pulses and some oil cakes.

During January to March, maximum tree fodder is collected from the forest. Since these resources are treated as common property, people over use them (Wallace, 1981). Uncontrolled grazing and frequent collection of forest fodder and firewood have further accentuated the problem of environmental deterioration (Shrestha, 1979).

Livestock feed supplied by crop residues, fodder trees, forests and range lands are inadequate and the quality is so poor that the nutritional requirements of the ruminants are never met. These sources could supply only 54 percent of standard nutritional requirements (Rajbhandari and Shah, 1981). During the dry season, animals live in semi starved conditions which is mainly responsible for the reduction in their prolificacy and productivity. Under these conditions, animal breeding programmes are unsuccessful; therefore, feed resources need to be improved to the optimum level of requirements. The genotype environmental interaction should be avoided.

3. Environmental Supports

Cultivated Land: There are 3.13 million hectares of cultivated land in the country (The Sixth Five Year Plan, 1981) which provides straw and stubble from rice, wheat, maize, millet and other leguminous crops. In addition, green grass and weeds are available in terrace risers and bunds during the summer and rainy season along with fodder leaves from fodder trees around the homestead garden during winter. The crop land contributes 28 percent of the total feed available and the rest 72 percent of the feed must be found outside the farms. The terrace risers and bunds which constitute about 24 percent of the total crop land is a significant source of green grass. Introduction of high yielding varieties of grass along with legumes in terrace risers and bunds, and relay cropping in portion of irrigated land such as cash crops will increase

fodder production. The planting of nutritious fodder trees will increase the supplies of fodder during winter. Conservation of surplus green grasses in the form of hay/silage will also increase the efficiency of grass utilization, and the conserved grass could be stored for use during critical periods.

Forest: Lack of alternative feed resources has forced farmers to utilize forests extensively for grazing and the lopping of fodder leaves. Continuous felling of trees for timber and firewood and reckless grazing and lopping of fodder leaves and seasonal burning have resulted in the deterioration of forest lands. Currently, about 23 percent of the total feed available comes from 4.10 million hectares of forest land. The carrying capacity of this land is estimated at 0.31 percent livestock unit per hectare and the stocking rate is about 9 times more than its carrying capacity.

Range Pasture: There is 1.8 million hectares of permanent meadows and pasture land which is 12.66 percent of the total land area in the country (The Sixth Five Year Plan, 1981). Range land alone constitutes 15 percent of the total land mass and contributes about 35 percent of the total feed available. It is distributed in three forms: the alpine meadows (57%), the steppe (10%), and open grazing land (33%).

These grazing lands are also under intense pressure. Continuous overgrazing gives little chance for the regrowth and regeneration of palatable species and these are replaced by non - edible species like Eupatorium and Rumex. The burning of open grazing land, frequently practiced, has reduced the chances for natural reseeding of desired species.

Waste Land: At present, 14 percent of the feed requirement comes from waste land.

4. Livestock and Environmental Issues.

a) *Livestock:* The estimated livestock population * for 1985 is as follows:

Livestock	Number in Million	Percent Distribution in		
		High Hills	Mid-Hills	Terai
Cattle	6.38	13.54	51.24	35.22
Buffalo	2.83	9.49	58.56	31.95
Sheep	0.68	40.27	43.98	15.75
Goat	4.82	14.75	55.94	29.31
Pig	0.44	11.30	58.70	30.00
Poultry	8.43	9.68	65.59	24.73

* Department of Food and Agriculture Marketing Services, 1985.

The average rural household of 5.8 persons keeps an average of 2.5 cattle, 1.10 buffaloes, 0.23 sheep, 1.59 goats, 0.13 pigs, 2.80 poultry.

Presence of large number of low producing livestock in the country and holding maximum number of animals per household have created enormous problems to the farmers, environment and nation as a whole.

Livestock distribution figures indicate that a large proportion of livestock population (about 56%) is concentrated in the mid-hills which is followed by terai and high-hills. Among the cattle and buffalo population, the highest percentage is concentrated in western mid-hills, whereas the large proportion of sheep is concentrated in mid-western high-hills. Goats and poultry are highly concentrated in mid-hills of central development region, whereas pigs are mostly concentrated in eastern mid-hills. As a whole, the situation is much more severe in mid-hills where the maximum percentage of human population (slightly over 46.6%) is dwelling in a limited area of cultivated land (less than 43% of the total cultivated area).

Selection among animals is not practiced and the technical know-how is not properly propagated to the farmers. The important developmental activities such as livestock extension, training and marketing aspects are not either affectively organized or too inadequate for significant change.

b) Environmental: People have relentlessly destroyed the forest and pastures and expanded the marginal and range land under cultivation for meeting their requirements. Again, continuous collection of enormous quantity of fodder, firewood, poles and timber has resulted in a wide circle of denuded hill mostly around the villages. The long-term consequences of environmental degradation is disastrous for the country while the worst impacts already noted are lower agricultural productivity, increase in the rural household energy and animal feed crisis, and soil erosion. Soil erosion is also caused by heavy monsoon, intensive faulty agricultural practices on steep slopes, shifting cultivation, overgrazed pasture and forest lands and rapid deforestation. The young age of the mountains and the steep terrain are also responsible for soil erosion.

The annual erosion rate has been estimated at 8 mt/ha for forest covered land, 15 mt/ha for scrub land, 30 mt/ha for grazing land and 10 mt/ha for terraced land

(Fleming, 1978). The annual soil losses are estimated at 9.4 mt/ha for pasture land and 34.7 mt/ha for overgrazed grass land in Phewatal Catchment (Mulder, 1978). The figures of soil loss cannot be generalized for all of Nepal as these were reported on the basis of limited study, and the catchment lies in the heaviest rainfall area in Nepal.

5. On - going Government Programmes

The government of Nepal has realized the rapid deterioration of the ecological balance throughout the country, and the following programmes have been initiated:

- i) FAO/UNDP assisted Watershed Management Project is being launched and some site - specific watershed development projects have been implemented.
- ii) The community forest project which was started in 1980 has begun to return some of the forest land to panchayats as Panchayat Protected Forest and has cleared barren land for establishing Panchayat Forest.
- iii) USAID assisted Resource Conservation and Utilization Project has been implemented in Gorkha, Mustang, Myagdi districts. The project aims at protecting the environment through reforestation, pasture development, alternative energy source development, improvement of agriculture and watershed management.
- iv) Integrated Rural Development Projects which are under implementation include reforestation and management of natural resources as major components.
- v) HMG/N is also trying to restore a balance through an annual massive afforestation programme.

All these projects have long - term impacts and continuous coordination from all related agencies is essential.

II. Suggested Topic For Future Research

1. Livestock

The effect of livestock population pressure on forest, pasture and cultivated land

is creating serious environmental deterioration. In order to protect the environment, livestock research could be conducted with the following broad headings:

- determination of ecologically potential and appropriate livestock farming;
- determination of performance levels of different species under the prevailing conditions of feeding and husbandry and assess their production potential under improved systems of feeding and management;
- successful ways and means of population control and importance of selection;
- determination of damages caused by free grazing versus stall feeding;
- determination of size and composition of livestock according to the land holding and possibility of imposing livestock tax system above certain level of holdings;
- potential of developing feed resources centres in various ecological regions, production of sufficient suitable extension materials of better quality, ways and means of protecting environment, production of adequate feed for livestock for winter critical period, efficient utilization of these feeds;
- possibility of conserving surplus grass for future use and production of seasonal grass and legumes for hay/silage;
- effects of disease control on productivity; and
- development of markets for livestock and livestock products.

2. Cultivated Land

Livestock utilize cultivated land for food in the form of grass, fodder, crop residues, grains and grain byproducts such as brans, meals, cakes and straws. The following research is essential to expedite the integration of livestock farming:

- ways and means of increasing productivity of crops, crop residues, grass and fodder in terms of quality and quantity and their efficient utilization;

- appropriate technology determination for ecologically safe cropping pattern for increasing soil fertility, productivity and income considering pricing policies and markets;
- introduction of technology of relay cropping/forage catch crop for grass and legumes production from arable and fallow lands;
- maximum utilization of terrace risers and bunds for producing ecologically suitable grass and fodder trees;
- training of enrichment of coarse roughages - straws and their benefits on livestock nutrition - both maintenance and production.

3. Forest

Forest is a source of timber, poles, firewood, fodder and medicinal plants. The forest is thought of as common property, and continuous overexploitation by large numbers of people and livestock have severely deteriorated its condition. Following research headings are proposed to protect it from the harmful effects of livestock:

- ways and means to eliminate the concept of common property: identification of resources for converting common property into private property, expansion of activities on returning some of the forest land to the panchayats as Panchayat Protected Forest and clear barren land for establishing Panchayat Forest;
- establishment of productive ground vegetation on non-arable privately or publicly owned lands in ecologically different locations.
- prohibition and protection of forest from fire and grazing;
- protection of all plants planted under reforestation and afforestation programmes;
- protection of forest fodder trees from relentless felling;
- fencing the forest. A managed forest produces 5000-7000 kg/ha/year of fodder and unmanaged forest 2000-3000 kg/ha/year, a ratio of two and a half to one; and

- reduction of dependency of urban centres on forest for fuelwood supply, study on alternative energy sources -- their potential, economics and pricing policies.

4. Pasture

Pasture is another important food source for livestock. It is mostly overgrazed, as a result, palatable species are disappearing, replaced by non-edible species. In the absence of adequate surface cover, erosion has taken place. The following research should be considered in order to initiate proper protection and increased productivity:

- development of community pastures at denuded hills around villages motivating large number of people and their participation;
- fencing of pastures for increasing productivity and allowing animals for rotational and controlled grazing. An enclosed and managed pasture produces 6000 kg/ha/year of green fodder while free grazing land produces about 1200 kg/ha/year, a ratio of five to one;
- protection of pastures from fire and overgrazing;
- revegetation and/or upgrading of mountain pastures by introducing high yielding cereal and legume grasses seed and fertilizer application in patches;
- determination of carrying capacity and limiting to it;
- restriction of free-range grazing
- optimum production of green forage and winter fodder; and
- ways and means to discourage expansion of cultivated land from forest, marginal and range land.

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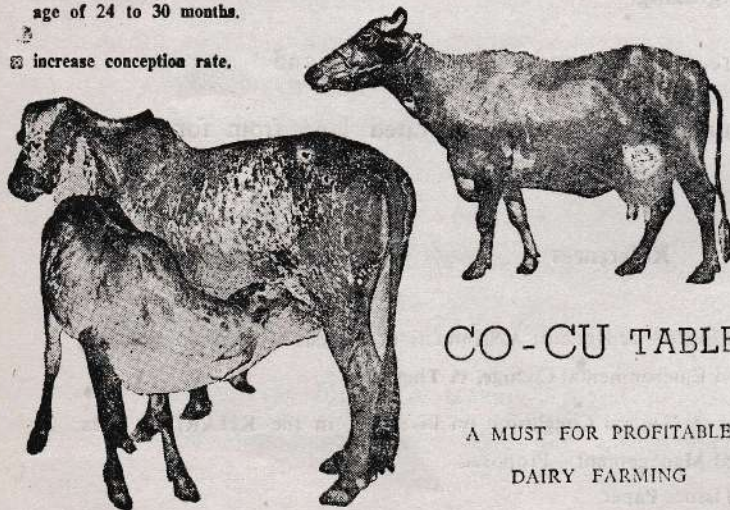
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MIGRATORY SYSTEM SHEEP RAISING IN GANDAKI ZONE OF NEPAL

N. P. S. Karki*

The Tibeto - Burman ethnic group "Gurung" are the pioneer pastoralist in raising sheep under migratory system in Nepal. Exceptions exist in far Eastern and Western mountainous region of Nepal due to the restricted movement of the tribe as it is mainly settled in Mid Eastern and Western region only. They are by any standard not only wool producer but are also good skill workers in processing wool for making blankets and other clothes.

An unique situation exist in far Western region where sheep are valued for pack animals rather than wool and mutton production. These animals carry cereal grain from Tarai to the higher hills and also walk to Tibetan border for bringing common salt.

Transhumance system of sheep keeping evolved in the world almost near the process of domestication of animals and survives still for thousand years in the mountainous region without going through much changes from its original characters (Own 1976). In Nepal, this system remains unchanged due to heavy interdependancy on crops and livestock. Also, wide range of agro - climatical condition imposed as result of altitude variation in the mountain, and shortage of arable and pasture land is allowing the system to exist.

In most hilly parts on the Northern side, there are snow capped peaks either from greater Himalayan range or lesser Himalayan range above snow line (approx 16,000 ft msl). Below snow line and above tree line there is grass growing area in

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mountainous slope which forms the alpine pasture for sheep grazing. Between the villages and alpine pasture the forest covered area is the main feed source and is described hereafter summer pasture. Migratory system is useful in using animal feed resources available far away from the village area.

On the priority basis, sheep are valued for wool production and manuring arable field during winter and autumn. Increased market price on meat is giving enough incentive on this aspect of production, however the system is not very efficient due to managerial difficulties and rampant disease problems. Twenty two diseases are considered prevalent (Shukla 1973) but there are many more to be considered.

Sheep enterprise in Nepal although looks independent from the point of view of uses of alpine pasture, it is not out of the complexity of total agricultural system. Hence, detail understanding of the interaction of the different components is much more desirous before some synthesis of biological models are attempted for improving migratory system of sheep keeping in Nepal.

Sheep population

In Gandaki Zone alone, there are altogether 28,068 Baruwal sheep and 18,319 Sindhal goats in 224 flocks in the migratory system. A group of flocks from a particular area tend to be together in alpine and winter pasture and hence, with such grouping Table 1 has been worked out.

Mostly one flock does not belong to one individual person, it comprises of animals from 7 -- 15 households. Such household joining the flocks depends upon either on family relationship with shepherd or from the availability of flocks for manuring field on its up and down movement.

Table 1. - Sheep and goat population in Gandaki Zone

S. N.	Flock Reference	Flock Nos.	No. of sheep	No. of Goats
Kaski				
1	Ghandruk Group	15	2865	1471
2	Ghachok/Mrisa	7	1114	527
3	Chyanglung	4	593	308
4	Siklis	9	1643	1065
5	Tangting	4	738	396
Total =		39	6953	3767
Lamjung				
6	Singdi/Pasgaon	5	932	363
7	Bhujung	4	1005	549
8	Ghalegaon	6	681	507
9	Ghanpokhara	4	751	697
10	Seurung/Dhagai	10	950	1114
11	Chipla	7	623	946
12	Sanjabu	4	425	432
13	Bhirpustang	4	512	502
14	Usta/Khasur	7	382	338
15	Tap	8	743	481
16	Phaleni	8	395	351
17	Semi/Taje	5	555	527
18	Nauthar	11	892	844
19	Charthar	16	1349	1074
Total =		99	10195	8725
Gorkha				
20	Hanspur	4	481	152
21	Barpak	9	1539	624
22	Laprak	28	3336	1245
23	Nyak/Pangby	24	4166	2083
24	Keraunja	2	257	56
Total		67	9779	4160
25	Manang	19	1141	1667
Grand Totals =		224	28068	18319 = 46,387

Population change

It was worked out from the verbal information from the shepherds that population decreased at the rate of 3.13% annually. Most of the villages not having rights on alpine pasture has given up sheep keeping. However, data analysed from footrot eradication work (Table 2,) indicates some improvement. According to the table, sheep population increased by 2.07% and goat population decreased by 1.16% annually. It may be the result of footrot team offering treatment to these animals. Goat population fluctuate due to heavy toll of mange and diarrhoea.

Table 2- *Change in sheep and goat population in migratory flocks.*

	: 1977/78/79 December :		1984 December :		Difference in year
	sheep	Goat	Sheep	Goat	
a. Kaski (Seti river East) :	2379	1797	2845	1661	7
b. West Lamjung :					
(Marsyangdi West) :	3979	2770	4419	2688	6
c. East Lamjung (Barah :					
pokhari ridge West) :	2193	2253	2243	1970	5
d. Manang :	984	1715	1141	1667	5

Flock composition

Goats are usually kept in the flocks as lead animal but their number is increasing in many flocks due to less mortality in comparison with sheep. Flock ratio between sheep and goat varies, however, average figure in Table 1 shows that there are 34.73% goats in total population.

Different age groups in the flock based on dentition is given in Table 3 for sheep and goats. Male to female ratio within the breedable population (from 2 year group onward) is 1:6 in sheep and 1:12 in goat.

Table 3. *Composition of different age groups of sheep and goats in the flocks*

Age group	Autumn		Winter		Average	
	Sheep	goat	Sheep	goat	Sheep	goat
Below six months	13.68%	11.26%	9.38%	19.82%	11.53%	15.54%
6 months	12.03%	15.84%	18.04%	9.72%	15.04%	12.78%
1 year	18.73%	9.07%	18.43%	15.41%	18.58%	12.24%
2 year	12.21%	12.40%	13.24%	10.92%	12.72%	11.66%
3 year	14.51%	13.20%	13.13%	12.02%	13.82%	12.61%
4 year	21.22%	25.83%	18.58%	19.14%	19.90%	22.48%
5 year and above	7.62%	12.40%	9.20%	12.97%	8.41%	12.69%
Total population	11,326	9,046	8,967	6,886		

Migratory route

Alpine pastures are located on Southern slope of Sringi, Baudha, Himalchuli, Ngandi chuli, Manasalu, Lamjung, Annapurna II, Machhapuchhre and Annapurna South Himalayas. Also in northern slope of Annapurna II and IV of Manang and in Lamjung Himal.

There is shortage of alpine pasture for Gorkha district and winter pasture for Gorkha and Manang both groups and these flocks come to Lamjung for wintering. Average walking distance from village to alpine pasture is 1-5 days and from village to winter pasture is 1-4 days.

Flock movement is dictated by the availability of food in summer pasture and distance from the villages. Each group of flocks have their own time for the movement, average figure from various flocks is given in the following diagram.

Alpine pasture	:	↑ — → — — — →	:	Snow line
22 July	:	↑ (49) 14 Sept.....	:	Tree line
Summer pasture	:		:	
15 May	:	 (109) ↓ 19 Oct... ..	:	
	:	↑	:	Village pasture
15 Apr	:	 (112) ↓ 10 Jan... ..	:	
	:	↑ (95)	:	
Winter pasture	:	— ← — — — — ←	:	Lower hills

Average time spent in days at different pasture is given within bracket. Short period is spent on alpine pasture due to weathering of grass as winter approaches. Migration is also done in accordance with harvest and plantation of crops in the villages and wintering places.

Liveweight change

Table 4 has been worked out after recording weight of 6772 sheep during February/March 1984 and 8778 in November/December 1984.

Around 10.63% of body weight is lost in winter. In term of liveweight, male group lost 4.688 kgs and female group 5.318 kgs on an average basis of the total population.

Animals normally loose body weight as soon as they start moving from the village towards the wintering places and the process continues until they reach summer pasture.

Most of the flocks reach in summer pasture in mid May and it is seen from the breeding pattern that they take 3/4 months to build condition to begin the breeding depending on winter body weight loss.

Table 4 *Liveweight variation in sheep in winter and autumn according to age group.*

Age group	Male sheep			Female sheep	
	Autumn	Winter		Autumn	Winter
6 month	25.021+6.284 (514)	18.702+4.330 (774)	:	22.643+3.876 (171)	17.561+4.272 (771)
1 year	30.236+6.174 (1134)	29.964+5.282 (628)	:	27.173+7.034 (1318)	27.645+4.430 (1009)
2 year	39.176+6.883 (641)	36.657+5.317 (320)	:	35.261+6.318 (791)	31.435+4.111 (832)
3 year	45.997+6.813 (243)	41.920+5.970 (150)	:	38.266+9.107 (1139)	34.034+3.774 (993)
4 year	50.828+4.953 (35)	45.062+6.342 (48)	:	41.506+6.154 (1776)	36.173+4.075 (1646)
5 year	X	X	:	42.657+5.394 (816)	36.782+3.804 (631)

Note:- Figure in the bracket is the animal number in the sample.

Breeding performances

From the total of 2192 births in sheep, twinning percentage found was 0.32% and twice a year lambing 1.51% only. Same figure for Sindhal goat was 6.14% and 3.04% respectively from a 1807 birth records.

It is obvious that under the present system, ewes are not capable to support twin lambs, twice a year single lambing would be much more profitable. As twin lambs do not survive, the shepherds have adopted negative selection process by removing such animals from the breeding stock. First lambing takes place at the age of 3 years. Lambing percentage from breedable ewes have yet to be known. Available figure for lambing is 40 - 96% giving an average of 79.75% in Baruwal breed.

Wool yield

Pooled data from various sources show 1.07 kg per annum yield of fleece per adult sheep - where as 1.29 kg was recorded in Ghandruk area and 0.775 kg in Jumla.

Diseases

Of the 22 commonly prevalent diseases, following diseases are causing loss in migratory systems:-

- (1) Foot and Mouth Disease, (2) Caprine pleuropneumonia, (3) Enzootic abortion, (4) Pasteurellosis, (5) Clostridial infection, (6) Contagious ecthyma, (7) Interdigital dermatosis, (8) Mange, (9) Unspecified diarrhoea, (10) Helminths, (11) Eye sickness, (12) Six Month Disease and (13) Footrot disease

Much of the epidemiological aspect of the diseases has yet to be known. Mange is becoming fatal mainly in goat population. Abortion is a common problem in Foot and mouth disease infected flock. Enzootic abortion is commonly seen in some flocks. So called Six Months Disease is not properly studied only a case study from Panchshaya Khola sheep Farm suggested similarity to Enterotoxaemia (Pyakuryal and Singh 1976).

Unspecified diarrhoea is very common in Lamjung district due to a type of herbal intake on the descending movement from alpine pasture. Pneumonia, Contagious ecthyma,

Interdigital dermatosis, other feet ailments and death of spring born lambs on ascending movement to alpine pasture are due to the monsoonal stress. It is commonly seen that lambs weighing less than 12 kgs during the monsoon do not survive from the monsoonal stress.

Drenching is done on empirical basis without proper study. Effectiveness of drenching on cost and benefit basis on the production system has yet to be known.

Footrot disease was prevalent in Lamjung, Kaski and Manang flocks, however, due to an intensive effort by Lumle Agricultural Centre now the disease is approaching toward total eradication.

As the flocks have been offered treatment, real mortality rate could not be obtained from a study of 3 flocks infected for the first time in mid June and controlled in November. It was seen that body weight in female decreases from 33.355 kgs to 32.535 kgs and in male population the body weight was more or less same ie from 29.035 kgs to 29.650 kgs. Body weight recorded in other flocks suggests weight gain (Table 4) and it is suggested that due to reduction in body weight, winter stress is doubled in these animals and it is further augmented due to difficulties in walking.

The reduction in animal population due to disease is 3% per annum.

Mortality

A pooled data from available source indicate 32.48% mortality in lamb and 19.70% in adult, giving an average figure of 26.06% in total population (Pradhan 1970, LAC annual report 1977/78). Following are the main causes of mortality recorded in a study (LAC Annual Report 1977/1978):-

Born dead = 14%	Six Month Disease = 14%	Other disease = 22%
Plant poisoning = 3%	Accident = 17%	Predator = 14%
		Missing = 16%

Only 36% mortality took place from diseases and 64% resulted from bad managemental practices.

However, LAC data from Ghandruk suggested 54.20% and 32.75% mortality in one year age group of sheep and goats respectively under the migratory system.

Sale or disposal

Accurate disposal figure in farmer's condition is not available but a study suggested 24% of the total population (LAC Annual Report 1977/1978). A survey recently conducted by the Livestock Section of LAC in a population of 4888 sheep and 2928 goat, a total of 480 animals were disposed only during Dasain alone. It is 6.14% of the total population.

Looking at the mortality figure of 26.06% or more and disposal around 24% it is very close to the lambing percentage and does not allow a large population increase.

Shepherds

94% Of the total shepherd in Gandaki Zone, are Gurung, 3% Tamang, 2% Chhetri and 1% Brahmin. Age group ranged from 12 - 75 years old (LAC Planning Unit 1984 unpublished). It is one of the most difficult job and is becoming more unpopular. Already many sheep owners are finding difficulties to find a shepherd for their flocks. The wages is so low, he is getting only one ewe and a lamb for his one years hard job. No provision of leave, shortage of seasonal dress, physical hardship during bad migration and suffering from paralysis and rheumatism are the major concerned raised by the shepherds.

Conclusion

From the facts and figure studied from Gandaki Zone, it is apparent that mortality of lamb is higher due to the scattered breeding and imposition of monsoonal and winter stress. As for winter stress on an average basis (male and female) animals are loosing approximately 5 kgs of liveweight. This in term of energy requirement would be $20 \text{ MJ} \times 5 \times 0.82 = 82 \text{ MJ}$, (1 kg LW=20MJ) and, in term of grass would be 66 kgs/animal (Based on- DM = 200 gm/kg, 1 kg DM = 10 MJ). Efficiency of ME utilization is 0.62% (MAFF Technical Bulletin No. 33). However, this area needs further study to differentiate this loss from diseases and, from availability of feed. A further study is also needed to quantify monsoonal stress in term of loss in production and so far, only lamb mortality is visualise in this respect.

October lambings is most desired period for providing better survival rate but generally lambing takes place from March - November with high percentage in January with scattered lambing throughout one year (Karki, 1984). It indicates that animals even after exposure to green lush pasture after 15 May onward, takes 4 months of "flushing" to built up condition for breeding, depending on the loss of condition in winter. A study between different body condition at the time of entering to summer pasture and lambing percentage within 3 years group may produce the required information in this respect.

A total loss in lamb crops or higher mortality in one year from infectious disease reduces flock size drastically, and if, taken a figure of 26% mortality in upto one year group and 13% mortality in adult on normal year, this in relation to lambing percentage 40 - 96%, takes years to built up population at the same level.

Community itself has right to protect forest area nearby the villages, under Panchayat and protected forest system from Community Forest Development Programme. Already, a sign of resentment in Kaski district has been found on using forest area of one Panchayat by the sheep of other Panchayat irrespective of the value received for manuring arable land. This may aggravate winter stress and villages having access to vast alpine pasture may find difficulties in the absence of enough winter grazing area.

Finally, it is concluded that before building up a synthesis of biological model for improving efficiency in the production from sheep in migratory system, further study is needed. This would be only possible through a research centre established mainly to investigate the problem encounter by this system of sheep raising in Nepal. The size of sheep enterprise in Nepal is not too small to justify the establishment and further, it has a value to generate the cash income in the population groups of Nepal settled in high mountains region where already 71% people are below poverty line (ADB/HMG (N) 1982).

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**LACTOSE HYDROLYSIS - A PROMISE FOR LACTOSE - INTOLERANT
POPULATION: A REVIEW.**

Nagendra P Shah*

Lactose is a disacchride found in mammalian milk. Since cow's milk and various products made from it are major human food items, lactose constitutes a substantial portion of daily carbohydrate intake. For instance, a daily intake of 1 litre of milk by an adult, amounts to ingesting approximately 50g of lactose. The breast fed infants receives substantially higher doses of lactose as human milk contains higher level of lactose. Feeding of milk powder (55% lactose) to the infants in developing countries simply adds to the already high lactose intake.

Besides milk, a variety of food items such as cream, non - fat dry milk (NDM) whey solids, modified whey products or refined lactose are rich source of lactose (Nickerson, 1978). More than 70% of whey solid is lactose, which is 1.5 times the amount of lactose in non - fat dry milk. Lactose has the capacity to accentuate flavors and contribute sweetness. However, lactose is less sweet as compared to sucrose and other sugars. It requires 2.5 to 3.5 times lactose to get the same sweetness as sucrose (Nickerson *et al*, 1978) and the relative sweetness of lactose is 16 as compared to a sucrose value of 100 (Arbuckle, 1972).

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Lactose is less soluble in water than sucrose. Maximum lactose solubility at room temperature under equilibrium condition is only 18% compared to about 68% solubility of sucrose (Holsinger and Robert, 1976). Hence, lactose utilization often is limited by its low solubility, lack of sweetness and its laxative effect if consumed in large amounts (Wendoiff *et al.*, 1970). Apart from this, the high lactose content in non fermented milk products such as ice cream and condensed milk products, poses technical problems of preventing excessive lactose crystallization (Shukla, 1975).

Lactose sensitivity in people:

Recent studies have demonstrated a pattern of milk intolerance in non Caucasian because of low levels of intestinal lactase. Some human infants cannot digest lactose due to lack of lactase, an enzyme that breaks lactose into glucose and galactose. Lactose intolerance may occur in infants on a congenital basis where as in adults it may be secondary due to intestinal damage or as a late manifestation of an inherited condition (Nuys, 1980). In the US, 70% of the adult black population and about 10 to 15% of adult Caucasians are afflicted with this condition (Rosenweig, 1969). It has been estimated that approximately 70% of the world's adult population is lactose intolerant (Whelan and Stare, 1980). In some developing countries, the incidence of lactose intolerance can be much higher. The incidence of lactase deficiency is about 95% for Asians (Whelan and Stare, 1980). This may be due to an adaptive decline in the enzyme following withdrawal of the milk from the diet as the child grows older (Reddy and Pershad, 1972). Lactase - deficient individuals may suffer abdominal pain, flatulence, bloating, or diarrhoea if they consume substantial quantities of milk or uncultured dairy products (Holsinger and Roberts, 1978).

These limitations are greatly minimized by hydrolyzing the sugar with the enzyme lactase. Lactase is the common name for beta - galactosidase or beta - D - galactosidase galactohydrolase (E. C. 3.2;1.23). The enzyme catalyzes the hydrolysis of B - galactosidic linkage of lactose (Borglum and Sternberg 1972; Shukla, 1975). Beta - galactosidase can be isolated from plant, animal and microbial sources (Shukla, 1975; Table 1). The microbes (bacteria, fungi and yeast) however, offer higher yields for commercial production.

Table 1. Possible sources of the enzyme lactase (beta - galactosidase).

Plants	Peach, tips of wild roses, Apricot, Alfalfa seed, Almond, Coffee Kefir grains,
Animal organs	Intestine, Brain and skin tissues,
Yeast	<i>Saccharomyces lactis</i> , <i>Saccharomyces fragilis</i> , <i>Candida pseudotropicalis</i>
Bacteria	<i>Escherchia coli</i> , <i>Bacillus megaterium</i> , <i>Thermus equaticus</i> , <i>Streptococcus lactis</i> , <i>Streptococcus thermophilus</i> , <i>Lactobacillus bulgaricus</i> , <i>Lactobacillus helareticus</i>
Fungi	<i>Neurospora craussa</i> , <i>Aspergillus foetidus</i> , <i>Aspergillus niger</i> , <i>Aspergillus flavus</i> , <i>Aspergillus orizae</i> , <i>Aspergillus phoenicis</i> , <i>Mucor pucillus</i> , <i>Mucor meihei</i>

Enzyme preparations of *Aspergillus niger*, *Saccharomyces lactis* and *E. coli* are produced by commercial laboratories.

The enzyme from aspergillus and saccharomyces appear to be the most useful for industrial exploitation because of ease of extracting the enzymes, and acceptance of these enzymes in processing of food (Borglum and Sternberg, 1972). These lactases differ widely in their properties, particularly in pH optima. Lactase from *S. lactis* has optimum activity at pH 6.8 to 7.8, is stable in the range of 6.0 to 8.5, and works best at a temperature of 35°C. Although it is suitable for treating milk (pH 6.6) and sweet whey (pH 6.2), the lack of stability below pH 6.0 precludes its use in treating acid whey (pH 4.5). *A.niger* lactase has a pH optimum 4.0 to 4.5, good stability over a wide pH range (pH 3.0 to 7.0) and an optimum temperature of 55°C is suitable for lactose modification of acid whey (Holsinger, 1978). The two lactases used today are "lactase LP" from *A. niger* and "Maxilact" from *S. lactis*.

In general the commercially available enzymes are obtained as powder (freeze dried) or possibly liquid. The process of hydrolysis can take place during overnight storage of cold milk or before heat treatment if the milk is tempered to the optimum temperature of the enzyme (35-37°C).

To make the milk and other dairy products suitable to the lactase-deficient individuals, a simple approach would be hydrolysis of the lactose prior to product manufacture, using lactase from non-human sources. Whether the hydrolysis is done inside or outside the body, the action is the same. Lactase catalyzes the hydrolysis of the lactose Beta-D-galactoside linkage liberating one molecule of glucose and one molecule of galactose.

The resulting sugars are known to be sweeter than lactose itself (Arbuckle, 1972). Hydrolysis of the lactose in milk and whey results in several changes in their physical and chemical properties of value to the dairy manufacturer. These changes include reduced lactose content, little or no lactose crystallization, increased carbohydrate solubility, increased sweetness, and more ready fermentation of the sugars (Holsinger, 1978).

Lactose - hydrolyzed dairy products:

Many dairy products have been prepared from lactose hydrolyzed milk

Fermented products:

A variety of fermented products including yogurt, cottage cheese and cheddar type cheeses have been made experimentally from lactase treated milk by Gyuricsek and Thompson (1976); Thompson and Gyuricsek (1974), O'Leary and Woychik (1976a) O'Leary and Woychick (1976b) and Thompson and Brower (1976).

It was reported that a superior Yogurt can be produced by taking advantage of the added sweetness of lactase-treated milk. It is found that the presence of glucose in lactase treated milk enhanced acid production by the organisms of the yogurt culture. This accelerated acid development in skim milk with 90% of its lactose hydrolyzed is also of value in making cottage cheese. The time to reach the required pH of 4.6 was cut as much as by 20% and lactose hydrolysis also produced a firmer coagulum. The ripening time for the cheddar type cheese is also accelerated, so that it develops good body, flavor and texture at least one to two months sooner than that made from untreated milk.

The use of lactase to sweeten yogurt without increasing calories is also reported by Engel (1973). Tamime (1978) prepared yogurt from lactose hydrolyzed milk and

reported that the starter culture was most active in 50% hydrolyzed lactose milk as compared to growth in unhydrolyzed or 100% hydrolyzed lactose milk.

The manufacture of yogurt by simultaneous hydrolysis fermentation was reported by Hingendorf (1981) and Dariani *et al* (1982). The coagulation time was reported to be shorter for yogurts made with lactase treated milk. In a consumer evaluation lactose hydrolyzed product was significantly preferred.

Smith and Bradly, Jr. (1984) made yogurt from lactose hydrolyzed milk with different levels of fruit and it was reported that the sweetness resulting from lactose hydrolysis was enough to compensate for the loss of sweetness from a fruit reduction of 2%.

Beverage milk:

Holsinger (1978) evaluated modified beverage milk for its physical and organoleptical properties and reported that hydrolyzing upto 60% of the lactose present resulted in the little change in consumer acceptance and the product was reported to be sweeter. Lactase enzyme was used for treating raw and pasteurized whole milk by Kosikowski Wierzbicki (1973) and reported that the flavor qualities other than sweetness were not disturbed by lactase activities.

Ice cream:

Use of lactose hydrolysis in ice cream to prevent sandiness which arises from lactose crystallization, has been reported by many workers (Guy *et al* 1974; Holsinger and Roberts, 1976; Lang and Lang, 1977; and Shukla, 1975). Lactose hydrolysis prevents the formation of lactose crystals and hence protein instability. Organoleptic evaluations indicated that acceptable flavor and body could be achieved in the ice creams with 10% reduction in sucrose level.

Conclusion

Some people suffer from lactose intolerance problems, thus indicating the need for a product with hydrolyzed lactose. Research works indicate that low lactose dairy products can be produced with properties equal or superior to untreated controls. The

crucial factor that can influence the commercial production of these products is the cost of enzyme. Although the enzymes available in the market are expensive, the cheaper grades of enzymes are becoming available. The increased sweetness caused by lactose hydrolysis offers the possibility of using less sweetener and reduction of fruit levels in yogurt. The use of lactase enzyme in yogurt by simultaneous hydrolysis fermentation process could be most useful for lactose intolerant individuals, since the residual lactase may enter the intestinal tract and aid in digestion.

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PROFESSIONAL NEWS

FIRST NATIONAL POULTRY FAIR

On the auspicious occasion of 40th birth day of **H. M. King Birendra Bir Bikram Shah Dev**, Nepal Veterinary Association and Entrepreneurs engaged in Poultry Jointly organized "First National Poultry Fair" on Dec. 29 and 30, 1984 (Poush 15 and 16, 2041 B. S.)

Inaugurationg the Fair, Chief guest, Mr. Prithu Narsingh Rana, Secretary, Ministry of Agriculture, expressed satisfaction that the poultry in Nepal has made quick strides in recent years. Mr. Rana said, much more has to be done. He extended all the help from the ministry. Earlier he garlanded the portraits of **H. M. King Birendra** and **H. M. Queen Aishwarya**.

Dr. Uday Singh, President, Nepal Veterinary Association, welcomed the distinguished guests and participants. Mr. Singh Bahadur Jhosi, who presided over the inaugural function, appreciated the progress made by poultry in Nepal in a short span of two decades.

Dr. Pawan K. Agrawal, Organizing Secretary of the fair and Joint Secretary, NVA highlighted the significance of the Poultry Fair. Mr. Kalyan Khatri in his vote of thanks underlined the importance for mutual Co-operation among the poultry entrepreneurs, scientists and farmers.

During the inaugural ceremony, chief Guest, Mr. P. N. Rana released the Poultry Farming Book in Nepali (Kukhura Palan Ek Labhadayak Byawashay) written by Dr. Pawan K. Agrawal.

The fair committee tried to make the fair more informative so that the farmers can take the advantage of the fair. Talk programmes on poultry management, feeding, disease control etc. by distinguished technicians were arranged at the mela site. Though this fair was first combine effort of Nepal Veterinary Association, poultry farmers, hatcheries, feed manufacturers, drug manufacturers, dealers, and technical field staff, it was a great success. The fair attracted large number of poultry farmers and field technicians. The fair was also successful in creating interest and confidence among the farmers. There were useful discussions among the poultry breeders, feed manufacturers, drug manufacturers, scientists and poultry dealer. The fair was scheduled for only one day but on the advice of higher authority of Ministry of Agriculture and Department of Livestock Development and Animal Health, the fair was extended by a day. The participants and delegates strongly felt the need of Poultry Farmers Association.

The following poultry agencies put up their stalls at the mela ground.

1) Sharna Agri Centre, 2) Ratna Feed Industries, (P) Ltd. 3) Khatri Industries, 4) Khatri Egg Service, 5) Khatri Vet. Enterprises 6) Veterinary Concern, 7) Nepal Poultry (P) Ltd., 8) Veterinary Medical Suppliers, 9) Star Feed Products (P) Ltd., 10) Star Quality Feed, 11) Joshi Poultry, 12) Nepal Feed Products, 13) Hoechst India Ltd. 14) Sarabhai Chemicals (INDIA), 15) Santoshi Feed Industries, 16) Eskayef Limited (INDIA), 17) Universal Poultry Breeding Farm (INDIA), 18) Nepal Veterinary Association, 19) Central Training and Extension Centre (H. M. G.), 20) Central Animal Health Centre (H. M. G.) and 21) Poultry Guide Group of Publications.

Following delegates from India participated in the First National Poultry Fair:

1. Dr. S. C. Sinha (Pfizer) 2. Mr. S. K. Upadhyay (Eskayef Ltd.) 3. Dr. M. L. Gautam (Cadila Veterinary) 4. Mr. Subhash Kumar (Cadila Veterinary) 5. Mr. Parkash Sehgal (Special Reporter, Poultry Guide) 6. Mr. Satish Garg (Universal Poultry Breeding Farm) 7. Mr. Sharma (Universal Poultry Breeding Farm) 8. Dr. A. K. Verma (Sarabhai Chemicals) 9. Dr. K. M. Prasad (Sarabhai Chemicals).

SCIENTIFIC TALK PROGRAMMES

To organise scientific talks and share practical experience among the international and national scientists, is one of the important activities of Nepal Veterinary Association. Nepal Veterinary Association was very fortunate to organise following talks:

- Oct. 18, 1984: Dr. A. K. Verma, Retd. Director, Institute of Animal Health & Production, Patna, India, Veterinary Scientist and Livestock Consultant, Asian Development Bank, was kind enough to deliver a talk on "Snail borne infection of men and animals". After the talk there was a very useful discussion among the scientists.
- Nov. 11, 1984: On the request of Nepal Veterinary Association, Dr. Konrad Bogel, Chief, Veterinary Public Health, WHO, Geneva, and Prof. of Vet. Microbiology & Epidemiology, University of Munich and Dr. M. Bahmanyar, WHO consultant for Rabies and Ex-Chief, Rabies Dept. for vaccine production and Research, Pasteur Institute, Tehran delivered very useful talks on Rabies and its Control. There was a very useful discussion among the participants of the programme on the various aspect of Rabies Control. Dr. Bogel and Dr. Bahmanyar were in Nepal on their study tour to formulate a programme for Rabies control activities in Nepal.
- Dec. 4, 1984: Dr. Kamchad Mongkolkul, President, The Science Society of Thailand, presented a talk on Thai Experience on research and development in Bio-technology. Dr. Mongkolkul was participating in the first symposium of FASAS organised by Royal Nepal Academy of Science & Technology.
- March 17, 1985: To share the experience of Dr. N. B. Singh, Member Secretary, RONAST, who participated in 10th conference on Emergency Diseases organized by Association of Advancement of Science, Bangladesh, Nepal Veterinary Association organized a talk on "Emergency diseases and their control" After the talk Dr. Singh answered the questions of the participants of the talk programme

NVA will join WVA

Nepal Veterinary Association (NVA) in its Executive meeting and General Body meeting held on 26 Aug, and 10 Sept. 1985 respectively, decided to apply for World Veterinary Association (WVA) membership. The application will be forwarded to WVA after completing necessary procedures. It is expected that the application will be placed as an item on the agenda for the next meeting of the permanent committee of the WVA, to be held in Paris, France on 31st May 1986.

*

Dr. N. B. Singh has been appointed member secretary of RONAST by **H. M. King Birendra Bir Bikram Shah Dev.**

Dr. P. N. Sharma, Dr. T. P. Subba, Dr. S. N. Mahato, Dr. B. R. Joshi, Dr. N. K. Yadav, Dr. B. Parajuli and Dr. S. K. Shah have completed their Master's degree.

*

Dr. B. N. Thakur, Dr. S. L. Shrestha, and Dr. N. B. Singh have been promoted to Gazetted First class, **Dr. A. Pradhan, Dr. M. S. Karki, Dr. S. N. Mahato, Dr. N. K. Yadav** have been promoted to Gazetted Second Class (Dy. Sec. level) and **Dr. P. Pathak** has been promoted to Gazetted Second Class (Asst. Sec. level).

*

Nepal Veterinary Association welcomes new graduates, **Dr. B. K. Shrestha, Dr. B. N. Chaulagain, Dr. B. Yadav, Dr. M. Mandal, Dr. G. H. Subedi and Dr. M. L. Chaudhary,** We wish their successful professional life.

*

Dr. T. N. Vaidya, Dr. Udaya Singh, Dr. D. D. Joshi and Dr. D. B. Singh have been honoured with Gorkha Dakshin Bahu IV (Decoration) by **His Majesty King Birendra Bir Bikram Shah Dev.**

National Award to Poultry Farming Book

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Kukhura Palan Ek Labhadayak Byawashay (Poultry Farming book in Nepali) written by **Dr. Pawan K. Agrawal** and published by **Mrs. Sharda Agrawal** in Paush 2041 (Dec. 1984) was awarded Silver inscription in the "Second National Book Exhibition 2042" organized by National Book Exhibition Committee at Exhibition Ground Hall, Kathmandu from Oct. 4-11, 1985 (Ashwin 18-25 2042 B. S.).

Her Royal Highness Princess Jayanti Shah gave away the Silver inscription to Dr. P. K. Agrawal in a Special function at Royal Nepal Academy Hall on Oct. 11, 1985.

"Brihad Nepali Shabdakosh" (Great Nepali Dictionary) published in 2040 B. S. by Royal Nepal Academy was awarded Gold inscription.

Office bearer of NVA

The General Body meeting held on Sept. 10, 1985 elected the following office bearer for the year 2042 B.S. (1985 - 86)

President. Dr. N. B. Singh

Vice President - Dr. Mrs. Poornima Manandhar

General Secretary - Dr. D. D. Joshi

Joint Secretary - Dr. P. K. Agrawal

Treasurer - Dr. S. P. Gautam

Regional Members:

Eastern Region:- Dr. Dilip Sapkota

Central Region:- Dr. L. B. Chand

Western Region:- Dr. D. P. Parajuli

Mid Western Region:- Dr. B. M. Shrestha

Far Western Region:- Dr. B. B. Khadka

Institute of Agriculture and Animal Science, Rampur:- Dr. N. P. Shah

Chief Editor:- Dr. P. Pathak.

Nepal Veterinary Association Building Fund

Nepal Veterinary Association is collecting donations for its office building. We earnestly request all our well wishers to donate generously towards the building fund.

Amount can be deposited directly in the saving Account No 19117, Nepal Bank Ltd. New Road, Kathmandu, or send your cheque/draft/money order/Cash to Nepal Veterinary Association P. O. Box 3130, Kathmandu, Nepal.

Life members of Nepal Veterinary Association

(Cont. from Bull. Vet. Sc. & A. H. Vol 12.)

27. Dr. Mrs. Eeva - Liisa Hintika, Chief for Production of Biologicals, National Vet. Institute, Helsinki, Finland.
28. Dr. Raimo Vidgren, Animal Health specialist, Finnagro, 74300 Sonkajarvi Finland.
29. Dr. M. S. Bhatnagar, Director, Kumaun Herbs, 20, Awani chhaya, Tilaknagar, Lucknow (INDIA)
30. Dr. B. N. Chaulagain, Zoonotic Disease Control officer, Zoonotic Disease Control Section, Dept. of Health Services, Teku, Kathmandu.
31. Dr. S. P. Gautam, Asst. Virologist, Biological Products Division, Tripureswar Kathmandu.
32. Dr. B. K. Shrestha, Vet. Officer, Vet. Hospital, Bharatpur, Nepal.
33. Dr. S. Pyakural, Tangal, Kathmandu (Nepal)
34. Dr. N. R. Joshi, Chief, Central Vet. Hospital, Tripureswar, Kathmandu.
35. Dr. P. N. Sharma, Chief, Biological Products Division, Tripureswar, Kathmandu.

**XXIII WORLD VETERINARY CONGRESS,
(MONTREAL, CANADA, 16 - 21 AUGUST 1987.)**

The next World Veterinary Congress will be held in Montreal, Canada from 16 - 21 August, 1987.

**IV INTERNATIONAL SYMPOSIUM OF VETERINARY LABORATORY
DIAGNOSTICIANS,**

On behalf of the World Association of Veterinary Laboratory Diagnosticians, the Royal Netherlands Veterinary Association is organising this congress which will take place in Amsterdam, the Netherlands from 1 - 6 June, 1986.

The symposium will deal with topics on diagnostic laboratory procedures and techniques on the subjects: Bacteriology, Virology, Parasitology, Serology - immunology, Pathology, Clinical Chemistry, haematology, Toxicology - Pharmacology and endocrinology.

The above disciplines will be referred to cattle, sheep, goats, swine, poultry, horses, fish and pet animals. Special emphasis will be given to new developments in laboratory diagnostic techniques.

For further detail please contact:

President, Scientific Committee,

Royal Netherland Veterinary Association

P. O. Box 14031

3508 SB Utrecht, The Netherlands.

RONAST SCIENCE & TECHNOLOGY AWARDS

Royal Nepal Academy for Science & Technology (RONAST) has decided to honour the Nepalese Scientists working in the various fields with the following awards.

1. **H. M. King Birendra** Award for Science & Technology.
2. **H. M. Prince Dipendra** Youth Award for Science & Technology
3. **RONAST** Award for the promotion of Science & Technology.

RONAST RESEARCH GRANT PROGRAMME

RONAST has started the Research Grant Programme (RGP). In this programme, research project proposals from scientists and technologists of Nepal are invited, and research grants are provided in order to encourage scientific research and development activities in the country.

For detail information please contact:

R & D Department,
Royal Nepal Academy of Science & Technology
P. O. Box 3323
New Baneswar, Kathmandu, Nepal
Phone — 215316

BOOK REVIEW

Kukhura Palan Ek Labhadayak Byawashay (Poultry Farming hand book in Nepali)
by Dr. Pa van K. Agrawal, Published by Mrs. Sharda Agrawal, Maharajganj, Kathmandu
Nepal (1984) P. P. 164, Price Rs. 25.00

The book was released at the inaugural function of "First National Poultry Fair" Organized jointly by Nepal Veterinary Association and Entrepreneurs engaged in Poultry farming. This is the first book on Poultry husbandry in Nepali Language.

This book covers various aspects of poultry husbandry including their management, nutrition, disease control etc. The author has provided a comprehensive hand book containing 39 good quality Photographs. This will be an useful hand book for the farmers, poultry breeders, feed manufacturers, professional technicians and students. Overall this is an excellent book rich in practical information.

Letter to the Editor

From:- Dr. A. K. Verma, Ph. D. (London)

Retd. Director, Institute of Animal Health & Production

Patna (Bihar) INDIA

Dear Sir,

I was impressed with your expanding organisation charged with enthusiasm at all levels. Veterinarians have to go a long way in developing the national economy from the grassroot in your agro-based rural life with mainly terrace farming in the mid-hilly and mountainous regions, where mechanization has but little scope. In fact livestock constitutes the major component in your rural economy, even in your Terai region. In my talk on the 18th. Oct. I felt the urgent need to emphasise that livestock health is the spring-board for livestock development, stronger the spring-board greater the development. This is a calling warrant to provide adequate health cover with all top priority. Greater the perfection provided in this inevitable cover, higher the develop-

mental achievements. The health problems have to be identified properly area-wise allocating priorities for applying suitable control measures. This is by no means an easy task, but this has to be ensured first for developing the livestock either in SFDP, or in IRDP, or in LDP. It is only under perfect health cover that the developmental activities will succeed in raising the production and thereby the economy. I am sorry, I could not do much during my extremely short visit owing to pressing engagements here.

I have appreciated your kindly gesture in presenting to me a copy of the Volume 12 [(1983)] of the Bul. Vet. Sci. Ani. Hus. Nepal, an official organ of NVA. I have gone through it and I find that the various articles by learned authors published there in are very informative and only lend support to my contentions. It is evident from these articles that both Animal Health as well as Livestock Development personnel are well alive towards their responsibilities and are moving in the proper direction, but their desired progress is marred by extreme shortage of qualified veterinarians on the one hand for providing the required health cover and dearth of suitable seed material on the other to boost production. This necessitates careful planning and meticulous harnessing of the available resources launching intensive developmental programmes in respect of the appropriate commodities in suitable areas.

Animal Husbandry, which entails both animal health as well as production to be achieved by developing both enjoining various scientific disciplines suitably and properly, i. e. *esprit de corps*, or in other words team spirit at all levels and in all directions. I have no doubt in view of what I have seen and observed that Nepal Veterinary Association will be able to ensure this and steer through any hurdle successfully.

I was very happy to meet my professional brothers and talk to them through the kind courtesy of NVA. I consider it an honour conferred upon by the august professional body of Nepal. Kindly remember me to all my professional brothers.

Dr. A. K. VERMA

69, Patliputra

Patna - 800013 INDIA

Phone - 62550

FINANCIAL STATEMENT OF NVA
(From 13th April 1984 - 12th April 1985)

<u>INCOME</u>	<u>Rs.</u>	<u>EXPENDITURE</u>	<u>Rs.</u>
Membership subscription and renewal	1246.00	Secretarial service	1800.00
Building fund collection	700.00	Stationary & Postage	430.75
Bulletin sale & advertisement	15696.25	Party and meetings	1104.00
Collection for poultry fair	12975.00	Bulletin publication	16575.00
Bank interest and others	5140.50	Poultry fair organisation	12975.00
		Sundry expenses	83.75
Total	35757.75	Total	32968.50

Balance sheet as at 12th April 1985

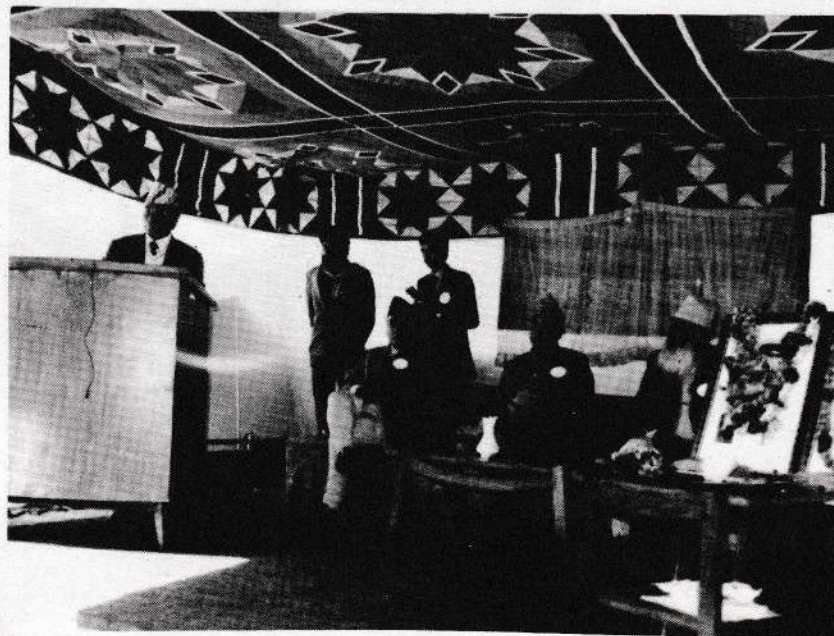
Balance as at		Statement of balance:	Rs.
13th April 1984	Rs. 54205.24	Fixed Account deposit	35000.00
Surplus for the year	Rs. 2789.25	Saving Account deposit	12960.49
Total	Rs. 56994.49	Cheques sent for collection	4234.00
		Due	4800.00
		Total	56994.49

S. R. Bhandary
Treasurer, NVA

NVA NEWS IN PICTURE



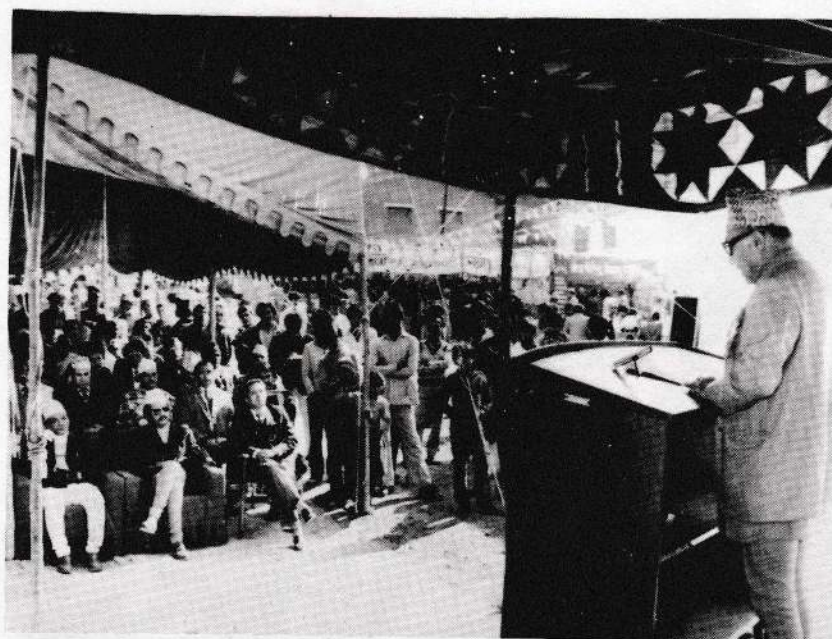
The "First National Poultry Fair" was organized on Dec. 1984 to mark the auspicious occasion of His Majesty's 40th Birthday. Chief guest of the ceremony, Mr. Prithu Narsingh Rana garlanded the portraits of H.M. King and Queen on the occasion.



Dr. Uday Singh, President, NVA, welcoming the guests and participants at the First National Poultry Fair.



Chief guest, Mr. P.N. Rana, Secretary, Ministry of Agriculture, inaugurating the First National Poultry Fair.



Chief guest, Mr. P.N. Rana delivering the inaugural address.



Dr. Pawan K. Agrawal, Organizing Secretary of the fair and Joint Secretary of NVA, explaining the objectives of the Fair.



Mr. Singh Bahadur Joshi, Chairman of the ceremony, addressing at the inaugural session of the Fair.



Mr. Kalyan Khatri, Member of the organizing committee, speaking at the inaugural session of the Fair.



Dr. Pawan K. Agrawal presenting the Poultry Farming book to the Chief guest to be released at the occasion.



Chief guest, Mr. P.N. Rana releasing the Poultry Farming Book in Nepali written by Dr. P.K. Agrawal.



A view of the participants attending the inaugural session of the First National Poultry Fair.



Chief guest and other distinguished guests visited the stalls at the Fair. Mr. M.L. Shrestha (Nepal Poultry P. Ltd) is explaining some important points to the guests.



Mr. Prakash Sehjpal (special reporter, Poultry Guide) is presenting Poultry publications to the Chief guests at the Fair.



Chief guest Mr. Rana and Dr. H.B. Rajbhandari, Director General DLDH, visiting HOECHST'S stall at the Fair.



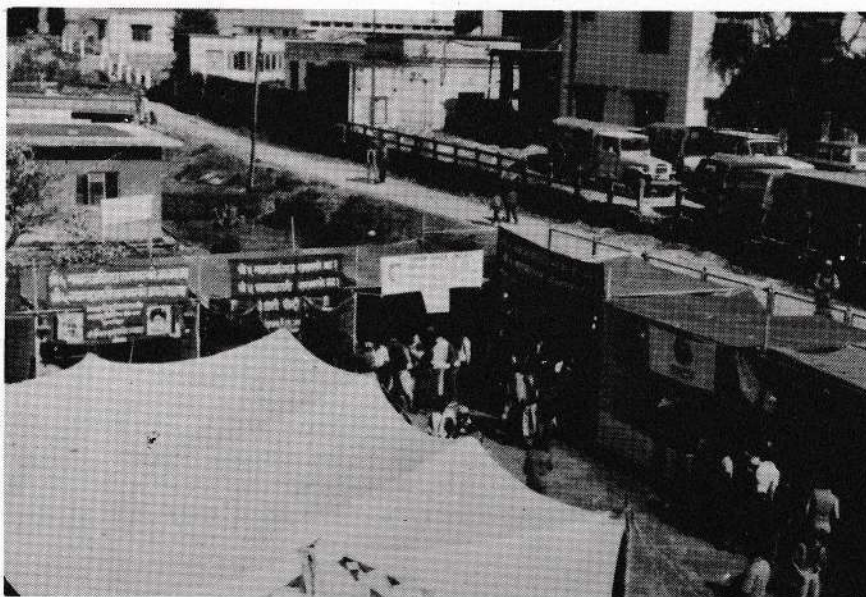
Mr. B.B. Shrestha of Ratna Hatcheries (P) Ltd. is explaining the advantage of cage system of poultry housing to the guests.



Distinguished guests at the Eskayef's stall



Chief guest, Mr. P.N. Rana and Director General, DLDAH, Dr. H.B. Rajbhandari with the participants of the Fair.



Another view of the First National Poultry Fair.



Dr. A.K. Verma (Retd. Director, Institute of Animal Health and Production, Patna, INDIA) is presenting a talk on "Snail borne diseases of men and animals" organized by NVA on Oct 18, 84. Rt. Director General Dr. T.B. Singh, Director General Dr. H.B. Rajbhandari, Regional Director Dr. M.N. Pandey are also seen in the picture.



A view of the audience attending the talk programme.



Dr. A.K. Verma had a discussion with Dr. M.N. Pandey (Regional Director) and Dr. S.C. Sinha (Pfizer Ltd) after the talk programme.



NVA organized talks on "Rabies and its control" by prof. Dr. Konrad Bogel and Dr. M. Bahmanyar on Nov. 11, 1984. Dr. Bahmanyar is speaking at the occasion. Dr. K. Bogel is also seen in the picture.



Her Royal Highness Princess Jayanti Shah giving away the Silver inscription to Dr. P.K. Agrawal writer of the Poultry book in the second National Book Exhibition - 2042. The book was released at the inaugural ceremony of the First National Poultry Fair.