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Animal Husbandry

Nepal



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Proceedings of the Second National Veterinary Conference

Vol. 15

1987

Regd. ZCBA 7/2025/26

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Second National Veterinary Conference Participants
with Distinguished Guests

Bulletin of Veterinary Science and Animal Husbandry, Nepal

Proceedings of the Second National Veterinary Conference

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Editorial

His Majesty The King provided royal directives on 16 December, 1985 to undertake pledge and political determination to uplift the standard of living of the Nepalese people to an Asian standard by the year 2000 AD providing the minimum basic needs of food, clothing, housing, education, health and security. This is a challenge to every Nepalese from all sector to plan the programmes properly and implement them carefully to achieve the targets at stated period of time.

Livestock provide most valuable animal proteins as well as energy in the form of milk, meat and eggs for human consumption. In an addition, they also produce manure for increasing crop production, draft power for transporting consumer's good, wool for clothing and carpet making and household income by selling surplus live animals and their products.

In order to achieve minimum basic needs by 2000 A. D. milk, meat and egg production have to be annually increased by 4 per cent, 6.6 per cent and 3.6 per cent respectively. These incremental targets can only be achieved if all the supporting services are made available in adequate quantity in appropriate time.

Animal health is one of the important supporting services affecting the livestock productivity. Losses in livestock production due to diseases alone is estimated at 40 per cent. Provision of adequate animal health services - prophylactic vaccination, drenching, prompt diagnosis and treatment could save 30 per cent of the total losses while the remaining 10 per cent of the total losses remains unsaved due to various other factors.

Nepal Veterinary Association (NVA) realised the importance right in time and organised Second National Veterinary Conference to discuss a topic "Role of Veterinary Profession in Boosting the Livestock Production to the Level of Asian Standard". This conference held on 23rd - 25th February 1987 and successfully accomplished after three days of its important deliberations.

The final recommendations made by the conference are related to the fulfillment of the Basic Needs programme. In order to achieve the targets the recommendations have to be executed by the concerned agencies in time. Criticalness has to be timely realised.

Editor-In-Chief



- * NVA is collecting building fund for its office building. We earnestly request our contributors to donate generously towards the building fund.
- * NVA is a National Member of WVA. It is paying Swiss Franc 1.55 per Veterinarian per year. Therefore, NVA request all the members to contribute Rs. 20.00 per year.

Nepal Veterinary Association



Proceedings of
THE SECOND NATIONAL CONFERENCE

(23 - 25 February, 1987)

Kathmandu

First day - Monday, the 23 February 1987

Inaugural Ceremony

On 23 February 1987, the inaugural ceremony of the Second National Conference of Nepal Veterinary Association was held in Hotel Blue Star, Kathmandu. Reception and registration of participants, distinguished guests, representatives of various organizations related to profession from home and abroad, was continued from 8.00 to 11.00 A. M. Out of 140 members of the Association 98 Veterinarians (81 Nepalese and 17 foreigners including 13 nonmember) took part in the conference. Veterinarians working in the Far - Western Region of Nepal could not attend the function because of the visit of **Their Majesties The King and The Queen** to that region.

Honourable Minister for Agriculture, Law and Justice Shri Harinarayan Rajauriya and Honourable Vice Chancellor of RONAST Shri Ratna S. J. B. Rana after being received by the President of NVA, Dr. N. B. Singh, were requested to take their seats of Chief Guest and Chairman of the ceremony respectively and were presented the programme of the Conference.

Portraits of His Majesty the King and Her Majesty The Queen were garlanded by the Chairman, the Chief Guest and the other distinguished personnel.

Dr. N. B. Singh, President of NVA presented the welcome address (Appendix-I).

The conference was formally inaugurated by **the Chief Guest, Honourable Minister for**

Agriculture, Law and Justice Shri Harinarayan Rajauriya by lighting the ceremonial lamp in a traditional manner. He addressed the conference (Appendix- II) giving emphasis on the very vital role of Veterinarians in boosting up livestock production to the level of Asian standard by the year 2000 B. S. He also reiterated the new concept of Government towards the animal wealth and assured to extend the full cooperation from Government to overcome the hindrances of livestock development in the country. He also released the special issue of the Bulletin of Veterinary Science and Animal Husbandry, Nepal published by NVA on the auspicious occasion of its second national conference.

On behalf of Association, President of NVA offered the gifts to the Honorable Guests.

Organizing Secretary, Dr. P. K. Agrawal, presented a speech focusing on the aims and objectives of the conference and highlighted the activities of NVA (Appendix- III).

Chairman, Dr. Ratna S. J. B. Rana addressed the function (Appendix - IV) highlighting the role and importance of livestock wealth and veterinary service in the national context and wished the conference all success.

Finally, Dr. D. D. Joshi, General Secretary of NVA presented the vote of thanks (Appendix - V).

After the completion of inaugural ceremony the Chief Guest, the Chairman and the participants all moved towards refreshment, informal chats and group photographs.

Technical Session - 1

1.00 - 5.00 P. M.

Chairman : Dr. Thir Bahadur Singh
Rapporteur : Dr. Udaya Singh

Presentation of Technical Papers and Discussion

1. Scope of Improving Indigenous Chicken (Shakini) for Egg and Meat

- Production in Nepal. - Dr. T. B. Basnet
- Discussion
2. Advances in Poultry Biologicals in India. - Dr. B. D. Survashe
- Discussion
3. Use of Poultry Manure as Fertilizer and Feeding Stuff.
- Dr. P. M. S. Pradhan
(Presentation by Dr. D. D. Joshi)
- Discussion
4. Efficacy of Ivermectin Against Nasal Leech *Dinobdella ferox*.
- Dr. S. N. Mahato and Dr. R. P. Thakur
- Discussion
5. Requirement for Rinderpest Eradication Campaign in Nepal.
- Dr. U. Mishra
- Discussion
6. Evaluation of Rice Straw as a Potential Source for *Fasciola* Infection of Ruminants in Nepal.
- Dr. B. R. Joshi
- Discussion
7. Summer Heat Stress Infertility in Dairy Cows. - Dr. D. E. Monty, Jr.
- Discussion
8. Rabies and Its Prevention. - Dr. A. M. Desai
- Discussion

Film show on Rabies
Dinner at Hotel Blue Star

Second day - Tuesday, the 24 February 1987

Technical Session - II

10.00 A. M. - 1.00 P. M.
Chairman: Dr. S. Pyakurel
Rapporteur: Dr. B. N. Thakur

(v)

Presentation of Technical Papers and Discussion

1. Some Observation on Reproductive Problems in Cattle and Buffaloes in Kathmandu Valley.
- Dr. B. K. Jha
- Discussion
2. *Eurytrema cladorchis*: An Obscure Parasite of Ruminant in Nepal.
- Dr. S. N. Mahato
- Discussion
3. The Training and Role of Veterinary Auxillary Health Workers in Boosting Livestock Production to the Level of Asian Standard.
(Presentation by Barbara Fargher Rana) - Dr. P. N. Quesenberry
- Discussion
4. Future Production and Productivity in Livestock Farming in Nepal.
- Dr. D. D. Joshi and Dr. H. B. Rajbhandari
- Discussion
5. Distribution of Foot and Mouth Disease Virus Type in Nepal.
- Dr. R. M. Shrestha
- Discussion
6. Role of Veterinary Profession in Dairy for Boosting Milk Production.
- Dr. C. R. Bhattarai
- Discussion
7. The Comparative Efficacy of 10% Formalin and 10% Zinc Sulphate Foot Baths for the Control of Ovine Foot Rot.
- Dr. B. Parajuli
- Discussion
8. Incidence of Common Diseases of Cattle, Buffaloes and Goats in Surkhet.
- Dr. N. P. Ghimire
- Discussion

Refreshment

(1.00 - 2.00 P. M.)

Technical Session III

2.00 - 3.00 P. M.

Chairman: Dr. Udaya Singh

- Group Discussion and Preparation of Final Report by the Group Leaders.

Commercial Session (Part - I)

3.00 - 5.00 P. M.

Chairman: Dr. M. N. Pandey

1. Vets Pharma Pvt. Ltd., Jallundhar, India.
2. Indian Herbs Research & Supply Co. Saharanpur.
3. Pfizer India Ltd.
4. Eskeyef Limited.
5. May and Baker (India) Ltd.

Dinner at Hotel Blue Star

Third day - Wednesday, the 25 February 1987

Closing Ceremony

11.00 A. M.

1. Presentation of Consolidated Report by Dr. D. D. Joshi.
2. Closing Remarks by the Chief Guest - Mr. Akrur Narasingh Rana.
3. Remarks by the Chairman - Dr. Heramba Bahadur Rajbhandari.
4. Vote of Thanks by Dr. P. K. Agrawal.

Refreshment

Commercial Session (Part - II)

1.00 - 3.00 P. M.

Chairman: Dr. K. P. Dhakal

1. Kumaun Herbs, Lucknow, India.
2. Hoechst (India) Ltd.

General Body Meeting of NVA

(3.00 - 5.00 P. M.)

Dinner at Hotel Shangrila



(vii)



Hon. Minister for Agriculture, Law and Justice Mr. Harinarayan Rajauria
- Addressing the Conference



Dr. D. D. Joshi (Gen. Secretary, NVA) - Extending Vote of Thanks



President, NVA - Presenting Souvenir to the Chief Guest



A Section of Audience at the Inaugural Session

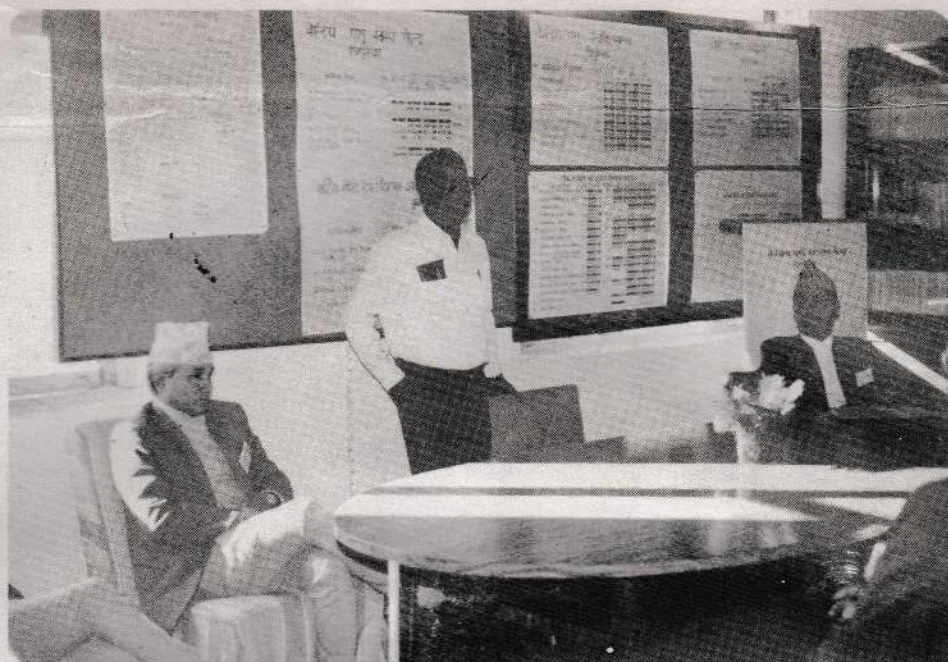


A View of the Closing Ceremony



Group Photograph - After the Closing Ceremony

(x)



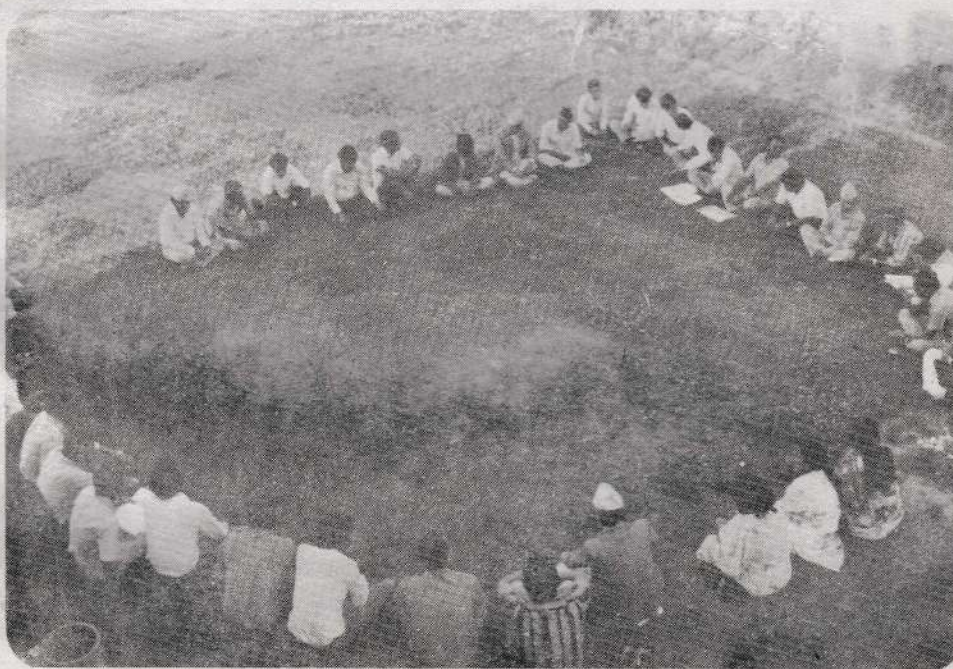
**Proffessor S. B. Tripathi – Delivering a Talk Programme on
' The Common Diseases of Animals in Tropics '**



**Proffessor Stig Larson – Delivering a Talk Programme on
' The Role of Veterinarian in Public Health '**



A Section of Audience in a Talk Programme



Members of NVA in a Meeting

SCOPE OF IMPROVING INDIGENOUS CHICKEN (SHAKINI) FOR EGG AND MEAT PRODUCTION IN NEPAL.

Dr. Tej B. Basnet*

Introduction

The total chicken population in Nepal is estimated at 8.92 millions with the annual growth rate of about 4.52 per cent per annum. Among them about one third of population is estimated to be layers. Out of total layer only 0.6 million are improved and rest 2.4 millions are indigenous the Shakini. The production performance of a Shakini layer is very low and does not exceed more than 45 to 55 eggs per annum. It can be estimated about 120 million eggs per annum from the Shakini chicken. Similarly the production from improved layers is estimated to be about 120 million eggs considering that an improved layer produces 200 eggs annually. Thus the twenty per cent improve layers contribute about fifty per cent of total national egg production. Hence the total national egg production in Nepal is about 240 millions which contribute about 14.4 eggs per capita per year, with an estimation at 16.7 millions population in Nepal.

The estimated egg production in Shakini chicken can be increased by 50 per cent in a few year times if its genetic make up is improved by up-grading in a planned way.

History of Domestication of Poultry

It is believed that domestication of chicken started as early as 3000 years in South East Asia. These birds were domesticated for the purpose of eggs, meat supply

* Dr. Tej Bahadur Basnet is chief officer at Central Livestock Development Centre, Khumaltar, Lalitpur.

and as games for recreation. The jungle fowls are considered as the origin of the modern breeds of poultry especially raised for meat type (Broiler) and egg type (Layer).

The local chicken (Shakini) has the character similar to jungle fowl which is influenced by a hormone known as prolactin. In the improved type of chicken this hormone is absent or present at a very low level. So the Shakini chicken can be used for incubating the eggs to hatch out chicks, brood and rear them until they are able to scavenge themselves.

Advantages of Raising Shakini Chicken in Rural Area

The feed conversion ratio is very high in poultry as compared to the other species of commercial livestock and they directly compete with human being particularly in the developing countries.

The following are the advantages of keeping Shakini chicken in rural areas:

- there is no direct cost involvement to farmers and chicks can be raised with minimum cost and care,
- no balanced feed is afforded as compared to the improved commercial chicken,
- multiplication of chicken is done by broody hens in order to maintain the population, and
- up grading for eggs and meat production is always successful.

Genetic Improvement of Indigenous Chicken

The productivity of local indigenous chicken can be increased by introducing the germ plasm of dual purpose pure lines such as Austrolop or New Hampshire or any other breeds in the following ways:

i. Distribution of improved breeds of chicken

The success of this programme depends on the availability of the following facilities:

- brooding and rearing facilities along with reliable electricity supply,
- technical know how of the farmers about poultry keeping, and
- vaccination for disease prevention and follow up programme.

In the absence of these facilities this programme can not be run effectively for the benefit of the farmers.

ii. Distribution of improved cockerels

Replacing the local males by improved cockerels at certain pockets for 3-4 years could be a good idea to upgrade the local population for increasing egg and meat production.

This programme can only become successful if breeding cockerels are harden enough to survive in the local conditions before they are distributed. The breeding males reared in an intensive system on a balanced feed face difficulty to adjust in scavenging system resulting in high mortality and poor breeding.

The hardening of male can be done by allowing them to run in semi-intensive system and every week reducing the amount of balanced feed and increasing the hand full of local grain such as maize, millet and wheat etc, until the male are totally adjusted. Hardening of males may take about four to six weeks.

iii. Distribution of fertile eggs of improved chicken

The indigenous Shakini birds are best for natural hatching of chicks particularly where incubators are not available. These hens not only hatch the chicks but also rear and train them to protect themselves against the predators and search food by scavanging.

Some practical difficulties observed to carry out this programme are as follows

- in target oriented programme the required number of broody hens may not be available at the time of fertile eggs distribution,
- hatchability reduces if the fertile eggs are held up for distribution for more than seven days, and

- some per cent of eggs may break while transporting and even loose the firmness which results reduction in hatchability.

iv. Establishment of pure line breeding units at government farms, veterinary hospitals and service centres

The main idea of this programme is to establish a flock unit of 100 to 200 birds as a source of constant fresh fertile eggs for distribution to the farmers. The advantages of this programme are outlined below:

- farmers get the fertile eggs at the time when their hens are ready to sit on eggs,
- losses due to ageing and long transportation of eggs can easily be reduced, and
- technical help to the farmers and organizing vaccination programmes against diseases by veterinary hospital and service centres would enhance the impact of the programme.

It is important for such programme to establish sufficient hatcheries functioning as a regular source of supply of pure line stock for breeding units. Annual average eggs production amongst cross breeds should be regularly tested and care should be taken not to loose the broodiness character amongst indigenous population.

Village Poultry Marketing for Meat and Eggs

Farmers require to sale their excess stock of birds and eggs to buy some daily necessary items. Organised marketing system is essential to dispose their products. The basic facilities such as sheds, water and road are important in the marketing centre. Strict measure must be taken to avoid the spread of diseases during transportation of live birds.



**BRIEF NOTE ON
ADVANCES IN POULTRY BIOLOGICALS IN INDIA***

Dr. B. D. Survashe**

Until 1980 poultry vaccines were being imported into India from developed countries like USA, UK and Holland. Due to various difficulties in the imports the vaccines were not available to farmers in right time. As a result, poultry farmers were exposed to tremendous economic losses due to high mortality in birds and reduction in egg production.

Considering the need to make available these essential vaccines to the poultry farmers, Venkateshwara Hatcheries Pvt. Limited (VHPL) decided to set up Ventri Biologicals Division near Pune in technical collaboration and association with the world renowned poultry vaccine manufacturers, M/s Tri Bio Laboratories/Inc. and Maine Biological Labs USA, for the manufacture of Mareks Disease and other poultry vaccines. Mareks Disease is a deadly Herpes viral disease of poultry, which, unless prevented by timely vaccination, can be disastrous to poultry industry,

Simultaneously, another company, Srimi Biological Laboratories Pvt. Limited, Pune was set up to produce the other essential poultry vaccines. All these vaccines are manufactured by local scientists after obtaining technical information from all over the world. Now Ventri Biological Division and Srimi Biological Laboratories Pvt. Ltd. together produce the following poultry vaccines:

- Mareks Disease Vaccine - HVT - Cell free
- Gumboro Vaccine

* Information on Poultry Vaccine producing Biologicals in India.

** Dr. B. D. Survashe is a director at Vaccine Division, Venkateshwara Hatcheries Private Limited, India.

- New Castle Disease - Lasota Vaccine
- New Castle Disease Vaccine (R₂B)
- Fowl Pox Vaccine
- Infectious Bronchitis (IB) Disease Vaccine
- I. B. & Lasota Combined Vaccine
- Gumboro Inactivated (Killed) Vaccine
- New Castle Disease Inactivated (Killed) Vaccine.

The laboratory buildings are ultramodern and equipped with sterile airflow system under positive pressure and are centrally air - conditioned. The design and the sterile air handling systems have been done with the technical collaboration of our leading consultants in India.

One of the vaccine division manufactures Cell Culture Vaccine using high quality Specific Pathogen Free Eggs (SPF Eggs) and Chicken Embryo Cell Culture Lines. In this division Mareks Disease Vaccine, HVT FC 126 Freeze Dried Vaccine is manufactured adopting the international standards of production as well as quality control.

During the manufacture of vaccines in Srimi Biologicals, egg bases technology is used wherein the vaccine viruses are inoculated in SPF eggs and monitored from time to time and then bulk vaccine is derived out of this and further formulated and freeze-dried at 40° and 5 micron in fully automatic lyophilizers. Alongwith certain other vaccines are also manufactured by cell culture technology.

Apart from quality control and testing these vaccines as per the British Pharmacopia, they are further tested for susceptibility on chicks maintained under strict isolation. In this process safety tests, immunogenicity potency tests are carried out before releasing any batch of vaccines to the market. Various profile of tests including Elisa techniques used for testing vaccine serials.

These days million doses of various poultry vaccines are manufactured in these laboratories. All these vaccines have got wide acceptance not only in India, but also in the international markets like Middle East, Malayasia, Indonesia, Bangladesh and Nepal. Ventri and Srimi Biologicals are now in a process of transferring the poultry Biologicals technology to other developing countries.

USE OF POULTRY MANURE AS FERTILIZER AND FEEDING STUFF

Dr. Prabesh M. S. Pradhan*

Introduction

Agriculture and livestock farming are closely inter-related. Increase in agricultural productivity depend upon soil fertility, improved seed and irrigation. Similarly increase in livestock productivity depends upon proper feeding, breeding and management. In the developed countries where livestock holds higher margin of economy, the problem of animal manure disposal has become acute not only because of an increase in the number of farm animals but mainly because of intensification. One suggested method of manure disposal is re-cycling it in the feed of farm animals and poultry, as soil fertility is mostly maintained by extensive use of chemical fertilizers. In the developing countries the food stuff production is not even sufficient for human. Both human and animals are underfed, lowering their prolificacy and productivity. Significant increase in agricultural productivity and livestock products could be achieved by using highly nutritious poultry manure as fertilizer and feeding stuff respectively. Using poultry manure as fertilizer and feeding stuff are described as follows:

1. Fertilizer

The term poultry manure refers to fresh poultry droppings or droppings mixed with various kinds of litter. It is a valuable manure and is not always used to the best advantage. There is no problem in handling manure if the birds are on free range as it is directly applied to the land. However, on the specialized poultry farm, or on a small farm with a large poultry unit, more manure may be produced than can economically be used on the land available.

* Dr. Prabesh M. S. Pradhan is presently posted at Department of Livestock Development and Animal Health, Harihar Bhawan, Lalitpur, Nepal.

Poultry manure becomes best fertilizer when the droppings fall directly on the land, as with birds on free range or when a portable poultry house system is used. Under these systems losses of nitrogen to the atmosphere are minimized and soluble constituents are mostly retained in the soil. Portable poultry house should be moved frequently to ensure that the droppings are distributed as evenly as possible over the whole area. This system is an excellent way of improving poor grassland.

In deep litter houses droppings become mixed with litter, and fermentation occurs producing a bulky organic manure, this manure is relatively dry and friable and is easily spread. However, if stored in the open it may be very wet and of less fertilising value, having lost considerable amounts of nitrogen and potash.

When poultry are kept in battery cages or on slatted or wire floors the manure is free from litter. It is a rather sticky semisolid and it should be spread as soon as possible to reduce any public nuisance from smell.

Quantities Produced

As a rough estimate, poultry produce fresh droppings which weigh about 30 per cent of the feed intake. These droppings contain about 75 per cent water. For layers an average amount of fresh droppings produced by 1000 bird in a year is 50-60 mt. Where litter is used, the amount of manure produced varies with the amount of litter, its state of decomposition and its moisture content.

In broiler production, the amount of manure produced is 10-15 mt per 1000 birds per year.

Composition

The composition of fresh poultry manure depends on the feeding regime and the type of birds for example, the droppings of broilers are richer in nitrogen than those of laying hens. In practice the manurial value depends mainly on the conditions under which the manure is collected and stored, the amount and kind of litter, and on the moisture content.

Heaps of manure exposed to the weather may lose much of their manurial value due to loss of ammonia to the atmosphere and the washing out by rain of the soluble

nitrogen and potassium. Manure made with litter contains over twice as much organic matter as fresh droppings and can be regarded as a bulky organic manure.

Table - 1 *Composition of Average Samples of Fresh Poultry Manure*

	Dry Matter	N	P ₂ O ₅	K ₂ O
	%	%	%	%
Fresh droppings	25	1.4	1.8	1.3
Deep litter manure	70	1.7	1.8	1.3
Broiler manure	70	2.4	2.2	1.4
Dried poultry manure	90	4.2	4.3	1.6
In-house air-dried manure	85	4.1	3.1	2.3
Farmyard manure (for comparison)	25	0.6	0.3	0.7

Table 1 shows the average composition of different types of fresh poultry manure compare with farm yard manure made from cattle excreta and straw.

Table - 2 *Approximate Amounts of Available Nutrients in Fresh Manures*

	(Kg/mt)		
	Nitrogen	Phosphate	Potash
Fresh droppings	9.0	5.5	5.5
Deep litter manure	10.0	9.0	10.0
Broiler manure	14.5	11.0	10.5
Dried Poultry manure	25.0	21.0	10.0
In-house airdried manure	24.5	15.5	17.0
Farmyard manure (for comparison)	1.5	2.0	4.0

Table 2 shows the approximate amounts of available nutrients in the various kind of poultry manure and in farm yard manure. Soils not naturally calcareous which receive large regular dressings of poultry manure may have their status modified depending on the calcium content of the manure. A check should be made periodically on the soil pH.

Storage

When poultry manure is stored care is needed to avoid under loss of nitrogen and potassium. These nutrients are soluble in water and can be washed out by rain. To reduce losses to a minimum the manure should be stored under cover, for example covered with polythene sheeting to avoid leaching.

Fresh droppings and broiler litter can be dried to 10-15 per cent moisture by various type of drying plant. The dried product is convenient to handle and store and it can be used as a fertilizer. The dried manure can be applied at useful rates - generally 2-6 mt/ha.

In deep litter and broiler house, the dropping are well mixed with wood shavings or straw or rice husk. In the case of deep litter, by the time the house is cleared, a composting process has taken place resulting in loss of moisture, ammonia and carbon dioxide. In both cases a relatively dry product is obtained and is easily handled in the same way as farm yard manure. Excessive amounts of saw dust or other litter should be avoided when making manure because nitrogen will become immobilized and temporarily unavailable to crops.

On a mixed livestock farm, poultry manure can be added to the manure heap. The small scale poultry keeper can add the manure to a compost heap where it will aid to improve the fertilising value of the compost.

Possible hazard

Pollution of streams, rivers, lakes and under ground water supplies must be avoided when using manure. It is also important to avoid offence to the public by spreading manure in such a way that the environment around houses or public places is not polluted. Manure and wind-blown dust from manure spreading can carry disease organisms into neighbouring land, crops and houses and must be avoided.

2. Feeding Stuff

Interest in the feeding of dried poultry manure (DPM) to livestock and poultry has developed as an economical means of disposal of poultry wastes from medium

and large scale intensive poultry units. The introduction of drying plants has become necessary because of the problems involved in the storage and transport of fresh manure and litter in developed countries. For example the manure output from 40,000 battery layers would amount to about 35 tons per week which could be dried down to 10 tons. The poultry waste contains 75 - 80 per cent water the drying costs can be high. Since high drying cost makes DPM more expensive than conventional fertilizers as a source of plant nutrients, the most profitable means of utilizing this product is by feeding it to livestock and poultry.

Composition of Dried Poultry Waste (DPW) and Dried Poultry Litter (DPL)

The organic components of modern high energy poultry feed are digested and metabolized to the extent of 70-80 per cent. The droppings contain the undigested feed, compound of metabolic origin, especially nitrogenous component such as uric acid, and microbial organisms from the lower gut. The manure from caged birds (DPW) contains little extraneous materials except wasted feed and possibly a small proportion of insoluble grit. The manure from birds kept on litter (DPL) also contains a variable proportion of litter normally in the form of straw, sawdust and rice husk.

DPW is very variable in composition. It contains a relatively high level of nitrogen, equivalent to about 27 per cent crude protein of which only about one third is true protein and the remaining is non-protein nitrogen, mainly uric acid. The true protein contains significant quantities of essential amino acid. DPW (particularly that obtained from caged layers) is low in digestible carbohydrate and high in mineral matter.

The mean and range in composition of DPW and DPL as found at the Poultry Research Centre, Edinburgh, is given in the table below:

	DPW		DPL	
	Mean	Range	Mean	Range
% Dry matter	91.4	82.3-96.1	84.5	78.7-89.1
% Crude protein	27.2	15.0-36.6	25.3	19.6-32.2
% True protein	10.6	8.8-12.9		
% Uric acid	5.7	2.0-9.9		

% Lysine	0.39	0.20-0.50	6.49	
% Methionine	0.12	0.05-0.21	0.13	
% Cystine	0.21	0.03-1.09	0.14	
% Tryptophan	0.53			
% Iso-leucine	0.37	0.23-0.50	0.58	
% Ether extract	1.08	0.9-3.0	2.3	
% Linoleic acid	0.85			
% Available carbohydrate	7.1	2.2-12.9		
% Crude fibre	14.9	10.1-24.6	18.7	11.2-23.0
% Total ash	26.5	18.1-40.4	14.1	13.4-16.7
% Calcium	7.4	3.8-12.5	2.5	1.8-3.2
% Phosphorus	2.1	1.7-2.8	1.6	1.2-2.5
% Sodium	0.4	0.1-1.0	0.4	
Copper mg/kg	57	15.0-94.0	23.0	
Manganese mg/kg	297	190 - 442	-	
Zinc mg/kg	289	40 - 555	343	

Food Values for Ruminants

The energy value of DPM will vary inversely with the mineral and litter content of the product, but in general it will be low and range between that of average hay and that of straw. Since the ruminant can utilize certain sources of non-protein nitrogen, including uric acid, to provide true protein, DPM has a high protein potential for the ruminant. In fact uric acid can be utilized particularly effectively for this purpose due to its low solubility in the rumen. DPM also provides a very valuable source of minerals, particularly calcium and phosphorus.

Feed Value for Pigs and Poultry

The feed value of DPM for pigs and poultry is lower than that for ruminants because they are unable to utilize the uric acid and crude fibre fractions. For this class of livestock DPW is broadly equivalent in terms of protein and amino acids to a cereal such as barley, DPW is low in available carbohydrate and fat so the energy value is low being about one third or less of the value for barley. It is a very useful source of readily available calcium and phosphorus. The feed value of DPL

will invariably be lower than that of the corresponding DPW because the accompanying litter will not have any significant feed value for pigs or poultry.

DPW has been successfully included upto 20 per cent in diets for layers and broilers. Where the birds require high density diets for example with broilers, fat must be used to maintain an adequate dietary energy for satisfactory growth rates.

Larger birds for example broiler breeds, and sows can be fed less dense diets. Thus the dietary energy level can be allowed to fall as DPW inclusion rates are increased. In this case daily feed allowances should be increased proportionately so that the daily intake of nutrients by the animal is maintained. For practical purposes DPW should be regarded as a relatively poor source of energy, a modest source of true protein and a rich source of phosphorus.

Possible hazards

Health hazard from the re-cycling of poultry manure could arise due to contamination with disease organisms, the presence of certain heavy metals and medicinal residues and incorporation of litter. A numbers of disease organisms may be present in the unprocessed manure but fortunately the majority of them are destroyed by the heat generated in the drying plant.

Non nutritional additives, growth promoters, and medicinal products are rarely used at high levels for caged layers, and therefore DPW should be free from significant levels of these substances. Where as, DPL presents a greater potential risk since birds in deep litter are likely to be fed additives such as growth promoters (copper, arsenicals and antibiotics), sulphonamides, coccidiostats and anti-black head drugs. Fortunately majority of antibiotics and sulphonamides would be destroyed by the temperature to which the manure is subjected. Coccidiostats and anti-black head drugs could well survive the process and could be present in DPL.

Further potential hazards from DPL could arise from the use of litter containing mycotoxins, wood preserving chemicals, insecticide residues (where these have been used for insect control on the poultry droppings) and from foreign objects such as nails and pieces of wire.

Despite such potential hazard laboratory examination of sample of DPM have indicated that contamination with bacteria is normally very low although in some cases recontamination of the end product has occurred. Further more, tests for bacterial contamination, odour and taste on milk, meat and eggs produced from animal and poultry fed on DPM, have indicated that these products are fully acceptable for human consumption.

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EFFICACY OF IVERMECTIN AGAINST THE NASAL LEECH,

Dinobdella ferox

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Summary

In - vitro and *in - vivo* trials were carried out to evaluate the efficacy of ivermectin against the nasal leech, *Dinobdella ferox*. The results of *in - vitro* trials indicated that the leech is highly susceptible to ivermectin even at very low concentration. The intramuscular and subcutaneous injections of ivermectin at the dose rate of 200, 400 and 600 ug/kg body weight to the experimentally infected sheep and goats failed to expell the leeches from the nasal passages. However the intranasal application and the method in which the leeches were allowed to be exposed to ivermectin solutions were found to be highly effective to secure the expulsion of leeches from the nasal passages of the infected animals.

Introduction

The nasal leech, *Dinobdella ferox*, infection (nasal hirudiniasis) in domestic animals is prevalent in the hills of Nepal. The mean percentage of infection in a herd may reach upto 52% in the dry season (December to May) of the year (Mahato, 1986). The young leeches are passed in the nasal cavity while drinking the infected water. They suck large quantities of blood and the suking sites continue to bleed for some times even after the sucking has been stopped so that in severe infections anaemia and loss of condition is resulted. After they have been attached in the nasal passages they start sucking the blood and some times their enlarged bodies cause marked local disturbances and serious respiratory distress.

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Although leeches are susceptible to most modern insecticides, and much simple solutions as sodium chloride, copper sulphate and Vinegar, no satisfactory treatment of nasal hirudiniasis is available yet. For the expulsion of leeches from the nasal passages application of the oil of chenapodium (Pillai, 1954) and chloroform water (Soulsby, 1876) have been recommended but these treatments are not very popular because of their variable efficacy and the complications associated with the application of large quantities of liquid in the nasal passages. The ivermectin which is a member of the group of antiparasitic agents avermectins, has been reported to be highly effective against a wide range of both ecto- and endoparasites (Fletcher, 1984; Lawrence, 1984; Armour, Bairden, Batty, Davidson and Rorr, 1985; Musemakweli and Monrad, 1985; Pegram and Lemche, 1985; Barth and Preston, 1985; Marker, 1986; Marriner, 1986). However there is no report available about its application against hirudiniasis. Therefore the efficacy of ivermectin against nasal hirudiniasis is evaluated and reported in this paper.

Materials and Methods

In-vitro trial

Trial 1. A 10-folds serial dilution of ivermectin (Ivomec, Merck, Sharp and Dohme, U. K.) from 10mg/ml to 0.1 mg/ml was prepared in 40 mm diameter polystyrene plastic pots. Tap water contained in one pot was used as control solution. Ten viable young *Dinobdella ferox* obtained from streams were introduced into each pot and their activities such as responses to external stimuli and viability were observed visually every 10 min. for one hr. and thereafter every 30 min. for two hr.

Trial 2. For this trial *Dinobdella ferox* were obtained surgically from the air passages of experimentally infected rabbits on the 10th day post infection (p. i.). Four such leeches were exposed to the experimental solutions of ivermectin-containing 20 ug/ml, 10 ug/ml and 1 ug/ml and the control beaker containing plain tap water for 30 seconds. They were then washed with three changes of tap water in which they were finally kept for observation.

In-vivo trial

Adult sheep and goats from Pakhribas Agricultural Centre, Dhankuta (PAC) were used in this study. All the animals were kept under close observation for three weeks and

were examined frequently for natural leech infection. They were experimentally infected with young *D. forex* collected from streams, using two leeches in each nostril and then the experimental animals are divided into different group composed of two sheep and 2 goats.

Trial 3. Parenteral routes of ivermectin administration were chosen for this trial. The dosage and administration schedules are presented in Table I.

Table I: Schedule of Parenteral Administration of Ivermectin to the Different Groups of Animals.

Group	Route of Administration		Doses (ug/kg of body weight)		
			First d. p. i.	10 d. p. i.	22 d. p. i.
A	S/C		400	—	—
B	S/C		600	—	—
C	S/C		—	400	—
D	S/C		—	600	—
E	S/C		—	—	600
F	S/C		400	600	—
G	S/C		200	400	600
H	I/M		600	—	—
I	I/M		600	600	—
J	I/M		—	600	600
K(control)	—		—	—	—

S/C Subcutaneous, I/M = Intramuscular, d. p. i. = Day (s) post infection.

Trial 4. The ivermectin solution was diluted to 20 ug/ml, 10 ug/ml and 1 ug/ml concentrations using tap water. The well mixed diluted solutions were then applied intranasally at the rate of 5 ml in each infected nostril of the experimental animals with the help of a plastic dropper as per the schedule shown in Table II. Some volume of plain tap water was applied to the nostrils of control animals. The time taken between application of the different concentration of solutions and expulsion of the

leeches from the nostrils were recorded. Next day the nasal cavities of all the animals were examined for presence or absence of leeches using an auroscope,

Table II: Schedule of Intranasal Ivermectin Administration to the Different Groups of Animals.

Group	:	Period Between Infection and Treatment (in days)	:	Concentration of Ivermectin Solution (ug/ml)
L	:	—	:	20
M	:	—	:	10
N	:	10	:	20
O	:	10	:	10
P	:	22	:	20
Q	:	22	:	10
R	:	22	:	1
S (control)	:	—	:	0

Trial 5. It was observed that after 15th d. p. i. the leeches protrude frequently through the nostrils and tried to dip their anterior parts in water while the infected animals were drinking. This tendency of leeches was utilized in this trial to expose the leeches to the ivermectin solution. Some water was sprinkled around the nostrils of infected animals which attracted the leeches to protrude through the nostrils. The ivermectin solution in a plastic pot was then placed in front of the nostrils. The leeches were allowed to dip their bodies in the solution for 1 to 2 minutes. The solutions containing 20 ug/ml, 10 ug/ml and 1 ug/ml ivermectin were used with T, U and V groups of experimental animals respectively. The experimental animal group W were offered only plain tap water indicating this as a control group. The time taken between exposure and expulsion with different concentration of ivermectin solutions were recorded. After 24 hours the nasal cavities of all the animals were examined visually using an auroscope.

Results

Trial 1. The results of the in-vitro trial 1 are presented in Table III. The exposure to ivermectin induced paralysis and eventually death in young leeches.

Table III: Effect of in - vitro exposure of young *Dinobdella ferox* to ivermectin.

Ivermectin concentration	Time of exposure min.	Lethargic/immobile leeches%	Dead leeches%
10.0 mg	Immediately	100	0
"	4		100
0.1 mg	10	50	50
"	20		100
10.0 mg	20	30	70
"	30		100
1.0 mg	30	60	40
"	60		100
0.1 mg	40	50	50
"	120		100
10.0 mg	60	50	50
"	150		100
1.0 mg	90	50	50
"	180		100
0.1 mg	150	50	50
"	210	20	80
0 (control)	210	0	0

Trial 2. In the in-vitro trial two exposure to the 20 ug/ml, 10 ug/ml and 1 ug/ml of ivermectin solutions for 30 seconds resulted in 100 per cent mortality of the *D. ferox* (which were obtained from the nasal passages of rabbits on 10th d. p. i.) within 4, 10 and 22 hours respectively.

In - vivo trials

Trial 3. All Parenteral routes of ivermectin administration failed to expell the nasal passages irrespective of the doses.

Trial 4. The results of the trial 4 are shown in table IV.

Table IV: *Efficacy of Intranasal Application of Ivermectin in Nasal Hirudiniasis*

Group	: Total No. of : leeches used to : infect the animals : in each group :	: Total No. of : leeches found : alive in the : nasal passage of : the animals : in each group : after treatment	: Expulsion : rate (%) :	: Mean time : taken between : treatment and : expulsion : (min)
L	: 16	: 11	: 31.25	: Not known
M	: 16	: 10	: 37.50	: Not known
N	: 16	: 5	: 68.75	: 55
O	: 16	: 7	: 56.00	: 70
P	: 16	: 0	: 100.00	: 65
Q	: 16	: 0	: 100.00	: 150
R	: 16	: 0	: 100.00	: 240
S (control):	16	16	0	-

It can be seen from the table IV that 100% of the leeches infecting the nasal passages were expelled irrespective of the concentration of ivermectin solutions used when the treatment was given on the 22nd day p. i. However the time taken between the treatment and the expulsion of the leeches was found to be proportionate to the concentration of the solutions. In the early stages of the infection the treatment was found to be partially effective.

Trial 5. The results of trials are summarised in Table V

Table V: Efficacy of Ivermectin in Nasal Hirudiniasis when the Leeches were Allowed Actively to Dip Their Bodies in the Solution.

Group	Concentration of Ivermectin	Expulsion Rate (%)	Time Taken Between Exposure and Expulsion (min)*
T	20	100	50 (45-70)
U	10	100	140 (80-180)
V	1	100	290 (240-350)
W (control)	0	0	--

* Figures in paranthesis indicate ranges.

Exposure to ivermectin solutions caused drooping in leeches which intensified later resulting the leeches hanging out from the nostrils. The flacid leeches dropped off on the ground either spontaneously or due to sneezing action of the infected animals the later appeared to enhance the expulsion of the leeches.

Discussion

From the in-vitro trials it appear that ivermectin is extremely lethal to *Dinobdella ferox* even at very low concentrations. Similar effect was reflected from the in-vivo trials too when the leeches were exposed to ivermectin solutions. Ivermectin is thought to act by increasing release of the inhibitory transmitter substance in the nervous system of the susceptible nematode and arthropode parasites (Marriner, 1986). The Present study, therefore, indicated that gamma amino butyric acid is also a transmitter substance in *Dinobdella ferox*.

A high efficacy of ivermectin against different nematode infections have been reported at the dose rate of 200 ug/kg and 300 ug/kg in sheep and goats respectively (Swan and Cros, 1985; Santiagoda Costa, Benevenga, Bordin and Guerrero, 1986). In the trials reported herein, the dose rates of 200, 400 and 600 ug/kg body weight for parenteral routes were found to be completely ineffective against *Dinobdella ferox* in sheep and goats even when the drug was administered during the early stages of

the infection. But the topical applications of ivermectin during patent period of the infection were found to be 100 per cent effective. These phenomenon could be explained in terms of the physiology of the leeches. A leech can suck the blood at a single meal several times its own weight. The ingested blood is stored uncoagulated in the crop and its diverticula serving as a huge reservoir. The digestion and absorption takes place slowly in the intestine. A leech may take more than a year for the complete digestion and absorption of a full meal. It could be possible, therefore that level of ivermectin required to release the inhibitory transmitter, never attained in the nervous system of the leeches because of extremely slow digestion and absorption of all the drug in the intestine from ingested blood. Where as the effective level of ivermectin in the nervous system may be attained quickly by the cutaneous absorption presumably because of the specialised haemocoelic system in the leeches. In the absence of true circulatory system, its function is taken up by a haemocoelic system in the leeches. An extensive network of fine haemocoelic capillaries containing haemocoelic fluid extend in between the cells of the epidermis which acts as a permeable membrane, through which the exchange of gases take place by diffusion with surrounding water (Kotpal, 1983,). Possibly ivermectin enters into the haemocoelic system of the leeches through the epidermis when applied topically and distributed to the tissues by the haemocoelomic fluid circulating in the system.

The reason for not achieving 100% expulsion by the intranasal treatment during the early infection could be that some leeches remained unexposed to ivermectin. It is unlikely that the exposed leeches recovered from the effect of ivermectin because the result of in-vitro trial 2 showed that once the leeches are exposed to ivermectin solution of 1 ug/ml concentration for 30 seconds only, they can not survive. It seems therefore that the unaffected leeches either were attached in the nasal passages in such a way, that taking advantage of their small size they escaped from being exposed to the solution or were absent from the nasal passages during the treatment. There are reports that in the early stages of the infection the leeches are often found attached in the pharynx of the infected animals (Easton, 1976).

The results of this study which record for the first time the therapeutic trials with ivermetin for the treatment of nasal hirudiniasis in sheep and goats are quite encouraging. This drug can be suggested for routine use to treat animals for nasal leech infection. Several cases of nasal hirudiniasis in different host species reported at PAC

have been treated successfully using ivermectin solution. The method used in Trial 5, i. e. allowing the leeches to dip their bodies in ivermectin solution (10 ug/ml) is preferred at this centre because it is convenient to use and only a few drops of the drug are required for securing expulsion of the leeches from the nasal passages of many infected animals. Again the solution could be kept for further use.

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REQUIREMENT FOR RINDERPEST ERADICATION CAMPAIGN IN NEPAL

Dr. Upendra Mishra*

Summary

Rinderpest is one of the most devastating contagious viral disease of ruminants. If this disease is controlled the losses could be saved in terms of livestock products needed to fulfil basic needs and make Nepalese to reach Asian standard upto year 2000 A.D.

Small ruminants do not act as virus reservoir. Unrestricted cattle movement is a potential source of Rinderpest disease infection. The foci of the disease lie some where near Indo-Nepal border from where it spreads every time specially in Western belt of the country. Strict control measures were taken to stop spread of the disease out side foci. Now it is convenient to suppress the incidence due to a net work of veterinary services with high frequency ratio communication system in the country.

Main constraints are lack of satisfactory method for identification of vaccinated animals, suitable legislation support, uncontrolled animal movements, maintenance of cold chain at field level and lack of awareness of the farmers regarding importance of vaccination.

Complete eradications of R.P. is possible from SAARC nations if technical co-operation and financial assistance are available to organize mass vaccination campaign with T.C.V. and follow-ups.

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Introduction

The noble desire to fulfil basic needs upto 2000 A. D. and make Nepalese to reach Asian Standard is the timely and high thinking of our beloved King Birendra. Food is the first basic human need to get 2250 calories per person per day, an ideal livestock - products should provide at least 10 per cent of the total calories.

An average Nepalese draws 1910 calories out of which 6.24 per cent from livestock products (Table - 1). This should be increased to 7.35 per cent i. e. total percentage increase will be 1.11 at the end of this century.

Estimated loss caused by various diseases is 30 to 40 per cent (Table - 2). Prophylactic vaccination, proper drenching and timely treatment of the livestock can save this loss and this will increase in animal production automatically.

As Rinderpest (R. P.) is one of the most devastating animal disease of ruminants and the losses caused recently (Table - 3) could be saved with mass-vaccination.

First incidence of R. P. was recorded in Kathmandu valley in 1939 which was controlled by traditional methods. After this incidence HMG of Nepal felt the need of Veterinary Services and set up first Veterinary Hospital at Tripureswar in Kathmandu valley by appointing Dr. T. B. Singh, as a first Veterinarian of the country in 1942.

A series of R. P. outbreak was recorded in the country which initiated HMG to make a request to F. A. O. to develop a programme for the expansion of Veterinary services in general and R. P. control in particular. Several experts have been assigned to fulfil Government's request. Dr. C. Seetharaman was one of them who helped in the establishment of Veterinary Laboratory and guided R. P. eradication campaign (1963/69) first phase. About 70 per cent of the bovine population of Terai were immunized under this phase.

After a lapse of 8 years, R. P. reappeared in the country and second phase of the control programme (1974/79) was effectively executed like previous one and 75 per cent of the bovine population were immunized against this disease (Table - 4).

In 1982 random serum samples from lower Terai belt were collected and on testing,

the immune status of population was found less than 19.1 per cent. This should have to be raised upto a level of 80 per cent through vaccination at strategic areas. Considering repeated outbreaks in bordering state of India there was a risk of disease transmission in Nepal and concerned authority was timely informed for the consequences.

In the absence of follow - up programme again the disease was recorded in those animals which are brought for sacrifice from Samastipur of Bihar at the time of Vijayadasami festival in Kathmandu valley in 1984. This time about 25 to 30 buffalo bulls were died and the disease was controlled with ring - vaccination.

Disease Status

Recently in Feb. 1986 there was a report of deaths of bovine across the open Indo - Nepal border at Muzaffarpur, Baxar, Patna in Bihar as well as Gorakhpur in U. P. due to R. P. Immediately after the information of this report HMG launched precautionary vaccination programme in the areas at high risk. For this purpose 1,00,000 doses of goat tissue vaccine (G. T. V.) were used for indigenous breeds and 10,000 doses of tissue Culture vaccine (T. C. V.) imported from I. V. R. I. India to vaccinate exotic and cross breed animals. But compared to large number of bovine population this quantity of vaccine was not enough. As a result HMG approached to FAO/APHCA for immediate assistance. Within a few days 20,000 doses of T. C. V. was made available from Pakistan under FAO auspices.

On March 3, 1986 deaths of 42 bovines were observed at Fatepur in Banke and eight at Rajapur in Bardia district of Mid-Western Terai of Nepal. Just after receiving the news, expert personel of HMG rushed at the site and disease was tentatively diagnosed to be R. P. The samples collected from the febrile cases and the postmortem materials quickly dispatched to Central Veterinary Laboratory Kathmandu as well as to I. V. R. I. for final diagnosis. Both institutions confirmed the disease to be R. P.

In the last week of April 1986 incidence of R. P. was recorded in Kathmandu valley at Thankot Village Panchayat where crossbred Sahiwal Holstein cows were brought from Ludhiana (Punjab) via Baxar in Bihar. Out of nine cows eight were died of this disease.

Recently in the month of June 1986 there was a report of R. P. outbreak in Banke, Kailali, Tanhu and Dang districts of Mid and Far Western Development Regions. Report of Tanahu was false. In the mean time again three cattle died at Patan - Lalitpur district in the month of September 1986.

Strict control measures were taken to prevent the spread of the disease. Details of the disease were sent to FAO for immediate assistance and a short term emergency control programme (4 months) was requested to the Ministry of Agriculture for the release of the budget. Rs. 3,00,000 sanctioned from Prime-Minister's natural disaster fund and allocated to 20 districts of Terai region for organizing immediate vaccination. In this short period 287,913 heads of bovine were vaccinated against the disease.

At the same time F.A.O. released US \$ 67,000 for the control of emergency disease. Immediately R.P. vaccination equipment, transportation and broad casting medias were procured and distributed to needed areas.

Short and long term vaccination programmes were prepared and submitted to the Ministry of Agriculture for final approval. Rs. 4,621,000 has been sanctioned for this fiscal year to start the vaccination programme. This has already been started at 28 Centres adjoining Indo - Nepal border with a target to vaccinate 1250,000 heads of bovine upto the end of June 1987.

Each Centre has a mobile team of 23 personnel which is as follows:

Dist. Level		Field level	
Vet. Officer	1	Junior Technician	1 x 3
Lab. Assistant	1	Vaccinators	4 x 3
Assistant Accountant	1	Messenger	1 x 3
Driver	1		
Messenger	1		

Each centre has been provided with a four wheel pick up and four bicycles to maintain prompt mobility in the field, supervise and monitor the vaccination campaign. There is a regular supervision of the vaccination programme from the central level. So far 418,800 heads of bovine population have been immunized.

Recently F.A.O. has submitted a time bound Rinderpest Eradication Project for SAARC nations, which will be financed by donor countries with the request of respective government to UNDP/FAO.

The project will have three phases:

1. Preparatory Phase (12 months)-preparation for the campaign - to ensure synchronised action along international borders, ordering of equipment, organising supplies and training of national staff.
2. Eradication Phase (3 years) - vaccination of susceptible animals according to national strategy development.
3. Surveillance Phase (2 years) - eliminating all residual foci of R.P. by strengthening surveillance team in the country,

The U.N.D.P. financed Regional Co-ordinating Unit will operate for the first 5 years of the 6 years campaign. The host country will take over the responsibility of follow-up action when UNDP assistance come to an end.

Head quarters of the Co-ordinating Unit will be located centrally at New Delhi, India. The regional R.P. laboratory at I.V.R.I. will be strengthened. The primary responsibility of planning and implimenting the regional campaign rests with the participating government. The Co-ordinating Unit will assist in the preparation of plans and will actively co-ordinate activities decided by the participating countries.

The host Govt. will provide all necessary office, laboratory and class room facilities for the regional activities. The participating Govt. will be fully responsible for the provision of the public relations, physical facilities, equipment, transport and fuel for the campaign in the respective countries.

Each participating Govt. will appoint a National Co-ordinator who will be responsible for the implimentation and execution of the project at national level and he will be provided with adequate qualified staff to undertake the task (Table-5.)

Vaccine Production Lab-will produce the vaccine required during the project period

and also for the follow-up programme. Facilities will be developed for T. C. V. production.

Disease Investigation Lab-will take necessary action in sample collection, prompt diagnosis and monitoring of the immune status of the animal also will provide guidances to the surveillance team.

Surveillance team-will work through-out the year with a vigilance to disease incidence. There will be six surveillance teams-one at centre with Disease Investigation Lab. and one at each Regional Directorate. They will also check the un-restricted cattle movement.

District vaccination team-R.P. eradication campaign will be organised at 30 district centres for six months each year specially in winter season.

Field vaccination team-each district will have three field vaccination teams for six months preferably in winter months to carryout effective vaccination work.

Vaccination check posts-there will be at least 25 vaccination check-posts located at the strategic points at Indo-Nepal border and at foot hills to check unvaccinated animals and will execute quarantine act.

There is no specific disease control legislation but legal provision for the control of infectious diseases are made in the Infectious Disease Act 1963 (First Amendment 2020) which has been published by HMG of Nepal Gazette. Part 4, Bhadra 25, 2041 (10th September 1984). Now a second proposal "Livestock Quarantine Act" has been submitted to the Ministry of Agriculture for final approval.

Trading of livestock is under taken on extensive scale in village livestock markets and cattle fairs which are held periodically at different parts of the country. Livestock traders collect bullocks, cows, buffalo cows and bulls from one area to sale in the other. Such cattle herd move at well established routes and traditional animals are taken to forest for grazing during scarcity of fodder. Presently buffaloes are brought in Kathmandu valley from Terai and India for meat purpose. They are moved either by truck or on hoof. Such animal movement is a potential source of R. P. disease infection.

Biological Products Lab. established during 1966, produces G.T.V. and its Quality Control Unit carries out safety tests. Production and standardization protocols are not enforced. At the field level the potency of the G.T.V. is not tested.

Tissue Culture Lab. is under establishment phase and production of T.C.V. is hoped in near future. At present it is imported from India and Pakistan. The quantity of G.T.V. used in the country from the different sources are also shown in Table - 4.

Roles of small ruminants (sheep, goats & pigs) are not confirmed for disease transmission, although sheep and goats have been proved to be unquestionably sensitive to potential inoculation and can be contagious for cattle placed in contact with them. Here under natural condition, vaccination of bovine without involving sheep and Goat led to remarkable level of control of the disease. Past experience shows that small ruminants do not act as reservoirs of R. P. and play role in the spread of the disease rather movements of animals from R. P. infected countries or area play an important role in the spread of this disease.

Our past experience again shows that the focal point of R. P. lies some where near Indo - Nepal border. Intermitant incidences are always reported in the adjoining Terai. Incidence of this disease in Tibet is unknown.

Nepal has a network of Veterinary Hospitals (75), Dispensaries (5), Livestock sub-centres (505), Checkpost (24) with Vet. Officers (148), Lab. assistants (417), Stock supervisor (1154), Stockman (459), Lab. boy (66) and temporary Vaccinators (336). The high frequency radio transmitters are installed in the Department of Live stock Development and Animal Health office in Lalitpur and at 60 remote centres to improve communication system.

Table - 1 Present Consumption of Livestock Products and Future Requirements in Terms of Calories upto 2000 A.D.

Livestock products	Present consumption		Consumption upto 2000 A.D.		Increasement within 14 year		Remarks
	per head per day						
	6.24%		7.35%		1.11%		
	Qty.	Cal.	Qty.	Cal.	Qty.	Cal.	
	gms.		gms.		gms.		
Milk	37	86.2	152	114.0	115	27.8	Present cal.
							intake of
Meat	15.61	29.5	38.35	47.0	22.74	17.5	119.2 should
							be increased to
Eegs	0.5	3.5	2.7	4.3	2.2	0.8	165.3 upto
							2000 A.D.
Total	53.11	119.2	193.05	165.3	139.04	46.1	

Note: Quantity = Qty., Caloris = Cal., Grammes = gms.

Table - 2 Livestock Production Loss Estimation Due to Various Diseases interns of Meat, Milk, Eggs and Wool.

Particulars	Present production in metric tones	Loss due to death 25%	Loss by morbidity 15%	Total loss 10%	Increase in production with vac, dren, t. 30%	Loss that can't be saved 10%	Remarks
Buff meat	86268	21567	12940.2	34507.2	25380.4	8626.8	
Mutton	2586	646.5	387.9	1034.4	775.8	258.6	
Goat meat	25446	6361.5	3816.9	10178.4	7633.8	2544.6	
Pig	7234	1808.5	1085.1	2893.6	2170.2	723.4	
Poultry meat	5210	1302.5	781.5	2084.0	1563.9	521.0	
milk Cow	219192	54798.0	32878.8	87676.8	65757.6	21919.2	
Milk Buff	525985	131496.25	78897.75	210394.0	157795.5	52598.5	
Hen eggs	249000	62250	37350	99600	74700	24500	
Wool	670	167.5	100.5	268.0	200.5	67.5	

Remarks : Losses caused in the production of livestock products by various diseases is estimated to be 40% and if this losses could be saved by prophylactic vaccination, proper drenching, prompt diagnosis and organizing treatment. In this attempt about 30% of the total losses could be saved and rest 10% remain unsaved due to natural phenomenon.

Table 4. *Number of Outbreaks, Animal Vaccinated, Doses of Vaccine Produced and Procured Since Beginning of R. P. outbreak in Nepal.*

Yrs	: : incidence:	Desease Inci. : : No of : : Place :	Heads of : : animal : : vaccinated :	Availability of vaccine : : in 1000 doses : : Loc.Prod : : Procured Place :	Remarks	
1938/39	1	Kath	-	-	-	Traditional method
1932/53	1	Pokhara	-	-	-	L.R.S. Wt.G.T.V. Paten
1954/35	4	Mid region of of Terai	-	-	-	„ R.P.Serum and G.T.V. G.T.V.
1962/63	-	-	-	-	800 Pakistan	-
1963/64	6	„	1,50,000	-	-	-
1964/65	-	-	6,08,667	-	1470 I.V.R.I.	-
1955/66	4	Mid Terai	7,77,052	443	-	- 1st G.T.V. Production
1966/67	21	Whole Terai	9,52,359	792	6	Cairo
1967/58	8	Western hills	4,56,529	556	-	-
1968/69	1	Kath	1,26,029	335	-	-
Total	46	-	29,70,636	2146	2275	1st phase
1969/71	-	-	-	435	-	-
1972/73	1	Mid region	-	261	21	-
1973/74	7	Allover terai	-	178	-	-
Total	-	-	-	874	-	-
1974/79	-	-	44,90,773	4172	-	-
1979/84	-	-	-	1300	-	-
1984/85	1	Kath Valley	-	-	20.1	I.V.R.I.
1985/86	6	Mid Western	2,87,913	207.75	10.0	„
1986/87	1	Banke	4,18,800	803.90	20.0	Pakistan
					50.0	Baif
					38.0	I.V.R.I.
Total			7,06,713	2311.65	138.1	

Table 5 *Man power Required for Longterm (1937/92) R.P. Eradication Campaign*

Name of Posts	Position	National	Vaccine	Disease	Survei	Dist.	Field	Vet. C. Post	Total
		Co-ordi nator off.	Product Lab.	Invt. Lab	llance team	Vac. Team	Vac. Team		
National Co-ordinator	G1	1	—	—	—	—	—	—	1
Asst. "	G2	1	—	—	—	—	—	—	1
Public Relation Off	G2	1	—	—	—	—	—	—	1
Senior Vet. Officer	G2	—	1	1	—	—	—	—	2
Junior Vet. Officer	G3	1	1	—	1x6	1x30	—	—	38
Cold Chain Supervisor	G3	1	—	—	—	—	—	—	1
Refrigeration Mechanics	G3	1	—	—	—	—	—	—	1
Accountants	G3	1	—	—	—	—	—	—	1
Assistant Cold Chain Sup.	NG1	1	—	—	—	—	—	—	1
Assistant Accountant	NG1	—	—	—	—	1x30	—	—	30
Assistant Cleark	NG2	1	—	—	—	—	—	—	1
Typists	NG2	2	—	—	—	—	—	—	2
Secretary	NG2	1	—	—	—	—	—	—	1
Junior Cleark	NG3	1	—	—	—	—	—	—	1
Lab. Assistant	NG1	—	1	1	1x6	1x30	—	—	38
Junior Technical Assistants	NG2	—	2	2	1x6	1x30	1x3x30	1x25	155
Driver	NG3	4	1	1	1x6	1x30	—	—	42
Vaccinators	NG3	—	—	—	4x6	—	4x3x30	2x25	434
Messenger	NG4	5	5	2	1x6	1x30	1x3x30	2x25	188
Total									939

Problems and Constraints Experienced

- There is no time bound R. P. eradication programme,
- There is no satisfactory method for identification of the vaccinated animals,
- Absence of proper quality control on the production, distribution and administration of vaccine.
- Absence of suitable legislative support for disease eradication programme.
- Un-restricted movement of animals inside the country as well as at open frontiers.
- Lack of awareness of the benefits of 'eradication' of R. P. is another factor for absence of proper support from the farmers.
- Non-availability of ice in winter season to maintain the potency of the vaccine in the field.
- Scarcity of Kerosene oil refrigerator for preservation of vaccine in case of irregular electricity supply.
- Lack of regional co-operation among the SAARC nations.
- Prompt disposition of all affected and exposed animals are not possible due to religion and act.
- Lack of strict quarantine at the point of entries in the country.
- Lack of animal production licenses issue.

Scientific and technical feasibility of R. P. eradication from the country.

There still remains some focal points specially in the Mid and Far Western Regions of the country or in neighbouring India from where disease spreads every time. However, in other parts of the country except Kathmandu valley the disease has not been experienced. Epidemiological situation has remained practically unchanged.

Recent events in west Africa and the present situation in South Asia regions amply justify the need for R.P. eradication specially in Nepal to meet the demands of live-stock products upto 2000 A.D. Even the disease is endemic in Terai regions but very large areas are free from the disease due to high himalayas. Vaccination of bovine population at regular intervals resulted in marked reduction of affected cases.

Small ruminants though susceptible must not be accused for being a virus reservoir. The R.P. virus belonging to para-mixoviridae family and to morbilli virus group and is very fragile and do not survive for longer period outside the animal body. As there is only one antigenic form of R.P. virus, a correctly prepared vacc-

ine gives protection in all the location. Starting from the inactivated vaccine we have now T.C.V. which is quite safe, cheap and can be used under any adverse circumstances unlike other previously developed vaccine. It can be used in large as well as small ruminants even in advanced stage of pregnancy, to young calf under one year of age and in exotic, cross bred and hilly cattle.

Recent arrival of FAO expert for R.P. Dr. V.P. Singh in September 1985 and Dr. Scott in April 1986 for a study of requirements for R.P. eradication from this region shows the future eradication of R.P. is possible.

It would be desirable to co-ordinate vaccine production and establish Vaccine Bank among SAARC countries. Joint inspection and surveillance team can fix the location of check posts and quarantine stations at international borders. Recently a proposal has been prepared by FAO for complete stamping out of this disease by collaborative approach of SAARC nations with a time bound programme (1987/92) starting at each international border organizing mass vaccination of total bovine population within a period of six years with adequate monitoring and surveillance of this disease.

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EVALUATION OF RICE-STRAW AS A POTENTIAL SOURCE FOR FASCIOLA INFECTION OF RUMINANTS IN NEPAL

- Dr. B. R. Joshi •

Summary

Rice-straw constitutes the major forage source of ruminants during the winter period in the mid hills and Terai regions of Nepal. In this area, the prevalence of fascioliasis is also reported to be high even in stall fed animals.

In the present experiment, fluke free buffalo calves were used as tracer animals in an attempt to study the role of rice-straw as a source of fasciola infection to the ruminant livestock.

It was found that feeding rice-straw even after storage for two months produced the disease in the tracer animals, indicating the possibility of rice-straw as one of the means of acquiring fasciola infection by the animals. The significance of these findings for the epidemiology of the disease is discussed and further areas of research are suggested.

Introduction

Fascioliasis is the most important parasitic disease of the ruminant livestock in Nepal. Although a proper survey in different parts of the country has not been conducted to determine the prevalence of this disease, the number of positive faecal samples reported from veterinary hospitals in the different parts of the country indicates its wide occurrence and high prevalence within the country. The economic loss caused by this disease to the national economy has been estimated to be Rs. 92 million/year (Hassel *et al* 1979, cited by Shrestha 1983).

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Some workers have attempted to evaluate the prevalence of this disease in some parts of the country. Report of Tinau Watershed Project Livestock Section (1983) showed the prevalence of 62.1% in cattle and buffaloes in the Madan Pokhara Panchayat of Palpa district. Joshi (1986) conducted a survey at different altitudes of Salija and Bajung hills of Parbat district and recorded a prevalence of 77.1% in the adult ruminants even at an altitude of 7,200' asl. (Upper Salija village).

In most countries, the principal source of infection in ruminants is grazing on the pastures contaminated by the metacercariae of *Fasciola* species; however, in rice growing countries, different workers have suspected the feeding of rice-straw as a disease perpetuation (Dumag, Batolos *et al* 1986, Joshi, 1985).

In Nepal, rice-straw is used as a principal source of animal feed during the winter period in the rice growing areas (Terai, Mid hills) of the country. The higher prevalence rate of the disease in the rice growing parts of the country and the occurrence of the disease even in stall fed animals indicate the possibility of rice-straw being a carrier for fasciola metacercariae to the animals.

The present experiment was conducted to analyse this possibility.

Materials and Methods

Seven buffalo calves (1 - 2 year old) were purchased from the fluke free areas (Baobare and Ghandruk Lekh) of Myagdi and Kaski districts. These areas were regarded as fluke free because no cases of fascioliasis has been observed in these areas and on a sample survey of 20% of animal population, none of the samples were positive for fasciola eggs on faecal examination by standard sedimentation method.

The animals were brought to LAC and were kept on a concrete floor under stall fed conditions and watered from tap water in buckets through out the experimental period. On faecal examination of the animals by the standard sedimentation method all were found negative. However, as a precautionary measure, all the animals were drenched against fascioliasis with Triclabendazole (Fasinex: Ciba Geigy) at the recommended dose rate of 12 mg./Kg body weight. Triclabendazole is the most recent development in the long list of fasciolicides and has been reported to be highly effective against all stages of *fasciola* sps. (Boray *et al* 1983).

Rice-straw for the experiment was brought from the endemic fluke area (Jhobang) of Kaski district, where in a survey 46% of the adult animals were found with *fasciola* infection on faecal examination (Joshi 1985, unpublished data). The straw was selected from paddy fields where high population of *lymnaea viridis* and *lymnaea auricularia* sps. of snails were observed during the monsoon (crop standing) period.

The straw was obtained after the grains were threshed out by animal trampling. It was kept as bales in the open throughout the experimental period. The straw was collected during the first week of November and fed to the calves for a period of 60 days from 26th December 1985 to 23rd February 1986. Meteorological data were recorded during the pre-feeding and straw feeding periods, which are presented in Table No. 1.

Table - 1 Meteorological Records During the Straw Storage Period

Month	Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm)	Total Rain Days
	Range	Average	Range	Average		
November:	6.4-22.3	12.93 $\pm$ 0.269	69-94	85.3 $\pm$ 1.118	20.3	6
December:	2.3-19.2	11.09 $\pm$ 0.369	56-100	80.58 $\pm$ 1.683	65.5	3
January :	2.9-16.5	9.67 $\pm$ 0.177	62-94	74.70 $\pm$ 1.436	1.4	4
February :	4.1-18.1	11.12 $\pm$ 0.22	51-96	74.03 $\pm$ 2.129	34.6	4

Apart from the straw feeding, the animals were reared on tree fodder supplemented with concentrate ration. Faecal samples were examined regularly at an interval of 15 days by standard sedimentation method. After the completion of straw feeding, the animals were reared for 70 days on tree fodder. Then the animals were slaughtered. Livers were carefully taken out, weighed and processed by the method described by Pullen et al (1970).

Results

Eggs of *Fasciola* sps. were not recovered from the animals on faecal examination during the period of experiment. On post-mortem examination the livers were normal

in appearance; however, on processing the livers, flukes of different size were recovered from the livers of all the animals. The number and size of the flukes recovered is presented in Tables 2 and 3 respectively.

Table - 2 Number of the Flukes Recovered on Post - mortem

Tag No. of the animals	Weight of the liver (kg)	No. of flukes recovered	Size of the flukes	
			Range (mm)	Average (mm)+SE
42	1.62	46	7-53	23.35 $\pm$ 1.414
44	1.47	8	15-36	25. 0 $\pm$ 2.654
45	1.38	11	11-30	20.12 $\pm$ 2.039
46	1.96	12	10-28	18.33 $\pm$ 1.929
47	1.45	22	15-40	25.23 $\pm$ 1.666
48	1.84	28	15-39	25.846 $\pm$ 1.295
49	1.64	11	22-35	29.142 $\pm$ 1.895

The intact flukes recovered on post-mortem from all the animals are grouped and presented in Table No. 3.

Table - 3 Size (Length) of the Flukes Recovered

Range	Total Flukes	% of the total intact flukes recovered
0 - 10 mm.	3	2.56
11 - 20 mm.	46	39.31
21 - 30 mm.	49	41.88
31 - 40 mm.	18	15.38
41 mm. and above	1	0.84
Total:	117	99.98

Morphologically, the flukes resembled to *Fasciola gigantica*; however, laboratory confirmation is still awaited.

Discussion

The recovery of the flukes from the calves brought from the flukes free area and fed only upon the tree fodder and rice-straw indicated the possibility that rice-straw could be a source for fascioliasis in these animals.

As the tree fodder could not be the source for the fasciola infection, it can be concluded that the calves acquired the infection from the rice-straw fed during the experimental period.

Paddy fields provide the ideal conditions for the habitat of intermediate snail hosts and the high population density of snails could be observed in some of the fields. However, especially in the hills, not all the paddy fields are populated by intermediate snail hosts. Hence it can be presumed that only the rice-straw from the fields populated with intermediate snail hosts would be contaminated by *fasciola* metacercariae.

It is assumed that the snail hosts in these fields are infected from the manure of the infected animals and in due course release this infection to the rice plants and grasses growing there. The infection in these plants remained viable for a considerable period and the animals acquired the infection even from the straw.

Although it can be considered that the metacercariae might not remain viable in the dried straw, the findings of the present experiment indicate that, under experimental conditions, the metacercariae remain viable for a considerable period in the rice-straw. The prolonged survival of *fasciola* metacercariae has been studied by many workers in different parts of the world. Marek (1927) reported that the metacercariae of *F. hepatica* survived for 8 months in moist hay collected during the rainy period. Kimura and Shimizu (1978) found that the metacercariae of *F. gigantica* in the rice-straw kept in a barn remained viable for upto 120 days post-encystment. Burino and Chaudhary (1982) reported that the metacercariae of *F. gigantica* could remain viable even at temperatures of 60 degrees Centigrade, provided the relative humidity was more than 60 per cent.

Ross and McKay (1929, cited by Boray 1969) have reported that metacercariae of *F. hepatica* were highly susceptible to sunlight and survived only 2 days when exposed to sunshine in Australia. It is possible that under Nepalese conditions most of the

metacercariae might be destroyed by sunlight; however, some of them might still remain viable and the practice of straw stacking might also contribute to their prolonged survival. Moreover, the viability of *F. hepatica* metacercariae might be different than that of *F. gigantica*, which is generally believed to be the predominant fluke sps. involved in most parts of the country, although the mixed infection of *F. hepatica* and *F. gigantica* have also been reported from Nepal (Lohani and Jaeckle, 1982).

In light of the present findings and the reports of other workers on the viability of *F. gigantica* metacercariae it can be concluded that, in Nepalese conditions, where the relative humidity is generally above 60% in most parts of the country during the winter, the metacercariae remain viable in the rice-straw and its feeding becomes only source of *Fasciola* infection for the ruminants. However, there might be slight differences in the survival of metacercariae which might depend upon the climatic conditions of the area concerned.

In Nepal, it can be said that rice cultivation and fascioliasis of animals are closely related, and a higher prevalence of the disease is observed in the rice growing areas. One of the reasons for this (higher prevalence) might be due to the practice of rice-straw feeding during the winter period.

This possibility was also supported by the findings of a drenching programme by Tinau Watershed Project (TWP Livestock Section report 1983) where, in stall fed buffaloes, the level of infection remained constant even after the regular CTC (Carbon Tetra Chloride) drenching at 2-3 months interval (November, March and June). During this period the animals were mainly fed on rice-straw and tree fodder and were generally watered in their sheds.

The constant prevalence level observed might be due to the regular infection acquired from rice-straw by the animals. The standard size (length) of *F. gigantica* has been reported to be 25-75 mm. (Soulsby, 1976). During the present experiment, most of the flukes recovered were between 13-40 mm. in length and few below 10 mm. as well. Although it can be argued that the animals were harbouring the infection prior to the experiment and the infection remained within them despite the Fasinex drenching at the beginning of the experiment. However, if the animals were infected prior to the experiment, during the experimental period of 145 days all the flukes would

have matured and would have attained the standard size. Hence, the immature flukes (below 20 mm. in length) recovered from the animals on post-mortem indicate that the infection was acquired by the animals during the experimental period from the rice-straw alone.

It was not possible to determine the exact period of metacercarial survival in the rice-straw by this experiment, but it is certain that some metacercariae remain infective upto a considerable period. The determination of the period of viability in different climatic conditions needs further research, the outcome of which will also be helpful in recommending the safe period for rice-straw feeding.

The identification of agro-ecological conditions favouring the snail habitat in some of the rice fields, leading to metacercarial contamination of the rice-straw and animal infection also needs further study.

At the present stage, it is not possible to recommend the practical and socio-economically adoptable methods for making the contaminated rice-straw safe for animal feeding, which also needs further study.

It is believed that the findings of the present experiment would be helpful to understand some aspects of the epidemiology of fascioliasis and to formulate a strategic drenching schedule against this disease, so that productivity losses in ruminant livestock could be minimised.

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**THE COMPARATIVE EFFICACY OF 10 PER CENT FORMALIN AND
10 PER CENT ZINC SULPHATE FOOT BATHS FOR THE
CONTROL OF OVINE FOOTROT***

Dr. B. Parajuli**

Summary

Comparative efficacy of 10 per cent v/v Formalin and 10 per cent w/v Zinc Sulphate foot baths for the control of ovine footrot was studied. Both foot baths were found effective, however, Zinc Sulphate proved superior to Formalin to cure the severe lesions and Formalin was better in hardening the hoof keratin and healing of the mild lesions.

Introduction

The ovine footrot is an infectious and contagious disease of the feet characterised by inflammation of the skin at the skinhoof junction, under running of the horn and inflammation of the sensitive laminae of the foot causing severe lameness. Although, it is a disease of mainly ovine foot and less frequently of caprine, it has been even reported in cattle (Thorley, et al 1977, Liang, Egerton, 1978) and red deer (Skerman, 1983).

Economic loss due to footrot is difficult to assess. However, it probably causes greater economic loss in enzootic area than any other disease of sheep with exception of helmenthiasis (Carroll, 1966).

Ovine footrot has been treated since the disease was first recognised and discovered by Beveridge (1941) that the *Fusiformis nodosus* as main causative organism. Many workers have recommended various therapeutic agents like Copper sulphate,

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Formalin, Creosote, Dichlorophen with Hexachlorophen, Chloramphenicol, Zinc sulphate etc. They were chosen largely for their antibacterial properties and easy to use, but the results obtained were very variable.

In Nepal, this disease was first recognised in 1960, however, the treatment programme to control this disease was started from 1975 only (Karki, 1983). The medicament used in foot bath was Copper sulphate (Joshi, 1987). It is well understood that due to high cost of labour involved in trimming and paring the feet, the medicaments used in the past did not become effective in the most parts of the world. Thus, most of the unsuccessful footrot control reports of the past were due to the insufficient foot paring.

This study has been directed towards the evaluation of efficacy of a foot baths containing either a 10 per cent Zinc sulphate or a 10 per cent Formalin solution to cure the footrot lesions of various degree of severity.

Materials and Method

This study has been undertaken in the month of August in a commercial lowland flock in England. The ewes were grazed extensively on mostly permanent pasture. The weather was relatively wet during the period as compared to previous years.

Footrot infection was detected by clinical examination only. From the whole flock ewes with one or more infected feet were isolated irrespective of breed or age and, identified with ear tags and spray marks. These ewes were divided randomly into three experimental group of 30 animals in each group. Apart from treatment periods, all the ewes were grazed together as a single flock in a paddock with short permanent grass. The experimental period was relatively wet to favour the transmission of the footrot organism (s) within the flocks.

Foot Inspection and Footrot Lesions Scoring

On the first day of the experiment all the ewes were turned up and their feet were examined. Foot rot lesions were scored using a modified method based on that of Egerton, Roberts (1971), and Stewart et al (1982) on the following way:-

- 0 = A healthy foot without any lesions.
- 1 = A foetid smell, with or without slight separation of hoof horn.
- 2 = A lesion with a marked degree of separation of hoof but undergoing to the healing process.
- 3 = An active footrot with complete underrunning of horn from heel to toe region or partial underrunning as in 3 but with granuloma at any region between heel to toe.
- 4 = An active footrot with extensive underrunning of hoof horn.

The lesions were scored for each foot and any score more than 1 was graded as infected foot. The lesions of all the feet were scored again on 26th day by cleaning the muck and exploratory paring whenever necessary to determine the presence of lesions.

Foot Baths

1. *Formalin*: Formalin (40 per cent formaldehyde) was diluted in water at 1:9 v/v and used in a run-through fibre glass trough. Thorough mixing of Formalin with water was ensured by stirring the solution before the ewes were run through.

2. *Zinc Sulphate*: Zinc Sulphate was dissolved in water at 1:10 w/v and again used in fibre glass trough as for Formalin.

Treatment: To facilitate the scoring of lesions a light trimming of the digits were undertaken whenever necessary which involved the removal of already separated hoof horns in all 3 groups of animals.

After the first examination the animals were treated on weekly interval as under:-

Group 'A' : Zinc Sulphate foot bathing for 3 occasions.

Group 'B' : Foot bathing in Formalin solution for 3 occasions.

Group 'C' : No foot bathing (Control group).

Animals from Group 'A' and Group 'B' were allowed to run without holding through the trough with appropriate foot baths for that group. Before they returned to the paddock they were held on a dry floor for about half an hour.

Chi-square test was used for statistical analysis of changes in the incidence and severity of footrot lesions in the different treatment groups of animals.

Results

Table I & II show the overall presence of footrot infection in different group of animals. On day 26 examination a number of newly infected feet were recorded: 2(1.66%) in Group 'A'; 3(2.5%) in Group 'B' and 6(5%) in Group 'C'. 3 (2.5%), 6(%) and 19(15.83%) feet recorded unchanged on day 26 in Group 'A' and 'B' and 'C' respectively. Pockets of infection were observed in some cases of Group 'B' ewes on day 26 examination; whereas, none such cases were observed in any of the Group 'A' ewes.

Results show that both Formalin and Zinc Sulphate foot baths were significantly effective ($P < 0.05$) in the control of footrot (Table - II). However, the zinc Sulphate foot bath was found to give a better healing in severe cases of footrot, whereas, the Formalin foot bath was better than Zinc Sulphate in mild footrot lesions (Score 1 and 2). Thus, in this study the average lesions score per foot increased to 2.73 on day 26 from 2.59 of day 1 in Group 'B' (Table-I).

In control group healing was continuous only in regressing lesions. Thus the mean score in control group increased to 2.97 from 2.6 of day 1.

Table - 1 Table Showing the Number of Infected Feet with Different Lesion Scores.

Treatment Group	Day	Footrot Lesion Scores On Number of Feet					Total Scores	Av. Lesion Score/Foot
		0	1	2	3	4		
A. Zinc Sulphate	1	83	5	12	13	7	96	2.59
	26	106	0	9	3	2	35	2.50
B. Formalin	1	79	3	21	7	10	106	2.59
	26	105	2	4	5	4	41	2.73
C. Control	1	75	7	17	8	13	117	2.60
	26	88	3	8	8	13	95	2.97

Table II *Effect of Treatment on Reducing the Severity of Footrot Lesion*

Treatment Group	Day	No. of Feet infected	Total Lesion Scores	Reduction in Infection %	
				Feet	Lesion Score
A. Zinc Sulphate	1	37	96		
	26	14	35	62.5	63.5
B. Formalin	1	41	106		
	26	15	41	63.4	61.3
C. Control	1	45	117		
	26	32	95	28.9	18.8

Discussion

In this study both Zinc Sulphate and Formalin foot bathing following some degree of initial trimming showed a significant curative effect in footrot infection of a wide degree of severity. It has been reported that daily foot bathing with 10 per cent Zinc Sulphate has been able to reduce the number of footrot cases greatly for 15 days without trimming of hoof (Cross and Parker, 1981). Single application of Zinc Sulphate after thorough paring also gave a good curative effect when re-examined after 2 weeks (Cross, 1978). In one study it has been reported that 10 per cent Zinc Sulphate was better than 10 per cent Formalin when used after paring of feet (Heitz, 1982). However, there are more reports of relapses following Zinc Sulphate foot bathing as opposed to Formalin when treatment are discontinued (Demertizis et al 1978; Preitz and Dietz 1982).

On a detail study Hone by Skerman et al (1983) added the surfactant 'Teepol' (40% Sodium Dodecyl Sulphate) to promote the penetration of zinc into hoof keratin. They obtained similar results as by Cross (1978); and Heitz (1982); when Formalin foot bathing was accompanied by paring of feet at twice weekly intervals. This indicates that after a thorough paring even Formalin will give the similar results as by Zinc Sulphate. In this study also results obtained by Zinc Sulphate foot bathing and Formalin foot bathing were not statistically significant.

However Zinc Sulphate gave a better cure to severe footrot lesions. This is possibly due to the ability of zinc to penetrate hoof keratin as shown by Malecki and McCausland (1982), Formalin gave a poor response to such cases as it is irritant to soft tissues, delaying the healing process. Also, Formalin is unable to penetrate the hoof keratin and thus do not have bactericidal effect on deeper infected tissues. That is why the hidden pockets of infection were left in the infected hoof.

No differences were observed either with Foramlin or Zinc Sulphahte in mild cases of footrot (score 1 and 2). The faster response shown by Formalin in such cases are due to the better hardening of hoof keratin (Ross, 1983) with complete destruction of organism (s) which has not reached the deeper tissues.

Zinc Sulphate showed marked degree of improvement in granulated lesions even though healing was not completed in day 26 This delayed healing is obviously due to the continuous irritation of the granulation tissues A small number of the lesions were found unchanged in Group 'A' and 'B' (3 and 6 respectively) and the following explanations are suggested.

1. As the control group was kept together with the treatment groups, new infection would have arisen as the environmental factors were suitable for transmission to occur.
2. This may be due to the hoof horn being covered with mud and faeces, thus not allowing the bath solutions to reach up to the hoof horn.
3. Some animals may lift up the foot while running through the foot baths and go unnoticed despite the close observation from one side, thus not responding to treatments.
4. As animals were not allowed to stand in the foot baths for a certain period, this gave less opportunity for better penetration of bath solutions through mud and faeces. By holding the animals in bath solutions for certain time might have changed the present results between Zinc Sulphate and Formalin. The healing obtained in this study from Zinc Sulphate was lower than that reported by Skerman et al (1983).

Recommendation

In severely infected animals Zinc Sulphate foot bathing followed by foot bath with 10 per cent Formalin may have beneficial effect by encouraging the faster hardening of healing tissues. In our country, where the sheep flocks are managed largely under transhumance system, need to walk kilometers away in a day in search of food, may have still more beneficial effect of this dual treatment hypothesis. Further work could be conducted on this hypothesis which may produce a significant reduction in the number of relapses occurring after Zinc Sulphate treatment.

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SUMMER HEAT STRESS INFERTILITY IN DAIRY COWS IN CENTRAL ARIZONA, U.S.A.

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Summary

The summer season in Central Arizona is characterized by intense heat and solar radiation, and low relative humidity. During the very hot months of July through September, the fertility rate of lactating Holstein-Friesian cows declines to less than 20%, based on live-births. Estrous cycle length, ovulation time and corpus luteal development and regression are not affected by hot weather, however estrus is significantly shortened. The preovulatory surge of LH secretion is not affected, however plasma progesterone levels are significantly increased during the luteal phase of the estrous cycle in lactating, hyperthermic cows. Estradiol-17B levels are depressed. The incidence of dystocia, retained placenta, parturient paresis are often noticed and post-parturient uterine infection is not increased, but their severity is often exacerbated. Morulase and blastocysts from superovulated cows, six to eight days after AI, have significantly reduced viability in vitro culture, and there is some evidence of retarded development of 1.5 to 4.0 day embryos in heat-stressed, normally-ovulating cows.

Introduction

A significant reduction in fertility occurs in dairy cows exposed to intense summer heat, particularly high-producing cows. Previous studies, and the experience of local dairymen (personal communication), reveal that artificial inseminations performed

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in Central Arizona during the intensely hot months of July, August, and September result in less than 20% live-births. Summer infertility creates serious problems for the dairyman. The interval between calvings increases in affected cows, and they are often maintained in production longer than is desirable. The number of breedings necessary to attain pregnancy increases and many dairymen reduce, or curtail, their breeding program during the summer months, because of the uneconomical waste of frozen semen. Milk production is also reduced during the hot summer months, and it is reduced again the following spring because of a lack of fresh cows in the herd, as a consequence of the previous summer's infertility. The economic losses are considerable.

Material and Methods

This article describes and discusses data collected from on going studies at the Arizona State University (ASU) Dairy and at a large commercial dairy-Arizon Dairy Co. (ADC), in Central Arizona. The data were collected through-out the year, and data collected during the hot summer months (June through September) were compared with data collected during the cool months. The measurements included: (1) Physiological measurements-rectal, vaginal, intrauterine, skin temperatures, respiratory rate, heart rates; (2) Behavioral activities-24 hour measurements of rumination, feeding, drinking shade-seeking, social and estrus behavior; (3) Reproductive cycle measurements-calving to first estrus, calving to conception; number of breedings to conception, estrous cycle length (including nonfertile breeding cycles), duration of estrus, ovulation time, corpus luteal development and regression; (4) Hormone measurements-progesterone, estradiol-17B, LH, T3, T4 and cortisol; (5) Fertilization and early embryo development-development of embryos retrieved from the oviducts of naturally-ovulating cows 1.5 to 4.0 days after breeding developmental capacity (viability) in *in vitro* culture of six to eight day old embryos flushed from the uterus of superovulated cows. These data were related to environmental conditions, such as daily high-and low-temperatures and relative humidity at 1700 hours.

Results and Discussion

The summer season in Central Arizona is characterized by intense heat and solar radiation, and low relative humidity, which extends from May to October. The very hottest

months are July, August, September, when the fertility rate in the ASU dairy herd dropped to 17%, 19% and 17%, respectively. The ability of the Holstein cow to adapt to continuous, intense heat is significantly affected by lactation, pregnancy and breeding. Ambient temperatures exceed body temperatures in most of the daytime, therefore it is important that the cow reduce her heat production and increase heat dissipation in order to maintain thermoneutrality. Nonlactating Holstein cows can, for the most part, maintain thermoneutrality if they are not stressed further, but this is not true of lactating cows which exhibit a significant increase in body temperature. The metabolic heat produced by lactation and pregnancy exceeds the ability of cow to dissipate additional body heat to the environment. The dairy cow lowers her body heat production by reducing activity during hot daytime hours, shade-seeking, and eating and drinking during the cooler evening and early morning hours. Activity decreases with increasing skin temperature (peripheral stimulation), and the response is reinforced by increasing body core temperature (central stimulation). Both nonlactating and lactating cows have significant increases in respiration; however, lactating cows have a much greater response. Heart rate decreases in both lactating and nonlactating cows. temperatures vary directly with micro-environmental temperature. Intra-uterine temperatures are slightly higher than rectal temperatures, in both nonlactating and lactating cows. The secretion of the calorogenic hormones T T_3 and cortisol is reduced in cows, exposed to high temperatures, in an attempt to lower metabolic heat production.

Estrous Cycle: The most striking change in the estrous cycle of summer heat-stressed lactating dairy cows is the reduction in length of estrus from an average of 14 hours to an average of 8 hours-with greatly reduced sexual activity.^{1,3} As a consequence, heat detection is difficult in the summer. Efficient detection requires 3-4 equally spaced observations per day. The short, relatively inactive estrous periods produce less body heat and are therefore, an advantage in the cow's struggle to maintain thermoneutrality. The length of the estrous cycles of heat-stressed dairy cows has been reported to be longer than normal by some investigators,¹² whereas others¹³ have reported them to be shorter, and still others¹⁴ have reported them to be of normal length. Studies at the ASU Dairy showed no significant effect of heat stress on estrous cycle length, in either nonbreeding or breeding cows^{1,3} It has been suggested that anestrus associated with heat stress may actually be due to unobserved estrous

periods.¹⁵ The studies at the ASU Dairy ^{1,3} ¹⁶ and ADC¹¹ show that ovulation and corpus luteal development are unaffected by summer heat stress. A normal LH surge precedes normal ovulation, in both lactating and nonlactating cows.¹⁶ Serum progesterone concentrations were significantly elevated during the luteal phase of the estrous cycle of lactating cows which became hyper-thermic, yet progesterone values did not change in nonlactating cows which remained thermoneutral.¹⁶ A similar relationship was observed between serum progesterone values and fertility, and between fertility and the degree of thermal stress caused by hot weather. Decreased fertility and increased serum progesterone values were associated with increased environmental temperatures and hyperthermia. There is also evidence that serum estradiol-17B levels are depressed in lactating, heat-stressed cows.¹⁷ Other studies report increased progesterone levels associated with high environmental temperatures,¹⁰ while others report decreased levels.^{18,19} Shaded cows have been shown to have lower progesterone levels than unshaded cows.²⁰ Acute exposure to high temperatures, for the first 72 hours after breeding, has been reported to raise plasma progesterone levels significantly in Hereford heifers. Obviously, the effect of heat stress on progesterone secretion is unsettled. It may be due to differences in the length and intensity of exposure to heat, or to the metabolic state of the animals.

Embryo viability: An association between heat stress and embryo mortality has been demonstrated in several species. ^{22,25} ²² A study of the development of embryos flushed from the oviducts of naturally-ovulating, lactating, heat-stressed Holstein cows, and the development and viability of embryos flushed from the uterine horns of superovulated, heat-stressed, lactating Holstein cows,¹¹ revealed a significant relationship between heat stress and embryo development. There was distinct reduction in the capacity of six to eight days old embryos, flushed from the uterine horns of superovulated cows, to undergo blastulation and hatching from zona pellucida in *in vitro* culture, and there was indication of retarded development of the 1.5 to 4.0 day old embryos in the oviducts of naturally-ovulating, heat-stressed cows. Heat stress did not affect ovulation. Fertilization was affected in superovulated cows, but not in naturally-ovulating cows. Plasma progesterone levels were elevated and variable in all super-ovulated cows, with no evident seasonal effect. Although superovulation is reported to increase peripheral progesterone levels and reduce embryo viability,²⁶ the predominant loss of developmental capacity occurred during the summer months and may be

attributed to seasonal heat stress. In Israel, it has been found that embryo mortality is greatest in repeat-breeder cows on day seven of the estrous cycle,^{27,28} at a time shortly after the embryo arrives in the horn of the uterus and when it is undergoing blastulation. The dangers inherent at this precarious stage of development may be exacerbated by heat stress. Heat stress induced early mortality is consistent with previous findings that heat stress does not affect the length of the estrous cycle of repeat-breeding cows in Central Arizona.¹ Since seven days old bovine embryos are not luteotropic,²⁹ but may begin to be luteotropic as day 10,³⁰ heat-stress induced inhibition of blastulation and the demise of the embryo would preclude maintenance of the corpus luteum and prolongation of the estrous cycle. Other studies with bred cows, however, report an association between heat stress and prolongation of the estrous cycle,² suggesting that under some conditions death of the embryo may occur after maternal recognition of pregnancy, which occurs between days 15 and 17 post-estrus.³¹ The mechanisms which underlie the observed adverse effects of heat stress on the viability of six eight days old bovine embryos are unknown, but may be due to a direct action of heat on the embryo or to an indirect effect that is mediated by the uterine environment. In support of a direct action, intrauterine temperatures are higher than rectal temperatures,³ and high intrauterine temperatures, which may affect spermatozoa, ova, zygotes or embryos, have been related to infertility.⁴² In support of an indirect action are the report (described above) of abnormal sex steroid hormone levels in heat-stressed animals. Progesterone and estrogen are essential to the control of uterine secretion and motility. It is reasonable to assume that abnormal steroid level could produce a uterine environment which is either unable to support embryo development or is toxic to the embryo. Progesterone levels have been reported to influence the protein composition of uterine secretions of cattle³³ and heat stress has been reported to change the amino acid composition of oviductal secretions in rabbits.³⁴ Either indirect or direct mechanisms may impair development and lead to the death of the embryo before maternal recognition of pregnancy, explaining one of the signs of summer heat-stress infertility observed in Central Arizona dairy cows.

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RABIES AND ITS PREVENTION

Dr. Abeay M. Desai*

"Rabies" or "Hydrophobia" - fear of water, a viral disease affecting all warm blooded animals including human beings has been well discribed from all the angles over more than 100 years, right from its invention by Dr. L. Pasteur in 1885. However, there are still many facts which remain unanswered and more important the fact that the availability of the right type of technically qualified vaccine in sufficient quantity to protect all species of animals including zoo animals.

Every one is well aware that vampire bats, foxes, wolves, jackals, stray dogs are the prime hosts and responsible for transmitting the disease rabies to other species of animals and human beings through the bite, scratches, etc. Since Rabies is a neuro-tropic viral disease and there is no cure by any type of antibiotic or synthetic drugs, the only way to prevent this disease is by vaccinating all animals with the right type of vaccine at the right time. Therefore, to protect the pet dogs, and other animals against rabies, as cited above, with the right type of vaccine at the right time is only the prime step to prevent the occurrence of this disease in human beings and other species of animals. Of course, the Municipality jointly with the Animal Husbandry Departments of each city, district and state are equally responsible for catching stray dogs, their proper disposal and absolute strictness in the issue of licence to the dog owners. Indeed proper education with audio-visual aid to the dog or pet owners through social organisations would be the additional step which can certainly help the nation to eradicate the disease rabies from the country.

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The Ministry of Agriculture has considered social and economic importance of rabies and planned for its elimination in the reservoir where dogs maintain the chain of infection. Since the Sixth Plan, a Centrally Sponsored Scheme under communicable diseases of national importance with 50% central assistance to the states and 100% to the Union Territories has been launched in selected metropolitan cities of the country, envisaging -

- i. Licensing of all pet. dogs.
- ii. Compulsory vaccination of such licensed pets.
- iii. Catching of all stray dogs and their euthanasia.
- iv. Post - bite vaccination to all the animals; and
- v. Permitting entry of not only vaccinated dogs but dogs under prescribed immunity period in the Municipality limits under this programme.

These steps are being concentrated in the selected urban areas where such controlled measures are not already in existence or, in cases where the existing programme is deficient. The present programme supplements the efforts considering that both the programmes are implemented effectively in a coherent manner. This scheme has been implemented under the overall control of a senior officer of the Animal Husbandry Department in the state headquarters. The field programme is carried out by specially constituted canine rabies control team fully equipped with device to catch stray dogs, storage of anti-rabies vaccine and facilities for carrying out antirabic vaccination of the canine population. Special rabies control units have been provided for each town where the scheme has been in operation. Such units have facilities for rounding up the stray dog and their maintenance at a central place for a period of 3 days as also for their painless killing.

The Municipality administrations are being pursued to enforce through legislative measures, compulsory licensing, vaccination of all pet dogs and destruction of all the stray dogs within their limits. The administration shall also be requested to regulate entry of only vaccinated dogs in its limits.

In many countries, the number of dogs is estimated at 9% - 12% of the total population of the said area; in U. S. A. it is even 16%. In India there are about 18.2 million dogs in the country as compared to the 665 million human population as per the 1981 census (Annexure I & II).

On the other hand the production of the Semples vaccine by the Government or private organizations in the country is of 25,417 lakh doses per annum as per the 1985 - 86 production, schedule. These Semples vaccine has only 6 months immunity. Therefore, each dog requires to be vaccinated twice a year. Hence, to protect 18.2 million dogs, 36.4 million doses of vaccine is required and the vaccine available is only 25.41 million doses. So there is shortage of approximately of 10 million doses for every year. This refers only to the dog population. There is additional cattle, sheep, goats, horses and zoo animal population which also require anti-rabies vaccine. Their inclusion will additionally increase the vaccine doses.

Therefore, it is essential either to increase the production or to import the vaccine, which has a better technology and longer duration of good immunity. To study the advantages and disadvantages of the Semples vaccine over the cell culture antirabies vaccine imported from France, can be compared from the enclosed Statement no. 3.

Considering the fact that the technology of anti-rabies vaccine production is changing very fast in order to minimise all bad effects of the Semples vaccine and to assure maximum protection against rabies right from an early age in all species of animals. Hence it is time now that India should either start producing cell culture anti-rabies vaccines or allow to import sufficient doses of vaccine to meet the demand from all over the country.

In short, when the right type of vaccine is made available in sufficient quantity to protect all species of animals, it would be the first step that India can look forward to a new era of complete eradication of Rabies from the country.

Annexure - I

Dog Population - Human Population

	State	Dogs	Human
		1982 (Census) Units in '000	1981 (Census) in million
1.	Andhra Pradesh	1443	53.55
2.	Assam	443	19.90
3.	Bihar	1017	69.91
4.	Gujarat	972	34.09
5.	Haryana	400*	12.92
6.	Himanchal Pradesh	135	4.28
7.	Jammu & Kashmir	236	6.00
8.	Karnataka	1375	37.14
9.	Kerala	1156	25.45
10.	Madhya Pradesh	1284	52.18
11.	Maharashtra	800*	62.78
12.	Manipur	124	1.42
13.	Meghalaya	122	1.34
14.	Nagaland	28	0.77
15.	Orissa	629	26.37
16.	Punjab	400*	16.79
17.	Rajasthan	1435	34.26
18.	Sikkim	21	0.32
19.	Tamil Nadu	976	48.41
20.	Tripura	111	2.05
21.	Uttar Pradesh	3809	110.86
22.	West Bengal	1000	54.58
UNION TERRITORIES			
1.	Andaman & Nicobar Islands	24	0.19
2.	Chandigarh	3	0.45
3.	Dadra & Nagar Haveli	4	0.10
4.	Delhi	31	6.22
5.	Goa, Daman & Diu	57	1.09
6.	Lakshdweep	1*	0.04
7.	Pondicherry	10	0.60
8.	Arunachal Pradesh	10*	0.63
9.	Mizoram	18	0.49
Grand Total		18132	665.29

* Estimated from human population.

Source Ministry of Animal Husbandry, Krishi Bhawan, New Delhi.

Comparison of "Rabisin" Vaccine imported from France with other vaccines

S. N. Particulars	"Rabisin" vaccine for Rabies inactivate cell culture vaccine imported from France	Duck Embryo vaccine flury strain	vaccine produced locally on sheep brain in each state in India
1. Use (indication)	Preventive and Post Bite treatment also as per the prescribed schedule of only two injections & five injections accordingly.	Only for prevention, with three injections.	Preventive and post - bite with different dose schedule of 3, and 14 injections accordingly.
2. Activity of virus (Composition)	NIL cell cultured inactivated with Beta propiolactone and adsorbed on aluminium hydroxide which ensures maximum titre in shorter period and titre remains for three years.	Live attenuated duck embryo cultivated with flury strain which confers short time immunity and wide variation in titre.	Sheep brain passaged phenol treated vaccine having high % of total proteins which gives many side effects (Neurological complications) NOT SAFE VACCINE WITH WIDE VARIATION IN TITRE.
3. Volume (Dose)	1 ml. (vial or disposable syringe with 1 ml. vaccine) (multidose vial of 10 ml = 10 dose is also available.)	2 ml. lyophilised vaccine	5 ml.
4. Total Protein Content	10 to 25 ug/ml.	1440 ug/ml.	5510 ug/ml.
5. Self life	18 months.	90 days.	90 days.
6. Route of Administration	Intramuscular or subcutaneous	Only subcutaneous	Only subcutaneous

7.	Period of immunity	3 years with 2 doses	6 months with 2 doses	6 months
8.	Pain involved and side effects	Painless, no side effects	Painful being given subcutaneous, fever, Malaise, rigors & Allergy	very painful, neurological complications, paralysis, fever, rigors, pruritis, allergy & sometime death
9.	Protection	Maximum protection against Rabies for prophylaxis and post-bite also.	No guarantee and wide variation of immunity for the period of 6 months only.	No guarantee and wide variation of immunity for the period of 6 months.
10.	Range of animals in which it is used	All species of animals including zoo animals, with doses of 1 ml. only.	Only for dogs.	Other species also but not zoo animals and with different doses 5 ml. in small animals and 10 ml. in large animals.
11.	An early age it can be given	Four weeks in dogs and cats and eight weeks in large animals	Not before two months	Not before two months.
12.	Probable price per dose.	Multidose vial of 10 doses having 10 ml. Rs. 15.65 per dose (Rs. 156/- per vial of 10ml.) exclusive of tax per dose. single dose vial @ Rs. 29/- per dose exclusive of tax. Attractive discount for bulk purchase, more than 300 doses at a time.	Rs. 13.50 exclusive of tax per dose.	Rs. 12.70 exclusive of tax per dose.
13.	Economics	Most economical : with 2 doses 3 years immunity.	Costlier : with 2 doses, 6 months immunity.	Costlier : with 2 doses, 6 months immunity.
14.	Opinion	Technically best vaccine.	Lot of limitations for the vaccines	Not good since produces many side effects.

Statewise Various Rabies Vaccines produced/available in India during 1985-86

State/City	5% Brain Tissue (Curative) Installed	20% Brain Tissue Prophylactic Instd.	Flury's Or LEP vaccine	HEP Flury Strain	B.P.L. Inactivated single M. D. (in ml.)	Grind Total
A.P., Hyderabad	14.00	14.00	0.80	0.80	—	—
Assam-Guwahati	3.00	2.00	0.12	0.05	—	—
Ghaziabad-Bio-Med (Pvt)	—	—	—	—	5.00	0.60
Haryana-Hissar	26.00	26.00	0.10	0.09	—	—
IVRI-Izatnagar*	—	4.00	—	—	0.10	—
Karnataka-Hebbal	10.00	6.00	1.00	0.50	—	—
M.P.-Mhow	7.00	7.08	0.12	0.12	0.08	0.08
Maharashtra-Pune	5.50	6.45	1.20	0.72	—	0.80
Orissa-Bhubaneswar	—	—	2.50	0.01	—	—
Punjab-Ludhiana	15.00	15.00	0.15	0.15	—	—
Rajasthan-Jaipur	25.00	25.00	0.15	0.15	—	—
Serum Instt. (Pvt.) Pune **	—	—	—	—	—	—
Tamilnadu-Ranipet	—	—	—	—	0.03	0.65
West Bengal-Calcutta	12.60	15.00	0.02	0.25	—	—
TOTAL	118.10	120.53	6.16	2.84	0.11	0.83
					5.00	0.60
					0.80	0.80
					7.00	7.00
					269.77	269.77
					254.17	254.17

* The production of these vaccines can be increased/decreased depending upon requirement.

** Cell Culture Rabies vaccine - The Vaccine is marketed only.

Source Ministry of Animal Husbandry, Krishi Bhavan, NEW DELHI.

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**BRIEF NOTE ON
AN OBSERVATION ON REPRODUCTIVE PROBLEMS IN CATTLE
AND BUFFALOES IN KATHMANDU VALLEY**

Dr. B. K. Jha*

A total 300 animals were examined for various reproductive problems during last 6 months period in Kathmandu Valley which were artificially inseminated by technician at least once before this examination. The following table shows the results of the observations made.

Conditions	No. of Cows	No. of Heifers (cattle)	No. of Buffa- loes
Pregnant	200	5	5
Repeat breeder	25	—	5
Delayed post partum oestrus	25	—	15
Anoestrus	—	10	—
Late Maturity	—	10	—

During the above observations following problems were noted:

- Late maturity in heifer
- Anoestrus
- Long calving interval and
- Repeat breeding.

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The above problems might have attributed either by heredity or environment or combination of both.

The breeding and the reproductive efficiency could be increased in the following way:

- Exporting the unproductive animals.
- Sterilizing the unwanted females by applying steel uterine clips, plastic loops or coils etc.
- Providing the artificial insemination services only to the selected stock of the local population.
- Treatment of animals with antibiotics and nitrofurans.
- Selection and culling of the animals on the basis of anatomical, physiological and productive capacity.
- Hormonal treatment should not be encouraged to restore the fertility and increase the breeding efficiency because this indanger the animal for future production.
- Considering the importance of buffalo in milk and meat production the physio-pathology study should be initiated.



EURYTREMA CLADORCHIS: AN OBSCURE PARASITE OF RUMINANTS IN NEPAL

Dr. S. N. Mahato*

Abstract

Eurytrema cladorchis is a little known trematode parasite of ruminants. It was first reported in China in 1965 and its existence passed almost unnoticed elsewhere until 1981 when it was reported for the first time in Nepal. The morphology of *Eurytrema cladorchis* is presented from the specimens recovered from cattle and goats in the hills of eastern Nepal. The Pathogenecity and clinical manifestations are also reported with a brief discussion on its life cycle.

Introduction

Eurytrema cladorchis is a trematode parasite belonging to the family Dicrocoeliidae. This species was first reported from the People's Republic of China by Chin, Li and Wei in 1965. Its existence passed unnoticed elsewhere until 1981 when it was reported for the first time in Nepal (Mahato, 1981). Since then post mortem and faecal examinations carried out at the Pakhribas Agricultural Centre, Dhankuta (PAC) and LUMLE Agricultural Centre, Pokhara, have revealed several cases of this infection in cattle and goats, however, it is still unknown to many other places. Indeed, little has been published about *Eurytrema cladorchis*; the published literatures are written in Chinese and are difficult to locate. Recently a redescription of the species based on the specimens collected at the Veterinary Investigation Laboratory,

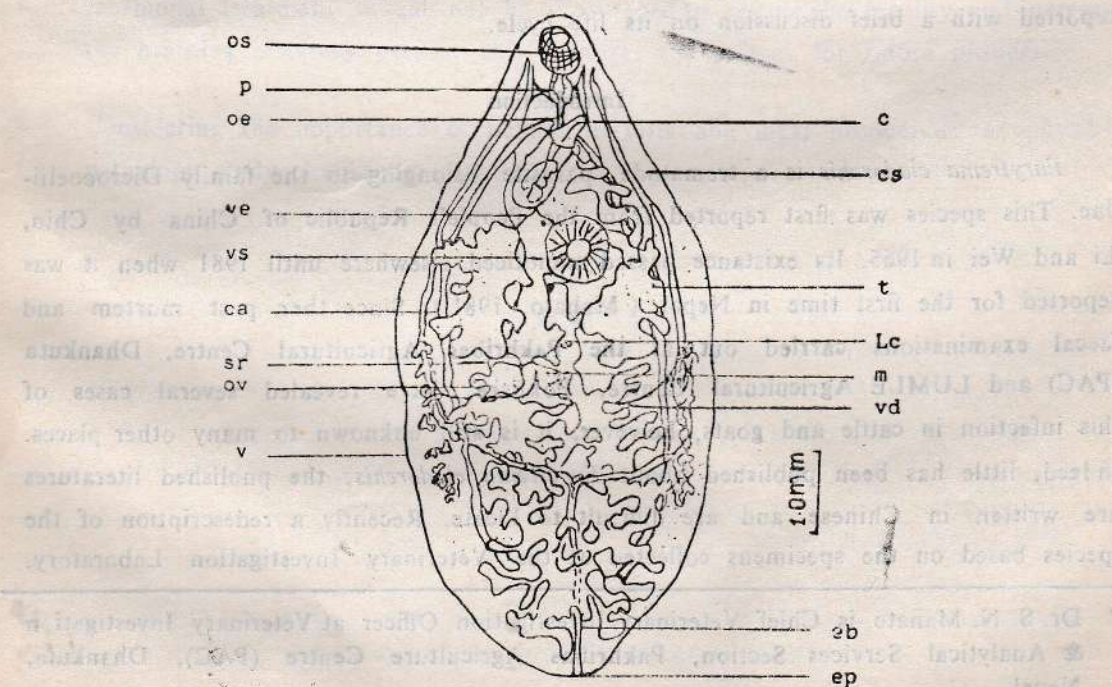
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PAC, Dhankuta has been prepared for publication by Dr. Jones of the Commonwealth Institute of Parasitology, England (Jones, 1984). In view of the paucity of communication, attempts have been made to draw the attention of the veterinarians of the country through this paper towards this member of a genus of considerable veterinary importance.

Materials and Methods

After the first incidental finding of *Eurytrema cladorchis* from a goat, all the goats and cattle autopsized at the veterinary Investigation Laboratory, PAC were carefully examined for its presence. The recovered specimen were fixed and preserved in 10% formal saline. The representative specimens were stained in aceto alum carmine and mounted on microscopic slides for morphological study. The eggs were teased out from the uterus of the preserved specimen, transferred on the microscopic slides and then studied under the low power microscope.

The clinical records of the infected animals were analysed for the purpose of this study.



RESULTS

Figure 1. *Eurytrema cladorchis*, Complete Specimen

(Ventral View)

os. oral sucker	c. cirrus
p. pharynx	cs. cirrus
oe. oesophagus	t. testis
ve. vas deferens	Lc. Laurer's canal
vs. ventral sucker	m. mehlis' gland
ca. caecum	vd. vitelline duct
sr. seminal receptacle	eb. excretory bladder
ov. ovary	ep. excretory pore
v. vitelline follicles	

Morphology

The fluke is 6 mm to 9.5 mm long and 2.85 mm wide. The body (Fig. 1) is elongated oval with tapered anterior and posterior extremities and is widest in the middle third. The cuticle is unarmed. The parenchyma is loose and the internal organs are easily seen through it.

The oral sucker is oval, subterminal and smaller than the ventral sucker. The ventral sucker is located within the anterior third of the body. Prepharynx is absent. The oesophagus is short. The intestinal caeca are narrow, relatively straight, extend posteriorly beyond the limit of the vitelline follicles but terminate short of the posterior extremity.

The branched testis are posterolateral to and larger than the ventral sucker. The testis are placed close to each other, hence the interval between them is usually shorter than the diameter of the ventral sucker. The vasa efferentia run straight from the anterior margin of each testis to the base of the cirrus sac which is obliquely inclined away from the mid line, hence the vasa efferentia are unequal in length. The cirrus sac is elongated and it contains internal sesicle. The cirrus is robust, digitiform and frequently everted.

The ovary is lobed and is situated near the median line, behind the testis. The seminal receptacle is oval in shape and is placed dorsal to the ovary. The Mehlis' gland is conspicuous and is situated dorsal to the level of ovary. The Laurer's canal opens dorsomedially, anterior to the level of female organs. The vitelline glands are follicular and are arranged in indistinct groups, situated laterally and almost entirely extracaecally, extending from the posterior margins of the testis, but not reaching the level of the caecal ends posteriorly. The uterus is mainly intracaecal, extends to the posterior extremity; the ascending limb passes between the testis, dorsal to the ventral sucker and then forms coils anterolateral to the ventral sucker before opening at the genital pore. The numerous eggs are operculate and brown, and measure 43 to 47 x 26 to 31 microns.

The excretory system is Y-shaped with a tubular vesicle and terminal excretory pore. The lateral arms diverge in the hind body and extend forward lateral to the caeca to the pharyngeal region.

Final hosts:

The adult parasites were recovered from four of the twenty cattle autopsized at the laboratory as part of an enzootic bovine haematuria investigation. The parasites are frequently seen on the post-mortem examinations of goats owned by the centre. On faecal examinations, the eggs of *Eurytrema cladorchis* have been detected in the faeces of only these two species of animals so far.

Locations:

The parasites are normally found in the pancreatic ducts, abomasum and duodenum. In a single goat they were recovered from the right gastro-epiploic vein and peritoneal cavity.

Pathogenicity and clinical manifestations:

A solitary case of death in a goat due to perforation of the right gastro-epiploic vein and subsequent haemorrhage into the peritoneal cavity associated probably with aberrant migration of large numbers of the flukes has been recorded.

(Mahato, 1931). Before death, the goat showed diarrhoea, weakness, anorexia and progressive loss of condition. Similar clinical signs were noted in the most cases, however, the contribution of this species in producing these signs was not clear because the animals were found to be parasitised by other species of helminths and/or affected with debilitating diseases such as enzootic bovine haematuria.

Discussion

Although *Eurytrema cladorchis* was first described in 1965 it was apparently unknown to Yamaguti (1971) who listed species allocated to the genus or Eduardo, Manuel and Tongson (1976) who provided a key to species of *Eurytrema* from ruminants. *Eurytrema cladorchis* differs from all other species of the genus primarily in having testis which are branched and from all except *Eurytrema dajii* in that the ventral sucker is larger than the oral sucker rather than smaller or more or less equal.

The life cycle of *E. cladorchis* has been studied in China by Tang and Tang (1977), Tang, Lin (1978) and Tang and Lin (1970). They found that the molluscan hosts are the land snails *Bradybaena similis*, Ferrusac and *Futicola ravidia*, sieboldians Pfeiffer and the insect intermediary is a needle cricket, *Nemobius caibae* Shir. The adult parasites have been reported from the pancreatic ducts of cattle, goats, the musk like deer - *Muntiacus reevesi* and the water deer - *Hydropotes inermis*.

Tang, Lin and Lin (1978) referred to the death of many cattle due to heavy infections resulting in great loss to the farmers in the regions of Pu - Cheng, North Fujian, without giving details of pathogenesis and clinical signs in naturally infected animals. However they stated that nursing goats developed signs of lethargy, anorexia and diarrhoea on the 15th day of experimental infection. The goats died on 22nd day post infection. The post-mortem examinations revealed partial congestion of the pancreas and presence of the immature flukes in the pancreatic ducts.

The present study indicates that *Eurytrema cladorchis* infection is probably common in cattle and goats and possibly in other ruminant species in Nepal. Its importance is hitherto unknown undeniably due to unawareness of its existence in the country and thus lack of proper study. It must be admitted that there is a great gap in knowl-

edge and understanding of not only such animal diseases but the other most commonly occurring diseases too. As long as this situation persists there will be serious obstacles to increase the animal production. To solve any problem we must first define it, know its distribution and understand how it works. Only then application of effective control measures can be made. Therefore proper study of the prevalent diseases seems essential which is only possible if the present veterinary investigation services are improved.

Acknowledgements

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**THE TRAINING AND ROLE OF VETERINARY AUXILIARY HEALTH WORKERS
IN BOOSTING NEPAL'S LIVESTOCK PRODUCTION TO THE LEVEL OF
ASIAN STANDARDS**

Dr. Peter Neil Quesenberry •

Background

1. It is estimated that livestock contributes approximately 15% to the overall GDP and 25% to the Agriculture GDP in Nepal. In addition, the indirect role of livestock through the provision of compost for the farming system of a subsistence farmer is also very significant; but this is difficult to estimate. The sale of milk and milk products, meat, eggs, etc, often provides almost the sole source of cash income for many Nepali hill farmers. And finally, the share in the value of livestock to the total assets of agricultural farms is estimated at 30% by Farm Management Studies. (1) Thus one can see that the protection of the health of livestock is a very worthwhile endeavor.
2. However, livestock technicians working in the hills of Nepal are also aware of the problems faced when trying to improve livestock health. Resources, both personnel and materials, are very limited; and these limited resources must be used in an environment that consists of rugged mountain, a few motorable roads, and almost total lack of modern communication systems. As a whole the average Nepali farmer, living in a remote area, often finds very difficult to obtain the services he needs to keep his livestock healthy and productive. For the same reasons, the veterinary doctors located in the remote district hospitals, and the junior staff located at the sub-centres, often feel isolated and kept away from the resources necessary to do their jobs properly.

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The following statistics illustrate the situation referred to above. The number of livestock in Nepal is cattle-6.4 million; buffalo-2.8 million; sheep-0.8 million; goats-4.9 million; swine-0.4 million; poultry-8.9 million; duck-0.3 million. In contrast, the total number of veterinarians in Nepal is only 120. Similarly, the FAO production year book, 1981, lists Nepal along with 17 other nations as it compares the number of livestock per veterinarian. Nepal ranks lowest on the list with 155,820 livestock/vet and India is next with 20,576 livestock/vet. In comparison, UK has 7566/vet; US has 5344/vet and Japan has 578/vet.

There is obviously a need for more veterinarians and trained manpower; and there is an obvious need for people with technical and practical skills to work with the farmers in the hills of Nepal. A real help would be a vet school located in Nepal and offering an abundance of clinical, practical training in addition to theoretical training. This training could be "Nepal specific", concentrating on the needs of Nepal. Such an undertaking is feasible but would be expensive and take time to implement.

3. However, in the meantime one of the ways that many countries, including Nepal have attempted to improve health, both human and animal, is by the practical training of auxiliary (lay) health workers. Many people feel that the judicious training and use of such lay workers can result in noticeably improved health care - particularly in remote areas. For example, one trainee that we are aware of obtained Haemorrhagic Septicaemia vaccine from the district Veterinary Hospital and vaccinated 900 animals. He also took part in the veterinary hospitals' liver fluke control programme and personally administered 600 doses of liver fluke medicine. This work was a tremendous help to the District Veterinary Officer and helped him to meet his annual targets in spite of limited resources. Based on examples like this, it is the author's opinion that the proper training and use of such lay workers is one of the ways that the veterinary profession in Nepal can have an important role in "boosting livestock production to the level of the Asian standard".
4. This report will deal with the experience of the United Mission to Nepal's (UMN) Animal Health Improvement Programme (AHIP) as it developed

a small scale training programme: as it trained lay workers (hereafter called "trainees"); and as it did follow-up work with these trainees. For further information on other livestock training programmes in Nepal, please see the report produced by the Agricultural Projects Services Centre entitled "Feasibility study on Establishment of Regional Livestock Training Centre". (1, APROSC)

5. History: The UMN has established human hospitals in Patan (formerly Shanta Bhawan), Amp Pipal (Gorkha District), Okhaldhunga and Tansen (Palpa District). Associated with these hospitals is a community health programme which attempts to take health care out to the villages and help the villagers to take more and more responsibility for their own health care. As these programmes moved out into the villages, the doctors and nurses were often asked to look at sick livestock. After all, to most villagers, a doctor is a doctor ! Anyway these people involved in the community health programmes began to see that the average villager considered the health of his buffalo as important as the health of any other member of his family. And they, in turn, began to request the local veterinary hospitals and others for help. One of the people they turned to was Alison Craven, a veterinary surgeon from England who was working as the farm manager at the United Mission to Nepal's Gandaki Boys' Boarding School in Pokhara. Miss Craven, in turn, began to develop a training programme for farmers and others interested in animal health care. During 1979 a preliminary syllabus was prepared, and an initial introductory course was held at the Boarding School Farm in Pokhara. This course developed into a full-time programme - called the Animal Health Improvement Programme - in the beginning of 1981 (at which time the author joined the programme).

Basic Principles of training

The two veterinary doctors involved in the AHIP training spent quite a lot of time studying successful training programmes in the area of human health; and they, in turn, tried to relate the basic principles to an animal health programme, based on their own experience in livestock training programmes. In addition, attempts were made to find out about similar trainings in Africa, Asia and America. A conference

was held by the Intermediate Technology Development Group (ITDG) in Britain and Miss Craven attended. The subject of the conference was livestock training for lay workers, and other people who had worked all over the world in various livestock training programmes were present. As a result of this conference (2) and our studies, we decided upon the following principles (the 4 "P's."):

1. Proper Selection of trainees:

Trainees should be selected by their own communities and they should be people who are respected within the community.

2. Practical Simple Training

The training should be as practical and as simple as possible. This is very important. Most farmers are not used to sitting in class; and most farmers are used to working with their hands. At the ITDG workshop in England the participants agreed that a functioning clinical practice was necessary in order for the trainees to receive lots of "hands-on" training. It was agreed that a centre was needed where sick animals came on a regular basis for treatment. These sick animals would then serve as the "patients" for the training classes. In addition, the presence of other farm livestock would serve as teaching opportunities in terms of general animal husbandry techniques. It was agreed that students should only spend about one-half of their time in the classroom. The rest of the time should be spent in practical settings.

3. Programme of Follow-up:

Each student should be visited in his own village after the training course. The purpose of this visit is to encourage the trainee; to learn more about the problems the trainees face; to revise what the trainees are taught; to encourage the neighbours to call upon the trainees for help; and to make contact with the local HMG/N veterinary officials. A very important aspect of the follow-up is to make sure that the trainee has the basic medicines and equipment necessary to do his job in the village. If they do not, then the trainees rapidly lose their interest in the work, and they lose the respect of their community.

In order to assure medicine availability, we supplied the trainees with a basic stock of medicines. They were expected to sell these medicines and use the money in order to buy more.

4. Public Relations:

The AHIP should help the trainees to relate to their local government veterinary post. Only in this way can the community obtain the assistance the government is able to give in the best possible way.

Methods used

1. Annually, 3 or 4 two-week long courses are held in the winter season in Pokhara. Beginners' courses are held for first-time students; and refresher courses are held for students who attended the beginners' course and then continued to work once they returned to their villages. Therefore the average student received a full month's training which split up over 2 years.
2. Follow-up visits are made to all trainees once or twice a year, including a visit to their local vet. hospital.
3. Medicines are supplied initially and the students are encouraged to find local supplies of the medicines also. Some students have been encouraged to set up medicine shops.
4. Source of improved animals have been found; and help has been given to obtain these animals (where appropriate).

Materials taught

The teaching syllabus, entitled simply "Animal Health", was produced and sent to many of the veterinary hospitals in Nepal. It has also been used by various people in different training programmes.

The main emphasis is on parasites, nutrition and reproduction (dystocias), and the most common infectious diseases are also touched upon. There are sections on first

aid and care of infected wounds. Students are encouraged to properly examine the sick animal as a part of the decision-making process.

In the past 2 or 3 years an increased emphasis has been put on the importance of trees and tree-fodder in the maintenance of our livestock's health.

Results

From 1981-1986 a total of 256 new students have been trained. Rough statistics show that over 50% of the students are still working 2 years after their training. This has been difficult to evaluate because the definition of "working" is rather difficult to agree upon. For instance, if a trainee treats only 1 or 2 animals a month, can one still consider him "working"? However, if we use as the criterion that any treatment of neighbours' animals is "working", then over 50% of them are still working after several years.

The number still working after a period of time seems to be dependent on several factors: the frequency and quality of the follow-up work, and the individual maturity of the people trained. The older the trainee, the more consistent they were in their own work; and the neighbours are more likely to call on them for help. (Trainees under 25 years of age have a very high dropout rate). Similarly, the better the follow-up, the better the students worked.

In the South Lalitpur area, the goal of the UMN Community Development Assistance Programme (associated with Patan Hospital) was to have one trained person per ward. They have not quite reached that goal yet, but are working towards it. An independent evaluation of the trainees in this area has been done and the detailed figures are available from us upon request (3). However, it can be summarized by saying that the communities have been satisfied and that the trainees have been successfully able to both diagnose and treat the most common health problems encountered in their area. The fact that we have more requests for training than we can fulfill is also an indication to us that the material taught is relevant.

Problems Encountered

Numerous problems have been encountered, including the poor selection of trainees

on the part of the community (the Pradhan Pancha's son is not always the best student around !). We have also struggled with the problem of medicine supplies and are now hoping that the establishment of medicine shops by individuals, using loans through the Agricultural Development Bank, may be at least a partial solution to the problem.

We have also been questioned by fellow professionals who query the whole idea of training auxiliary health workers. In fact, those of us involved in such training have been accused of training "fake doctors"; of misuse of antibiotics which leads to antibiotic resistance; and of generally exacerbating the inappropriate use of medicines in developing countries. To back up these accusations, numerous examples are given; and many of these examples are legitimated. However, numerous examples can also be given where sick animals (and people) have been treated successfully (including the judicious use of antibiotics) by trained lay people; and there are also numerous examples of misuse of antibiotics by professionals, too. In addition, the training of such lay people also includes the basic principles of health, hygiene and disease prevention which is an important part of the education process in any country.

Summary and Future Expectations

The United Mission to Nepal's Animal Health Improvement Programme has developed a very small-scale training programme in the area of animal health/husbandry. This programme has trained some farmers who appear to be successfully dealing with the most common livestock health problems encountered in their village areas. The training itself is based on four principles:

- proper selection of trainees by the community involved,
- practical simple training including lots of "hands-on" work with sick animals,
- an active follow-up programme which includes medicine availability at a village level, and
- relating to the nearest government veterinary post as closely as possible.

The actual material taught emphasises nutrition, parasite control, first aid and reproduction (dystocias). Despite various problems which have been encountered, AHIP staff feel that such training programmes are appropriate for Nepal.

We feel that the veterinary profession can have an important role in the training of village animal health workers; and that these trainees can, in turn, play an important role in helping to boost the livestock production in Nepal.

In the past, AHIP existed as a part of the Gandaki Boarding School's Agricultural Programme. However, now the AHIP exists as merely a small part of the infrastructure which serves to support UMN field staff. Each of the project areas, where field staff work, has official recognition with HMG/N and we are merely supporting them so that they can do their work with the villagers in a professional way. AHIP is just one part of a support team known as the Rural Development Centre, which is located in Pokhara.

As for the future, we in AHIP wish to continue as a part of the administrative support team for UMN's various projects. However we also want to do everything we can to work with HMG/N in their livestock development efforts. We truly do want to do part of the exciting work which will help boost Nepal's livestock production to the Asian standard.

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FUTURE PRODUCTION AND PRODUCTIVITY OF LIVESTOCK FARMING IN NEPAL

Dr. D. D. Joshi
Dr. H. B. Rajbhandari •

Introduction

Production and productivity of Livestock farming should be examined in time to time. The development of performances in animal production is mainly based on the productivity of different species of animals and birds.

Livestock products like milk, meat and eggs are expensive items in comparison to the cereals in the diet of average Nepalese families of below subsistence level. Again, these are one of the basic necessities or needs for the proper growth of the children of the country.

His Majesty has called for meeting the minimum basic needs in accordance with the Asian standard of the SAARC countries by the year 2010. Altogether six basic needs food, clothing, shelter, education, health and security have been identified. National Planning commission has recently prepared a prospective plan document for meeting the minimum basic needs. Food grains, milk, meat, eggs, fruits and vegetables, drinking water and firewood or fuel are kept under the broad food heading.

At present, consumption pattern of milk, meat and eggs are 37 ml./day, 15.61 gms./day and 0.5 no./day respectively and it is assumed that the increment in consumption will be reached by the year 2010 in milk, meat and eggs at 115

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ml./day, 22.74 gms/day and 2.2 nos./day respectively. Presently, energy intake per person per day from milk, meat and eggs is 82.2, 29.5 and 3.5 calorie respectively whereas by the year 2000 these have to be proportionately increased to 27.8, 17.5 and 0.8 calorie in above mentioned items.

Strategy in Livestock Development

Increase in the production and productivity of livestock should be aimed by strengthening breeding, animal health, pasture and nutrition, and farm management practices, and supported by facilities such as adequate livestock marketing and provision of credit.

Objectives of livestock Development

- to increase the genetic improvement of local breeds of cattle, buffaloes and other animals by strengthening A. I. as well as proven bull services for increasing the production and productivity of the livestock industry. At the same time conservation of genetic resources of the local breeds by selection should be promoted.
- to prevent and control and/or eradicate most common diseases like FMD, RP, H S, Rabies, Ranikhet, through disease intelligence epidemiological surveillance, sufficient vaccination coverage and other relevant preventive and control measures.
- to produce good potent vaccines possibly within the country against most important and common diseases of the livestock and poultry.
- to develop and strengthen collaboration among adjoining countries like India and People's Republic of China to eradicate common border diseases like R P, FMD, Rabies etc,
- to establish and regulate the animal quarantine system and then creation of disease free zones, districts, regions for ensuring profits by marketing, trading and exporting animals products in and outside the country to ensure assured profits from livestock farming,

- to promote pasture and fodder production by introducing improved stock as well as by preserving the indigenous grass seeds and fodder trees in all geographical regions of the country and promote the use of effective ureamolasses treatment of straw and other crop-residues under village conditions, and
- to improve the socio-economic conditions of the large and medium farmers in general and small farmers in particular by increasing livestock production.

Production and Productivity Indicators

1. Genetic improvement by A. I. endorsed as a policy at the highest level (Indicator I)

Nepal has endorsed genetic improvement by artificial insemination (A. I.) as a policy at the highest level. In local cattle and buffaloes, the production and productivity can only be increased by A. I. in terai and accessible areas where as in hilly areas bull service is more appropriate and most effective. These activities will be carried out by the government agencies in all the districts until the end of the Ninth Plan. To reach the goal of minimum basic need for milk projection of improved cattle and buffalo milking animals is made in Table- 1.

Besides government level it is also essential to establish private sector improved livestock breeding farms and such nucleus farms will be main supplier of pure or crossbred animals to other needy farmers. The projection of improved private breeders for different species of animals up to the Ninth Plan period is shown in Table - 2.

Table-1 *Projection of improved cattle and buffalo milking animal by the end of the Ninth Plan Period.*

S.No.	Type of Animals	End of Seventh Five year Plan	End of Eighth Five year Plan	End of Ninth Five Year Plan
1.	No. of existing milking cows	672300	672300	672300
2.	No. of improved cows by A.I. (2%)-cross bred	-	47062	77316

3.	No. of improved cows by bull service (2%)-cross bred	-	67230	100845
4.	No. of pure breed cows for nucleus herd (milking)	420	1120	1820
5.	No. of existing milking buffaloes	678932	678932	678932
6.	No. of improved buffaloes by A.I (1%)-cross bred	-	20367	50910
7.	No. of improved buffaloes by bull service (1%)-cross bred	-	101835	190092
8.	No. of Murrah buffaloes for nucleus herd (milking)	2100	3500	3500

Table-2 *Projection of improved private breeder farms by the end of the Ninth Plan Period*

Animals	Existing	7th Plan	8th Plan	9th Plan
	No	Period No.	Period No.	Period No.
Buffalo	350	350	400	450
Cow	75	150	150	200
Sheep	15	15	30	50
Poultry	5	13	20	30
Yak	10	10	10	10
Pig	125	125	150	200
Total	580	618	760	940

2. **Animal Health Services (Indicator II)**

Infectious and parasitic diseases are the main cause of high mortality and morbidity in animals and birds in Nepal. About 3-40% loss of animals production and 15-20% loss of animal productivity is due to diseases such as Rinderpest, Haemorrhagic Septicaemia, Foot and Mouth Disease, Liverfluke New Castle Disease, Coccidiosis etc. Therefore, to increase the productivity and production of livestock it must be supported by a strong preventive and

curative animal health services throughout the kingdom. Genetic improvement programme must be backed up by Veterinary Services. The indicators for effective animal health services are:

- vaccination campaign.
- drenching campaign.
- diagnosis services,
- mobile veterinary clinic services,
- animal drug revolving scheme,
- vaccine production,
- epidemiological surveillance and disease information service, and
- animal health research.

Projection for preventive and curative services and vaccine production required annually for three Plan Period, Seventh, Eighth and Ninth is shown in Table-3 and 4 respectively.

Table-3 *Projection of preventive and curative animal health services required by the end of the Ninth Plan Period*

Particulars	End of Seventh Five Year Plan	End of Eighth Five Year Plan	End of Ninth Five Year Plan
A) Preventive			
1. Vaccination against H.S. B.Q, R.P., F.M.D., Rabies, Ranikhet, Fowl Pox etc. (heads in 000)	2596.2	4883.9	9186.7
2. Diagnosis total samples tested (heads in '000)	44.55	115	298
3. Epidemiological surveillance	75	75	75
B) Curative			
1. External and Internal Parasite control cheads in '000)	1360.6	2043.7	3070

2. Treatment (heads in '000)	456.8	486.	617.7
3. Mobile Veterinary services (heads in 000)	206.15	466.6	1056.8
4. Foot rot (heads in 000)	2	2	2

Table-4 *Projection of vaccine production required by the end of the Ninth Plan Period*

S. No.	Vaccines	End of Seventh Five Year Plan.	End of Eighth Five Year Plan.	End of Ninth Five Year Plan.
1.	Rinderpest (000 doses)	229.3	279.7	296.3
2.	H. S. "	729.3	779.7	796.3
3.	B. Q. "	129.3	179.7	196.3
4.	Ranikhet M-Strain "	1847	1880	1960
5.	Ranikhet F-Strain "	2047	2080	2160
6.	Fowl Pox "	1047	1080	1160
7.	Glycerine Saline 10% "	33.2	53.3	86
8.	F. M. D. "	25	279	466
9.	Rabies vaccine for animal use (000 cc)	266	428	690
10.	Rabies vaccine for human use (000 cc)	200	322	518

3. Pasture and Nutrition (Indicator III)

Along with indicator I and II pasture and nutrition development is one of the major component for the increment of livestock production and productivity. In Nepal pasture and fodder production and their availability is seasonal. Animal feed development programme should be promoted and strengthened on the following basis:

- alpine pasture development,
- fodder trees plantation,
- backyard pasture,
- pasture farms development in hilly areas,
- double cropping of forage crops in irrigated lands, relay cropping and
- treatment of straw.

4. Resource Identification and Mobilization (Indicator IV):

Resource identification and its proper mobilization or utilization is most essential to run the above mentioned development activities. Resources could be categorized as follows:

- financial management,
- physical infrastructures,
- trained manpower- both levels, and
- technology

Projection of infrastructures and manpower requirements by the end of Ninth Plan Period is shown in Table- 5 and 6.

Table-5 *Projection of infrastructure of animal production and health up to the end of the Ninth Plan Period.*

S. No.	Infrastructures	Existing No.	7th Plan No.	8th Plan No.	9th Plan No.
1.	Semen Bank with liquid nitrogen plants	2	4	4	5
2.	Livestock farms	16	16	16	16
3.	Veterinary laboratories	3	3	5	8
4.	Veterinary hospital	75	75	75	75
5.	Livestock and animal health sub-centres	505	675	735	765
6.	Veterinary dispensaries	5	5	5	5
7.	Veterinary check post	23	23	33	36
8.	Alpine pasture development centres	10	10	13	15
Total		639	811	886	925

Table-5 *Requirements of manpower for animal production and animal health by the end of the Ninth Plan Period.*

Year	High level	Mid level	Total
Existing manpower	315	2096	2411
7th Plan Period	375	3647	4022
8th Plan Period	475	4377	4872
9th Plan Period	615	4787	5402

5. Milk, Meat and Eggs Production (Indicator V):

After providing all the four factors such as breeding, health, feed and resources for the productivity of livestock farming the production of milk, meat and eggs significantly improves. The basic need for these items has been calculated and projected in table-7. The annual growth rate of milk production could be reached upto 4.4 from 2.2 by the year 2057, like wise meat to 6.6 from 3.6 and eggs to 3.6 from 2.5.

Table-7 *Milk, meat and eggs production projection by the end of the Ninth Plan Period.*

Products	Position	Position	Target	Annual growth	
	in the	in the	in the	rate %	
	year	year	year	year	year
	2031/32	2041/42	2056/57	2032 to 2042	2043 to 2057
Total milk	597	738	1334	2.2	4.4
a) Cow milk	179	219	472		
b) Buff milk	418	519	862		
Total meat	95	148	333	3.6	6.6
a) Buff meat	78	110	199		
b) Goat meat	12	23	83		

c) Sheep meat	2	3	16		
d) Pig meat	2	8	26		
e) Poultry	1	4	9	2.7	4.3
Eggs	1950	2470	4220	2.5	3.6

Unit: 1. Milk and meat production in 000 metric ton.

2. Eggs in million numbers.

Acknowledgement

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**BRIEF NOTE ON
DISTRIBUTION OF FOOT AND MOUTH DISEASE VIRUS TYPES
IN NEPAL**

Dr. R. M. Shrestha*

The samples from tongue and feet of the infected cattle, buffaloes and pigs were collected in 50 per cent glycerine and were sent to Animal Virus Research Institute (AVRI), Perbright, UK for virus typing during the year 1983/84, 1984/85 and 1985/86. The findings are as follows:

Table-I : *Samples Collected and Typed in the Year 1983/84.*

S. No.	District	Species of animal	No. of samples collected	No. of samples sent for typing	Virus Type			NVD
					O	A	Asia I	
1.	Lamjung	Cattle/Buff.	13	6	5	1	-	-
2.	Dolkha	"	5	2	-	-	-	2
3.	Sindhupalchok	"	4	2	-	-	-	2
4.	Rolpa	Cattle	3	3	3	-	-	-
5.	Lalitpur	"	6	6	-	6	-	-
6.	Bardia	"	2	2	-	-	2	-
7.	Banke	"	1	1	-	-	-	1
8.	Kathmandu	"	1	1	-	-	-	1
			35	23	8	7	2	6

* Dr. R. M. Shrestha is presently attached at National Epidemiological Laboratory for FMD, Budhanilkantha, Kathmandu.

Table-III : Fiscal Year 1985/86.

S. No.	District	Species of Animal	No. of samples collected	No. of samples sent for typing	Virus Type			NVD
					O	A	Asia I	
1.	Kathmandu	Cattle	7	5	1	-	1	3
2.	Kavre	"	1	-	-	-	-	-
3.	Sindhupalchok	"	5	1	-	-	-	1
4.	Jumla	"	1	1	-	-	-	1
5.	Pyuthan	"	5	3	-	-	-	3
6.	Kaski	Sheep	3	2	-	-	-	2
7.	Tanahu	Cattle	3	3	3	-	-	-
8.	Lalitpur	"	4	2	2	-	-	-
9.	Ramechhap	Buffalo	9	8	3	-	-	5
10.	Rasuwa	Pig/Cattle	3	-	-	-	-	-
			41	25	9	-	1	16

These findings indicate that the incidence of FMD outbreak by virus type 'O' is increasing and that of Asia I is spreading slowly. Furthermore, serotype 'O' is distributed all over the country, type 'A' appears to be decreasing while serotype 'Asia I' is present in Far-Western Terai and Midd Hill of Western Region of the Kingdom and it has shown the trend of increasing in incidence.

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Table-III : Fiscal Year 1985/86.

S. No.	District	Species of Animal	No. of samples collected	No. of samples sent for typing	Virus Type			NVD
					O	A	Asia I	
1.	Kathmandu	Cattle	7	5	1	-	1	3
2.	Kavre	"	1	-	-	-	-	-
3.	Sindhupalchok	"	5	1	-	-	-	1
4.	Jumla	"	1	1	-	-	-	1
5.	Pyuthan	"	5	3	-	-	-	3
6.	Kaski	Sheep	3	2	-	-	-	2
7.	Tanahu	Cattle	3	3	3	-	-	-
8.	Lalitpur	"	4	2	2	-	-	-
9.	Ramechhap	Buffalo	9	8	3	-	-	5
10.	Rasuwa	Pig/Cattle	3	-	-	-	-	-
			41	25	9	-	1	16

These findings indicate that the incidence of FMD outbreak by virus type 'O' is increasing and that of Asia I is spreading slowly. Furthermore, serotype 'O' is distributed all over the country, type 'A' appears to be decreasing while serotype 'Asia I' is present in Far-Western Terai and Midd Hill of Western Region of the Kingdom and it has shown the trend of increasing in incidence.

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SUMMARY ON AIMS AND OBJECTIVES OF DAIRY EXTENSION FOR BOOSTING MILK PRODUCTION

Dr. C. R. Bhattarai*

Dairy Extension

The main aims and objectives of dairy extension are as follows:

1. Increasing the production of milk of the dairy animals;
2. Improving the supply of feeds and fodder;
3. Improving reproductive efficiency by shortening the age of maturity and calving interval;
4. Introducing scientific management practices;
5. Providing effective health care;
6. Providing remunerative and regular market for milk;
7. Arranging inputs supplies and services at the door steps of the farmers;
8. Launching a vigorous programme for imparting knowledge of the latest scientific practices to dairy farmers;
9. Organizing farmers association and mobilizing them in milk collection.

These diversified aims and objectives are the responsibility of multi-disciplinary organizations.

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- The Department of Livestock Development and Animal Health may have the responsibility of breeding, treatment, feeds and fodder development.
- Other aspects of dairy development and milk marketing should be the responsibility of Dairy Development Corporation which should coordinate, collaborate, cooperate and integrate with other related agencies for meeting these aims and objectives. Furthermore, the dairy extension methods adopted by AMUL could be replicated here in Nepal.



The incidence of parasitic infections reached their peak during late winter and autumn season.

2. Digestive Disorders

a. Digestive Disorders

The disease and disorder of gastrointestinal tract represented 10.3, 10.7 and 7.9 per cent of all the diseases in cattle, buffaloes and goats respectively. The disorders included diarrhoea, indigestion, constipation, tympany, anorexia, vomition

Results

During the past four years, 19,536 cattle, 3,495 buffaloes and 18,961 goats were examined for various diseases and disorders. The incidence of diseases are presented in Table-II and Table-III.

1. Infectious Diseases

The commonly recorded infectious diseases were Haemorrhagic Septicaemia, Foot and Mouth Disease, Black Quarter, Anthrax and Rabies. The outbreaks of Haemorrhagic Septicaemia of cattle and buffalo were recorded in Surkhet Valley, Ramghat and Babiachour areas during summer. Black Quarter was recorded mostly in the months between February to August in Surkhet Valley and Sahare areas. Foot and Mouth Disease occurred more commonly affecting almost all the cattle and buffaloes every year (Thai *et al* 1985) and its peak incidence was recorded during July/August causing a heavy economic loss in terms of morbidity and productivity.

2. Parasitic Diseases

Parasitic disease constituted 60.6, 69.9 and 82.8 per cent of all diseases in cattle, buffaloes and goats respectively. The internal parasites were more common and severe whereas the incidence of endoparasitic infections were 8-10 times less. The endoparasitic infections recorded were fascioliasis, toxocariasis, hookworm, stomach-worm, paramphistomiasis, internal schistosomiasis, coccidiosis, balantidiasis, moniciziasis, thelaziasis, and nasal hirudiniasis. Among all of these infections fascioliasis was mostly predominant. Ectoparasitic infestations recorded were myiasis, mange, mite, tick, lice, flea, fly, mosquito and leeches (hirudiniasis). Among which myiasis was mostly common. The incidence of parasitic infections reached their peak during late winter and autumn season.

3. Digestive Disorders

The disease and disorder of gastrointestinal tract represented 10.3, 10.7 and 7.9 per cent of all the diseases in cattle, buffaloes and goats respectively. The disorders included diarrhoea, indigestion, constipation, tympany, anorexia, vomition

(especially in goat), grain overload, pica, colic, debility, enteritis and dysentery. Among these disorder diarrhoea and tympany were most common and were associated with endoparasite infection.

4. Respiratory Diseases

Respiratory diseases constituted 4.7, 2.8 and 2.8 per cent of all the diseases in cattle, buffaloes and goats respectively. The commonly recorded diseases were cough, rhinitis, bronchitis, asthma, and pneumonia. Inhalation pneumonia was also recorded in ruminants and horses due to faulty drenching of some medicines, oil and alcohol.

5. Genito - Urinary Disorders

These constituted 1.3, 2.4 and 0.1 per cent of all the diseases in cattle, buffaloes and goats respectively. The frequently encountered ailments were anoestrus, abortion, dystokia, retained placenta, infertility, repeat breeding (more common in cattle), metritis, utero-vaginal prolapse, mastitis, dysuria, orchitis (mostly following castration). Among these ailments anoestrus was most common. Although the incidence per cent was not much significant, however, it provides a very important field of research before launching any breeding programme in this area.

6. Traumatic disorders

Disorders of trumatic origin constituted 5.1, 6.9 and 2.2 per cent of all the diseases in cattle, buffaloes and goats respectively. The recorded disorders include the various types of wounds, traumatic injuries, swelling, sprain, lameness, broken horn, horn cancer, yolk gall, fracture (commonly in limbs), dislocation, necrosis, gangrene, pricks, and abscesses. Among all disorders wound was predominant. Traumatic constituted a very significant problem especially during dry season because of improper care rendered by owners to their animals. Again, most of the wounds were reinfected with myiasis during summer season when the flies were very active.

7. Miscellaneous Disorders

They represented 1.1, 2.1 and 1.5 per cent of all the diseases in cattle,

buffaloes and goats respectively. Plant poisoning, tumour, skin cancer (in goats) congenital anomalies and allergies were most common miscellaneous disorders.

Discussion

There could be many more diseases and disorders amongst livestock in Surkhet. In this paper, those diseases reported at Veterinary Hospital, Surkhet have only been considered. There could be many other diseases unnoticed—mostly those which the farmers could not bring their sick animals at veterinary Hospital due to acute illness. Sporadic and acute cases are not mostly brought to the notice of the Veterinary Hospital because of very short course of the disease. Again, lack of proper communication facilities, ignorance of the farmers are also responsible for not reporting the diseases.

In Nepal, animal diseases are responsible to cause economic losses reducing livestock product and productivity every year but the maladies responsible for these losses have not been thoroughly studied.

According to Thai *et al* (1985) the prevalent diseases in Surkhet were liverfluke (67%), external parasites (9%), internal parasites (8%), Foot and Mouth Disease (15%) and others (1%).

In Karnali Zone, liverfluke alone is responsible for more than 50% of the total death (Karki, 1973) and 36% mortality have been recorded in migratory sheep by various diseases. (Karki, 1983).

The economic loss due to animal diseases is not estimated in this study but the finding of the incidence of diseases supports the economic loss estimated by Hassels and Associate (1979). It can be concluded that the role of various animal diseases in the economy of Surkhet is very important.

The findings indicate that improvement in livestock development will be unsuccessful in the presence of diseases. Hence, disease control should be the primary concern in the national level in order to bring improvement in livestock development.

Table-1 *Livestock Population & Livestock Products of Surkhet*
(HMG, Liv. Statistics 041/042)

Animals	Total Population in 000	Total milk (000 mt.)	Total meat (000 mt)	Total wool (mt.)	Total egg in 000
1. Cattle	116549	3843	—	—	—
2. Buffalo	38982	8077	1486	—	—
3. Sheep	3258	—	6	2173	—
4. Goat	84887	—	332	—	—
5. Pigs	5463	—	103	—	—
6. Poultry	79631	—	47	—	—
7. Duck	223	—	—	—	1468
Total	328903	11920	1974	2173	1474

Table-2 *Overall Incidence of Various Groups of Diseases of Cattle, Buffalo and Goat in Surkhet.*

Disease Groups	Percentage of Incidence		
	Cattle	Buffalo	Goat
1. Infectious Diseases	16.17	4.68	2.42
2. Respiratory Diseases	4.68	2.83	2.84
3. Digestive Diseases	10.28	10.73	7.94
4. Genito-Urinary Diseases	1.25	2.43	0.11
5. Parasitic Diseases	60.50	69.91	82.82
a) Liverfluke	49.38	55.04	70.89
b) Worm Parasites	4.24	6.03	2.94
c) Ectoparasite	6.97	8.84	8.99
6. Traumatic Disorders	5.11	6.93	2.21
7. Ocular Disorders	0.82	0.41	0.11
8. Miscellaneous	1.10	2.08	1.50

Table-3 *Percentage of incidence of commonly encountered diseases of cattle, buffalo and goat in Surkhet (4 years record)*

Disease	Cattle		Buffalo		Goat	
	No.	%	No.	%	No.	%
1. F. M. D.	2881	14.75	375	4.41	458	2.42
2. HS, BQ. Anthrax	234	1.20	18	0.21	—	—
3. Babesiasis	44	0.22	5	0.26	—	—
4. Pneumonia	914	4.08	240	2.83	539	2.84
5. Tympany, Indigestion	217	1.11	75	0.88	216	1.14
6. Diarrhosa	751	3.84	293	3.45	695	3.67
7. Anorexia, Debility	1042	5.33	544	6.40	594	3.13
8. Male Genital Disorders	101	0.55	—	—	5	0.03
9. Anoestrus	40	0.20	109	1.28	15	0.08
10. Dystokia	24	0.12	11	0.13	—	—
11. Retained Placenta	31	0.16	29	0.34	—	—
12. Utero-vaginal Prolapse	9	0.05	18	0.21	—	—
13. Mastitis	32	0.16	40	0.47	—	—
14. Liver fluke	9647	49.38	4676	55.04	13442	70.89
15. Worm Parasites	328	4.24	512	6.03	558	2.94
16. Ectoparasites	326	4.74	619	7.30	1659	3.75
17. Myiasis	436	7.23	131	1.54	45	0.24
18. Wound	599	3.07	290	3.42	305	1.30
19. Swelling, Sprain	235	1.20	140	1.65	95	0.50
20. Yolk gall	154	0.79	158	1.86	—	—
21. Ocular Diseases	160	0.82	35	0.41	20	0.11
22. Miscellaneous	215	1.10	177	2.06	315	1.66
Total	19536	1.00	8495	1.00	18961	100

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Scientific Talk Programmes Organized by NVA:

- Dr. S. B. Tripathi, Professor and Head, Dept. of Veterinary Medicine, Orissa Veterinary College, Bhubaneswar, delivered a lecture on "The Common Diseases of Animal in Tropics" on October 27, 1987 at Veterinary Complex, Tripureswar.
- Prof. Stig Larson, Visiting Professor of Community Medicine delivered a talk on "The Role of Veterinarian in Public Health" on November 19, 1987 at Veterinary Complex, Tripureswar. The professor was accompanied by Dr. Mathura Shrestha, Professor, Community Medicine TUTH, Nepal.
- Dr. Chinta Mani Lamichhane Ph. D. Scholar, James Cook University, Australia delivered a lecture on "Recent Development in Disease Diagnosis" at Tripureswar Complex.
- Prof. Emeritus S. McConnell, Prof. of Microbiology, Texas A & M University, Texas, U.S.A., Currently A D B Consultant, spoke on "The Development of vaccine Production and highlighted the importance of genetic engineering in the production of various biologicals.

Besides, NVA has also organized several slides and film shows on relevant subjects.

- Japanese Animal Hospital Association is organising 4th International Convention on July 8th to 10th, 1988 in Tokyo, Japan. For detail information please contact Seiden Truruno, D V M, Prisent JAHA, Koji-machi center Bldg. 5-8, Koji-machi 3-Chome, Chiyoda-ku Tokyo 102.

List of Contributors to the Building Fund of NVA:

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

- 29. Dr. P. K. Agrawal, Biological Products Division, Tripureswar Rs. 100.00
- 30. Dr. S. P. Gautam, Biological Products Division, Tripureswar Rs. 100.00



FAINNCIAL STATEMENT OF NVA

(From April 1986 - April 1987)

<u>INCOME</u>	<u>Rs.</u>	<u>EXPENDITURE</u>	<u>Rs.</u>
Membership Subscription and Renewal	18,554.00	Office Secretary Salary	1,800.00
Financial Help From RONAST	14,000.00	Postage & Stationary	545.25
Building Fund Collection	200.00	Party & Meetings	691.55
Bulletin Sell & Advertisement	9,720.00	Bulletin Publication and	.
Bank Interest and Collection	14,119.00	Other Press Work	26,302.00
Conference Contribution	18,636.00	Conference Organization	54,547.90
(Collected upto April 1987)		Sundry Expenses	260.75
Total Rs.	75,229.12	Total Rs.	84,647.45

Balance Sheet as at April 1987

<u>Balance as at</u>	<u>Rs.</u>	<u>Statement of Balance</u>	<u>Rs.</u>
April 1986	70,444.33	Fixed Deposit	50,000.00
		Nepal Bank Ltd.	35,000.00
Deficit of the year	9,418.33	NABIL Bank Ltd.	15,000.00
Total Rs.	61,026.00	Saving Deposit	4,210.00
		Nepal Bank Ltd.	103.23
		NABIL Bank Ltd.	4,107.57
		Cheques Sent for Collection	2,016.00
		Due	4,800.00
		Total Rs.	61,026.00

Dr. R. M. Shrestha
Treasurer, NVA