

Restricted Copy

Vol. 14

1986

Regd. ZCBA 1/2025/26

Bulletin of

**Veterinary Science &
Animal Husbandry**

Nepal



SPECIAL ISSUE PUBLISHED
ON THE OCCASION OF
SECOND NATIONAL VETERINARY
CONFERENCE

Official Organ of Veterinary Association

WITH BEST COMPLIMENTS
FROM
Nepal Veterinary Association

**Bulletin of Veterinary Science
and
Animal Husbandry, Nepal**

*Special Issue published on the occasion
of Second National Veterinary Conference*

14

1986

Regd. ZCBA 7/2025/26

Editorial Board

Editor - in - Chief
Dr. Upendra Mishra

Associate Editors:

Dr. Pawan K. Agrawal
Dr. U. M. Singh
Dr. S. P. Gautam

Annual Subscription

Rs. 40.00
U.S. \$ 10.00

Phone : 4392

Regd.)
(INDIA)

A-800 001

"PERSONALLY

**I HAVE ALWAYS FELT THAT
THE BEST DOCTOR IN THE
WORLD IS THE VETERINARIANS
HE CAN'TASK HIS PATIENTS
WHAT IS THE MATTER?
HE'S JUST GOT TO KNOW 'I'**

**- WILL ROGERS,
SENATOR, USA**



Nothing remains unattainable when a collective endeavour is made to achieve the goal of national development.

H.M. KING BIRENDRA



Veterinarian's Oath

Being admitted to the profession of veterinary medicine, I solemnly swear to use my scientific knowledge and skills for the benefit of society through the protection of animal health, the relief of animal suffering, the conservation of livestock resources, the promotion of public health, and the advancement of medical knowledge.

I will practise my profession conscientiously, with dignity, and in keeping with the principles of veterinary medical ethics.

I accept as a lifelong obligation the continual improvement of my professional knowledge and competence.

**Bulletin of Veterinary Science
and
Animal Husbandry, Nepal**

Vol. 14

1986

Regd. No. ZCBA 7/2025/26

CONTENTS

Editorial	Pages 1
<u>NEWS AND REPORTS</u>	
Past, present and future of NVA	3
Professional news	18
Financial statement	25
RONAST news	26
<u>TECHNICAL ARTICLES</u>	
The epidemiology of Fascioliasis in the Koshi hills of Nepal	27
A.M.Morel and S.N.Mahato	
Preliminary observation on enzootic bovine haematuria in the hills of eastern Nepal	36
S.N.Mahato	
Evaluation of egg laying performances of crossbred chickens under semi-intensive conditions	42
K.P.Oli	
Normal values of certain blood constituents in buffalo calves	49
L.L.Dass, P.N.Sahay and A.A.Khan	
Fascioliasis in Nepal: problems and prospect for control	52
B.R.Joshi	
Importance of mobile veterinary service in integrated rural development project area of Nepal	60
D. D.Joshi and P.M.S.Pradhan	
Jowar poisoning in draught affected area	66
D.K.Thakur and S.K.Verma	
The effect of steaming-up in milk yield	67
T.P.Shrestha	
Use of whey as a human food: a review	71
N.P.Sah	
Review of literature on the control of Sarcoptic -mange in pigs	81
P.M.S.Pradhan	

Editorial

Nepalese economy is heavily dependent on Agriculture which contributes 66.4% of Gross Domestic Products, 80% of the total earnings and over 90% of employment. Livestock rearing is an integral part of Nepalese Agriculture system. Apart from their contribution in terms of milk, meat, wool, hide, fuel & farm yard manure, bullocks are the main source of farm power. It is estimated that contribution of livestock subsector in Agricultural GDP is atleast 25%.

A review of our past efforts to boost the production of livestock products gives a clear picture of some success in meat and milk production. But the growing demand of these products due to uncontrolled population growth has adverse effect on the productivity.

The desire to fulfill basic needs by the year 2000 A.D. and make Nepalese to reach Asian standard is the timely and high thinking of our beloved King Birendra. As food is the first basic need to acquire 2250 calories per day per person, an ideal livestock products should provide at least 10% of the total calories.

We have to mobilize the available resources to boost the livestock production. This objective could be achieved with a physical infrastructure created in the country as a livestock development efforts in the past years. Effective mobilization of manpower, financial resources, mutual co-operation among SAARC Nations, Co-ordination and commitment is a must.

Uncontrolled importation of genetic materials and livestock products has brought several new exotic diseases which are becoming a great threat to our growing livestock and Poultry industry. Open Indo-Nepal frontier also creates uncontrollable movements of domestic and wild animals which provokes new incidence of diseases. Quarantine act for the implementation has been approved. In such circumstances it is advisable for the Vets. and also the farmers of either side of the border to remain vigilant so that any possible appearance of the disease can be checked in time.

Land is limited and maximum agricultural production has been geared up and there is no alternative source of food except to boost livestock production. In such condition if a farmer loose a productive animal, whose very survival depends on his animal means a great economic disaster to the family and complete paralysis of the farming system. High cost of animal has made the farmer more conscious about disease problems of their animal. Thus any disease that affects livestock will

have serious and negative effect on agriculture in general and food security in particular. Roughly estimated loss by various diseases is 30 to 40%. If we save this loss with prophylactic vaccination, proper drenching, timely diagnosis and treatment of the productive livestock, there will be automatically an increase in livestock products.

We have highest animal density in the world and paradoxically the poorest veterinary manpower (1:3,00000). The trained veterinary manpower and their posting in respective fields of veterinary services is the main constraint which has been realised since last several years. There can be no other opinion that the veterinarians can bring positive impact on livestock productivity. We have to give more services to private sectors to boost livestock industry.

HMG has to pay full attention on the recommendation of the First National Veterinary Conference. There should be a separate institute of veterinary science under the Tribhuvan University where sufficient graduate level trained manpower could be produced to meet the present days demand of veterinarians in the country.

More technical journals should be provided to Vets to acquire more technical knowledge and can apply in the field to give better services to the farmers. Really the Veterinarians are the true friends of the farmer.

The Editorial Board is happy that, this special issue of Bulletin is being released by Honourable Minister for Agriculture, Law and Justice Mr. Hari Narayan Rajauria at the Inaugural ceremony of Second National Veterinary Conference.

We welcome all the participants of the conference and wish the Second National Veterinary Conference a great success.

PAST PRESENT AND FUTURE OF NEPAL VETERINARY ASSOCIATION

The Nepal Veterinary Association (NVA) was established on 2024.3.11 and legally registered on 2025.11.13 (1967). From the very beginning of its establishment followings were the regular activities of NVA:

- (a) Executive Board meetings
- (b) Annual General Body meetings
- (c) Publication of Bulletin of Veterinary science and Animal Husbandry, Nepal, an official organ of NVA.

The NVA had been organising its annual general body meeting every year until 1980. Due to certain reasons the NVA was unable to organise its annual general body meeting after this period. It was believed that the veterinarians were benefitted from these regular meetings through exchange of knowledge and experience among the participants and discussions on the problems faced by the field vets and their possible solution.

The NVA is proud to inform that inspite of many ups and downs, the NVA had been publishing its official journal "Bulletin of Veterinary Science and Animal Husbandry, Nepal" regularly since last 15 years. The Editorial Board had been trying its best to improve the standard of the publication. Now the Editor is receiving articles from distinguished national and international researchers, veterinarians and technicians for publication. It is also a matter of satisfaction that the articles published in Bulletin are being abstracted in the reputed international periodicals. Now NVA is planning to convert this publication into a bi-annual Journal of Veterinary Science and Animal Husbandry.

The official circular is another source of NVA which plays an important role in diffusing the information regarding the NVA activities, recent discoveries, and other information NVA receives for circulation among its members from other national and international agencies. NVA sends these circular to its members and concerned individuals from time to time.

NATIONAL VETERINARY CONFERENCE

In 1982 NVA decided to hold its national conference at regular intervals. The First National Conference of NA was held on August 15 and 16, 1983. NVA would consider it a great achievement in its 15 years history. The inaugural ceremony of the First National conference of NVA was held in the APROSC hall on August 15, 1983. In spite of certain general and individual difficulties, all the Nepalese Veterinarians, specialists from India and Veterinarians working in Nepal have actively participated in the First National Conference.

Rt. Honourable Prime Minister Mr. Lokendra Bahadur Chand inaugurated the First National Conference of Nepal Veterinary Association by lighting the ceremonial lamp in a traditional fashion. Honourable Minister of Agriculture and Land Reform Mr. Hem Bahadur Malla presided over the function. Distinguished guests, representatives of professional organizations, Pharmaceutical companies, Feed Companies, Hatcheries and concerned individuals attended the inaugural ceremony.

After the inauguration, three technical sessions were held on August 15 and 16, 1983. Technical papers on Livestock health, production, breeding, economics, Research, nutrition, specific and general diseases, zoonotic diseases, Biological production, veterinary field activities etc were presented. All the participants of the First National conference actively participated in the discussion on individual papers.

On August 16, 1983, consolidated recommendation of the conference was presented at the closing ceremony. Mr. Bed Bahadur Khadka, Associate Member, National Planning Commission was chief guest and Dr. Deep Raj Sharma, Act. Secretary, Ministry of Agriculture presided over the function. The prestigious gathering contributed a great deal in respect of sharing of knowledge and experience among the participants. On the same night, NVA Organised a Veterinarians Night at Veterinary Complex, Tripureswar. The members and other invitees enjoyed the dinner and film show.

The chief guests and presidents of both the inaugural and closing ceremony assured the house that the HMG will give proper consideration to the recommendation of the First National conference. NVA feel sorry to inform the concerned authority that after three years of its First National conference not even a single recommendation has been executed.

Once again NVA is listing the recommendations of First National conference here under which need immediate attention of HMG for the quickest and allround development of livestock sector in Nepal.

पशुधनको विकास गरी साना
किसानको आर्थिक अवस्थामा
सुधार ल्याउन विशेष जोड

(कार्यालय प्रतिनिधि)

काठमाडौं, साउन ३० गते । कृषिमा आधारित अर्थात् व्यवस्थापना पशुपालन व्यवसायको महत्त्वपूर्ण भूमिका रहेकोले श्री ५ को सरकारले पशु विकास नीति अनुसार पशुधनको गुणात्मक स्तर कायम गरे निम्न आयलएका साना किसानहरूको आर्थिक अवस्थामा सुधार ल्याउने कुरामा विशेष ध्यान दिएको छ ।

प्रधानमन्त्री श्री लोकेन्द्र बहादुर खड्गेले उक्त कुरा नेपाल भेटेरिनरी एजोसिएशनको प्रथम राष्ट्रिय सम्मेलनको भाग काठमाडौँमा उद्घाटन गर्दै बताउनु भएको हो ।

प्रधानमन्त्री श्री चन्सेलर श्री ए. भट्टराजगिराज सरकारबाट देशको भूबनोटलाई हृदयंगम गरि- बस्ती पहाडी क्षेत्रमा पशुपालनको विकास तथा विस्तारमा प्राथ- मिकता दिने निर्देशन बमस भए अनुरूप पहाडी क्षेत्रका जनताको पशुपालन व्यवसायलाई बढी लाभदायक बनाउन पशुहरूको खाहार, प्रजनन पशुहरूलाई संकासक रोगबाट बचाउन व्यवस्था गरि कारामा जोड दिनुपर्ने

प्रधानमन्त्री श्री चन्द्रशेखर विलास
दत्तकः हनुमान भक्त, पण्डित, वन

जंगलको बिनाश तीव्र गति
भएको तथा जनसंख्याको बढेकोले कृषि उत्पादनमा आएको तथा मुलुकमा उल्लेखनीय वनश्रवण तथा वायुमयानुपातको प्रभाव प्रधानमन्त्रीद्वारा

पशु, सक्षमा बढी भएको र यसले पशुपालन व्यवसायलाई प्रतिकूल प्रभाव पारेको उल्लेख गर्नुहुँदैन। पशुपालनको विकसितमा नयाँ प्रविधि र साधनको उपयोग गर्न सकिएमा जनतालाई पौष्टिक (बाँकी आठौँ पृष्ठको छैटौँ) लहरमा



Prime Minister Lokendra Bahadur Chaudhary lighting an oil-fed lamp to mark the inauguration of the first national conference of Nepal Veterinary Association Monday —GS. Photo.

HMG Policy On Livestock Development Reiterated

PM Opens Veterinary Association Meet

By A Staff Reporter

Prime Minister Lokendra Bahadur Chand has reiterated His Majesty's Government's policy to bring about qualitative improvement in animal husbandry so as to help small farmers improve their economic lot.

Prime Minister Chaudhary, who was delivering his inaugural address to the first national conference of Nepal Veterinary Association here Monday, noted that a predominantly agricultural country, like Nepal had regarded animal husbandary as an important profession throughout the ages.

Highlighting the importance of animal husbandry in the country, Premier Chand stated that it provided employment, dairy products, meat, wool, fertilisers and transport needs.

Recalling that His Majesty the King had issued a clarion call for livestock development in the hill regions, Premier Chand emphasised the need for measures aimed at meeting the requirements of animal feed, pastures, veterinary services and provision for

artificial insemination.

Protection of animals from diseases, he said, was an important requirement. He also pointed out that there were insufficient grazing lands to meet the requirements of the country's livestock development.

Stressing the need for meeting the basic needs of farmers engaged in animal husbandry, Prime Minister Chaud said that integrated rural projects would contribute significantly in this respect.

Also speaking from the chair, Agriculture and Land Reforms Minister Hem Bahadur Malla touched upon various aspects of livestock development and underlined the importance of veterinary

Minister Malla stated that veterinary clinics had been established in all the seventy-five districts of the country.

He also added that artificial insemination programme was also being increasingly expanded in an effort to improve the quality of animals.

He noted that the importance of veterinary doctors was considerable in the country where skilled hands were far too few.

Earlier, Nepal Veterinary Association president Dr N.B. Singh highlighted the benefits of animal husbandry in raising the economic standard of the people.

General secretary of the Association, Dr. D.D. Joshi, and Dr. Uday Singh also shed light on the objectives of the conference.

The today conference is being participated by veterinary personnel from all over the country, including guests from outside Nepal.

Nepal Veterinary Association has a total of one hundred and five members.

FIRST NATIONAL CONFERENCE IN NEWS PAPERS



Rt. Hon. Prime minister Shri L.B. Chand inaugurating the conference



Rt. Hon. Prime minister Shri L.B. Chand addressing the conference



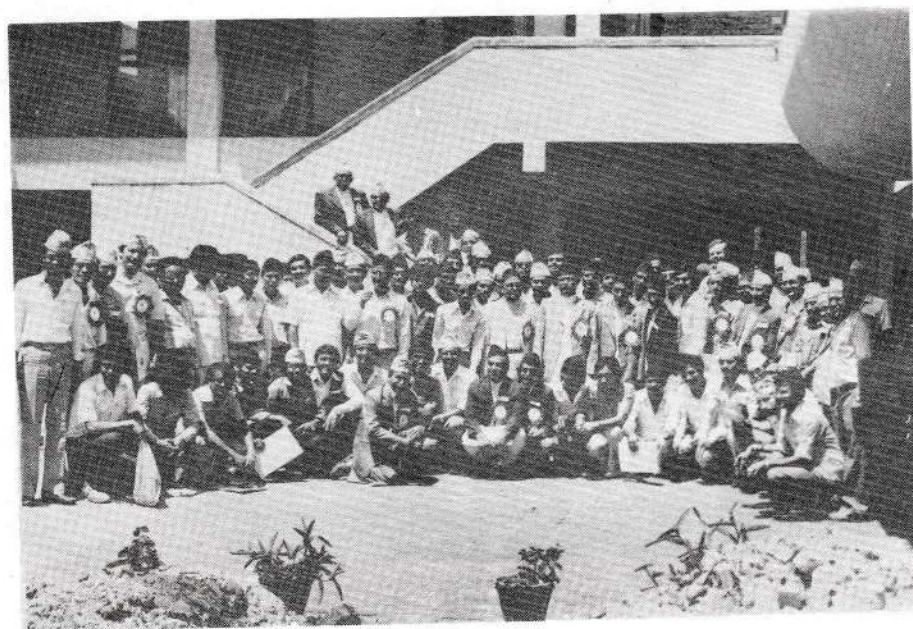
Hon. Minister of Agriculture Shri H.B. Malla addressing the conference



A section of the audience at the inaugural function



Shri B.B. Khadka, Associate member, National Planning Commission
at closing ceremony



Honourable Minister for Agriculture Shri H.B. Malla
with participants of the conference

Consolidated recommendations of First
National Conference

1. We have the highest animal density in the world and paradoxically the poorest veterinary manpower. In spite of good scope for self employment as the professional, scientists, and opportunities in private and public sectors for employment, the growth of veterinary manpower is negative in this country.

There is demand for Veterinarians in the Dept. of Wild life, Dept. of Health Services, Royal Nepal Army, national and international pharmaceutical companies, Institute of Agriculture and Animal Science, hatcheries etc. Utmost, all the Veterinary institutions, livestock farms and other activities under the Dept. of Livestock Development and Animal Health are suffering because of the scarcity of manpower, as a result the establishments are either in low production or defunct in most instances.

According to the recent statistics one Vet in this country is serving 300000 heads of animals. It would be clear from following statistics; out of total vets numbering 110, the Vets under taking their own private activities 10, vets working in T.U. and other organizations like Dept of wild life, Dept. Health Services, Royal Nepal Army, Dairy Development corporation, BTC, APROSC, ROMAST etc. 20 and remaining vets have to shoulder different activities under the Dept. of Livestock Development & Animal Health such as administration, livestock extension, breeding, Livestock farm management, vaccine production, Rabies vaccine production, FMD Lab Disease diagnosis and parasite control project, District Hospitals (75) and regional directorate.

Scarce veterinary manpower is the main problem which has been realised since last one and a half decades, unfortunately nothing so far has been done to improve this situation.

The First National Conference of NVA, strongly recommend to take necessary steps to improve veterinary manpower in the interest of national development. Effort should also be made to establish a veterinary Institute in Nepal.

2. In a veterinary degree programme courses on Livestock, Poultry, Breeding, Nutrition, Management, Agri. Extension, Livestock Economics, Dairy Science, Forage Production, Rural Development etc. are also included. A veterinary graduate is capable to handle all types of day to day activities of livestock farms, extension activities, breeding programmes etc. It is not wise to appoint one

technician for livestock breeding activities and a separate veterinarian to treat reproductive disorders. So far veterinarians are confined to veterinary Hospitals only. Concern authorities will surprise to know that a veterinarian has to take a special course "FORAGE PRODUCTION" in his degree programme and independently produce fodder crops for a complete agricultural cycle. In our own situation the choice should go for one person who is equally capable to handle the livestock health and production activities.

Therefore conference strongly request the concern authorities to provide equal opportunity to veterinarians to serve in the field of Livestock production and extension activities.

3. So far there is only one faculty (veterinary) under the Agriculture Service. There are various types of activities under the Animal health organization. The veterinary field activity is quite different than the Laboratory and Research activities and need quite different types of trained and qualified manpower. To run all these activities smoothly and to provide a stability in these fields following sub faculties should be formulated:-

(I) Animal Health faculty

- (a) Veterinary Sub faculty
- (b) Para veterinary Sub faculty

(II) Veterinary Laboratory faculty

- (a) Vet. Research Sub faculty
- (b) Vet Laboratory technology Sub faculty.

To run the sophisticated and specialized laboratories e.g. Biological Products Lab., Disease Investigation Lab; Rabies Lab; FMD Lab, regional labs and veterinary Hospitals smoothly the above sub faculties are essential.

4. Establishment of National Animal Science Research Institute to carry out the necessary research activities in the field of Livestock breeding, nutrition, disease control and eradication, development of effective biologicals etc.
5. Establishment of Disease investigation laboratories in all the five regions.
6. Foundation of Nepal Veterinary council.
7. The designation "VETERINARY OFFICER" is strictly a professional title. There are certain criterions which should be full filled

before any body is given the title "Veterinary officer". In Nepal Junior technicians are being promoted as veterinary officer. A technician who is not a veterinary graduate can not be given the title Vet officer or Asst. Vet. officer. Technicians working in the field of animal health can be promoted to some other gazzeted post such as Vet. Inspector (in Para veterinary sub faculty).

8. Veterinarians working in laboratories, plannings, Administration should get NON PRACTICING ALLOWANCE.
9. The job of a veterinarian is full of risks. A veterinarian not only deals with animals but also works with organisms (Bacteria/virus) harmful to life. Therefore the life of all the staff working in this field should be insured.

Rabies is a fatal disease having no cure but effective vaccines are available. Therefore the Veterinarians should be vaccinated against this dreaded disease at regular interval.

NATIONAL POULTRY FAIR

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

The chief guest Mr. Prithu N. Rana, Act. Secretary, Ministry of Agriculture, inaugurated the fair and Mr. Singh Bahadur Joshi presided over the inaugural function. During the inaugural ceremony, chief guest Mr. P.N. Rana released the Poultry Farming Book in Nepali (Kukhura Palan Ek Labhadayak Byawasay) written by Dr. Pawan K. Agrawal.

The NVA tried to make the fair more informative so that the farmers can take the advantage from the fair. Talk programmes on poultry management, feeding, disease control etc. by distinguished technicians were arranged at the mela site. The fair attracted large number of poultry farmers and field technicians. The fair was also successful in creating interest and confidence among the farmers. The fair was scheduled for only one day but on the advice of the higher authorities of Ministry of Agriculture and Dept. of Livestock Development and Animal Health, the fair was extended by a day.

NVA feel satisfaction to note that after two years of its organisation, people still remember the First National Poultry Fair and keep on requesting the NVA to make the fair a regular event.



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



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



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



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



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



A view of the First National Poultry Fair.

SCIENTIFIC TALK PROGRAMMES

To organise scientific talks, and share practical experience and knowledge among the national and international scientists, is one of the important activities of Nepal Veterinary Association. In the past NVA invited following national and international distinguished scientists to deliver talks on their respective fields.

Oct.18,1984: Dr A.K. Verma, Retd. Director Institute of Animal Health and production, Patna, India, Veterinary Scientist and Livestock consultant, ADB. delivered a talk on "snail borne infection of men and animals".

Nov 11,1984: Dr. Konrad Bogel, Chief, Veterinary Public Health, WHO, Geneva and Professor of Vet. Microbiology & Epidemiology, Univ. of Munich and
Dr. M. Bahmanyar, WHO consultant for Rabies and Ex-chief, Rabies Dept. for vaccine production and Research, Pasteur Institute, Tehran delivered very useful talks on "Rabies and its control".

Dec 4, 1984: Dr. Kamchad Mongkolkul, President, The Science Society of Thailand, presented a talk on "Thai Experience on research and development in Bio-technology".

March 17, 1985: Dr. N.B. Singh, Member Secretary, RONAST, delivered a talk on Emergency diseases and their control.

June 8, 1986: Prof. Pavel Jelen, Ph.D, P. Eng. Dept. of Food Science, University of Alberta, Edmonton, Canada delivered a lecture on Dairy Products.

June 29, 1986: Dr. A.N.D. Nanavati, Formerly Head, Dept. of Virology, Haffkine Institute, Bombay, India presented an interesting lecture on "Infectious diseases of men and animals and their prevention".

Besides above lectures, NVA also arranged several slide and film shows in the past.



Prof. Pavel Jelen, Dept. of Food Science, University of Alberta, Canada, delivering a lecture on Dairy products



A view of the audience attending the talk programme.

FUTURE ACTIVITIES OF NVA, IN BRIEF

1. Establishment of a Veterinary Library.
2. Exchange of Journal.
3. Publication of a monthly NEWS LETTER
4. Technical Consultancy and assistance in the related fields.
5. Organisation of film shows and lectures on zoonotic diseases and their prevention in schools and colleges of the country.
6. Establishment of ANIMAL WELFARE SOCIETY OF NEPAL. A team of NVA members has already started its work to formulate society constitution.

The aims and objectives of the Society will be :

- a. Emergency first aid to deal the accident and emergency cases including the rescue of trapped animals.
- b. To extend help in relief works for animals under conditions of famine, floods, landslide and disease outbreaks etc. (including feed and health coverage).
- c. To make available/liaison for Veterinary aid to sick and injured animals through animal clinics, Veterinary dispensaries, and such other means.
- d. To establish drugs bank for animals.
- e. Efforts to provide (or home finding) shelter and other basic amenities to old, sick or stray animals through veterinary dispensaries, gaushalas etc.
- f. Mass education programme, for animal care, welfare, management and first aid, with the help of audio visual aids, organizing exhibitions, talks, animal shows etc.
- g. To motivate love for animals in school children.
- h. To initiate and to organize junior branches of the society for active involvement of young and school children.
- i. To establish and maintain small libraries on animal welfare and related subjects with the help of donations.
- j. To publish animal welfare society bulletin periodically.
- k. To coordinate the confluence of knowledge from different disciplines related to animal welfare and to work in collaboration with other organizations in relation to animal welfare for promoting its objectives.
- l. To bring out picture cards, greeting cards, calenders, stickers etc. in support of animal welfare.

OFFICE BEARER OF NVA 1985-86

President :	Dr. N.B. Singh
Vice President :	Dr. Mrs. P. Manandhar
General Secretary :	Dr. D.D. Joshi
Joint Secretary :	Dr. Pawan K. Agrawal
Treasurer :	Dr. S.P. Gautam
Editor :	Dr. Upendra Mishra
Member :	Dr. S.R. Bhandary

Regional Members :

Eastern Region :	Dr. Dilip Sapkota
Central Region :	Dr. L.B. Chand
Western Region :	Dr. D.P. Parajuli
Mid Western Region :	Dr. B.M. Shrestha
Far Western Region :	Dr. B.B. Khadka
IAAS, Rampur :	Dr. N.P. Shah

Professional News

Dr. D.D. Joshi, Dr. K.P. Dhakal and Dr. U. Singh have been promoted to Gazetted First class and Dr. S. Singh, Dr. R. Roy, and Dr. S. Yadav have been promoted to Gazetted second class (Asst. Sec, Level).

Dr. D.R. Adhikari, Dr. Bimal Giri, Dr. R.K. Khatiwada and Dr. K. Acharya have completed their Masters degree.

Nepal Veterinary Association welcomes new graduates, Dr. Narayan Ghimire, Dr. N.P. Basyal, Dr. S.R. Aryal, Dr. K.P. Paudel, Dr. Dinesh Singh, Dr. P.R. Bhusal, Dr. K.P. Premi, Dr. Rabindra Thakur, Dr. Karuna Sharma and Dr. Amar Shah. We wish their successful professional life.

NVA has received Rs. 14000.00 as the financial Contribution for the fiscal year 2043/44 from Royal Nepal Academy of Science and Technology. The NVA expresses its sincere thanks to RONAST for this financial assistance.

NVA JOINED WVA

The permanent Committee of the World Veterinary Association in its 35th meeting held in Paris, France on 31st May 1986, Unanimously accepted the Nepal Veterinary Association as a national member of the WVA.



WORLD VETERINARY ASSOCIATION
ASSOCIATION MONDIALE VETERINAIRE
WELT-TIERÄRZTEGESELLSCHAFT
ASOCIACION MUNDIAL VETERINARIA
ВСЕМИРНАЯ ВЕТЕРИНАРНАЯ АССОЦИАЦИЯ

PRESIDENT

Prof. Dr. J. F. Figueroa, 54 Sayre Drive, Princeton, N.J. 08540, USA.

VICE-PRESIDENTS

Africa:

Dr. B. H. Pappalicio South African Veterinary Assn., P.O. Box 25033, Monument Park, 0105 Pretoria Rep. of South Africa.

America (Latina):

Dr. L. Querrollo, President, Sociedad de Medicina Veterinaria, Avda. Libertador Brig. Gen. Lavalleja 1464 14° Montevideo, Uruguay.

America (North):

Dr. V. L. Sharp, College of Vet. Medicine, The Ohio State Univ., Columbus, Ohio 43210, USA.

East Asia and Oceania:

Mrs. B. F. Smith, ICI Tasman Ltd., Private Bag, Upper Hutt, New Zealand.

Europe (Eastern):

Dr. D. A. Tretyakov, Main Veterinary Dept., Ministry of Agriculture, Moscow 10713, USSR.

Europe (Western):

Prof. Dr. I. Mansson, Sveriges Landbruksuniversitet, P. O. Box 583, 751-23 Uppsala, Sweden.

Associate Members:

Prof. Dr. E. H. Kampelmacher, State Institute for Public Health, P. O. Box 1, 3729 BA Bilthoven, The Netherlands.

SECRETARY-TREASURER

Prof. Dr. C. L. De Cuenca, Isabel la Católica, 12, Madrid-13, Spain; phone (34-1) 247 18 38, telex 22762 CDIBE.

ADMINISTRATOR

Mr. E. Aalbers
(Address same as that of the Secretary-Treasurer)

No. 360

Dr. Pawan K. Agrawal,
Secretary, Nepal Veterinary Association,
Post Box No. 3130
KATHMANDU, Nepal

Dear Dr. Agrawal,

It is my pleasure and privilege to let you know that at its 35th meeting held in Paris, France on 31st May, 1986, the Permanent Committee of the World Veterinary Association (WVA) unanimously accepted the Nepal Veterinary Association as a national member of the WVA.

On behalf of the Executive Bureau and the Permanent Committee of the WVA I wish to extend to you my sincere congratulations on this favourable decision and hope that our future cooperation will be fruitful and of mutual benefit.

Would you please let us know to whom all future correspondence should be addressed.

With kind regards, also on behalf of Prof. Figueroa,

Yours sincerely,

Prof. Dr. C. L. De Cuenca,
Secretary-Treasurer

Copy to Prof. Figueroa

NEPAL VETERINARY ASSOCIATION
BUILDING FUND

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

Amount can be deposited directly in the Saving Account No 19117, Nepal Bank Ltd; Head office, Kathmandu or send your Cheque/Draft/money order or cash to Nepal Veterinary Association, Veterinary Complex, Tripureswar, Post Box 3130, Kathmandu, Nepal.

Name and address of the contributor will be published in the annual issue of "Bulletin of Veterinary Science and Animal Husbandry, Nepal".

LIFE MEMBERS OF NVA
(Cont. from Bull. Vet. Sc. & A.H.Vol 13)

36. Dr. Barbara Fargher, U.M.N, Pokhara, Nepal
37. Dr. Mrs. Poornima Manandhar, Disease Investigation Lab.
Tripureswar, Kathmandu.

XXIII WORLD VETERINARY CONGRESS

The XXIII World Veterinary Congress will be held in Montreal, Canada from 16-21 August, 1987. Registration forms available at NVA secretariate.

VISITORS IN 1986

1. Jaana Airakisnen (Student of Economics),
Kasarmikata, 4D47 0014, Helsinki, Finland.
2. Taina Sateri (Veterinary Student)
Kaharintic 79, 21290 Rusko, Finland.
3. Dr. Barbara Fargher (Veterinary Surgeon)
10, Fair ways, Llandudno LL30, 2H2 Gwynedd, North Wales, U.K.
* Dr. Fargher is working at UMN, Pokhara and she has joined NVA as
a life member.
4. Prof. Pavel Jelen, Ph.D. P. Eng.
Dept. of Food Science, University of Alberta, Edmonton,
Canada T6G 2PS.
5. Dr. A.N.D. Nanavati, Formerly Head
Dept. of Virology, Haffkine Institute, Bombay, India.
6. Dr. Dewey Edwin Monty Jr. DVM, MS, Ph. D.
Prof, Dept of Vet. Science
University of Arizona, Tucson, Arizona, USA,
* Prof. Monty is working at IAAS, Rampur
7. Bruce Vande Steeg
2824, ottowa Avenue
Davis, Lalif 95616 USA
8. Peter S.V. Comont (Vet. Surgeon)
Churchill College
Cambridge, CB3 9BA, England.
9. J. Allen Forsyth, BSA, DVM
Registrar, British Columbia Vet. Med. Association, 101-644 S.W.
Marine Drive, Vancouver, British Columbia, Canada.
10. Mrs. B. Joan Forsyth, B.S.A. DVM
Rosedale Veterinary Service Ltd. 7760 South Wood Place
Burnaby, B.C. V5J 2G7



BE KIND TO ANIMALS

**UNSEEN THEY SUFFER UNHEARD
THEY CRY IN AGONY THEY LINGER
IN SILENCE THEY DIE IS IT NOTHING
TO YOU ALL YE WHO PASS BY**

- LORD BUDHA

FINANCIAL STATEMENT OF NVA
(From April 1985 - April, 1986)

<u>INCOME</u>	<u>Rs.</u>	<u>EXPENDITURE</u>	<u>Rs.</u>
Membership subscription and renewal	3960.00	Office Secretary Salary	1800.00
Financial Help from RONAST	10,000.00	Postage & Stationary	595.00
Building fund collection	130.00	Party & Meetings	185.90
Bulletin Sale & Advertisement	6,532.00	Bulletin publication 11,317.50 World Veterinary	
Bank interest & others	7,704.24	Association membership & subscription charge	978.00
	<u>28,326.24</u>		<u>14,876.40</u>

Balance sheet as at 16th April 1986

<u>Balance as at</u>	<u>Rs.</u>	<u>Statement of balance</u>	<u>Rs.</u>
April 13, 1985	56,994.49	Fixed Deposit	35,000.00
Surplus of the year	13,449.84	Saving deposit	27,215.53
		Cheques sent for collection	3,428.80
Total Rs. 70,444.33		Due	4,800.00
			<u>70,444.33</u>
		Total	70,444.33

THE EPIDEMIOLOGY OF FASCIOLIASIS IN THE KOSHI HILLS OF NEPAL

A.M. Morel * and S.N. Mahato *

Summary

The epidemiology of Fasciola gigantica was studied in the intermediate and definitive host and the epidemiological cycle was determined. Lymnaea auricularia race rufescens and Lymnaea luteola were identified as being responsible for the transmission of F. gigantica in the Koshi Hills of Nepal. The ecology of the snail was studied at 9 different habitats in Hattikharka panchayat.

Mature infection in the snail was detected from May to August and again in November.

The prevalence of the disease in cattle was highest during the monsoon and again in January and February.

Based on these findings, a control programme for the disease was formulated.

Introduction

Bommeli, Eichenberger, Singh and Basnyat (1973) reported that liverfluke infestation caused an economic loss of NCR 200 million per annum, (\$ 19.7 million), and recorded infestation rates of 50-90% in areas below 1830 metres a.m.s.l. The Central Veterinary Laboratory, Tripureswor (1978) also recorded a Prevalence of 60% in cattle and buffalo. Tinau Watershed Project (1983) found that 67.1% of untreated cattle and buffalo were affected with liverfluke in Madan Pokhara, and from November 1981 to June 1982 the levels rose from 33.8% to 62.2%. In Humin, during the same period, the rate rose from 34.1% to 42.3%. Lowcock (1982), reporting on a survey conducted in the Pokhara valley, found that 79% of adult buffalo, 66% of adult cattle and 37% of adult goats were positive for liverfluke on faecal examination.

In 1973, Bommeli et al collected snails from different regions of Nepal and found Lymnaea viridis and L. auricularia race rufescens to be widespread.

Lohani and Jaeckle (1981) identified Fasciola gigantica, F. hepatica and intermediate forms in water buffalo and goats slaughtered in Tansen, Palpa.

* Pakhribas Agricultural Centre, Pakhribase, Dhankuta.

In 1980, it was decided to carry out a detailed study of the epidemiology of fascioliasis in cattle in the Koshi Hills, concentrating on Hattikharka panchayat, (altitude 610 -1830 metres a.m.s.l.), adjacent to Pakhribas Agricultural Centre, Dhankuta District. The climatic conditions and altitude range in this panchayat are comparable with much of the rest of the Koshi Hills. Results were recorded for 1981, 1982 and 1984. Epidemiology in the intermediate host was also investigated in the last year of the trial.

Materials and Methods

For the trials conducted in 1981 and 1982, 12 permanent watering sources were selected at altitudes of 671 metres a.m.s.l. (low), 1068 metres a.m.s.l. (mid) and 1678 metres a.m.s.l. (high).

5 cattle, sharing each water source, randomly selected and monthly faecal samples collected. The faecal samples were analysed using the differential flotation technique described by Sewell and Hammond (1972).

In 1984 the trial was slightly re-designed and expanded to include a study of the epidemiology in the intermediate host. Snail samples were collected monthly from 9 of the 12 watering sources previously identified. All the snails, live and dead, were counted at each water source using a 0.1 metre quadrant and 10 random quadrant throws. A proportion of the snails, preserved in 10% formalin, were sent to Dept of Parasitology, Central Veterinary Laboratory, Weybridge, England for identification and dissection. Samples were also sent to the British Museum, London.

The number of cattle sampled was increased in 1984. Initially, 130 cattle over 7 years, 128 cattle between 9 - 18 months and 20 calves 2 - 4 months of age were randomly selected for monthly faecal collection. This number decreased over the year due to sale, death or drenching of the stock by the farmers. No faeces were collected from cattle over 7 years in January nor were any collections made in June and July due to unavoidable reasons.

The faecal samples were analysed using the flotation technique described in the MAFF. Technical Bulletin No. 18 (1977). It was subsequently found that this method, although faster to perform, was substantially less sensitive than the differential flotation technique previously employed (Technical paper No. 74), hence the 1984 results have been adjusted to account for this.

The meteorological data for Hattikharka panchayat is similar to that of Pakhribas panchayat (for which full records exist), therefore

Pakhribas Agricultural Centre temperature and rainfall figures are quoted in this paper, this meteorological station being sited at 1667 metres a.m.s.l., latitude $27^{\circ}2'$, longitude $87^{\circ}7'$.

Results

A. Intermediate host

1984 data shows that at high altitude (678 metres a.m.s.l.) only snails with a similar gross morphology to L. auricularia race rufescens were found. Although cases of parasitism with xiphidiocercaria were detected, only two cases of parasitism with F. gigantica were noted. L. luteola species were commonly present at low (671 metres a.m.s.l.) and mid (1068 metres a.m.s.l.) altitudes, but no L. auricularia species were found. Parasitism with F. gigantica and Xiphidiocercaria occurred in snails collected from both altitudes. Bithyniid snails were common at low altitudes and Chaetogaster species in lymnaeid snails at mid altitude. A few snails resembling L. truncatula were found at low altitude in December, but these have not yet been positively identified. No instance of parasitism with F. hepatica was recorded.

The shell of L. auricularia race rufescens varied from light to dark brown with a non-operculate aperture extending $2/3$ the length of the shell which was blunt ended. L. luteola were similar in colour but the non-operculate aperture was only $1/2$ the length of the shell which was pointed. Although the internal anatomy of the snails was investigated, doubt still exists as to whether snails classified as L. luteola might not be examples of L. viridis.

The habitats under study were spring fed ponds or paddy field and were flooded with running water during the monsoon (June to September). Most sites were North to West facing, sunlit, permanent water sources. All were used as drinking places by livestock and were contaminated with dung. Nasturtium officinale (watercress) and unspiciated grasses grew in the water and Eupatorium adenophorus, N. officinale, bamboos and trees grew around the water's edge.

The average monthly population figures, divided into three altitude ranges (low, mid and high) have been given in Table 1 - the highest concentration of snails being found at the beginning of the dry season.

The percentage of snails harbouring intermediate stages of F. gigantica are given in Table 2. The level of infection at high altitude was much lower than at low and mid altitudes.

A single immature infection in January was the only evidence of overwintering infection in the Snail. Snails with mature infections were most prominent in May and June (possibly July), declining in August. There appeared to be a resurgence of new infection at mid altitudes in October, although no mature infections were found at this time. A single mature infection was found in November at low altitudes.

Table 1: Mean snail population (per square metre) 1984

Altitude	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D
High	6	3	NR	NR	13	2	24	2	27	4	0	0	NR	NR	22	1	36	3	49	5	69	7	103	13
Mid	16	2	NR	NR	27	3	39	4	43	6	46	4	NR	NR	48	6	39	3	70	12	86	16	81	9
Low	19	3	NR	NR	26	3	44	4	31	3	48	7	NR	NR	44	6	47	3	66	10	86	11	72	12
Mean	14	3	NR	NR	22	3	36	3	34	4	31	4	NR	NR	38	4	41	3	62	9	80	11	85	11

NR = Not recorded, L = Live, D = Dead,

Table 2: Percentage of snails harbouring intermediate stages of *Fasciola*.

	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec		
	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M	I	N	M			
Number of snails examined	20			NR			23			43			53			0			NR			45			43			41			59			55		
% infected	0	0	0	NR	NR	NR	0	0	0	0	0	0	0	0	0	0	0	0	NR	NR	NR	0	4	0	0	0	0	0	0	0	0	0	0	0		
Number of snails examined	49			NR			62			136			65			68			NR			72			69			155			100			107		
% infected	2	0	0	NR	NR	NR	0	0	0	2	1	0	17	5	0	3	0	3	NR	NR	NR	0	0	0	0	0	0	3	2	0	0	0	0	1	0	0
Number of snails examined	60			NR			50			84			62			88			NR			33			7			52			26			56		
% infected	0	0	0	NR	NR	NR	0	0	0	1	0	0	3	5	5	3	0	1	NR	NR	NR	0	0	0	0	0	0	0	0	0	0	4	0	0	0	

I = Immature (redia containing germ balls), N = Nearly mature (redia containing developed cercaria)
M = Mature (cercaria), NR = Not recorded

B. Definitive host

The prevalence of chronic fascioliasis, as detected by faecal egg output, and the average monthly temperature and rainfall records for the years 1981, 1982 and 1984 are given in Figures 1, 2 and 3. Figure 4 allows comparison of the annual prevalence rate fluctuations for the three years under study and also records the average rainfall for the years 1976 - 1984.

Figure 1: Average monthly liverfluke prevalence, rainfall and temperature (1981)

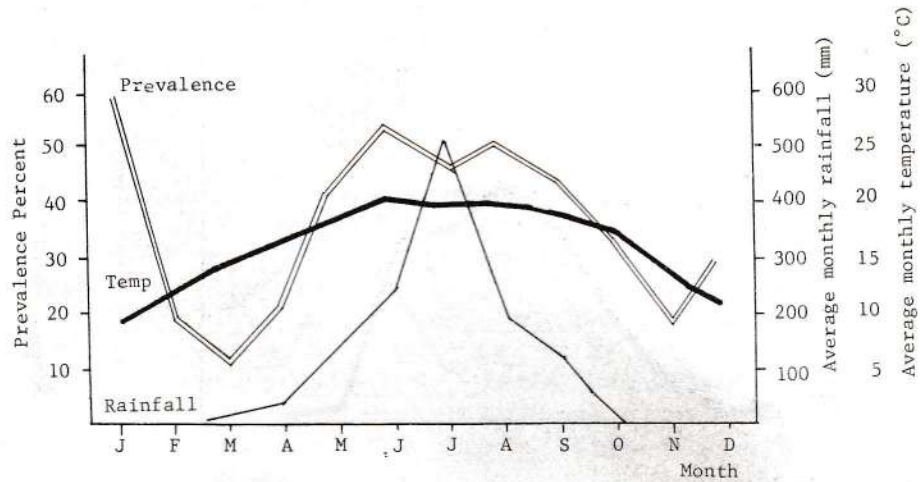
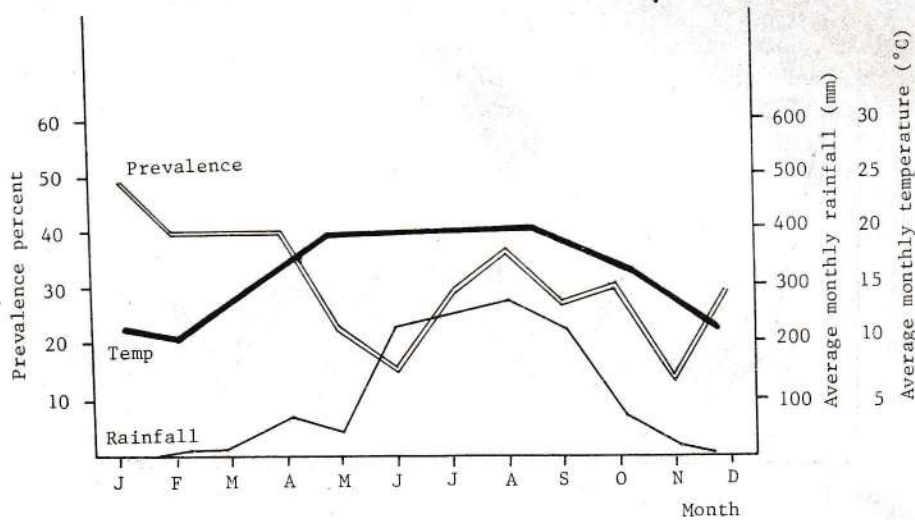


Figure 2: Average monthly liverfluke prevalence, rainfall and temperature (1982)



These Figures show a high prevalence rate in January, declining as the dry season advances and increasing again during the monsoon with another decline early in the following dry season. This pattern is not so appreciable in 1984 due to the missing data for the months of January, June and July, but such data as presented, is in general accordance with the epidemiology of the disease in the intermediate host and with the meteorological records.

Figure 3; Average monthly liverfluke prevalence, rainfall and temperature (1984)

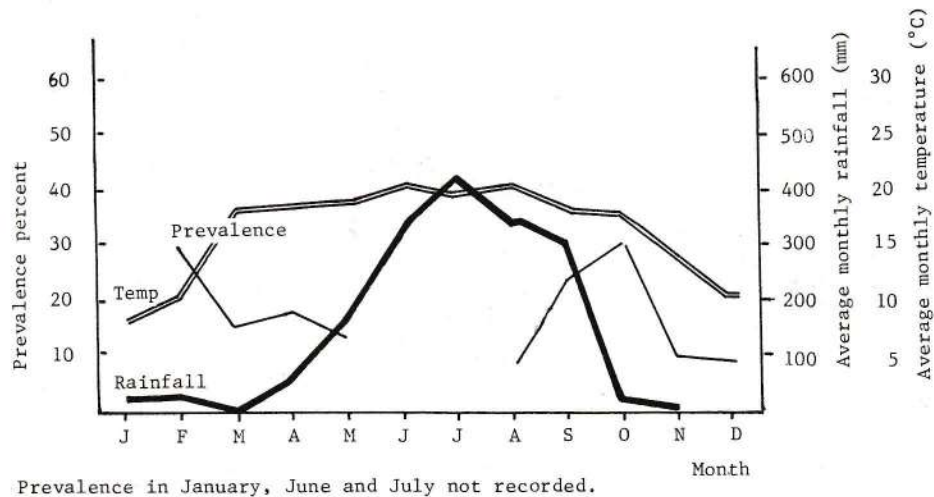


Figure 4: Average monthly liverfluke prevalence (1981, 1982, 1984) and average monthly rainfall 1976-1984

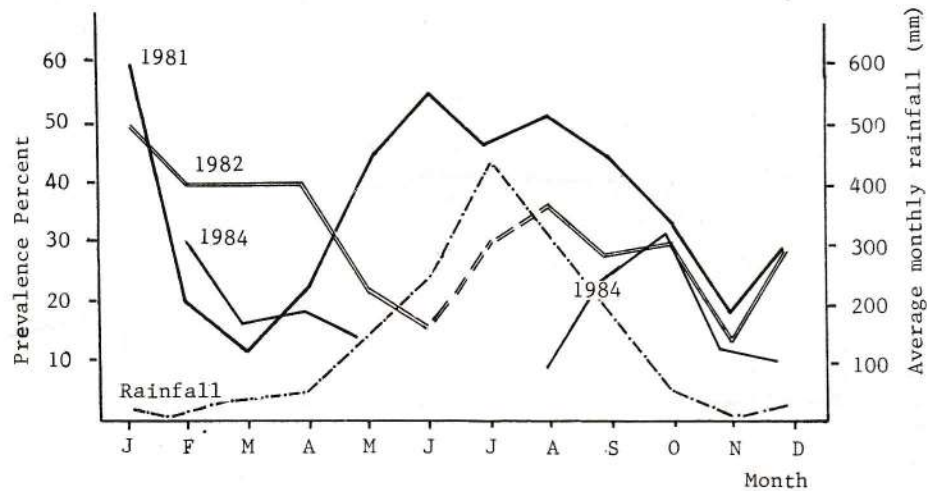


Table 3 shows the monthly prevalence rate of Fasciola infection in cattle, stratified by age. The young stock monitored in this trial had been grazing with the herd for between 6 to 9 months before Fasciola eggs were first detected on faecal examination in September. This primary infection fits well with the presence of mature infection in the snail.

Table 3: Prevalence (percent) of fascioliasis in cattle (1984)

Age of cattle in January 1984	Prevalence (percent)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2 - 4 months	0	0	0	0	0	NR	NR	0	24	56	26	28
9 - 18 months	12	18	4	17	5	NR	NR	13	0	27	5	0
Over 7 years	NR	39	23	21	20	NR	NR	6	31	29	10	10

Discussion

At high altitude, only L. auricularia race rufescens were found, few being parasitised by F. gigantica. At low and mid altitudes L. luteola (or possibly L. viridis) is the intermediate host of F. gigantica. No cases of infected bithyniid snails were detected nor was any instance of parasitism with F. hepatica recorded. These findings are similar to those of Bommeli et al (1973).

The populations of L. auricularia race rufescens and L. luteola fluctuated widely during the year. In January, when temperature and rainfall were low, the snail population was also at a low level, rising slowly with increasing temperature in permanent water sources until April. (This may also be a reflection of higher concentrations due to contraction of water sources). From the onset of the monsoon, snail populations rose again slowly, favourable climatic conditions being offset to some extent by flooding of the water sources with a consequent dilution effect. Towards the end of the monsoon (September - October), the snail population increased dramatically as water movement slowed and allowed the growth of suitable vegetation.

Investigation of the life cycle of the parasite in the snail indicated that the over-wintering infection was negligible, - a single immature infection being found in January. New infections were detected in April (coinciding with pre-monsoon showers). Infection in the snails built up in May when the first mature infections (consequent on finding immature infections in April) were detected at low altitude, possibly as a result of higher temperatures at this altitude. Mature and immature infections in June demonstrated continuing maturation of infection derived from eggs hatching in April together with further hatching in May. This pattern probably continued in July (during which month no data was collected). Few infected snails were detected in August and September, indicating maturation and death of the April and May infections with no further apparent snail infection taking place in late June, July and August; this may be due to the multiplicity of water sources available during these months with a consequent reduction in the number of stock grazing adjacent to the water sources under study, to the monsoon rains diluting the pasture contamination of those animals

still grazing these sites and due to the limited practice of stall feeding during the maize and paddy season (June - August). A resurgence of infection was detected at mid altitude in October from eggs hatching in September - animals again having free access to these sites following the maize harvest. By October, the dry season had started with increasing snail mortality as the drought intensified. This is born out by finding only one mature infection in November. Finding only one immature infection in December confirms the previous finding that the over-wintering infection is at a low level.

Metacercaria ingested by cattle from May to July become potent from August to October as reflected by the high incidence of fascioliasis recorded in this trial. However, with the onset of the dry season, few eggs deposited on the pasture survive and only the eggs dropped in March, April and May will survive to infect new generations of snails the following year.

If the epidemiological picture varies little from year to year, then the resurgence of infection in snails in October will account for the high prevalence of chronic fascioliasis in January and February.

The investigations described in this paper thus give a picture of the epidemiological cycle of F. gigantica in the Koshi Hills of Nepal (Figure 5).

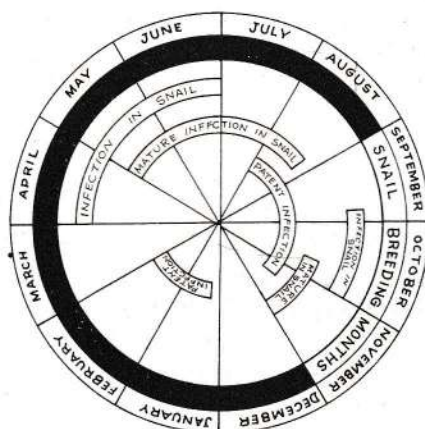


Figure 5. Epidemiological cycle of F. gigantica in the Koshi Hills, Nepal.

If further investigations confirm that the over-wintering infection is insignificant and that the bulk of the infection in snails is derived from fluke eggs deposited on the pasture in March and April and again in

September there would be a good case for a single administration of anthelmintics in February with, perhaps, a further drenching in late August to control the pasture contamination. This approach will only work if all the stock are drenched with one of the more efficient anthelmintics.

Whereas dosing stock in the middle of the monsoon would not be a very effective control measure, it may be justified on an individual animal basis.

Control of snails using molluscicides during the dry season is of doubtful value due to the large number of water sources, the great biotic potential of the snails and the recurrent labour and equipment costs.

Acknowledgements

The authors are indebted to Dr C.B. Ollerenshaw for his painstaking identification and dissection of the snails and also for his invaluable help in interpreting the results. Thanks are also due to Dr. D.S. Brown for his technical assistance. The authors are grateful to the field and laboratory staff at Pakhribas Agricultural Centre and finally would like to thank the Overseas Development Administration for providing funds for this project.

REFERENCES

- Bommeli N. Eichenberger G., Basnyat B.M. and Singh N.B. (1973) Report on the preparatory phase of Parastic Control Project. HMG/SATA
- Lohani M.N. and Jaeckle M.K. (1981/82) An attempt to identify Fasciola species in Palpa. Bull Vet Sci & A.H. Nepal, Vol 10 & 11.
- Lowcock M. (1982) Parasitological Problems and Anthelmintic Usage in Livestock in Nepal. A short Survey and Review. United Missions Nepal.
- M.A.F.F. (1977) Technical Bulletin No. 18: Manual of Veterinary Parasitological Laboratory Techniques.
- Morel A.M. (1985). Technical Paper No. 74: Detection of Fasciola eggs in faeces a comparison of methods. P.A.C.
- Sewell M.M.H., & Hammond J.A. (April 1972) Vet. Rec.

PRELIMINARY OBSERVATIONS ON ENZOOTIC BOVINE HAEMATURIA IN THE HILLS OF EASTERN NEPAL

S.N. Mahato *

Summary

Preliminary clinical, pathological and epidemiological findings of Enzootic Bovine Haematuria in Dhankuta, Terhathum and Taplejung districts of eastern Nepal are reported. Affected animals suffered from intermittent chronic haematuria and progressive anaemia. Haematuria was due to haemorrhage from tumours in the urinary bladder. Histopathological examinations revealed the condition to be a case of transitional cell carcinoma. The incidence of the disease appeared to be most frequent during January to March and least in June and July. Cattle in the age group of 7 to 10 years were found to be mostly affected. The affected animals had grazed local grasses growing in forests and grazing lands, supplemented by crop residues and tree fodder. The forests and grazing lands in this area are abundantly covered with Eupatorium adenophorum, Artemisia vulgaris and various species of ferns including Asplenium spp. and Pteridium aquilinum; the later being incriminated as a cause of Enzootic Bovine Haematuria by various workers.

Introduction

Enzootic Bovine Haematuria (EBH) is an important disease of cattle. The disease is worldwide in distribution occurring mainly in hilly regions. Although the disease has long been recognised in various parts of the world its occurrence in Nepal has only been reported recently (Mahato, 1983). Previous papers from this laboratory, described the prevalence of EBH in the hills of eastern Nepal (Mahato, 1983) and the haematological picture of EBH affected animals (Mahato 1985). This paper deals with preliminary observations on clinical manifestations, pathology and epidemiology of EBH in this area. Possible aetiological factors associated with the disease are also discussed.

Materials and Methods

Clinical records of the EBH cases brought for treatment to the vaterinary clinics of Pakhribas Agricultural Centre during April 1979 to March 1983 were processed for purpose of this study. The laboratory and post-mortem reports on EBH affected animals were also analysed.

* Veterinary Investigation Laboratory, Pakhribas Agricultural Centre, Dhankuta, Nepal.

During September 1982, all the farms in eleven village panchayats* of Dhankuta, Terhathum and Taplejung districts were surveyed. The data relevant to EBH, such as the sex of affected animals, months and age at which disease occurred, course of the disease and the effects of the disease on work and production were collected. In addition to feeding practices, fodder available during different period of the year and the weeds contained in the forages were also recorded.

Results

Clinical manifestations:

Clinical records revealed that apart from the character of the urine there was no other abnormality in the early stage of the disease. Onset was insidious and characterised by a slow and progressive course with frequent intermissions of haematuria of variable duration extending from a few days to months. The urine was pale pink to bright red in colour, depending on the quantity of blood. Numerous unhaemolysed erythrocytes were seen on microscopic examination of urine. Some urine contained blood clots. Occasionally, the clots blocked the urethra in male animals. Haematology revealed anaemia in most cases, which worsened as the haematuria intensified. In severe cases haemoglobin fell to the level of 30g/l. Haematuria ceased suddenly or slowly and reappeared after a variable period. Data from the villagers revealed that the recrudescence of haematuria was increased when the affected animals were subjected to work load. The affected animals became weak and emaciated. There was a decrease in reproductive performance, milk yield and working efficiency. The majority of the affected animals died within three years after the first onset of haematuria; however, some animals were recorded as surviving for 10 years.

Pathological findings:

Autopsy of affected cattle revealed that lesions were confined to the wall of urinary bladder. The entire walls were thickened and contained neoplasms of variable size with gross haemorrhages. Histopathologically, the neoplasms were identified as transitional cell carcinomas.

Epidemiological findings:

A total of 171 cattle with active haematuria were recorded in the eleven panchayats of the three district during September 1982. No cases

* 1. Pakhribas, 2. Muga, 3. Phalate, 4. Ghorlikharka, 5. Sanne, 6. Hattikharka, 7. Murtidhunga, 8. Change, 9. Hangpang, 10. Niguradin, and 11. Khamlalung.

were seen in buffaloes or in other species. Prevalence of the disease in the different districts are shown in Table 1.

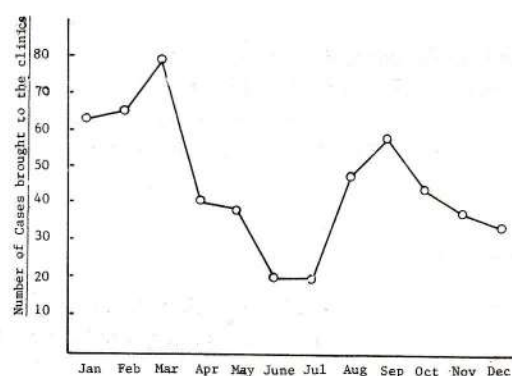
Table 1: Prevalence of EBH in the hills of eastern Nepal.

District	No. of panchayats under investigation	Cattle population in Sept 1982	No. of active cases recorded in Sept 1982	Prevalence rate (percent)
Dhankuta	7	13,603	107	0.79
Terhathum	1	1,695	25	1.47
Taplejung	3	6,325	39	0.61
Total	11	21,623	171	

Mean 0.79

It was presumed that the number of animals brought to the clinics for the first time reflected the incidence of the disease during different seasons of the year. As can be seen from Figure 1, the incidence of EBH was recorded almost every month, though most frequently in March.

Figure 1 : Seasonal incidence of EBH



The age of animals at which haematuria commenced is shown in Figure 2. It can be seen from the figure that the highest frequency of the age at which haematuria commenced was seven years.

Figure 2: Frequency of age at which haematuria commenced.

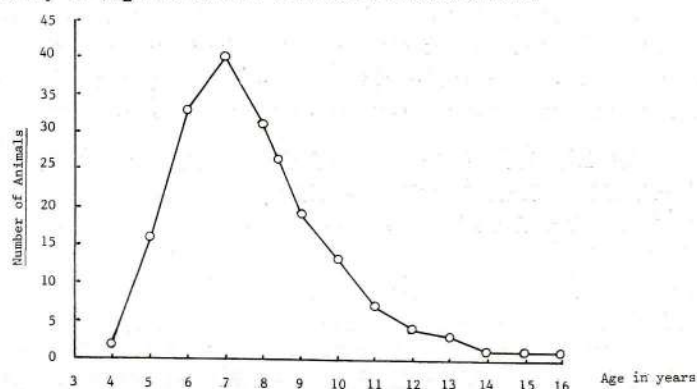


Table 2 indicates that the majority of affected animals were in the 7-10 year age group. No cases were reported from animals below 4 years of age. The sex ratio (Male: Female) of clinically EBH affected animals was 1: 0.69 as compared to the overall sex ratio of cattle in the survey panchayats of 1: 0.88. However, ratio of males to females was 1: 0.7 in the affected animals which were brought to the veterinary clinics.

Table 2: Frequency distribution of sex and age groups in EBH affected animals

	Male	Female	Below 7 yrs	Between 7-10 yrs	Between 10-15 yrs	Above 15 yrs
Cases recorded in 11 panchayats during September 1982	107	64	20	94	49	8
Cases reported at veterinary clinics during April 1979 to March 1983	315	229	81	272	151	40
Total:	422	293	101	366	200	48

Stall feeding is rarely practiced in this area. The majority of the affected animals are grazed upon local grasses growing in forests and grazing lands, except for a few milch cows which are stall fed during their lactation period. The most crucial period for fodder supply, when animals are kept in a semi-starved condition is from January to April when all local grasses wither or remain dormant. During this period animals are mainly fed crop residues such as rice straw, wheat straw, millet straw, dry maize stalks, husks and pods of soyabeans etc and are grazed upon dry grasses supplemented by tree fodders.

Imparata cylindrica, Pogonotherum incans, Bistorta amplexicaulis, Eulalipsis binata, Eragrostis tenalle, Paspalum commersoni, Thysanolaena maxima, Chrysopogon spp, Digitaria spp and Polygonum spp are common grasses available in the area. Tree fodders generally used are of the Ficus, Bauhinia, Sauraria, Litsea, Prunus, Celtis, Albizia, Morus, Dendrocalamus, Machilus, Brassiopsis and Salix species. It is noteworthy that almost all grazing lands and forests in these areas are covered with Eupatorium adenophorum, Artemisia vulgaris and various species of ferns including Asplenium and Pteridium spp, which are usually used as bedding materials. Normally animals do not consume fresh ferns unless under starvation conditions or accidentally browsed during grazing.

Discussion

The present observations show that the bovine haematuria prevalent in the hills of Nepal is a cancerous condition of the urinary bladder, clinically characterised by intermittent chronic haematuria and progressive anaemia. Although the prevalence of disease is not great, it appears that the disease may be causing considerable economic loss to the nation. It was experienced during the survey that the prevalence figures are somewhat distorted as the local farmers generally conceal the incidence of the disease because

- (a) the price of animals is reduced if it is known that they are suffering from haematuria and
- (b) no permanent cure is assured by the veterinary field workers; moreover the clinical symptoms of the disease may be unnoticed for months. Thus it is difficult to determine the exact prevalence rate of EBH or to evaluate the extent of the loss due to this disease.

The reason for a sudden rise in the incidence in August might be purely circumstantial as farmers are free during this period to bring their animals to the clinics after a busy rice planting season in June and July.

Several agents have been implicated as causing EBH, however the specific cause is still obscure. The main contender for aetiological primacy is bracken fern. Rosenberger and Heeschen (1960) produced bladder lesions and haematuria symptoms typical of EBH in cattle by feeding bracken fern (Pteridium aquilinum) hay. Samaddar (1973) also produced the disease in cattle by feeding a ration containing P. aquilinum. Nandi (1982) reported that prolonged consumption of a number of Himalayan weeds eg. Artemisia vulgaris, Asplenium thelipteroids Mich., A. macrocarpum B.L. Osmonda regalis, A. esculentum and P. aquilinum identified in forage, were associated with EBH in the Indian hills (Himalayas). The present study revealed that the grazing lands and forests in the hills of eastern Nepal are also dominated by the same species of weeds. In the absence of enough nutritious fodder, the animals are obliged to consume these weeds and hence may develop cancer of the urinary bladder.

Acknowledgement

The author is grateful to the staff of the Livestock Section, Pakhribas Agricultural Centre, Dhankuta, especially K.P. Oli, P.P. Rai, P. Thapa and S.R. Katuwal for their assistance in this study. He is also thankful to M.G.O'Sullivan, L.L. Swift and A.M. Morel who have been associated with this study. Finally, he wishes to express his gratitude to Dr B.K.P. Shaha, Pathologist, Central Veterinary Laboratory, Kathmandu, for his help in histopathology.

REFERENCES

- Mahato, S.N. (1983). The prevalence of Enzootic Bovine Haematuria in the hills of eastern Nepal. Technical Paper No. 66, Pakhribas Agricultural Centre, Dhankuta, Nepal.
- Mahato, S.N. (1985). Haematological observations on cattle suffering from Enzootic Bovine Haematuria. Technical Paper No. 78, Pakhribas Agricultural Centre, Dhankuta, Nepal.
- Nandi, S.N. (1982). Bovine haematuria of Indian hills (Himalayas), - a haemorrhagic syndrome, due to development of transitional cell carcinomas of the urinary bladder, associated with the consumption of Himalayan weeds and ferns, as cheap fodder. Deutsche Tierärztliche Wochenschrift, 88, 479-482.
- Rosenberger, G. and Heeschen, W. (1960). Alderfarn (Pteris aquilina), die Ursache des sogenannten stallrotes der rinder (haematuria vesicalis bovis chronica). Deutsche Tierärztliche Wochenschrift, 67, 201-208.
- Samaddar, J. (1973). Role of Pteris aquilina in Enzootic Bovine Haematuria. The Indian Journal of animal Sciences, 43 (6), 510-514.

EVALUATION OF EGG LAYING PERFORMANCES OF CROSSBRED CHICKENS UNDER SEMI-INTENSIVE CONDITIONS

Krishna P. Oli *

Summary

A comparative study was made on the age at first lay, egg production and egg weight of Light Sussex cross Local (LS x Lo), Black Austrolop cross Local (BA x Lo), New Hampshire cross Local (NH x Lo) and Local (Lo) chickens under semi-intensive condition.

Result showed that LS x Lo chicken take significantly longer time to reach the point of lay than the Locals and other breeds ($P < 0.01$).

All the crossbred exotic chickens showed significantly higher egg production than the Locals ($P < 0.01$). The average egg weight of all the crossbred chickens was significantly higher than the Locals ($P < 0.01$). There was no significant difference in egg production between NH x Lo - BA x Lo, BA x Lo - LS x Lo chickens. Between NH x Lo and LS x Lo there was significant difference at the 10% level ($P < 0.1$).

Study indicated that New Hampshire is the best breed for upgrading and crossbreeding purposes in villages as compared to the other two breeds.

Introduction

Traditionally many hill farmers keep scavenging indigenous chickens. Government and donor agencies have put efforts to increase production of these Local birds through crossbreeding and up-grading.

Informations on the performances of crossbred chickens were lacking. Therefore, the present study aims to evaluate the performances of three different types of crossbred chickens under semi-intensive conditions with Locals as control. The study also aims to evaluate the relative superiority of different crossbred chickens under the same system.

Materials and Methods

Light Sussex cross Local (LS x Lo), New Hampshire cross Local (NH x Lo), Black Austrolop cross Local (BA x Lo) and pure Local (Lo) birds were raised under broody hens. All of them were reared under semi-

* Pakhribas Agricultural Centre, Pakhribas, Dhankuta.

intensive condition at the Centre. Their growth rate up-to the point of lay was measured (Morel and Oli 1984).

The run space was established with Kikuyu (Pennisetum dandestinum); Clover (Trifolium repens) and cocksfoot grass and each bird was allowed 3 metre square (m^2) of scavenging area. Additionally local type of houses were constructed in which housing space per bird was $0.37 m^2$. The houses were kept open throughout the day.

Prior to the commencement of lay, each bird was numbered with alluminium wing band. Trap nests designed at the centre were provided in each house. Each egg from individual hen was marked.

Age at first lay, egg production, egg weight and clutch size of each birds were recorded for one year.

Daily 0.055 kg per bird supplementary food was given throughout the year (Table 2). Water was provided ad lib.

The birds were vaccinated against newcastle and fowl pox disease.

Recorded data were statistically analysed and the efficiency of egg production as per supplementary feed given was calculated.

Results and Discussion

Study on the performances of different crossbred and Local hens up-to one years lay are shown in Table 1.

From the analysis of the above results it shows that the average egg weight of all the exotic crosses is significantly higher than for the Locals ($P < 0.01$). The egg production from different crossbred chicken is significantly higher than for Locals ($P < 0.01$). Between different exotic crosses e.g. NHxLo, BAXLo and LSxLo there is no significant difference in egg production, however there is significant difference ($P < 0.1$) in egg production between NHxLo and LSxLo. Regarding point of lay LSxLo take significantly longer time than the Locals and the other breeds.

When considering the above results, it appears that N⁴xLo chickens seems superior to the other breeds in terms of total egg production and total egg mass output which is followed by BAXLo. Hence for upgrading the indigenous chicken in the hilly areas New Hampshire and Black Austrolap breed of chicken seems better than Light Sussex.

Table 1: Performances of different breeds of chicken under semi-intensive conditions

Traits	Breeds of Chicken			
	LSxLocal n = 10	BAxLocal n = 5	NHxLocal n = 7	Local n = 8
Age at 1st lay (days)	170 $\pm$ 9	15 $\pm$ 9	160 $\pm$ 10	156 $\pm$ 10.
Average number of eggs produced per hen per year	160 $\pm$ 25.9	171 $\pm$ 39.4	188 $\pm$ 32	125 $\pm$ 18.9
Average weight of egg (g)	47.29 $\pm$ 1.63 (n 1599)	45.1 $\pm$ 4.17 (n 855)	45.65 $\pm$ 1.75 (n 1013)	39.43 $\pm$ 1.96 (n 997)
Total egg mass/bird (g)	7566.4	7712.1	8582.2	4928.75
Average clutch No. per year	11.6 $\pm$ 1.07	10.8 $\pm$ 1.3	11.28 $\pm$ 2.21	11.6 $\pm$ 2.38
Average clutch rest days per year	152 $\pm$ 39.6	140.5 $\pm$ 58.4	124.14 $\pm$ 53	215.87 $\pm$ 17.9

It is also interesting to note that the egg production from local chickens is greater than it has been reported by Shrestha (1982) and Oli (1984). Such increase in egg output from the Local hens may probably be due to frequent collection of eggs from the nest and avoiding hens to sit on the eggs. It therefore appears that the egg output from indigenous hen can be greatly increased by frequent collection of eggs from the nest and forcing them from going broody.

With respect to the broodyness, this investigation confirmed that all the three different types of crossbred hens have broodyness characters. They can be used for village incubation after few clutches of eggs have been laid in order to reproduce replacement chickens.

Economics of semi-intensive system

In the hilly areas of Nepal, lack of balanced poultry meal, poor marketing system compounded with transportation and communication facilities, restricts the adoption of intensive system of poultry keeping. Traditional scavenging system is most commonly practiced. Although the later system is the most efficient (as this system requires very little input) however, high production rate (upto 60%) and difficulty for treatment in case of disease outbreak have limited its efficiency. Therefore many problems of these nature could be greatly reduced if scavenging system is switched towards semi-intensive methods of poultry keeping.

This study indicated that even with little food supplementation (0.055 kg/day/hen) under semi-intensive conditions, the productivity of local hens greatly increases. Table 2 shows the amount of food supplemented for all types of chicken and food cost per dozen of eggs.

Table 2: Supplementary food given to the hens and their cost.

<u>Hen Type</u>	<u>Total feed supplemented in a year(kg)</u>	<u>Cost/kg of feed</u>	<u>Total egg laid in a year</u>	<u>Food cost/dozen of eggs</u>
LSxLo (n=10)	200.75	NCRs 3.50 =0.19 US\$	1599	NCRs 5.27(0.29 US \$)
BAxLo (n=5)	100.37	NCRs 3.50 =0.19 US\$	855	NCRs 4.93(0.27 US \$)
NHxLo (n=7)	140.52	NCRs 3.50 =0.19 US\$	1411	NCRs 4.49(0.28 US \$)
Local (n=8)	160.6	NCRs 3.50 =0.19 US\$	997	NCRs 6.77(0.37 US \$)

Note: One US\$ = NCRs. 18.00

Diet Composition

The composition of supplementary diet is shown in Table 3. The ration seems to have optimum level of energy i.e. 12.26 MJME/kg of feed.

Table 3: Composition of supplementary feed

<u>Ingredients</u>	<u>Proportion of Ingredients</u>	<u>Estimated energy value MJME</u>
Maize	37	525.2
Wheat	10	127.4
Molasses	4	44.3
Rice Polish	25	341.4
Fish meal	10	115.7
Bone meal	2.5	7
Roasted soyabean	5	65.88
Minimix	5	-
Salt	0.5	-
Lime stone	1	-
	100	1226.88 per 100 kg feed

Estimated energy requirement for different types of birds

Energy requirements for the experimental birds derived from ARC (1975) equation are shown in Table 4.

Table 4: Estimated energy requirement for laying hens (per bird/year)

<u>Hen Type</u>	<u>Average body weight (kg)</u>	<u>Energy * required per day MJME</u>	<u>Total energy require- ment per year/MJME</u>	<u>Energy supplied from diet MJME</u>	<u>Energy from eating worms, insects Tender - grass etc</u>
LSxLo	1.8	2.05	748.25	246	502.25
BAXLo	1.8	2.05	748.25	246	502.25
NHxLo	1.8	2.05	748.25	246	502.25
LoxLo	1.4	1.50	547.50	246	301.50

Note: * Includes ME required for growth and egg production.

From the Table 4 it appears that major proportion of energy is supplied to the chicken through scavenging. However although informations about the performances of these different crossbred chickens under intensive conditons are lacking, it can be stated that high proportion of their time must have been used in getting the nutrients from the yards leading to lower egg production. This can be partly explained by the number of clutch rest days as shown in Table 1.

Efficiency in egg production (under semi-intensive condition)

Efficiency is very difficult to define which can have many meaning. General definition involves a ratio of "output" per unit of "input" (Spedding, 1981). In this study, the amount of food energy supplemented to the chicken is considered "input" as other factors were constant for all the chickens and for "output" the amount of energy yield after biological processing from the hens in the form of whole egg is considered, which is shown in Table 5.

Table 5: Efficiency of egg output in different crossbred and local chicken

Traits	LSxLo	BAxLo	NHxLo	LoxLo
Average egg production per year	160	171	188	125
Average egg weight (g)	47.29	45.1	45.65	39.43
Energy yield from egg/hen year (MJME) (One g. of whole egg = 0.027 MJME or 1.62 Kocal (Spedding 1981))	204.29	208.22	231.71	133.07
Input/Bird MJME	246	246	246	246
Efficiency with supplementary feeding	90%	92%	102%	59%

From the Table it appears that with the same amount of food supplementation NHxLo chicken seems relatively efficient than the other. Local chickens are less efficient because they are not selected for egg production.

Acknowledgement

The author wishes to thank Mr. N.P. Shrestha and Mr. Kamal Rai for their assistance in this work.

REFERENCES

- A.R.C. (1975) The Nutrient Requirements of Farm livestock. No 1. poultry. ARC, London.
- Moral A.M. and Oli K.P. (1984). Poultry livestock gain comparison trials under semi-intensive conditions. Technical Paper No. 71. P.A.C., Dhankuta, Nepal.

Oli K.P. (1984). Chicken Production System in the eastern hills of Nepal. Technical Paper No. 72. P.A.C., Dhankuta, Nepal.

Shrestha T.P. (1982). Egg laying performance of local hen. Bull. Vet. Sc & A.H., Nepal 10 & 11.

Spedding C.R.W. (1981). The principles of animal production. In: The biology of Agricultural Systems. Academic Press, London.



in management of

Repeaters

Infertility

exotic, cross or local breeds

ALARSIN Ayurvedic Research products

• Safe • Simple drugs without draw backs of Hormones

in repeaters

LEPTADEN (Vet)

Helps Repeaters to Settle Down. When A.I. or Natural Service done during Ovulatory heat Helps nidation of Zygote & Prevents early embryonic death. **Dose:** After A.I. or Natural Service, 10 tabs. daily for 15 days.

INFERTILITY: non-pathogenic

ALOES COMPOUND (Vet)

Brings the animal into pronounced ovulatory heat:

Safe: No draw backs of hyperstimulation of ovaries or cystic ovaries, as is usual with fertility promoting agents (hormones, clomiphene) **Dose:** 5-10 tablets bd till animal shows pronounced heat/oestrus. Majority of animals show pronounced ovulatory heat within one or two oestrus cycles.

Note: discontinue treatment once animal comes in heat

INFERTILITY: pathogenic

MYRON (Vet)

Acts as an antiseptic, antibacterial, anti-inflammatory & Uterine tonic: in Cervicitis, chronic Endometritis, Parametritis, Pelvic inflammatory diseases and Atonic reproductive tract. **Dose:** 10 tabs bd for 15 days.

BANGSHIL (Vet) + MYRON (Vet)

in Severe & Resistant Pathogenic cases: with purulent discharge per Vagina **Dose:** 5 tablets bd of each for 10 days. (Note: Bangshil is anti-inflammatory, antibacterial, astringent, diuretic, healing & cooling)



FORTEGE (Vet)



in all breeds of Bulls, Stallions & Breeding Males in Zoo. • in disturbed spermatogenesis & semen defects • hasty coverers • sluggish sex behaviour **Dose:** 10 tabs bd for 15 days and then 10 tabs. a day for one or two months

LEPTADEN (Vet)

Stimulates - Increases - Maintains milk yield in large & small animals. **Dose:** 10 to 15 tabs bd for 1-2 weeks Then 10 tabs a day for 10 days.



Leptaden (Vet) in POULTRY

Promotes • Growth • Weight gain • Improves egg quality & average.

Dose: Crush & Mix 3 to 5 tabs per Kg. FEED.

SUPPLY

for Prescriptions available at Chemists for Govt. & Semi-Govt. Institutions, Hospitals & Farms: Bulk Packs of 1000 tabs. Direct supply from factory only.

Please write for Vet. Sets, Therapeutic Index, Latest Research data.

ALARSIN Marketing (P) Ltd. Post Box 1279 G.P.O., Bombay 400 001.



Crossbred chicken during experiment



Trap-nest designed at PAC to study egg laying performance of individual hen.

NORMAL VALUES OF CERTAIN BLOOD CONSTITUENTS IN BUFFALO CALVES

L.L.Dass, P.N.Sahay and A.A.Khan,

Summary

Some basic and important blood constituents like Haemoglobin, total serum protein, serum sodium, potassium and chloride and plasma bicarbonate were evaluated in normal buffalo calves and reported.

Introduction

In health, various biochemical constituents of blood are maintained within normal limits. In diseased conditions the integrated reactions inside the cells are altered resulting in far reaching effects. So, it becomes imperative to have a knowledge of different blood constituents when the animal is in health. This work documents the normal values of certain blood parameters in buffalo calves which will be of immense help to the clinician to assess the magnitude of deviation from normal limits in diseased animals.

Materials and Methods

The present investigation was conducted on eighteen clinically healthy male buffalo calves of one to one and a half years of age. The calves were kept on isomanagerial conditions. Blood samples were taken by jugular veni-puncture.

The haemoglobin was estimated by Sahli haemoglobinometer (Hawk, et al., 1965), serum sodium and potassium by Flame photometer (Hawk, et al., 1965), total serum protein by colorimetry as recommended in "Bausch and Lomb Clinical Methods and Calibrations manual (cat. no. 33-29-46)". Serum chloride by Sigma Technical Bulletin No. 830 and plasma bicarbonate by Van-Slyke (1922) method.

* Ranchi Veterinary College:
Birsa Agricultural University, Ranchi - 834007

Results and Discussion

Table showing normal blood picture in buffalo calves.

<u>Blood constituents</u>	<u>Value $\pm$ S.E.</u>
Haemoglobin (gm %)	9.45 $\pm$ 0.60
Serum Sodium (mEq/L)	141.40 $\pm$ 2.80
Serum Potassium (mEq/L)	4.25 $\pm$ 0.15
Total Serum Protein (gm %)	5.60 $\pm$ 0.22
Serum Chloride (mEq/L)	94.75 $\pm$ 1.48
Plasma bicarbonate (mEq/L)	28.53 $\pm$ 0.38

It is essential to establish the norms of biochemical constituents of blood and serum in different animals since in clinical and experimental investigations the interpretation depends on these values (Singh *et al.*, 1972). The values of sodium (141.40 mEq/L) and chloride (94.75 mEq/L) in this study were conspicuously different to the values 163.86 and 73.36 mEq/L, respectively reported by Sodhi and Singh (1974) and 181.38 and 77.88 mEq/L, respectively by Bhutani and Nangia (1975). These wide variations can probably be attributed to regional soil variations. However, the value of serum potassium of the present study (4.25 mEq/L) was comparable to the former study (4.36 mEq/L) and variant to the latter (7.49 mEq/L).

The average value of total serum protein in this study was 5.60 gm%. The same was observed to be 6.30 gm% in buffalo calves (Malik *et al.*, 1974) and 6.95 gm% in Haryana Cows (Pyne & Maitra; 1981). The haemoglobin level (9.45 gm%) in the buffalo calves of this investigation was marginally different to the value (10.57 gm%) observed by Malik *et al.*, (1974) in the same species. On the contrary, the plasma bicarbonate level (28.53 mEq/L) of this study was higher than the value (25.57 mEq/L) observed by Sodhi and Singh (1974) in buffalo-calves. Pyne and Maitra (1982) have also reported variations in many of the blood parameters, not included in this study, from the observations in the same species by other workers. No explicit explanation has been offered for these variations.

REFERENCES

- Bhutani, R.K. and Nangia, O.P. (1975) Studies on some blood electrolytes in buffalo calves under normal and stressful conditions. *India J. Anim. Sci.* 45: 61-64.
- Hawk, P.B., Oser, B.L. and Summerson, W.H. (1965) "Hawk's physiological chemistry", 14th Ed., McGraw-Hill Book Company Inc. Newyork, pp. 1141.

Malik, J.K., Chand, N., Singh, R.V., Singh, P.P., Bahga, H.S. and Sud, S.C. (1974) Haematology of male buffalo calves. Ind. Vet.J., 51: 95-98.

Pyne, A.K. and Maitra, D.M. (1981) Physiological studies on blood of lactating Hariyana and Sahiwal cattle. Ind. Vet. J., 58: 526-528.

Pyne, A.K. and Maitra, D.M. (1982) The biochemical constituents of blood of male buffalo calves. Ind. Vet. J. 59: 347-348.

Sigma Technical Bulletin (1974) No. 830, Sigma Chemical Company, U.S.A.

Singh, A.P., Joshi, H.C. and Singh, Ratan (1972) Studies on certain blood constituents in cattle and buffaloes, Ind. Vet. J., 49: 473-477.

Sodhi, S.P.S., and Singh, A. (1974) Blood and plasma volumes and changes in the electrolyte contents under stress and normal conditions in buffalo calves. Ind. J. Anim. Sci. 45: 61-64.

Van Slyke (1922) J. Biol. Chem; 52: 495 (cited in Hawk's Physiological chemistry, 14th Ed., McGraw-Hill Book Company Inc. New York, pp. 952).

Be healthy and think better with the help of

Pasteurised Milk, Butter, Cream, Cheese and other
dairy products

Contact :

Kathmandu Milk Supply Scheme, Lainchaur
Biratnagar Milk Supply Scheme, Kanchanbari
Hetauda Milk Supply Scheme, H.I.D. Hetauda

DAIRY DEVELOPMENT CORPORATION

Lainchaur, Kathmandu.

FASCIOLIASIS IN NEPAL: PROBLEMS AND PROSPECT FOR CONTROL

Bhoj Raj Joshi *

Summary

Fascioliasis is a serious livestock disease of Nepal. Efforts have been done by various workers to identify the fasciola and snail species of Nepal. Life cycle, epidemiology and possible control measures have been discussed. It has been suggested to carry out epidemiological studies so that suitable control measure against this economically important disease could be developed.

Introduction

Fascioliasis is probably the most widely spread disease in the animal population of Nepal, and perhaps, one of the important cause of livestock deterioration. The economic losses caused by fascioliasis is difficult to establish in terms of production losses. Various workers have estimated these losses in terms of milk yield, weight gain, wool yield, lambing percentage, birth weights and growth rates of lambs. Hope coudery (1976) also showed significant improvement in fertility rate after treatment against fascioliasis. Soliman and zaki (1964, cited by El-azazy and Vanveen 1983) estimated a loss of 100 and 150 litres of milk/head/year in cattle and buffaloes respectively in tropical countries.

Though the accurate economic loss caused by fascioliasis is not available, it is obvious that this is a very constant and chronic disease reducing the productivity of the infected livestock.

The fluke

Though the proper study has not been conducted to identify the fluke species from different parts of the country it is generally believed that the Fasciola gigantica is present in most part of the country. Some fluke sample collected by PAC were identified as F. gigantica. However, the samples collected in Palpa area were identified as F. gigantica, F. hepatica and also an intermediate form of both the above species. Lohani and Jaeckle (1981) found all the three species in

* Lumle Agricultural Centre, Lumle, Pokhara, Kaski.

the same animals. The emergence of the intermediate species has also been reported by other workers in various countries (Price 1953, Kendal 1954).

Considering the vast topographical and climatological variation within the country, it may be assumed that the infection of F. hepatica is prevalent in the high hills, mixed infection of F. hepatica and F. gigantica in mid hills and F. gigantica in Terai which was also suggested by Lohani and Jaeckle (1981). The same situation was observed by Kendall (1954) in Pakistan where the demarcation line of F. hepatica and F. gigantica infection was 7000 a.s.m.l.

The Hosts

All the herbivorous animals are the susceptible hosts for Fasciola sps, including human beings, and in some countries e.g. in Peru human infection is quite a serious problem.

Although any herbivorous animal is a potential host for Fasciola, Boray (1969), divided the animals into three groups on the basis of resistance exhibited against fascioliasis. Some animals exhibit a considerable resistance towards the infection. These animals include swine and equine species, where the infection does not remain for long period and the disease is not very serious, but these animals may act as a source of infection in a disease free area. These animals may act as the carriers.

The other group of animals includes cattle where a significant resistance against fascioliasis is shown and infection is self terminated, but this resistance has shown to be very much depended upon the state of nutrition of the animals. Up to now, no work has been done regarding this resistance in buffaloes.

Sheep, goats and rabbits are shown to be the animals of least resistance and infection continues throughout the animals life.

In Nepal, fascioliasis is considered as a serious problem especially in buffaloes, which does not necessarily reflect the true picture of infection and the other animal species might be equally infected. However, it is clear that, in general, the infection is at a low level leading to a chronic infection.

This could be assumed, because the epidemic of fascioliasis causing heavy mortality in sheep by acute infection has not been reported in the migratory or stationary sheep flocks of the country. However, it does not exclude the possibility of chronically infected sheep and goat

population and other animal species. Thus a survey to identify the percentage of infection in different animal species at different altitude levels in different parts of the country may be helpful to identify the suitable climatological and ecological requirement for snail breeding.

The Intermediate hosts

It is generally accepted that the mud snail Lymnaea truncatula and aquatic super species of Lymnaea auricularia are the important intermediate hosts of F. hepatica and F. gigantica respectively (Boray 1965). Kendall (1965) suggested Lymnaea rufescens in several variants acts as a intermediate host for F. gigantica in Indian sub-continent. Some specimen collected from PAC area were identified as Lymnaea viridis, which has also been reported as the intermediate host for F. gigantica in Phillipines. Although, the intermediate snail host for F. hepatica and F. gigantica are considered quite distinct, and normally development does not occur in other species; however, Harith (1977), in his experimental study in laboratory condition found that F. hepatica develops normally in L. auricularia as it does in L. truncatula and that F. gigantica develops normally in L. truncatula as well as in L. auricularia, but the development was significantly influenced by temperature.

These studies and observations indicate that Fasciola can adopt to various snail species provided the other conditions are favourable. Thus, a survey of snail species and snail habitats from different ecological and climatological zones of the country is desirable, because, it may be considered that, due to the variable climatological conditions within the country, different snail species may act as an intermediate hosts for this parasite.

Epidemiology

To complete the life cycle and to pass the infection from one infected animal to other, Fasciola has to pass through different environmental conditions and each stage is subjected to a varying degree of unfavourable factors. The epidemiological dynamics of the parasite and successful transfer and establishment of infection from one host to another, depends upon the micro and macro-climatic conditions such as the shade characteristics, volume and height of the pasture, the grazing and feeding habits, managemental systems, immunological and nutritional status of the hosts, the presence and number of the intermediate hosts, the number of infective stages and eggs in the environment and the interaction of these variables (Ollerenshaw & Smith 1969),

The infection of this parasite not only depends upon the suitable condition for the continuity of its life cycle but also depends upon the livestock management system within that area. In Nepal the livestock management system varies greatly from one place to another and from one animal species to another.

In general, buffaloes are reared on stall fed condition mainly on grass grown in the terraces and banks of the fields during the monsoon and post-monsoon period, and entirely upon the crop byproducts and tree fodder during rest of the year. Whereas, the other animal species are mainly grazed upon common grazing areas, fallow lands and in jungles, and stall feeding only plays a supplementary role.

It is commonly found that in these grazing areas most of the places are dry and unsuitable for snail habitats and the area suitable for snail breeding is limited. However, the watering places may play a very important role for disease transmission, because this will provide a suitable snail habitat and condition for the continuity of parasite's life-cycle.

The climate in the country is almost dry except during the monsoon period. It is observed by several workers that, in tropical countries, where temperature is not a limiting factor for the development of Fasciola, rainfall and moisture conditions are the significant limiting factors for the development of fascioliasis.

The Fasciola eggs do not survive desiccation and are killed in the dried dung pads and presence of moisture film is essential for the survival of eggs. The development of eggs does not occur unless they become separated from the faecal mass (Ollerenshaw 1959). Henle (1975) found that eggs of F. hepatica could survive for 30 days in summer and 50 days in winter in diluted manure, but died in undiluted manure. Romaniuk (1978) found that fermenting at 27 C killed the eggs by 15 days.

Considering these facts, it can be assumed that faeces of infected animals can be regarded safe after proper composting, as well as the faeces voided during winter, and summer months in the fields does not play a major role for the continuity of life cycle. However, the infected fresh faeces dropped during monsoon and pre-monsoon period in the suitable snail habitats can be a significant factor for disease perpetuation. This factor will be more clear after observing the viability of eggs in different climatological conditions within the country.

Paddy cultivation and the paddy fields provides a very ideal condition for snail development in this country and the grasses or crop byproducts produced there, are the possible potential source of the infection; which is reflected by the high percentage of infection in stall fed buffaloes in this country.

To break up this continuity of life-cycle a system should be developed, so that farmers could be advised to manure their fields with properly composted manure only.

The snails possess a high degree of aestivating and hibernating ability and can survive for a long period. The external stimulus for aestivation and hibernation is moisture and temperature respectively. The "over wintering" infection in snails might play a crucial role in disease transmission even with the absence of infected manure during the initial stage of planned fascioliasis control programme, and this aspect should not be neglected.

Ingestion of the grasses contaminated by Fasciola metacercariae is the principal way of disease transmission, however, Boray (1969) reported that 10% of metacercariae encyst on water surface also.

Many workers have studied the viability of F. hepatica metacercariae and found that after 14 days at +35 C, they are not viable. Relative humidity of 90% or more is necessary for prolonged survival especially at high temperature. Very few studies have been conducted to study the viability of F. gigantica metacercariae. Burino and Chaudhary (1982) from Pakistan, reported that, metacercariae of F. gigantica were found to survive even at the temperature of 60 C, provided that, relative humidity is greater than 60 percent. Kimura and Shimizu (1978) from Japan, found that at +2 C to +28.5 C and with a humidity of 37-88% metacercariae of F. gigantica remain viable after 120 days in rice straw, however, Boray (1969), stated that, properly dried and stored hay or straw is unlikely to produce a substantial infection. Ross and McKay (1929, cited by Boray 1969) observed that metacercariae are very susceptible to desiccation and in summer survived only 2 days in sunshine and 17 days in shade. Alicata (1938, cited by Kendall 1965) reported that, metacercariae of F. hepatica or F. gigantica did not survive in silage.

From these studies, it is clear that metacercariae can survive for a considerable period, depending upon the temperature and moisture conditions for a particular place and Fasciola species. It is not possible, at this stage, to state how long they survive in the contaminated grass or straw in our country, but it is certain that there

will be a great variation within the country, depending upon the climate of the particular place.

It seems that, the potential source of infection is the grass or crop byproducts collected after the mid-monsoon period to 2-3 months post-monsoon period, but, it cannot be said conclusively, until it is properly studied in the different climatological conditions within the country.

Considering the climate, cropping pattern, and animal management practices within the country, it seems that, the infection of Fasciola is not a continuous process and perhaps the cycle could be interrupted at one or more stages, if a careful control programme could be designed. But the other fact is that, fascioliasis infection is so common in the animal population of the country and despite some effort of its treatment by mass drenching (TWP 1983), it is as prevalent as it was before. Realising these facts, it is clear that, by the existing methods, we should not expect any break-through in controlling this disease.

Treatment

The available drugs for the treatment of fascioliasis in the country are Carbon tetrachloride, hexachlorophane (Distodin), hexachloroethane (Avlothane) and Oxyclozanide (Zanil) and all the drugs are used, as and when required. As the epidemiology of the disease is not known, any strategic medication could not be suggested and is not practiced.

All the available drugs are only effective against the adult flukes only.

Possible control strategy

The first and foremost step of any control programme is to understand the epidemiology of the disease for that particular area. As the climate within the country is much variable, the epidemiology of the disease will be different in Terai, mid hills and higher hills. Even, within these three main climatological zones, there might be variations depending upon the rainfall and animal husbandry practices.

It will only be possible to mobilise all the available efforts towards the control of this disease when the infection cycle of the parasite could be revealed.

Anthelmintic medication is the most efficient and practical means of disease control, but the dosing of anthelmintics should not only be oriented for the elimination of the parasite within the animals but also with the objective of reducing the risk of further spread of the disease.

Along with anthelmintic medication, the limited habitats of the snails, could be treated as required by some of the efficient molluscicides now available (e.g. Frescon), however, recolonization after 3-6 months of treatment is common.

Proper composting of manure before its use in rice field may be helpful to avoid the contamination of the snail habitats. The composting period could be estimated after studying the viability of eggs in manure.

Rice straw and the grass collected from the paddy fields are suspected as a potential source of infection to the animals, however, viability of the metacercariae in these sources has not been studied. Efforts should be made to avoid these sources.

The fallow land after harvesting rice crop used for grazing might be a potential source of fascioliasis infection upto the viable period of metacercariae, and the treatment of the animals grazed in these fields before the establishment of the infection could be a possible approach of control.

Thus, with all the possible methods, control should be regarded as a unified concept. The emphasis on one method or another depends upon variations in snail habitats, livestock density, cost of control methods in relation to livestock productivity as well as on livestock management and agricultural systems, topography and climatic condition of the area. The emphasis should be on a fully integrated approach based upon sound epidemiological data.

Conclusion

The two principal methods of fascioliasis control are chemotherapy of parasitised hosts and destruction of the intermediate hosts. For the chemotherapy efficient drugs are now available which are active against all stages of the parasite. A knowledge of local epidemiology of the disease is, however essential in order to obtain the maximum benefit from chemotherapy, so that animals can be treated before liver damage becomes established, as well as, the pasture contamination by the parasite eggs could be avoided.

Because, the losses are considerable due to this disease in the national livestock population and drenching by the existing drugs without knowing the development of the disease has already been proved unsuccessful and can be regarded as a fruitless effort, research to establish the epidemiological pattern of this disease should get the priority in the disease control programme of the country, so that an appropriate policy for its control could be adopted and losses could be avoided.

REFERENCES

- Boray J.C., (1965) Aust. Vet J. 41, 291-294
- Boray J.C., (1969) Adv. Parasitol. 7 95-210
- Burino, S.N; Chaudhary, A. W.H. (1982) Pakistan Vet J. 2, 117-118
- EL-azazy, O.M.E; Schillhorn Van Veen, T.W. (1983), Helminth. Abstr. 53, 421-427
- Harith A.El. (1977) Thesis, Bronder-offset B.V. Rotterdam
- Henle, D. (1975) Inaug. Diss. Fachbereich, Tiermedizin Munchen 76.
- Hope coudery, M.J.H. (1976) Br. Vet. J. 132, 568-575.
- Kendall S.B. (1954) Ann. Trop. Med. Parasit 48, 307-313
- Kendall S.B. (1965) Adv. Parasitol, 3, 59-98.
- Kimura, S. and Shimizu, A (1978), Jap. J. Vet. Sc, 40, 357-359
- Lohani, M.N.; Jaeckle M.K. (1981-82) Bull. Vet. Sc. & A.H. Nepal (10-11), 1-7.
- Ollerenshaw C.B., (1959) Vet Rec. 71, 957-965
- Ollerenshaw C.B., Smith L.P. (1969) Adv. Parasitol 7, 283-323.
- Price, E.N. (1953), J. Parasitol. 39, 119-134.
- Romaniuk, K. (1978) Waid. Parazyt. 24, 699-706.
- Tinaw Watershed Project, Livestock Section Report, June 1982.

IMPORTANCE OF MOBILE VETERINARY SERVICE IN INTEGRATED RURAL DEVELOPMENT PROJECT AREA OF NEPAL

(A case study)

D.D. Joshi * and P.M.S. Pradhan **

Introduction

Agricultural production in the rural development project area is characterised by mixed farming enterprises combining crop and livestock production primarily for subsistence purposes. Livestock raising is an integral part of the subsistence farming operation. Buffalo, cattle, sheep, goat, yak and poultry are the main types of animals raised in the area. However, there is little commercialization in livestock farming.

A study to evaluate the importance of Mobile Veterinary Service (MVS) in Integrated Hill Development Project (IHDP), aided by Swiss Govt., was carried out in 1984. The objective was to determine whether or not MVS have had a positive influence on animal disease prevention and overall livestock production in the project area. The study was also expected to suggest a suitable method for the improvement of MVS programme.

Treatment of sick animals, vaccination of livestock against infectious diseases, collection of livestock population data and to provide basic knowledge of livestock farming and health to the farmers were the main activities of the MVS.

Methodology

Farmers, village panchayat leaders, members and MVS team members were interviewed in the project area.

Two Panchayats (Thulopakhar and Phulping Katti) out of 23 village Panchayats of Sindhupalchowk district and two Panchayats (Mati and Babre) out of 30 village panchayats of Dolakha districts were selected for the study. The above panchayats were selected on the basis of their

* Central Animal Health Centre, Tripureswar, Kathmandu.

** Dept. of Livestock Dev. & Animal Health, Hariharbhawan, Lalitpur.

According to the survey findings, buffaloes, cattle, sheep, goats, and Poultry are raised in all village Panchayats by all strata of farm families. Pig rearing is not very popular in the project area.

The total human and animal population statistics of each 30 households of the sample panchayats are shown in the table 2. Average human and animal population ratio in the study area was 1:2.7 which is very high.

Targets and achievements made by MVS

Number of visits made by MVS team members during different fiscal years were recorded and achievements made (in percentage) were 68.75, 68.57, 56.41, 73.33 and 100.00 for the years 1978/79, 1979/80, 1980/81, 1981/82 and 1982/83 respectively. Total number of Panchayats covered by MVS teams were also recorded and achievement percentage (Panchayat wise) for different fiscal years from 1978/79 to 1982/83 was 82.35, 67.92, 100.00, 100.00 and 100.00 respectively.

Prevalence of diseases and their treatment

The MVS teams treated the sick animals and vaccinated livestock and poultry against the common infectious diseases in the project area.

Table 3: Occurrence of Animal Diseases in the Project Area From Respondents (in %)

S.No.	Diseases	Sindhupalchowk (%)	Dolkha (in%)
1	Foot & Mouth Disease	60.0	100.0
2	Haemorrhagic Septicaemia	3.3	20.0
3	Black Quarter	3.3	-
4	Babesiosis	13.3	3.3
5	Liverfluke	100.0	100.0
6	Respiratory disorder	56.6	30.0
7	Digestive disorder	100.0	100.0
8	Reproductive disorder	3.3	-
9	Others	56.6	45.5
<u>Poultry</u>			
10	Fowlpox	56.6	43.3
11	Coccidiosis	93.3	100.0
12	Ranikhet	43.3	46.6
13	C.R.D.	90.0	66.6
14	Ascariasis	100.0	100.0
15	Crop indigestion	53.3	63.3

Economic loss and animal production trend

Animal production parameters were measured both in healthy and diseased conditions by evaluation team. It was found out from the respondents that due to disease, there is 60 - 70% loss in milk production from cattle, buffaloes and Chauries, 50 - 60% loss in wool production from sheep, 40 - 50% loss in meat production from sheep and goats, 75 - 80% loss in egg production from poultry and similarly calving interval, lactation period, live weight and other production parameters were also disturbed.

Awareness of MVS Programme among the farmers

The data collected on the awareness of the MVS programme among the farmers of the project area is given in table 4, which revealed that

Table 4: Awareness about the MVS among the sample farm households (in %)

S.No.	Village Panchayats	Total no.of households interviewed	Yes	No
<u>In project area</u>				
1.	Phulping Katti	30	11 (36.67)	19 (63.33)
2.	Thulopakhar	30	6 (20.00)	24 (80.00)
3.	Mati	30	6 (20.00)	24 (80.00)
4.	Babre	30	7 (23.33)	23 (76.67)
5.	Small Farmers	64	18 (27.12)	46 (72.88)
6.	Medium Farmers	49	17 (34.70)	32 (65.30)
7.	Large Farmes	13	3 (23.10)	10 (76.90)
<u>Outside project area</u>				
8.	Namdu	30	-	30 (100.00)
9.	Kadambas	30	-	30 (100.00)

Percentage is shown in the parenthesis

higher percentage of the farmers are not aware of the MVS programme. Altogether 75% of the samples in project area and 100% outside the project area were not aware of MVS programme in the Village.

Farmers training programme

One of the main objective of MVS team is to train the integrated progressive farmers (IPF) of the project area. These IPF were trained mostly on common prevalent animal diseases, their control and prevention, animal care, management, sanitation and hygiene, pasture grasses, fodder trees and motivation to increase their livestock production. The training programme was found very effective.

Impact of the MVS

During the field survey various aspects of MVS activities were studied very closely and following observations were made:

1. Most of the farmers who were aware of the MVS programme were found to be benefitted from the programme.
2. The MVS provided door to door service to the farmers of the project area free of cost.
3. The MVS programme created awareness about the various useful activities of the livestock and animal health sector among the farmers.
4. It was also felt that a big percentage of the farmer of the project area are still unable to obtain the services provided by the MVS which may be due to lack of proper advertisement and approach.

Discussion and conclusion

Though the farmers of the project area were benefitted from the programme, effort should be made to provide integrated and standard services to the majority of the farm households. In our mixed agricultural society it is very important to create awareness about the livestock health and their production among the farmers. It is further suggested to provide standard services in respect of treatment, vaccination, drenching, modern methods of livestock farming, feeding, breeding etc. to the needy farmers which is directly related to uplift their living standard. Effort should also be made to provide the above services to the farmers of the remote areas.

Proper advertisement regarding the MVS programme should be made so that the farmers can avail the services provided by the MVS. The MVS team should stay atleast 5 - 6 days in one panchayat and atleast 6 visit should be made in a year to each panchayat. The MVS team should work in

close co-operation with the local organizations and panchayat workers. The effective and systematic training to educate the farmers should be organised regularly. The refresher training programme should be organised for the technicians working in MVS programme.

CORRESPONDENCE

General Secretary

Nepal Veterinary Association

Post Box No. 3130

KATHMANDU, (Nepal)

OR

Editor - in - Chief

Bulletin of Veterinary Sc. & Animal Husbandry, Nepal

Post Box No. 3130

Veterinary Complex, Tripureswar

KATHMANDU, (Nepal)

JOWAR POISONING IN DRAUGHT AFFECTED AREA

(A case report in buffaloes)

D.K.Thakur & S.K. Verma

Case History

Twelve buffaloes of over 2 years of age accidentally grazed on jowar plants which were stunted in growth due to draught condition. All these animals after about 2 hours of grazing developed symptoms of toxicity and died within 4 hours without any veterinary aid. The present report contains two cases of similar poisoning after 10 days from the same village. The symptoms observed were dyspnoea, restlessness, moaning and muscular tremor. The mucosae were bright red. The pulse was small, weak and rapid.

The history of the case and sudden onset of anoxic symptoms suggested the Hydrocyanic acid poisoning which was further confirmed by testing the rumen fluid for the presence of Hydrocyanic acid according to the method described by Blood et al (1979).

Treatment

Both the animals were treated with Sodium Thio-sulphate 15g and 4gm Sodium nitrite in 200ml distilled water intravenously. Camphor in mustard oil was rubbed on the chest region. Both the animals improved within 2 hours after the treatment but the twitching of head muscle was still persisting. Sodium Thio-sulphate 5g was given orally to fix the free hydrocyanic acid in rumen (Blood et al, 1979). After about 12 hours both the animals started rumination but dullness was still present. B. Complex injection 15ml i/m was given daily for 4 days and the animals were completely cured.

Discussion

Acute cyanide intoxication causes histotoxic anoxia and the resultant tissue asphyxia due to paralysis of tissue enzyme systems. Sodium Nitrite and Sodium Thio-sulphate produce methaemoglobin which combines with hydrocyanic acid to produce cyanomet-haemoglobin which is non-toxic and is readily excreted (Blood et al, 1979). Therefore, these drugs may be used to treat cases of Jowar poisoning in animals.

REFERENCE

Blood, D.C., Henderson, J.A. and Radostits, O.M. (1979). Veterinary Medicine, 5th ed. P. 966. ELBS and Bailliere Tindall.

* Ranchi Veterinary College, Ranchi - 834 007.

THE EFFECT OF STEAMING-UP IN MILK YIELD *

Tulsi Prasad Shrestha **

Steaming-up is the term given to the feeding of additional concentrates above maintenance requirements to pregnant cows in the period immediately before calving with the hope to obtain more milk during post-partum. Voluntary food intake is low in the last few weeks of gestation period and at the same time young cows need more energy and energy reserve for increasing milk production and maintaining growth. After parturition appetite gradually increases to a maximum at about 100 days within when the peak yield has already been reached. So the lactating cows have to rely on body reserve for producing more milk. Young cows should be steamed-up to ensure good body condition, that is, 3-4 lb concentrates per day going up to 10 lb per day should be allotted in order to achieve growth rate of 1 lb/day. The concentrate feed should contain 15-16 per cent DCP¹ and 65 per cent SE². The quality of feeding during pre-partum and post-partum should be same in order to avoid stomach upset during the lactation period. Steaming-up is usually done 6-8 weeks before calving. Under feeding during this period causes the loss of 10-15 per cent of milk yield.

Steaming-up is widely advocated and practiced in the United Kingdom as a technique essential for maximum milk production. Its greatest protagonist was Professor Robert Boutflour who unquestionably could obtain large amounts of milk from cows. He proposed a feeding of an additional concentrates in the dry period in quantities increasing from a mere handful about two months before calving to an amount shortly before calving equal to 3/4 of the anticipated allowance in early lactation.

A series of experiments have been conducted in this subject at New Zealand, United Kingdom and United States of America. Experimental evidences on the effect of steaming up in milk yield and liveweight change can be grouped under the following headings:

- I. Low plane of nutrition as the basal ration which caused a fall in liveweight before calving;

* Review paper of available literatures on the topic.

** Agricultural Projects Services Centre (APROSC), Ram shah Path, Kathmandu, Nepal.

1/ DCP - Digestible Crude Protein,

2/ SE - Starch Equivalent.

- II. Moderate plane of nutrition as the basal ration which caused a small gain in liveweight before calving;
- III. High plane of nutrition as the basal ration which caused a marked gain in liveweight before calving.
- I. Low plane of nutrition as the basal ration which caused a fall in liveweight before calving

In this group of experiments Campbell and Flux (1948) and Lee et al (1948) tested the effect of prepartum feeding bare pasture plus some hay and bare pasture plus ad lib hay on the body weight and milk yield. They reported that previously better fed animals lost more weight in lactation than the poorly fed group and generously fed animals in late pregnancy increased milk yield in comparison to low fed animals. Davenport and Rakes in USA compared the effect of three levels of feeding in the dry period on subsequent milk production. The daily rations were 2.0 kg hay, 2.3 kg concentrates + ad lib hay, and 12 kg concentrates + ad lib hay which made the cows thin, moderately fleshed and fat in pre-partum condition respectively. Generous feeding for all groups followed in early lactation. The findings were: the previously underfed animals gained weight in early lactation; the moderately fed animals maintained their weight; and the generously fed group lost weight. Again, the lowest level of feeding pre-partum reduced milk yield significantly when compared with the most generous level. Milk yield in restricted group was lower than generously fed group because the animals were growing at the expense of milk.

- II. Moderate plane of nutrition as the basal ration which caused a small gain in liveweight before calving

This section deals with experiments in which the basal ration equalled or slightly exceeded the maintenance requirements of the cow in late pregnancy. Broster et al (1958) compared the effects of 25.4 kg and 101.6 kg concentrates given to 88 Friesian and Shorthorn heifers in the last 3-4 week of pregnancy, in addition to group fed roughages estimated to be equal to maintenance requirements. Following calving, the heifers received either 3 or 5 kg concentrates per 10 kg milk during the first twelve weeks of lactation, again in addition to roughages equal to maintenance requirements. A further trial with 29 Friesian and Shorthorn heifers was conducted using same pre-calving treatments followed by 4 kg concentrates per 10 kg milk during the first nine weeks of lactation in addition to a basal ration of roughages equal to maintenance requirements. The findings were: firstly the higher level of feeding in pregnancy increased milk yield when the level

of feeding lactation was 3 kg concentrates per 10 kg milk but not when the rate of feeding was 5 kg concentrates per 10 kg milk; secondly the adverse effect of low level of feeding pre-partum may be at least partly offset by more generous feeding after calving did not increase yield additively. These points all indicate that pre-calving feeding does not exert an effect on milk yield which is independent of the general nutrition of the cow. Emery et al (1969) conducted a trial on 98 heifers and 50 cows feeding two treatment diets: grain given to appetite versus no grain in the last three weeks of pregnancy. All animals received hay to appetite. Ad lib grain was offered + hay for the first 45 days after calving. Heifers ate 7 kg grain per day whereas cows ate 8-11 kg per day. The supplemented group gained 8 kg live weight in this period; the control group maintained their liveweight. The group receiving concentrates before calving lost less weight at parturition than the control group, but lost more in early lactation. Milk yield in the first 45 days of lactation for the grain and no grain groups was not significantly different. This finding confirms with Davenport and Rakes (1969) who reported that the medium fed group gave less milk than the generously fed group. In fact they gave also less milk than the sparsely fed group.

III. High Plane of nutrition as the basal ration which caused a marked gain in liveweight before calving

This group of experiments include studies of moderately generous feeding compared with very generous feeding before calving. Broster et al (1964) conducted a trial with 40 Friesian heifers. The heifers were individually fed hay ad lib in addition they received 1 of 4 contrasting concentrate rations ranging from 0.9 to 2.7 kg per day and including various combinations of protein and energy during late pregnancy period. After calving all the heifers were given the same amount of food per day according to Woodman's standards. In this trial the heifers fed more generously in pregnancy, lost more weight in early lactation than the more sparsely fed ones. Gardner (1969) used 64 Friesian cows in a factorial experiment with two levels of feeding in gestation and two in early lactation. The pre-calving levels equalled 160 per cent and 115 per cent of the National Research Council (1958) recommended allowances; the higher level bordered on ad lib feeding with the intention of preventing loss of liveweight in early lactation. Before calving the liveweight gains were 29 and 18 kg on the higher and lower plane of nutrition. Liveweight losses in early lactation were greater following the most generous plane of nutrition in late pregnancy than following the more sparse one. The combination of low level before and low level of feeding after

calving resulted in the lowest yield of milk. Low level before with high level after calving gave the greatest yield of milk.

The general conclusion is: generously overfed animals during pre-partum lose more bodyweight than underfed after calving. Again, weight gain during post-partum is proportionately more higher in underfed animals than generously overfed or moderately fed during pre-partum. Previously underfed animals gain weight in early lactation in the expense of milk and moderately fed animals maintain their weight, whereas, generously overfed animals lose weight for producing more milk. Hence, steaming-up for 6-8 weeks pre-partum can significantly increase the milk yield.

In the Nepalese context where the pregnant cows are mostly underfed should be steamed-up during 6-8 weeks before calving with 2-3 kg concentrates containing 15-16 per cent DCP for increasing milk yield and maintaining growth rate. After calving these cows should be fed according to the maintenance and production requirements for obtaining more milk and maintaining their health.

REFERENCES

- Amir S, Kali J and Volcani R (1968) - Growth and Development of Mammals. Lodge G.A and Lamming G.E (Ed.) London, UK: Butterworth.
- Broster W.H., Ridler B and Foot A.S (1958) - J. Dairy Res. 25: 373.
- Broster W.H., Tuck V.J. and Balch C.C. (1964) - J. Agric. Sci., Camb 63: 51.
- Campbell I.L. and Flux D.S. (1948) - Proc. 8th Ann. Conf. N.Z. Soc. Anim. Prod. p 61.
- Davenport D.G. and Rakes A.H. (1969) - J. Dairy Sci, 52:1037
- Emery R.S, Hafs H.D, Armstrong D and Snyder W.W. (1969) - J. Dairy Sci 52: 867.
- Gardner R.W. (1969) - J. Dairy Sci. 52: 1973.
- Lees F.T, McMeekan C.P. and Wallace L.R. (1948) Proc. 8th Ann. Conf. N.Z. Soc. Anim. Prod. p. 60.
- Shrestha T.P. (1974) Seminar paper prepared at Reading University, U.K.

USE OF WHEY AS A HUMAN FOOD: A REVIEW

Nagendra P. Sah*

Summary

Whey is a byproduct of cheese making and is a cheap source of nutrients. Whey has been used in a variety of food products. Whey is plenty, in the year 1982/83 Dairy Development Corporation of Nepal produced over 6 million kg of whey. The bulk of this whey is either fed to animals or dumped. With the existing malnutrition problem in Nepal, it is not justifiable to dump or feed the whey to the animals. Whey can be incorporated in a variety of food products to supplement the diets of malnourished segments of human population. This paper gives an overview of the current progress in utilization of whey as a human food.

Introduction

The disposal of whey has been an inherent part of the cheese making process for hundreds of years. Liquid whey represents 85-90% of the volume of milk used to make cheese. The total global production of fluid whey in 1977 exceeded 15.6 million tons (Ryder, 1980). Nowhere in the world is whey fully utilized. Ranked in terms of annual production of fluid whey (billion kg), the major whey producing regions (Graham *et al.*, 1981) are: Western Europe, 23.6; US, 15.4; USSR, 10.4; East Europe, 7.7; Australia/New Zealand, 3.2; and Canada, 9.

In the past, whey had been regarded as waste product and was either fed to animals or dumped into rivers. In 1955, the dairy industry processed only 25% of the liquid whey that was produced, while the other 75% of the whey was either fed to animals or dumped. By 1975, this situation had been reversed, with 75% of the whey being processed and only 25% thrown away (Robinson, 1979). In recent years, utilization of whey has been felt to be an inexorable necessity in view of the current requirement for using available nutrients for feeding the malnourished segments of human population. The National Nutrition Co-ordination Committee (1979) reports that the prevalence of third degree malnutrition in Nepal varies from 5 to 15% as against 2-3% in several other countries.

* Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal.

In the year 1982/83 Dairy Development Corporation (DDC) of Nepal produced 71,000 kg of cheese (Rajbhandari, 1985) leaving behind over 6 million kg of liquid whey. Besides DDC, there are some private dairies processing cheese. The bulk of this whey is either fed to animals or dumped. This is unfortunate since the whey proteins and other nutrients in whey are of high nutritional quality. With the existing malnutrition situation in Nepal, we can not afford to ignore such a potential and cheap nutritious food source. The objective of this paper is to provide an overview of the current progress in whey utilization. First, the composition and functional properties of whey will be discussed and then this paper shall consider the application of whey products to human food.

Whey composition and properties

Whey is the liquid left after the removal of casein and fat from milk in the manufacture of cheese. It contributes about 85 to 90% of the volume of milk used for transformation into ripened cheese and it retains about 55% of the nutrients, about 20% of the protein, nearly all the lactose, and most of the minerals and vitamins in milk (Jelen 1979; Kennedy, 1985; Kosikowski, 1979). From cheddar type cheese, the whey is sweet (pH 5.9 to 6.3); but from unripened cottage type cheese, which is consumed fresh, the whey is acidic (pH 4.4 to 4.6). There is more lactic acid, calcium and phosphorus and less lactose in acid whey and more resistance to acceptance by consumers because of the acid flavor (Kosikowski, 1979). (Table 1). This makes it difficult for acid whey in any form to enter standard channels of whey utilization.

Fourteen percent of the solids of whey are proteins and these represent 20% of the total proteins of whole milk. Alpha Lactalbumin and Beta-lactoglobulin comprise around 90% of the whey proteins (Kennedy, 1985). Whey protein is one of the highest quality naturally occurring proteins having a protein efficiency ratio (PER) of 3.0 to 3.2 as compared to casein at 2.5. Whey proteins have adequate levels of essential amino acids and are easily digestible, and are thus considered to be highly nutritional and physiologically complete food (Cox 1973; Shahani *et al.*, 1978). They are useful in supplementation of cereals, since they contain lysine, and tryptophan, two limiting aminoacids in cereal proteins (Cox, 1973; Anon, 1980). Nutritional and biochemical studies of whey products have been reported extensively by Forsum and Hambraeus, (1977) and Glass and Hedrick (1977, 1977a). Forsum and Hambraeus (1977) reported that all whey products contained a surplus of available lysine as compared to the lysine content recommended by FAO.

Milk sugar (lactose), the most abundant ingredient of whey solids, is a unique sugar which plays a major role in the assimilation of

calcium and phosphorus (Cox, 1973; McDonough, 1977). Lactose acts as a carrier for flavor and colour when added to many foods.

It has physical and chemical properties that give it distinct advantages over other sugars in certain foods and pharmaceutical applications. Nutritionally lactose is a source of galactose, the structural sugar needed for repair of brain, mucous, and other delicate tissues (McDonough, 1977), and of glucose, the sugar of blood necessary for brain function and tissue metabolism.

Whey is an excellent source of milk minerals such as calcium, potassium, sodium, and certain trace elements. It is also a rich source of water soluble vitamins of B complex riboflavin, panto-thenic acid, thiamine, niacin and, perhaps, surprisingly, vitamin B12, the antipernicious anaemic factor (Cox, 1973; Webb and Whittier, 1948). So its use in stable foods helps supplement the diet of those persons who may be deficient in these nutrients.

Table 1. Composition of whey*

Component	Fluid sweet whey (%)	Fluid acid whey (%)	Dried sweet whey (%)	Dried acid whey (%)
Total solid	6.35	6.50	96.5	96.0
Water	93.70	93.50	3.5	4.0
Fat	0.50	0.04	0.8	0.6
Total Protein	0.80	0.75	13.1	12.5
Lactose	4.85	4.90	75.0	67.4
Ash	0.50	0.80	7.3	11.8
Lactic acid	0.05	0.40	0.2	4.2

* From Kosikowski (1978).

The fat content of whey is quite low, but separation may be worth while for large quantities of whey. The separated cream can be used to make whey butter.

The total solids content of nonfat dry milk (NDM) and dry whey is the same. The lactose and mineral contents in dry whey are nearly one and one-half times greater than those of NDM. However, the protein content of dry whey is substantially lower (Arbuckle, 1979; Nielsen, 1975). Although, the nutritional contribution of dry whey is less than

that of NDM, it is advantageous to a food processor firstly because it is the least expensive dairy product available for use in food products and secondly, its performance can be very similar to skim milk powder (Cox, 1973).

Some Food Products of Whey

The manufacture of whey protein concentrates (WPC) by cold precipitation techniques is reported by (Shahani *et al.*, 1978). WPC recovered from this technique is considered superior to those recovered by the heat coagulation process. WPC has been prepared commercially using reverse osmosis, ultrafiltration and electrodialysis. The properties of such products have been reviewed by Morr (1976), and Delaney (1976). Protein concentrates of whey show good solubility and functionality and contain from 30 to 60% protein. These products are establishing themselves in standard dairy, bakery, and beverage industries as food supplements (Hidalgo and Camper, 1977; McDonough *et al.*, 1974; McDonough, 1971; Modler and Emmons, 1977). Whey solids for human nutrition are being produced in a variety of forms such as dried whey, condensed whey, partially delactosed whey, partially demineralized whey, partially delactosed/demineralized whey, protein concentrates, etc. (Mathur and Shahani, 1979). There has been a steady upward trend in the utilization of whey for human food during recent years, primarily due to a better understanding of the unique nutritional, biological and functional characteristics of whey components.

Whey Utilization in Human Foods

A variety of uses for whey has been suggested by Mathur and Shahani (1979) and Shahani *et al.* (1978) including its use in the production of cheese and related products, infant food formulations, special dietary products, soup and gravy bases, and beverages.

Use of whey in yogurt

Application of liquid whey in the manufacture of yogurt was reported by Jelen and Horbal (1974), Hekmati and Bradley (1979) and Hartman (1975). It is feasible to use a substantial portion of neutralized liquid cottage cheese whey and sweet whey in the manufacture of yogurt. Use of whey powder in the manufacture of yogurt has been reported by Hartman (1975), Todoric and Savadinovic (1974), Nielsen (1976), and Shah (1982). The recommended level of fortification of the basic mix is 1-2%. Higher level impart an undesirable whey flavor to the yogurt. It is feasible to replace 25% of the nonfat dry milk (NDM) with dry whey in manufacturing yogurt with reconstituted NDM. Prodanski (1970) and Korner (1973) made yogurt from milk fortified with proteins

which had been recovered from whey and butter milk. The product made with the addition of whey and/or butter milk proteins were said to have good consistency and flavor. A modified whey product (WM-34 and WP-34) was used (Whalen, 1982) to replace 50% of the NDM with no detectable flavor differences.

Use of whey in ice cream

Modified wheys such as partially delactosed whey, partially demineralized whey and other protein concentrates have been used successfully to contribute to the milk solids not-fat content of ice cream and other frozen desserts. The addition of modified whey solids to ice cream is said to improve texture and freezability while giving an acceptable flavor and sweetness (Anon, 1979). United States Federal regulations permit addition of dry whey upto 25% replacement for milk solids-not-fat. This amount apparently retains the basic quality of the product. (Arbuckle, 1979; McDonough, 1977; Mathur and Shahani, 1979; Weiner, 1977). The problem of lactose crystallization associated with the usage of whey solids in ice-cream mixes has been controlled by the proper selection of suitable stabilizers (Mathur and Shahani, 1979). There are strong economic reasons for using less expensive whey solids in place of nonfat dry milk.

Cheese and cheese foods

Traditionally, Ricotta cheese is produced by heating blends of about 3 to 10% whole milk with whey. However only 50% protein is recovered by the traditional process.

Another large use of whey solids in the dairy industry is in the manufacture of processed cheese and cheese spreads. Whey protein concentrates have been blended successfully with processed cheese foods (Shahani *et al.* 1978). Apart from making Ricotta cheese, Devos *et al.*, (1960) have developed and patented a method of improving characteristics of cheese by the addition of whey proteins.

A similar kind of whey cheese is made locally in Eastern hills and Himalayan region of Nepal called "Sherkam". Sherkam is made by boiling butter milk, which is obtained by churning yogurt (Dahi), to coagulate the whey protein. This coagulated whey protein is consumed fresh or kept in skin bags for further use. There is another similar product known as "Chhurpi" and is made by cutting "Sherkam" in small pieces followed by drying in the sun. After it is dried, it becomes very hard and can be kept for longer period (Bhandari, 1984).

Manufacture of Infant foods

Reports have indicated that some infants fed exclusively on cows milk leads to the physiological disorders such as microcytosis, ferropenia and minimal anaemia (Woodruff *et al.*, 1972). These disorders are believed to arise from impaired organ functions in the infants and can be rectified by feeding diets more closely resembling human milk. The process of preparing infant food formulae resembling human milk is popularly referred to as the "humanization" of milk. Certain compositional differences exist between human and bovine milk such as human milk has a higher level of lactose and a greater percentage of proteins are whey proteins. Lactose and whey proteins, can be used to be incorporated in bovine milk for humanization. Formulae based on demineralized whey can be produced with a composition closer to that of breast milk, thereby providing bottle fed infants with a more "natural" milk substitute (Kennedy, 1985). The feeding of humanized milks increases nitrogen retention and utilization (Mathur and Shahani, 1979).

Beverages:

Research dealing with whey beverages has been extensively reviewed by Holsinger *et al.* (1974). Generally there are three categories of beverages: (a) alcoholic, (b) Non-alcoholic, and (c) high protein beverages. Alcoholic beverages are prepared from deproteinized whey such as Champagne-like whey beverage lactovit produced in Poland. Non-alcoholic beverages are generally mixed with fruit juices and provide a nutritious alternative to carbonated soft drinks. In western Europe a whey beverage called "Rivella" has enjoyed some popularity. "Whey vit", a sparkling beverage described as nutritious soft drink was developed in India (Rambha *et al.*, 1972).

Bakery products

Bakeries have been the largest single user of whey solids. As a measure for reducing costs of manufacture, whey solids steadily have been replacing more costly nonfat dry milk. Use of whey solids increases dough mixing time, lowers water absorption and depresses bread volume. This problem can be overcome by modified whey products which are low in lactose and high in protein content.

Confectionary products

Whey formulae make caramels with a fine flavor. Caramels produced by using sweetened condensed whey and soya proteins closely resemble those produced from skim milk or whole milk. Various formulae for the

manufacture of confections contain 2 to 7% soluble proteins to provide improved nutritional value. Use of demineralized whey in such formulations gives products of superior quality.

In Mexico tortillas have been supplemented with whey protein concentrate, resulting in a doubling of their PER value (Kennedy, 1985).

Conclusion

There are now so many innovative uses for whey that it is hard to believe that some people still regard it as a waste product. With the advancement of science and technology, many processes which may not be commercially feasible today will be transformed to practical success in the future. Efforts have been made to utilize selective components of whey, e.g., proteins in making "Sherkam" and "Chhurpi". But the process of using whey proteins results in lactose as a by product. If lactose is allowed to be wasted, then a valuable sources of nutrients would be lost and problem of whey utilization will still persist. It will be most desirable to direct the research work towards finding newer methods of utilizing a majority of the whey rather than resorting to selective fractionation method. Efforts should be made for using cheap but nutritious whey and whey products to incorporate in traditional products to improve the nutritive status of the malnourished population.

REFERENCES

- Anonymous. 1979. Using modified whey in dairy products. Dairy Ice cream Field. 162 (4): 82 I.
- Anonymous. 1980. The new potential of whey. Food Manufacture. 55(7).
- Arbuckle, W.S. 1979. Whey solids in frozen dessert formulations. Am. Dairy Rev. 41 (2): 500.
- Bambha, P.A., Setty, P.A.S. and Nambudripad. V.K.N. 1972. "Whey Vit" a nourishing soft drink. Indian Dairyman. 24 (7): 153.
- Bhandari, B.R. 1984. Doodh Tatha Dugdha Padarth Utpadan Prabidhi (in Nepali). 1st ed., Kathmandu, Nepal.
- Cox, A.C. 1973. Whey powder. Food processing Ind. 42 (505): 49.
- Delaney, R.A.M. 1976. Composition, properties and uses of whey protein concentrates. J. Soc. Dairy Technol. 20: 91.
- Devos, P., Desjoinqueres, A. and Rambaud. M. 1960. French Pat. 1,237,225.

- Forsum, E., and Hambraeus. L. 1977. Nutritional and biochemical studies of whey products. *J. Dairy Sci.* 60:370.
- Glass, L., and Hedrick. T.I. 1977. Nutritional composition of sweet and acid type dry wheys. I. major factors including amino acids. *J. Dairy Sci.* 60:185.
- Glass, L., and Hedrick. T.I. 1977a. Nutritional composition of sweet and acid type dry wheys. II. Vitamin, minerals, and caloric contents. *J. Dairy Sci.* 60:190.
- Graham, D.M., Hutton, J.T. and McIntire. J.M. 1981. Concentrated milks and wheys in the third quarter of 20th century. *J. Dairy Sci.* 64 (6): 1055.
- Hartman, G.H. 1975. The use of whey in the manufacture of yogurt. *Cult. Dairy Prod. J.* 10 (2):6.
- Hekmati, M., and Bradley, R.L. Jr. 1979. Utilization of acid whey in frozen yogurt. *Cult. Dairy Prod. J.* 14 (2): 6.
- Hidalgo, J. and Camper. E. 1977. Solubility and heat stability of whey protein concentrates. *J. Dairy Sci.* 60:1515.
- Holsinger, V.H., Posati, L.P. and Devilbiss. E.D. 1974. Whey beverages: A review. *J. Dairy Sci.* 57: 849.
- Hynd, J. 1980. Drying of Whey. *J.Soc. Dairy Technol.* 33 (2).
- Jelen, P. 1979. Industrial whey processing technology: An overview, *J. Agri. Food Chem.* 27: 658.
- Jelen, P. and Horbal. H. 1974. Utilization of cottage cheese whey in yogurt manufacture. *J. Dairy Sci.* 57:584.
- Kennedy, J.P. 1985. Utilization of whey. *Cult. Dairy Prod. J.* 20 (1):13.
- Korner, H. 1973. Process for production of yogurt. *Dairy Sci. Abstr.* 35:449.
- Kosikowski, F.V. 1978. Page 668 in cheese and fermented milk foods. 2nd ed., Edward Brothers Inc., Ann Arbor, MI.
- Kosikowski, F.V. 1979. Whey utilization and whey products. *J. Dairy Sci.* 62:1149.
- Mathur, B.N., and Shahani. K.M. 1979. Use of total whey constituents for human food. *J. Dairy Sci.* 62:99.
- McDonough, F.E. 1977. Whey solids utilization and salvage systems. *Cult. Dairy Prod. J.* 12 (1): 8.

- McDonough, F.E., Hargrove, R.E. Mattingly., W.A. Posati, L.P. and Alford. J.A. 1974. Composition and properties of whey protein concentrates from ultrafiltration. J. Dairy Sci. 57:1438.
- McDonough, F.E., Mattingly, W.A. and Vestal. J.H. 1971. Protein Concentrate from cheese whey by ultrafiltration. J. Dairy Sci. 54: 1406.
- Modler, H.W., and Emmons. D.B. 1977. Properties of whey protein Concentrate prepared by heating under acidic conditions. J. Dairy Sci. 60:177.
- Morr, C.V. 1976. Whey Protein concentrates: An update. Food Technol. 14:18.
- National Nutrition Co-ordination committee. 1979. National Nutrition Strategies, Kathmandu, Nepal.
- Nielsen, V.H. 1976. Use of whey solids in cultured milk products. Cult. Dairy Prod. J. 11 (1):12.
- Nielsen, V.H. 1975. Replacement of nonfat milk solids with dry whey. Am. Dairy Rev. 37 (2):22.
- Prodanski, P.G. 1970. Utilization of Proteins from whey, butter milk and skim milk. Dairy Sci. Abstr. 32:25.
- Rajbhandari, H.B. 1985. Livestock and livestock product marketing problems and required improvement. Nepalese J. Anim. Sci. 1 (1):47.
- Robinson, D.L. 1979. Making the most of whey. Food manufacture. 54 (7): 19.
- Ryder, D.N. 1980. Economic considerations of whey processing. J. Soc. Dairy Technol. 33 (2).
- Shah, N.P. 1982. Use of dry whey and lactose hydrolysis in yogurt bases. M.S. Thesis, South Dakota State University, Brookings, S.D., U.S.A.
- Shahani, K.M., Mathur, B.N. and Kilara. A. 1978. Utilization of whey as a human food. Cult. Dairy Prod. J. 13 (2): 7.
- Todoric, R., and Savadinovic. K. 1974. Use of dry whey in yogurt manufacture and its effect on acidity and consistency. Dairy Sci. Abstr. 35:449.
- Webb, B.H., and Wittier. E.O. 1948. The utilization of whey: A review. J. Dairy Sci. 31:139.
- Weiner, G.D. 1977. Changing times for the whey industry. Am. Dairy Rev. 39 (12):42 B.

Whalen, C.A. 1982. Whey caseinate blends and lactose hydrolysis in yogurt manufacture. M.S. Thesis, South Dakota State University, Brookings, SD, U.S.A.

Woodruff, C.W., Wright, S.W. and Wright, R.P. 1972. Comparison of Fresh cow milk with preped formula. Amer. J. Dis. Child. 124:26.

REVIEW OF LITERATURE ON THE CONTROL OF SARCOPTIC-MANGE IN PIGS

Prabesh M.S. Pradhan.*

Introduction

Sarcoptic mange is a common disease of pigs in many parts of the world. The disease is notifiable in New-Zealand. Mange due to Sarcoptes scabiei var suis in pigs, is becoming more prevalent throughout Nepal, particularly in the vicinity of urban areas where the swine population is greatest. In Nepal pig raisers, veterinarians and livestock extension workers have reported a definite increase in the incidence of sarcoptic mange in pigs.

The early stages of sarcoptic mange are not always readily apparent and the existence of the disease in a herd, especially among well fed and vigorous pigs, may be easily overlooked until it has made considerable progress. During the warm months of the year mange mites are usually less active than during the cold winter (Cabbett, et al 1948).

It is now considered that losses caused by this disease are of major economic importance to the pig industry. In a recent paper, Hewett and Heard (1982) reported that their findings support the views of earlier workers that Sarcoptes scabiei infestations depress growth rates and feed conversion efficiency and the growth rate increased in affected pigs after treatment.

Once the disease becomes established in a herd, efforts to combat the disease usually have been confined to measures of control rather than eradication.

History

The first mention of itch mites on animals was made by Linnaeus (1761, cited by Magee, 1974). He described and termed it Acarus exulcerans. Degeer (1778, cited by Magee, 1974) made the first accurate description and drawing of Acarus scabiei, which he classified as identical with the Acarus exulcerans of Linnaeus. Latreille (1806, cited by Soulsby, 1982) suggested the genus Sarcoptes (species type: Acarus scabiei) and since then the terms Acarus scabiei and Sarcoptes scabiei have been used synonymously (Magee, 1974).

* Dept. of Livestock Development & Animal Health, Hariharbhawan,
Lalitpur.

The literature concerning these itch mites, Sarcoptes scabiei, on pigs, is much less voluminous. Megnin (1895, cited by Magee, 1974) described in some detail and gave length and width measurement of the adult male and female Sarcoptes scabiei var suis. Imes, (1920) describes Sarcoptes scabiei suis on swine and the mange it caused. Baker and Wharton (1952) described hog mange and stated that S. scabiei var suis was probably just a biological race of S. scabiei and morphologically similar to others. Magee (1974) stated that the mites from different hosts are not morphologically different; their biology has been assumed to be the same on all of the hosts. Leak (1975) has studied the morphology of Sarcoptes scabiei var suis.

Biology of Sarcoptes

The genus Sarcoptes latreille comprises various species of Sarcoptes scabiei. They are considered as host specific and designated as Sarcoptes scabies var bovis, Sarcoptes scabies var suis, etc., but this host specificity is not complete and transference from one host species to another can occur (Sheahan, 1974).

Sarcoptes scabiei is a minute parasite roughly circular in outline. The length and width of an adult female is respectively 447 μ and 343 and that of the adult male is 447 μ and 189 (Leak, 1975). All the legs of both sexes are short and the third and fourth pairs do not project beyond the margin of the body. There is a sucker in the first, second and fourth pairs of legs of the male and in the case of the female only in the first and second pairs of legs (Leak, 1975).

The female burrows into the skin and lays eggs into the tunnel it forms. The life cycle of Sarcoptes scabiei var human is described by Medlany (1952, cited by Soulsby, 1982). Probably the life cycle of the varieties found on other animals is similar. The six legged larvae escape from the breeding tunnel and wander on the skin, but some remain in the parent tunnel or side pockets of it and continue their development as far as the nymphal stages. The nymphs have four pairs of legs but no genital apertures. They may stay in the larval pockets or wander and make new pockets. Finally, male and female are produced. The life cycle from egg to egg laying female may last about 17 days. The female probably does not live longer than 3-4 weeks (Soulsby, 1982). Infection is spread mainly through contact by the wandering larvae, nymphs and fertilised young females (Sheahan, 1974; Cargill and Dobson, 1979a). Adult sows are often the source of infection for young piglets even though they show no signs of disease (Bogatako, 1974).

The mites are very susceptible to dryness and they did not survive in the absence of pigs more than 12 days in the piggery, 3 - 10 days in

manure or 10 days in outdoor pens. Air temperature ranged from 7°C to 18°C and relative humidity 65 - 75 percent (Mikhalochkin, 1975). Under optimal laboratory conditions the mites have been kept alive for 3 weeks.

Epidemiology

Amongst domestic species, pigs are most commonly affected by Sarcoptes scabiei. It is a notifiable disease in most countries and is important because of its severity (Dobson and Cargill, 1979b; Sheahan, 1974). The main source of mites in infected piggeries is from chronically affected animals with ear lesions. Large numbers of mites can usually be found in the ears of normal sows and it is presumed that the mites are in a latent stage (Soulsby, 1982). Ear lesions occur mostly in dry sows which are in contact with a boar in groups. In this situation there is maximum possibility for mite build up and minimal opportunity for mite control. Egg laying-stage mites are apparently responsible for more damage than male or immature mites (Walton, 1967). This is probably due to the greater activity and longer migration of egg laying females. Damage is increased by increasing the skin temperature, because the mites become more active (Bennett, 1975).

The infection is spread chiefly by direct contact between hosts. The female mites, larvae and nymph stages are capable of migration; the inert materials such as bedding, grooming tools and clothing may act as carriers. Eggs or mites that become dislodged and dropped in moist protected places may remain viable 2 - 4 weeks in mild weather but if in dry surroundings, exposed to direct sunlight they seldom survived more than a day or two (Bennett, 1975). Sows are often the source of infestation for young pigs even though they show no signs of the disease (Sheahan, 1974). Cargill and Dobson (1979b) state that the piglets from chronically affected sows started scratching during the first few days of life. However, significant rubbing does not occur until the development of mite hypersensitivity, some three to six weeks later. It is suggested that the sensitisation of the host occurred during the incubation period and that there was no itching until the host became sensitised (Sheahan, 1974). A small proportion of grower pigs which do not develop a hypersensitivity to mites, develop chronic mange (Cargill and Dobson, 1979b). The thick scab in which mites are found is not readily penetrated by insecticides (McPherson, 1960).

Pathogenesis

The parasites pierce the skin to suck lymph and may also feed on young epidermal cells. Their activities and secretions in the burrows of epidermis produced a marked irritation which causes intense itching and scratching, which aggravates the condition. In pigs skin changes are

characterised by excessive keratinisation and proliferation of connective tissues, with the result that the skin becomes much thickened, wrinkled and yellowish brown scales form over the body (Pullar, 1941; Magee, 1974). Sheahan (1974) studied the development of sarcoptic mite hypersensitivity. He reported that the disease differed from human scabies in that hypersensitivity to mites developed more quickly in pigs and was more transient. Clinical signs and pathological changes associated with sarcoptes hypersensitivity resulting from an experimental infestation in pigs are reported (Cargill and Dobson, 1979a).

Clinical signs

Sarcoptes prefers those parts of the body that are not covered by much hair. It is reported that the mange lesions were first observed in a pig's ear specially on the inner side of the pinna. Signs of mange then appeared over the head and progressed towards the rear of the pig as the severity of the infestation increased (Cabbett, 1956; Griffiths, 1970; Magee, 1974). Early lesions are characterised by the presence of small red papules and general erythema of the skin. A generalised urticarial reaction developed in the young pigs two to three weeks following infection. This reaction generally persisted for two to three weeks and resulted in severe pruritis (Sheahan, 1974). While light infections with Sarcoptes scabiei in animals have often gone unnoticed or unrecognised, severe infections have been reported to cause serious loss of condition, progressive emaciation, permanent stunting and even death (Pullar, 1941; Seddon, 1951; McPherson, 1960).

Diagnosis

Although the itch mites had been described from animals many years earlier Sheathen (1915, cited by Magee, 1974) stated that positive diagnosis of hog mange must be based on finding the actual mites in the skin of the host. Cabbett et al (1948) stated that mites could be found inside the pig's ears and should be used as diagnosis for mange. Griffith (1970) stated that diagnosis of mange should be confirmed by microscopic demonstration and identification of the mites. Diagnosis of sarcoptic mange can be made on the presence or absence of these mites. It may be difficult to find specimens that can be identified with certainty and clinical signs should also be considered (Sheahan, 1974). The diagnosis of sarcoptic mite hypersensitivity is best made from a clinical assessment of the skin of the pig and by observing the animal after it has been disturbed. Evidence of rubbing, hair loss, abrasions and urticaria are a more reliable guide than examination of skin scrapings which invariably give negative results. Skin scraping would only be of value in the chronic form of the disease (Cargill, et al, 1979a).

Control

In the past, sarcoptic mange in pigs has been considered of minor economic importance, but studies have shown that treatment of infected pig herds results in improved productivity (Sheahan et al 1974). Because the mites burrow deeply into the skin, where they feed on tissue fluid and skin debris, treatment with conventional water based insecticides are not very effective. The present practice of scrubbing, spraying or deeping to attempt to expose the mites to the insecticide are difficult, time consuming and costly (Lee et al 1980).

Sulphur ointment and lime-sulphur dip, commonly used in the past have now been replaced almost completely by chlorinated hydrocarbon and organophosphorous compounds. It is reported that the chlorinated hydrocarbon insecticides need repeated treatments, left excessive residue and, due to the development of resistance in parasitic arthropods, their use are limited or restricted (Avon, 1957; Radcliffe and Woodland, 1957). organophosphorus insecticides are much less toxic for mammals and are widely used to control parasites of livestock (Radcliffe et al, 1957).

Some workers have reported a new approach to sarcoptic mange control in pigs. An organo-phosphorus compound*, in a base of organic oil that can be applied directly to the pig's skin. When applied along the back, the insecticide diffuses through the skin into the blood stream. It is then distributed throughout the body. As the mites continue to feed, they take in the insecticide contained in tissue fluids and are killed. The systemic insecticide has sufficiently long-acting power in the skin tissues to kill those mites that develop from eggs following the initial treatment. According to the manufacturers, the product is not toxic to the pig and a withdrawal period of 28 days before slaughter is advised.

Control of sarcoptic mange must be directed towards the destruction of all mites on the skin of pigs and in the environment (Walton, 1967). Spraying is the method of choice for applying acaricide in all except young pigs which may more readily be dipped (Sheahan, 1970). Sheahan (1970), Bennett (1975) and Linnet and Sorensen (1980) suggest that the efficiency of control measures depends on the adoption of a rigid routine involving the spraying of all sows prior to farrowing, spraying fattening houses. All pigs in a herd or house should be sprayed on the same day. Special care should be taken to spray into the ears of pigs and to the building, farrowing crates and other implements used on the pig farm.

* Porect - Beecham Animal Health, Brentford, Middx

It has been considered generally that thorough spraying of the animals with 0.125% benzene hexachloride and simultaneously spraying the stalls at half the concentration used on the animals, effectively reduces the incidence of mange. Repeated treatment 3 - 4 times at an interval of 9 - 15 days and special care taken to spray into the inner surface of the external ear are necessary. This method of treatment was successful in eradicating the mange and there was no side effect observed (Cobbett et al 1948; Alexander, 1949; Roberts 1953; Keller, Eckert and Trepp, 1972; Sheahan et al, 1974).

Two treatments with 0.1 per cent Amitraz aqueous emulsion applied as a spray or wash at an interval of 6 - 10 days showed a high acaricidal activity against sarcoptic mange in pigs. It is also suggested that to get effective control all animals should be sprayed on the same day in their pen and the floor and walls of the stall at the same time. The medicament is harmless to pigs of all ages but the farmer applying the treatment repeatedly may suffer from headaches, painful eyes and nausea, though of a minor nature (Griffith, 1975; Linnet et al, 1980; Johansson et al 1980). Some of the treatments against sarcoptic mange, recommended by different workers are presented in Table 1.

A solution containing chlorinated hydrocarbons or suitable organophosphorous compounds are equally effective against all stages of the parasites with the exception of the ovum. The complete life cycle from production of the ova to maturation of the adult stage is 10 to 15 days (Bennett, 1975). Accordingly treatment should be applied, to allow time for all the ova to hatch and for the new generation of mites to become susceptible. Walton (1967) recommended repeating the treatment twice at 7 to 10 days interval; Sheahan (1970) recommended spraying 2 or 3 times at 5 to 7 days interval; Johansson et al (1980)

recommended repeating the treatment at 10 days interval in longstanding chronic infestations when the skin is thickened and encrusted. Many of the authors recommended the use of a spray or dip to penetrate the manoe lesions and keep treated animals out of the sun and wind for a few hours to permit slow drying.

McPherson (1960) and Hewett et al (1982) have pointed out the difficulty of maintaining a mange free herd of pigs because of the presence of asymptomatic carriers and the result of treatment very much depends on the diligence of the pig man. 'Porect' (twenty per cent phosmet), by dermal absorption and strictly by systemic action, was shown to exert effective acaricidal activity against sarcoptic mange. It has sufficiently long activity in the skin tissue to kill those mites that develop from eggs following the initial treatment.

Table 1. Methods of treatment of sarcoptic mange in pigs

S/No.	Chemical	Concentration	Reference source	Directions for use	Effectiveness	Side effect
1	Chlordane*	0.25%	1; 4	Power spray up to 1-2 qt per head. Single spray treatment.	Destroys all mites; degree of control high but failed to eradicate.	No systemic disturbance or skin irritation.
2	Benzene hexachloride*	0.125%	2; 3	Dipping young pigs and scrubbing adults. Repeated after 14 day interval (including inside of ears)	Two applications eradicate.	No side effect but odour of insecticide detected up to 2 days
3	Alodan*	0.3% or 0.5%	5	Dipping (0.3%) & spraying (0.5%). Repeated 2nd and 3rd time within 10-14 days	Successfully controlled.	Harmless to pigs of all ages
4	Malathion#	1.0%	6	Scrubbing the adults and dipping piglets once only	Effective cure.	Not mentioned
5	Diazinon#	0.025%	7	Spraying animals 3-4 times at interval of 9-15 days; inner surface of external ear sprayed separately. Stalls sprayed at half concentration used on pigs	Mange was eradicated	No side effect
6	Lindane*	0.025%	4	,, , , , ,	,, , , , ,	No side effect but not to be used within 30 days of slaughter or on pigs before weaning
7	Benzyl benzoate emulsion	25.0%	8	Two applications	100% effective	No ill effect

8	Amitraz	0.1%	9;13;14	Spray or wash Repeated at 6-10 days interval. Housing should be sprayed on same day.	Controlled sub-clinical mange; was cured 95%	Farmer applying treatment reported headaches, painful eyes and nausea
9	Trichlorophan#	2.0%	11	Scrubbed & sprayed all over body; repeated 2-5 times at interval of 7-8 days	Effective	Personal suffering from irritation of mucous membrane
10	Alugan#	0.5%	11	" " " "	" "	" "
11	Ciodrin#	0.15%	10	Spraying twice at an interval of 10 days	Effectively reduced the incidence	No side effects non detectable residue in milk or meat
12	Rabond#	0.5%	10	" " " "	" "	" "
13	Ragadan#	0.075%	12	Spray up to 2 litres per head & 0.2 litres per sq. metre house area, 3 times at 2 weeks interval	No reinfection was detected up to slaughter (55-100 days)	Not mentioned
14	Ivermectin#	-	15	Oral administration of 300 & 500 μ g per kg body weight	100% control	Not mentioned
15	Cyhexatin	0.05%	16	0.7 litre spray or 1.5 litres brushed on body & repeated after 8 days	66% effective but difficult within the ear	Not mentioned
16	Forect#	20.0%	17	Pour-on along the back of the animal, 1ml per 10 kg bodyweight	Marked clinical improvement of skin condition	No side effect. Withdrawal period 28 days before slaughter

* Chlorinated hydrocarbon compound

Organo-phosphorous compound

Reference source for Table. 1

- | | |
|---------------------------------|-----------------------------------|
| 1. Spencer, 1948 | 2. Cobbett <u>et al</u> , 1948 |
| 3. Alexander, 1949 | 4. Roberts <u>et al</u> 1953 |
| 5. Behrens, 1958 | 6. Vegad <u>et al</u> , 1970 |
| 7. Keller <u>et al</u> , 1972 | 8. Manickam <u>et al</u> , 1974 |
| 9. Griffiths, 1975 | 10. Melbourne <u>et al</u> , 1976 |
| 11. Kamyszek, 1977 | 12. Ricken, 1978 |
| 13. Linnet <u>et al</u> , 1980 | 14. Johansson <u>et al</u> , 1980 |
| 15. Lee <u>et al</u> , 1980 | 16. Monastel, 1980 |
| 17. Hewett <u>et al</u> , 1982. | |

In addition to treatment of pigs with acaricides, it is necessary to eliminate nutritional, parasitic, bacterial, viral or environmental factors that might produce debility (Walton, 1967). Often the most economical approach is to cull chronically affected pigs and the remainder are thoroughly treated, particularly in the ears (Walton, 1967; Dobson and Cargill, 1979a). Any premises not used by pigs for at least a month should be safe, with respect to sarcoptic mange, without cleaning and disinfection (Bennett, 1975).

REFERENCES

- ALEXANDER, F.C. (1949) *Veterinary Record* 61, 707-708.
- ANON (1957) *Journal of American Veterinary Medicine Association* 130, 125.
- BAKER, E.W. and WHARTON, F.W. (1952) *An Introduction to Acaralogy*, 465. The MacMillan Co., N.Y.
- BEHRENS, H. (1958) *Deutsche tierarztliche Wochenschrift* 65, 204-206.
- BENNETT, D.G. (1975) External parasites In: *Diseases of Swine*. H.W. Dunne and A.W. Leman, Eds. Iowa State University Press, Ames, Iowa, U.S.A.
- BOGATAKO, W. (1974) *Medycyna Weterynaryjna* 30 (1), 38-39.
- CABBETT, N.G., PETERMAN, J.E. and BEAGLE, A.G. (1948) *Veterinary Medicine* 43, 407-409.
- CABBETT, N.G. (1956) *Animal Disease Yearbook of Agri. USDA*, 347.
- CARGILL, C.F. and DOBSON, K.G. (1979a) *Veterinary Record* 104 (1), 11-14.

- CARGILL, C.F. and DOBSON, K.J. (1979b) Epidemiology and Economic Consequence of Sarcoptic Mange in Pigs. In: Veterinary Epidemiology and Economics. Australian Government Publishing Service, Canberra.
- GRIFFITH, H.J. (1970) External parasites. In: Diseases of Swine. 3rd edition. H.W. Dunne, Ed. Iowa State University press, Ames, Iowa, U.S.A.
- GRIFFITH, H.J. (1975) Proceedings, Eight British Insecticide and Fungicide Conference, Droitwich, Worcester, U.K.
- HEWETT, G.R. and HEARD, W. (1982) Veterinary Record 111, 558.
- HEWETT, G.R. (1983) Veterinary Record 112, 112.
- IMES, M. (1920) Farmer's Bulletin No. 1085, 28.
- JOHANSSON, L.E., NILSSON, O. and OLEVALL, O. (1980) Nordisk Veterinaermedicin 32 (3/4) 161-164.
- KAMYSZEK, F. (1977) Medycyna Weterynaryjna 33 (6), 354-356.
- KELLER, H., ECKERT, J., TREPP, H.C. (1972) Schweizer Archiv fur Tierheilkunde 114, 573-582.
- LEAK, S.G.A. (1975) Thesis. Parasitic Mites of Farm Livestock and Incidence and Morphology of Sarcoptes scabiei var suis. University of Newcastle.
- LEF, R.P., DOOGE, D.J.D. and PRESTON, J.M. (1980) Veterinary Record 107 (22) 503-505.
- LINNET, A. and SORENSEN, H.J. (1980) Danish field trials. In: Proceedings of the International Pig Veterinary Society Congress, Copenhagen, Denmark.
- MAGEE, J.C. (1974) Dissertation Abstracts International 358, 2240. Iowa State University.,
- MANICKAM, R., KATHAPERUMAL, V. (1974) Kerala Journal of Veterinary Science 5 (2) 150-153.
- McPHERSON, E.A. (1960) Veterinary Record 72, 869-870.
- MELBOURNE, C.P. and JACOBS, D.E. (1976) A Shell Animal Health Reprint, AHR/ECT/ 22 January, 1976.
- MIKHALOCHKIM, E.I. (1975) Uchenye Zapiski Vitebskago Veterinernogo Institue 28, 179-180.

- MONESTEL, M. (1980) These. Ecole National Veterinaire d'Alfort, 82.
- PULLAR, E.M. (1941) Journal of the Department of Agriculture, Victoria. 39, 99.
- RADCLEFF, R.D., WOODARK, G.T. (1957) Journal of the American Veterinary Medicine Association 130, 215-216.
- REIKEN, J.M. (1978) Inaugural Dissertation. Tierarztliche Hochschule, Hannover. 87.
- ROBERTS, T.H., ROGOFF, W.M. (1953); Journal of the American Veterinary Medicine Association 123, 227-233.
- SEDDON, H.R. (1951) Commonwealth of Australia Department of Health Service Publication 7, 147.
- SHEAHAN, B.J. (1970); Irish Veterinary Journal 24, 201.
- SHEAHAN, B.J. (1974); Veterinary Record 94, 207-209.
- SHEAHAN, B.J. O'CONNOR, P.J. and KELLY, E.P. (1974) Veterinary Record 95, 168-170.
- SOULSBY, E.J.L. (1982) Helminths, Arthropods and Protozoa of Domesticated Animals. 7th edition. Bailliere Tindall, London.
- SPENCER, W.T. (1948) Journal of the American Veterinary Medicine Association 113, 153.
- VEGAD, J.W., DHODAPKAR, B.S. and PARKER H.K.B. (1970) Indian Veterinary Journal 47, 277-278.
- WALTON, G.S. (1967) Veterinary Record 80 (9) 11. Clinical Supplement.

A GOOD FAMILY FROM GOOD HOME

Every day that your pullets sit around waiting to start laying costs you money.

So there's a lot to be said for an egg that makes its appearance at eighteen weeks instead of the usual twenty-one or even twenty-four weeks.

With feed costs as high as they are, a saving of three weeks' feed (Say NC. Rs 15 per pullet) speaks for itself.

How do you get an eighteen week (and sizeable) egg? You buy a CLIFTON PULLET. The CP Brown for brown eggs.

With its unique early sexual maturity, the Clifton pullet will give you a head start in the profitability stakes.

So if feed costs and a sluggish market are getting you down, think about the eighteen-week egg. It could keep you in business.

CONTACT:- **NIMA POULTRY FARM**
GHA 1/889
CHABAHIL TUSAL
KATHMANDU, NEPAL
TEL:- 410747
TLX NO. 2317 ATLAS NP