

TO OUR CONTRIBUTORS

1. THE INDIAN VETERINARY JOURNAL is intended for the publication of papers on Original work, General and Clinical articles, Extracts, Reviews, Association News and other cognate matters pertaining to animal health and disease and the progress of Veterinary Science and the profession in general. The Editor, in his work of assessing papers received for publication, is assisted in an honorary capacity by a large number of Scientists working in various parts of India.
2. Papers are accepted for publication on the understanding that they have neither been published before nor are being considered for publication elsewhere.
3. Matter for publication should always be typed and sent in duplicate. The type-scripts should be on one side of the paper only with double spacing and one inch margin on the left side. They should be sent after careful revision and correction and without over-writings. Otherwise they are liable to be not considered.
4. Names of authors should be followed by their academic qualifications. Their official address or otherwise should also be stated to enable correspondents to communicate with them direct if they so desire.
5. The papers must be concise and not unnecessarily elaborate. To achieve this object extensive summaries of all available literature with numerous references should be avoided, wherever possible. *The bulk of the paper should record the actual work done by the author or authors.* If papers submitted are considered to be of excessive length, they may be returned to the authors for necessary reduction and re-submission. Papers are accepted subject to the right of minor editorial revision, if considered necessary. No reasons will be given in cases of non-acceptance of articles.
6. A copy of the page-proof will be sent to the author, only in cases where it is found necessary and it should be returned without delay, duly corrected. Extensive changes in the matter are not permissible at that stage.
7. Order for extra reprints should be placed at the time of the initial submission of the paper. Otherwise only the usual number of complimentary reprints viz. 10 will be sent to each author up to a maximum of thirty, irrespective of the number of authors over three.
8. Drawings and diagrams should be in Indian Ink on stout white drawing paper or on Bristol board.
9. A small number of blocks illustrating articles are normally paid for by the Journal; but the authors may however be required to pay the entire cost of blocks if they are far too many for a single article. Half-tone photographs should be included only when they are found essential and they should be on glossy paper, bringing out the differences clearly.
10. The number and size of tables, charts and plates should be strictly restricted as the cost of publication is mounting up every day. Coloured plates will not be reproduced, except under exceptional circumstances or when the author is willing to bear the entire cost.
11. Publication of group photographs of some news-value to the profession and of individuals will be undertaken only if space permits and the cost of blocks in such cases will be thankfully received from parties concerned.
12. Abbreviations and mode of references to Authors, years and journals should be on the model normally adopted in all international publications.

Note:—We request our Contributors to help us by observing the above rules, and they will then be facilitating early publication of their articles.

Vol. 35

September, 1958

No. 9

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION]

PUBLISHED MONTHLY

★

A Monthly Record of Veterinary Science
Devoted to the cause of the
Veterinary Profession

★

EDITOR

Rao Sahib T. VINAYAKA MUDALIAR, G.M.V.C.

Office:—23, First Street, Vidyodaya East, T'Nagar, AD 11
Madras-17, (S. India)

✱

All communications should be addressed to the Editor.

Advertisements should be in the hands of the Editor on or before the 15th of the previous month.

Subscription payable in advance	{	Rs. 8.00 per annum to Members of profession.
		Rs. 12.00 per annum to Government and all public institutions. Single copy Rs. 2.00.
		Foreign: 25sh. per annum. Single copy 3s. 6d.

Members who do not receive the Journal regularly or who find it wrongly addressed are requested to communicate their correct address to the Editor at once. Non-receipt of a particular issue should be intimated before the close of that month.

ADVERTISEMENTS

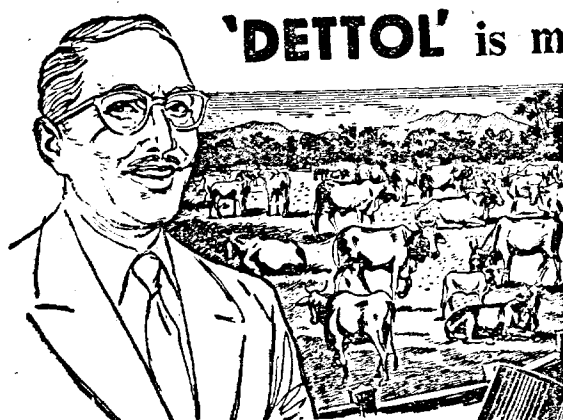
SOME OUTSTANDING BOOKS ON VETERINARY SCIENCE

HENNING : Animal Diseases in South Africa, 3rd Revised & Enlarged Edition.
ROBERTS : Veterinary Obstetrics & Genital Diseases.
BRANDLY & JUNGHERR : Advances in Veterinary Science,
Vol. I - 1953
Vol. II - 1955
Vol. III - 1957
57 AUTHORS Diseases of Cattle - 1956.
MONNIG : Veterinary Helminthology & Entomology - 1956
LAPAGE : Veterinary Parasitology - 1956



For lists and further particulars please write to :

VETERINARY BOOK DEPARTMENT
BRITISH BOOK DEPOT,
84, HAZRATGANJ, LUCKNOW, (U.P.)



'DETTOL' is my best assistant

Thousands of tons of milk and thousands of head of cattle are lost in India through infection—Mastitis, contagious abortion—and primitive post partum protection. To combat this, veterinarians are holding 'classes' to teach farmers the methods of prevention.

In all phases of prevention 'Dettol' Antiseptic is extensively used in India. No wonder the veterinarian says, "My best assistant is Dettol".

'DETTOL'
The antiseptic
doctors use

Atlantic (East) Limited
(Incorporated in England)



AEL 697

'Dettol' helps the veterinarian to fight sepsis. As an antiseptic 'Dettol' leads the field. Safe, non-poisonous, pleasant to use and long-lasting in effect, it prevents all kinds of external infection. Whether he is treating a cow for a small wound or during parturition the veterinarian knows that 'Dettol' is the best protection against germs.

DVI-4

When writing to advertisers, please mention *The Indian Veterinary Journal*.

ADVERTISEMENTS

A drug of established uses



The properties of this drug have considerable clinical significance and it has been adequately established that chlorpromazine is a sedative of a unique type, a potent anti-emetic, and a premedicant which enhances the quality of anaesthesia.

'Largacil' may be used in both large and small animals.

PRESENTATIONS

1% solution 10 x 5 c.c. ampoules
2.5% solution 10 x 2 c.c. ampoules
10 mgm. tablets in containers of 50
25 mgm. tablets in containers of 50 and 500

Detailed literature is available on request

AN M&B BRAND VETERINARY PRODUCT
To the profession only



MANUFACTURED BY
MAY & BAKER LTD

DISTRIBUTORS

MAY & BAKER (INDIA) PRIVATE LTD - BOMBAY - CALCUTTA - GAUHATI - MADRAS - NEW DELHI

VAS76-161

When writing to advertisers, please mention *The Indian Veterinary Journal*.

ADVERTISEMENTS

VETERINARY BOOKS

FRANCIS: Tuberculosis in Man & Animals: a comparative Pathology 1958 ...	105 sh.
MARTINDALE: Extra Pharmacopea 1958 Vol. I New Ed. ...	65 sh.
LAING: Fertility & Infertility in Domestic Animals 1956 ...	35 sh.
MILLER: Infertility & Artificial Insemination 1952 ...	25 sh.
WIRTH: Veterinary Clinical Diagnosis 1956 ...	25 sh.
ANTHONY: Diseases of Pig 1955 ...	25 sh.
UDALL: Practice of Veterinary Medicine ...	65 sh.
MERCK: Veterinary Manual thumb Index ...	\$7.50
BOYD: Pathology for the Physicians 1958 ...	\$17.50
FAUST: Clinical Parasitology 1957 ...	\$15.00
LEVINSON: Clinical Laboratory Diagnosis 1956 ...	\$12.50
SIMONS: Medical & Public Health Laboratory Methods 1955 ...	\$18.50
PATTEN: Fundamentals of Embryology 1958 ...	\$9.50
SOFFER: Diseases of Endocrinology 1956 ...	Rs. 82.50
CARD: Diseases & Parasites of Poultry 1958 ...	\$5.00
MOORE: Science & Practice in cropping for Meat & Milk ...	Rs. 14.00
Poultry Hand Book by Poultry World 1958 ...	32/6d.

OUR VETERINARY PUBLICATIONS

CHAUDHURI: Practical Dairy Science & Laboratory Methods 1958—New about	Rs. 10.00
MUKHERJEE: Veterinary Bacteriology 1956	Rs. 12.50

For Veterinary Books of all branches, please write to:

SCIENTIFIC BOOK AGENCY

103, Netaji Subhas Road, Post Box No. 239
CALCUTTA, 1. (India)

ANTIMOSAN

A PARENTERAL ANTIMONY PREPARATION OF EXCELLENT TOLERANCE.
SPECIFIC IN BOVINE SCHISTOSOMIASIS.

also indicated in:
hamorrhagic filariasis in horses, lungworm in cattle, sheep and goats
and dirofilariasis in dogs.

Bottles of 500 cc. Boxes of 5 amps. of 50 cc.

NAGANOL

THE RENOWNED REMEDY FOR SURRA.

According to researchers in Indonesia, where the field conditions are similar to those in India, for surra prophylaxis, Naganol can be administered intramuscularly, combined with hyaluronidase. Thus applied, the curative and prophylactic action of Naganol remains unaffected.

Bottles of approx. 14 g., 28 g., and 100 g.



"Bayer"

Leverkusen, Germany

Sole Importers in India:

(Chowgule & Co., (Hind) Private Ltd.

P.O. Box 1478, Bombay-1.

BRANCHES:

P.O. Box 8943, Calcutta-13. P.O. Box 3738, Madras-2.

When writing to advertisers, please mention *The Indian Veterinary Journal*.

The Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. 35

SEPTEMBER, 1958

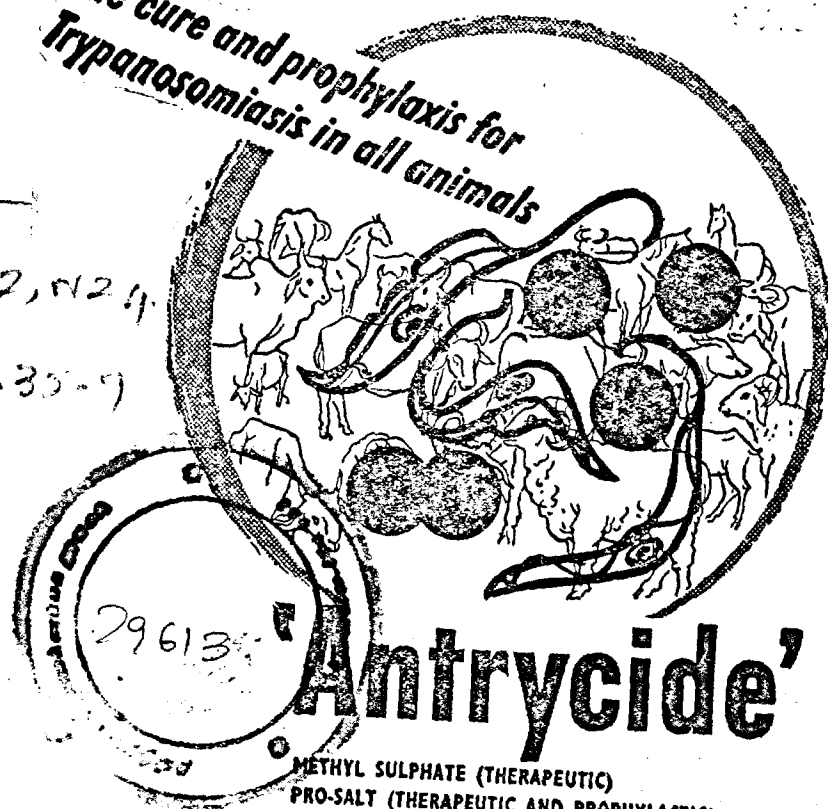
No. 9

CONTENTS

	PAGE
I. Editorial	
Veterinary Associations and Government Recognition ...	E-29
The Veterinary Council ...	E-31
II. General Articles	
The Anatomy of the Foetal Indian Elephant. Part IX.—The histology of certain organs.—By D. Mariappa ...	433
Therapeutic Trials Involving the Effect of 1-Diethylcarbamyl -4-Methyl-Piperazine Dihydrogen Citrate For Treatment of Eye Worm (Filaria Oculi) of Horses.—By Chusaburo Shoho, F. Darrel Ferdinando and K. Kumarasamy ...	443
Further studies on Freeze dried Rinderpest Goat tissue vaccine.—By S. Shanmugham ...	452
Weight of different organs in relation to body weight in Indian Goats.—By M. L. Kalia. ...	468
Studies on Pneumococcosis in domestic animals. Isolation of <i>Streptococcus Pneumoniae</i> from Pneumonic lungs of Sheep and Goats.—M. R. Dhanda and P. Chandrasekariah ...	473
III. Clinical Articles	
Laparo-Cystotomy in a horse.—By M. N. Menon and U. Mohanlingham ...	482
IV. Abstracts	
An outbreak of Rinderpest involving Cattle and Sheep ...	486
Clostridial Enteritis in Cattle ...	487
V. News and Views	488
VI. Block Development Corner	
The Cow versus the Buffalo.—By T. Vinayaka Mudaliar ...	490
I.C.A.R. News Release ...	492
VII. Association News	
The All-India Veterinary Association—The I. V. J. Reserve Fund ...	492
The Mysore Veterinary Medical Association—Silver Jubilee Celebrations of the Mysore Serum Institute and the 13th A.I.V. Conference. ...	494
The Bihar Veterinary Association ...	494
The M. P. Veterinary Association—B.V.Sc. Examination Result May 1958 ...	499
Veterinary Students' Association—Proceedings of the 4th Conference ...	499

ADVERTISEMENTS

the cure and prophylaxis for
Trypanosomiasis in all animals



METHYL SULPHATE (THERAPEUTIC)
PRO-SALT (THERAPEUTIC AND PROPHYLACTIC)

Since its discovery in the I. C. I. Research Laboratories the use of 'Antrycide' has steadily expanded in many parts of the world. It is now available for the prophylaxis and treatment of Asian trypanosomiasis ('Surra') in animals due to *Trypanosoma evansi* by means of a single subcutaneous injection. No adverse systemic effects are likely to follow the injection of the recommended dosage. 'Antrycide' is thus easy to use and superior to drugs previously employed in the control of animal trypanosomiasis, the curative doses of which were liable to produce serious toxic effects.

METHYL SULPHATE: Containers of 1 Gm. in boxes of 100.
PRO-SALT: Containers of 3 Gm. and 35 Gm.

IMPERIAL CHEMICAL INDUSTRIES (INDIA) PRIVATE LTD.
Calcutta Bombay Madras New Delhi

Sole Distributors in India for
IMPERIAL CHEMICAL INDUSTRIES LIMITED, PHARMACEUTICALS DIVISION
WILMSLOW, CHESHIRE, ENGLAND

ICI SIG

When writing to advertisers, please mention *The Indian Veterinary Journal*.

THE Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. 35

SEPTEMBER, 1958

No. 9

Editorial

VETERINARY ASSOCIATIONS AND GOVERNMENT RECOGNITION

Eleven long years have rolled on, since the much coveted independence had dawned on India. But yet the old association of ideas of pre-independence days is still there. The rulers and the ruled being one and the same now, with interests of both rooted in the country, there can be no question of one exploiting the other or the latter subverting the former, for any reason whatsoever.

Foreign rulers never liked the idea of any class of people coming together and forming themselves into an association, even if it be in pursuit of science. They felt they were there to dole out even science and as such there was no need for the ruled to combine and congregate. Several were the obstacles placed in the way of such associations. But yet causes rooted in justice and fair-play never get smothered so easily. These associations continued to live, may be in a state of suspended animation, but yet they lived.

Now circumstances have changed. The clarion call of the leaders to every individual to do his best and nothing short of his best, in his own field of work, has had its repercussions and it is no wonder therefore that the Veterinary Profession in India is pulsating with this new life. What then could be more reasonable, nay, more conducive to national interests than the formation of professional associations in every State. Opportunities for higher scientific work are knocking at our door and our budding scientists are itching to meet and compare notes with other workers in similar fields of work. Prudence suggests that this tendency should be fostered and encouraged, if for nothing else, at least on grounds of national interest. There should be no room for suspicion. Every one should act in such a way that he commands the confidence and respect of others in the profession.

Thus we notice that the several Veterinary Associations in different States are showing signs of revival and rejuvenation and it is up to the elder members of the profession who are at the helm of affairs to take up the reins and guide these Associations on right lines. Lack of such sympathy on their part will only damp the feelings of the members of the profession. In turn the rank and file of the profession should behave with greatest possible decorum at all meetings of such Associations. Hard words break no bones. Moderation, persuasion and patience should be the high lights of all their discussions. These Associations should be *primarily* intended for discussion of professional subjects where all ranks of the profession could meet without any embarrassment. Only broad policies and programme for national development in our own field of work, should be the ambit of discussion at such meetings. The bone of contention is the so-called "Service questions" or to be more explicit "Pay and prospects" of the men in service. They are best left to be discussed in person 'off the record' with departmental officers and Government personnel. In certain States they have "Service Associations" which tackle these questions. In any case it is up to every member of the profession, to build up a powerful scientific body in every State and seek the recognition of the Government which should not be difficult to obtain. After all, what does this much discussed 'recognition' mean? It is merely an understanding that the Government would consider the proposals emanating from such a recognised body. It is open to them to accept or reject such proposals and as such the Government need not be unnecessarily touchy on this matter. To foster science in our land, such happy augury is necessary—such patronage and such sympathy. And those who work against such a consummation of events, are definitely acting against the interests of this great land of Bharath.

Let the profession in every State rise up from its lethargy, shed its fear-complex, realise its greatness as a scientific body and try to do its duty by the country. The rest will follow as day follows night.

Hallo!

Have you sent in your Contribution to the I. V. J. Reserve Fund?
It is to serve you better and for ever! Pay then and Prosper!

THE VETERINARY COUNCIL

The Executive Committee of the Interim Indian Veterinary Council met at Calcutta on the 18th and 19th July 1958 to prepare a model bill and the necessary rules and regulations thereunder, for the establishment of Veterinary Councils in the different States. The Directors of Uttar Pradesh, Madras, West Bengal and Madhya Pradesh were either present or represented by their deputies, by special invitation. Dr. S. Datta was also present by invitation.

The Committee took up for consideration the various Acts and the draft bills so far prepared by several States. They went clause by clause of the U. P. Veterinary Council Act, 1947, the Bombay Veterinary Practitioners Act, 1953, the Madras Registration of Veterinary Practitioners Act, 1957, the draft bills of Bihar, Madhya Pradesh and West Bengal. Next the Committee took up the preparation of a model bill and a rough draft was agreed upon. This will be placed before the next meeting of the Interim Indian Veterinary Council for its approval. The remaining States which have not yet moved in the matter, would do well to take up immediately drafting of their own bills. They have enough material before them from States like U. P., Bombay and Madras. Probably by the time they finalise their draft bills, the model bill may be before them. There may not be many changes to make. We suggest this because it is nearly four years now since the Interim Indian Veterinary Council came into existence and it has not yet found its statutory status. When all the States establish their statutory Councils, it would be easy for the Central Government to place the Indian Veterinary Council on a statutory basis. So let the States be up and doing and hasten the day of culmination of our desires in this direction.

THE I. V. J. RESERVE FUND

Every brick in an edifice counts.
Let us have your Contribution, please!

ADVERTISEMENTS

A BRAND THAT NEVER WEARS BRANDING WITHOUT HEAT

BRANDELUX

(DEVELOPED BY SHRI H. S. VAIDYA)

*A Scientific Chemical Compound for Branding Cattle,
Horses and Sheep with a Cold Branding Iron.*

THE MODERN BRANDELUX WAY

Compounded scientifically, according to the original formula, Brandelux is no new comer to the field of modern Branding. Thousands of Dairymen have found it the ideal way to Brand their Stock. Enough Brandelux has been sold to Rinderpest Schemes in India, for which it has proved indispensable. It is time tested, practical and economical.

1. For the best results always follow these simple but important Directions.
 - (a) Prepare site of Brand by brushing to remove dirt; or if necessary, clipping extremely long hair to permit the fluid to contact the hide.
 - (b) Stir Brandelux thoroughly to the bottom of the container each time before pouring.
 - (c) Pour out a layer of Brandelux not over $\frac{1}{2}$ inch deep into a shallow pan dish. Dip Branding Iron into the liquid taking care that the face of the iron is well covered.
 - (d) Remove Iron from liquid, allowing excess to drip back into the pan, and scrape any excess liquid from the sides of the iron if covered.
 - (e) Press iron firmly against animal, holding it in place long enough to ensure a complete impression. In the case of wide irons, a slightly rocking motion from left to right and top to bottom is advisable. Always re-dip the iron between each brand.

ADVANTAGES

1. The number comes out distinctly in about five minutes after application.
2. No after-care since the scab that forms peels off leaving a fine brand mark of a lasting nature.
3. Economical — with a lb. of material over 400 brand marks can be obtained.
4. Does not perforate or spoil the hide in any way.
5. Least painful to the animals.

Cirurgia De Lux Private Limited

Head Office:

24, CHOWRINGHEE ROAD,

CALCUTTA - 13.

(PHONE : 23 - 5552)

Branch Office:

Bombay Mutual Annexe Building,

17, GUNBOW STREET,

FORT, BOMBAY - 1.

(PHONE : 26 - 3802)

Telegrams : "SURGIQUIP"

When writing to advertisers, please mention *The Indian Veterinary Journal*.

General Articles

THE ANATOMY OF THE FOETAL INDIAN ELEPHANT

Part IX The Histology of Certain Organs

By

D. MARIAPPA, G.M.V.C.,

Professor of Anatomy, Madras Veterinary College.

Introduction

Home (1799) has studied the structure of the teeth of the elephant. Eales (1925) has reported on the structure of the skin and temporal gland of the foetal African elephant. Wislocki (1939) has studied the structure of the hypophysis of an adult Indian elephant. Weatherford (1940) has made some observations on tusks of Indian elephant and innervation of their pulp. Grafflin, Allan (1942) has studied the histology of kidney, thyroid and parotid gland of the Indian elephant. Ijiri *et al* (1948) have studied the microscopic structure of teeth of proboscidea. Bourne (1949) cites Kolmer (1918) and Kohno (1925) and their studies on the adrenals of the Indian elephant. Ayer and Mariappa (1950) have reported on the histology of the skin, temporal gland and nipple of the foetal Indian elephant. The present author (1955) has reported on the histology of the skin and mammary gland of this specimen.

Thus, the few references cited above will indicate the great difficulty in obtaining tissues of the elephant considered suitable for histological study. It is usual to hear the news of the death of an elephant some time after the event and several hours are lost in moving the carcass to a convenient place for any one to start his investigation. Several previous workers had to contend working on partly decomposed material that permitted only the study of details of gross anatomy. The tissues of the present specimen were fixed thirty hours after the death of the foetus. Some of them—skin, pancreas, kidney, oviduct, thymus, adrenals, thyroid, liver, lymph and haemolymph glands have been fairly well fixed; some others though showing slight putrefactive changes, did permit proper interpretation; and the brain and organs of the digestive system were unfit for histological work. The microphotographs of only those tissues properly fixed are given.

1. Lymph and Haemolymph Glands

Haemolymph glands have the same structure as the glands of the ruminants and are found in different parts of the body. Lymphatics and lymph glands in the elephant are confined to the mesentery.

Lymph glands are small and few placed along the lymphatics, and their structure is similar to the glands of other animals.

2. Thymus (Fig. 1)

In structure, it resembles the gland of other animals but differs in some respects. Lymphocytes in the medulla also are densely packed unlike in other animals where they are less numerous. The concentric corpuscles of Hassall are small, each consisting of a large nucleated central cell with acidophil cytoplasm. The nucleus of the cell is large, vesicular and pale. Spindle shaped cells arranged concentrically round the central cell as seen in man are totally absent and are replaced by thin concentrically arranged laminae and lymphocytes.

3. Spleen (Fig. 2)

The capsule and trabeculae are thick and rich in plain muscle fibres. Malpighian corpuscles (white pulp) are very small and few in number. The red pulp has all the cellular elements of blood indicating active hemopoiesis.

4. Parotid Salivary Gland

It is a racemose gland of the serous, type; alveoli, ducts and their epithelium resemble those of other animals in their structure and staining affinity.

5. Submaxillary Salivary Gland

It is a racemose gland of mixed type, the mucous alveoli with the demilunes or crescents of Gianuzzi preponderate over serous alveoli. Alveoli, ducts and their epithelium resemble those of other animals in structure and staining affinity.

6. Sublingual Salivary Gland

It is represented by a sickle shaped mass of *brown fat tissue* which appears lobulated and glandular to the naked eye. Such mass in rats and other rodents is called *hibernating gland*.

7. Buccal Glands

They are glands of pure mucous type.

8. Oesophagus (Fig. 3)

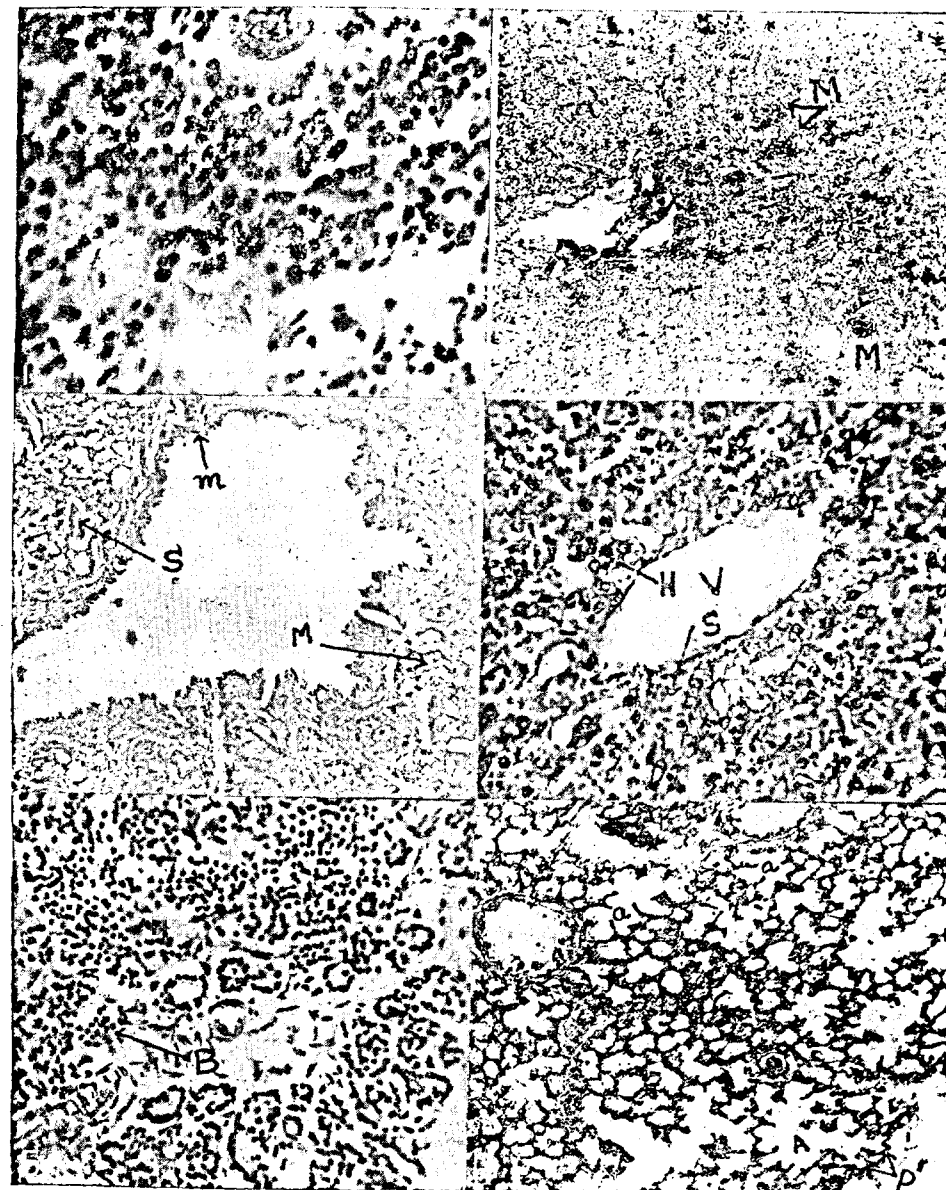
The muscular coat consists of skeletal muscle throughout, the fibres being arranged in two layers—an outer longitudinal and an inner thick circular layer. Oesophageal glands of the submucous coat are more numerous. In all other animals, the mucous glands are more numerous and the serous glands are very few. But in the elephant, the condition is reversed, the serous glands greatly outnumber the mucous glands and even extend into the muscular coat. The secretion of

The Anatomy of the Foetal Indian Elephant

Part IX: The Histology of Certain Organs

By

D. MARIAPPA, G.M.V.C.,

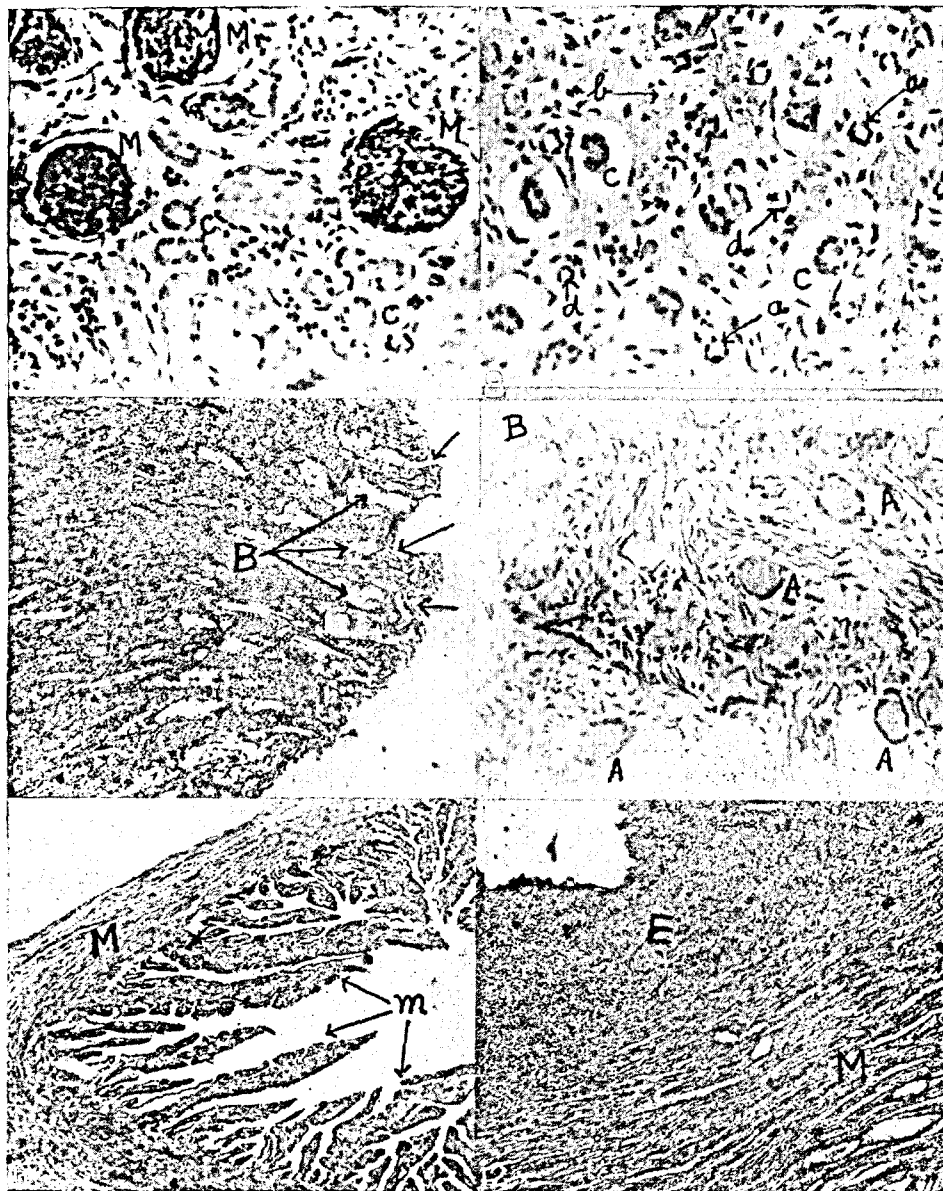


The Anatomy of the Foetal Indian Elephant

Part IX: The Histology of Certain Organs

By

D. MARIAPPA, G.M.V.C.,



oesophageal glands thus is more serous and watery, which should be a great advantage in dealing with food that is entirely fibrous. The mucous membrane is lined by stratified squamous epithelium and is thrown into folds that obliterate the lumen. Epithelium is partly denuded.

9. Liver (Fig. 4)

Liver has a thick fibroserous capsule and resembles the liver of all mammals except the pig in having a poorly developed Glisson's capsule and thus the outlines of hepatic lobules are indistinct. The hepatic sinusoids are engorged with blood elements indicating active hemopoiesis. Hepatic cells are large and polygonal, forming cords radially arranged round the central vein. Each hepatic cord in section (longitudinal) is two cells thick and in the deeper plane has another three chains of cells, so that, each cord is made up of five chains of cells. Transections of hepatic cords, thus exhibit five cells, which form the bile capillary as in the viper (and pig probably). Structures of the portal canals are similar to those of other animals.

10. Pancreas (Fig. 5)

The structure of the foetal pancreas is distinctly different from that of the functionally active organ. The alveoli are round and the alveolar epithelium takes only the eosin stain. The bipolar staining of alveolar epithelium—the basal ends of the cells taking the basic stain and the central ends of the cells taking the acid stain which is so characteristic of the functional pancreas is totally absent. Similarly the islets of Langerhans are a mass of densely arranged and deeply stained cells—detached buds. In the functional pancreas, the cells of the islet are pale, lightly stained and they show granules in their cytoplasm having affinity for different kinds of stains.

11. Lung (Fig. 6)

The pulmonary lobules are distinctly marked by the abundance of interlobular tissue. The bronchial tree of the foetal lung has passed the stage of glandular type and is nearly identical with that of the respiratory type; as the foetus has already passed beyond the midterm gestation (12 months). The pulmonary alveoli, air sacs, atria, alveolar ducts and bronchioles are slightly smaller than the corresponding structures of the respiratory lung.

12. Kidney (Figs. 7, 8, 9)

The cortex and medulla with the different parts of urineferous tubules and their lining epithelium are identical with those of other mammals in their structure and staining affinity. The ducts of Billini open on the summits of the renal papillae which are embraced by the

calyces minores. The collecting tubules in the medulla by their size and the character of their lining epithelium stand out more prominently among the descending and ascending limbs of Henle which nearly alternate with arteriole rectae.

13. Ovary (Fig. 10)

The cortex is very narrow and is densely packed with spindle shaped elements among which are numerous primary Graafian follicles and a few growing follicles. The free surface of the cortex is covered by the *germinal epithelium* of cubical cells. The medulla forms the bulk of the gland and consists of loose connective tissue and a mass of contorted blood vessels.

14. Oviduct (Fig. 11)

The muscular coat consists of plain muscle fibres, majority of them being circular and a few outside run longitudinally. The mucous folds are numerous, occlude the lumen and consist of primary and secondary folds only which are lined by ciliated epithelium.

15. Uterus (horn) (Fig. 12)

The myometrium consists of an outer longitudinal and an inner circular layer of plain muscle fibres. The lamina propria is very thick and forms broad ridges which are lined by ciliated epithelium that is desquamated. There are no uterine glands in the mucous membrane.

16. Vagina (Fig. 13)

In the fibromuscular coat, the plain muscle fibres form a few bundles circularly disposed. The mucous membrane shows broad round ridges and the lining stratified squamous epithelium is completely denuded.

17. Glans Clitoris (Figs. 14, 15)

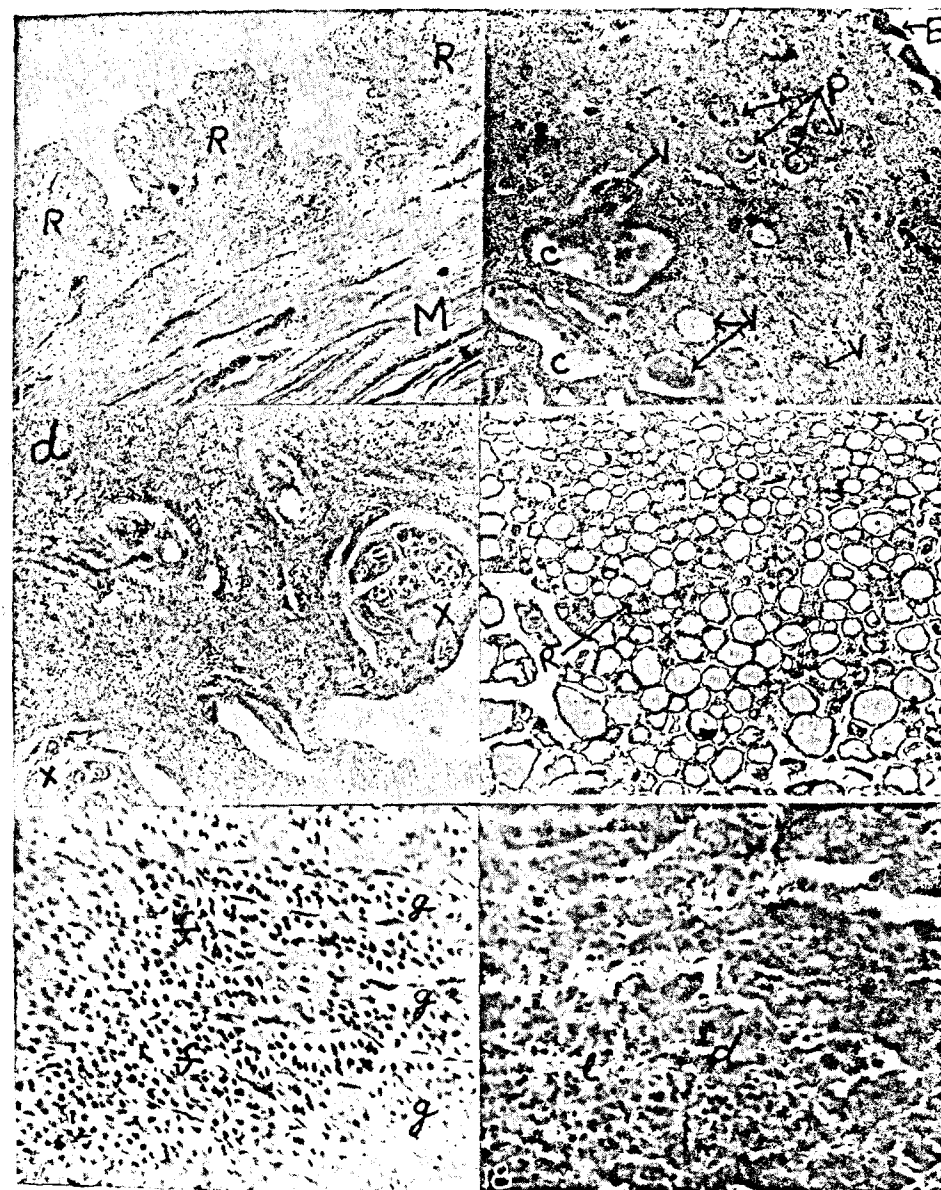
The free surface of the glans is lined by stratified squamous epithelium which descends into the urethral groove. The subepithelial layer is a highly vascular dense connective tissue which forms below the epithelium, numerous small conical papillae containing *tactile corpuscles*. In the deeper part of the subepithelial layer, are numerous *pacinian corpuscles*. Below the subepithelial layer, the bulk of the mass is cavernous tissue with numerous large cavernous spaces lined by endothelium. In the walls of the cavernous spaces are found groups of *round laminated bodies*. Their exact nature is not known, but they bear some resemblance to the muscle spindles and may be some kind of nervomuscular endorgans. In the centre of the cavernous tissue is an oval mass of dense tissue full of blood vessels and devoid of any cavernous spaces. The cavernous tissue contains elastic and plain muscle fibres.

The Anatomy of the Foetal Indian Elephant

Part IX: The Histology of Certain Organs

BY

D. MARIAPPA, G.M.V.C.,

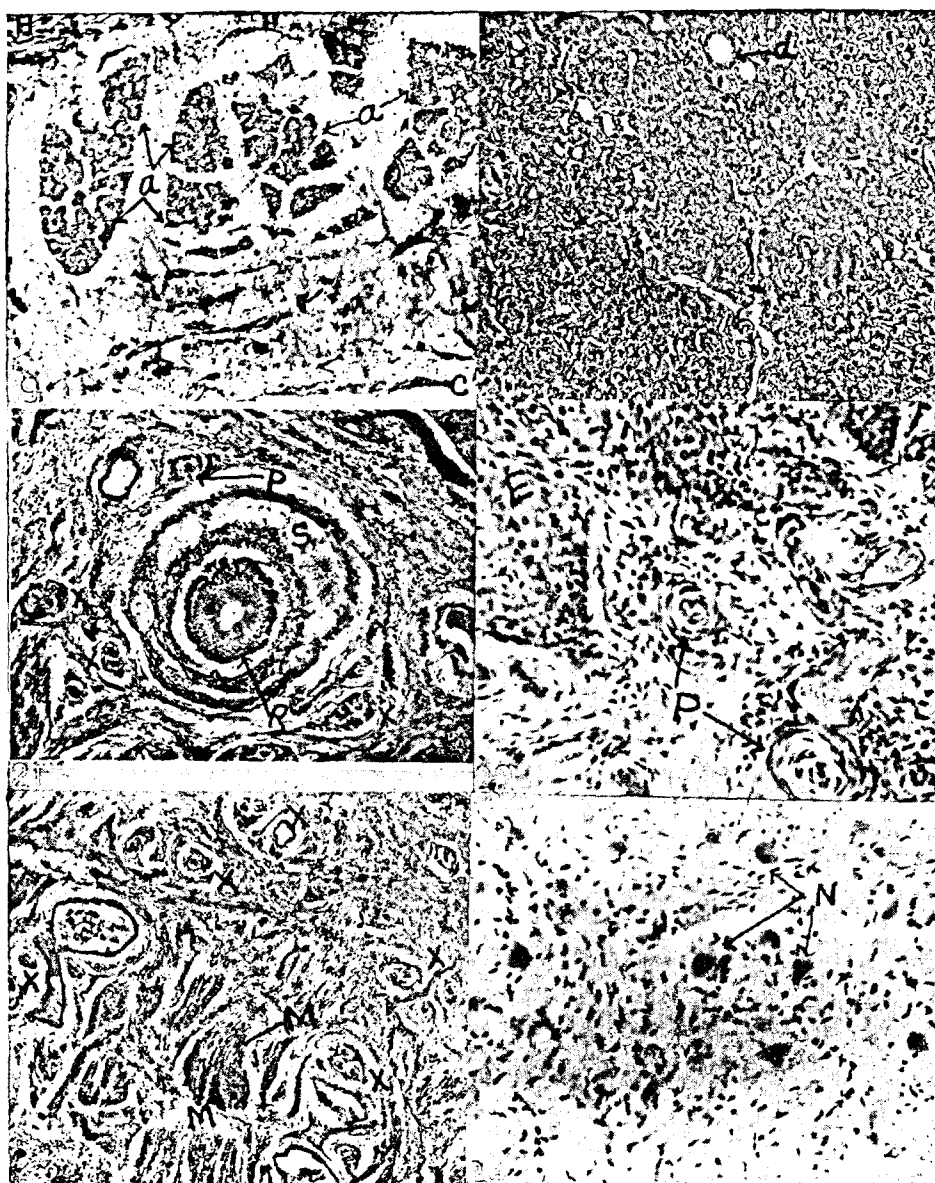


The Anatomy of the Foetal Indian Elephant

Part IX: The Histology of Certain Organs

By

D. MARIAPPA, G.M.V.C.,



18. Thyroid (Fig. 16)

The structure and staining affinity of the thyroid tissue resemble those of other animals. Thyroid vesicles are of various sizes containing colloid and between the vesicles are found masses of reserve tissue. The lining epithelium of the vesicles is cuboidal and their cytoplasm is basophile as also the colloid.

19. Adrenal (Fig. 17, 18)

The gland has a thick fibromuscular capsule. Zona glomerulosa of the cortex is very wide with arched columns of columnar cells arranged in four tiers. Zona fasciculata is the largest zone of the cortex with long columns of polyhedral cells whose cytoplasm is acidophil and free from lipoids which are elaborated in the gland of the adult (functional). Zona reticularis is very narrow and merges imperceptibly with the medulla which is larger than the cortex and forms the bulk of the gland. The cells of zona reticularis are of two kinds—"light cells" and "dark cells", the latter being in majority. In the medulla there is a large central vein and numerous sinusoids all round, which are surrounded by long columns of chromophil cells whose cytoplasm is basophile.

20. Harderian Gland (Fig. 19)

It is a large racemose gland with saccular alveoli. The alveolar epithelial cells have small spherical nuclei situated at the basal ends of cells and their cytoplasm is basophile exhibiting a syncytium. It produces a watery secretion like the harderian gland of horse and other animals.

21. Temporal Gland (Fig. 20)

It is a racemose gland with large saccular alveoli lined by one layer of cubical cells. The ducts are lined by double layer of cubical cells and as the ducts increase in size the epithelium becomes stratified so that the main duct has a multilayered epithelium of several layers deep. This is a cutaneous gland functionally associated with the sex glands. The gland is well developed in the male, so that, its outline can be marked on the skin even in the smallest foetus. The gland is less developed in the female and it is not possible to mark its outline in the present foetus which is aged 12 months. The gland is very active during the rutting season of the male and produces a thick, viscid, brown secretion that oozes out of the temporal vent of the duct. The nature of the secretion and the structure of the epithelium indicates that it is an *apocrine gland*.

Eales (1925) has reported that the tubules of the gland are lined by a double layer of epithelium. Ayer and Mariappa (1950) have reported a double layered epithelium lining the alveoli of the gland. It is

evident now that what were observed by them as alveoli, and tubules by Eales are only ducts—the ductular system only having been developed at the early stage.

Prehensile Finger of Proboscis (Figs. 21, 22, 23)

A transection of the prehensile finger shows the skin forming a covering all round and enclosing a dense core of connective tissue with bundles of skeletal muscle projected into it from the muscles of the proboscis. The epidermis is well developed with all its layers differentiated as in the skin of the tip of the tail. The dermis forms numerous conical papillae under the epidermis. Several dermal papillae contain small *tactile corpuscles* and others contain vascular buds. In the deeper part of dermis are found numerous *pacinian corpuscles* in groups. There are ordinary and *tactile hairs* (sinus hairs) implanted in the dermis. The blood sinus is of an interrupted type round the root of the hair as in ox and horse. Pacinian corpuscles are in close relation to the blood sinus of the tactile hairs. Numerous groups of *round laminated bodies* in relation to the bundles of skeletal muscle in the core are noticed. They bear some resemblance to the muscle spindles and probably are a type of nervomuscular endorgans peculiar to the elephant.

The skin of the proboscis about its middle has been examined. The epidermis is very thin and all the layers are not well differentiated. The dermis does not show many nerve endorgans.

Hence, it can be concluded that the *prehensile finger* of the proboscis is the most tactile and sensitive part of the organ.

23. Sympathetic Ganglion (Fig. 24)

The first lumbar ganglion has been examined. From the connective tissue capsule, trabeculae penetrate the ganglion at a number of places. The nerve cells are large pear shaped and mostly multipolar and their cytoplasm is basophile. The nuclei are small, spherical and compact. Several nerve cells are binucleate (mitosis) and are encapsulated by connective tissue elements.

Discussion

1. Grafflin (1942) has made histological observations upon the thyroid, parotid and kidney of the adult Indian elephant (*E. indicus*) with particular reference to the deposition of fat and pigment in the glandular epithelia and to the autofluorescence of the tissues.

The follicular size of the *thyroid* varies over a considerable range. Very small follicles are not very numerous and frequently occur in groups. The follicular epithelium is typically cuboidal; however, it exhibits a rather wide range in cell height, being in some instances

quite flat and in other instances distinctly columnar. A careful search failed to reveal Lagendorff cells observed in the human thyroid. The present study agrees with these observations.

The end pieces (alveoli) of the *parotid* are composed of a single cell type comparable with the "serozymogenic" cell of the human parotid and of the exocrine portion of the mammalian pancreas. No mucous or mixed (mucous and serous) end pieces are observed anywhere in the gland nor can any myoepithelial ("basket") cells be identified. Excretory ducts of considerable size are equivalents to the "striated secretory ducts" of the human parotid gland. Their wall is composed of a single layer of columnar cells which exhibit a distinct and rather coarse striations in their basal portions. Smaller ducts lined by a single layer of cuboidal epithelium resemble the intercalated ducts of human gland. The present study agrees with the observations.

The available material does not justify a detailed description of the histology of the elephant *kidney*, and this will not be attempted. The glomeruli exhibit the usual highly lobulated structure. They are variable in size, but are on the whole considerably larger than in man, the largest ones having an average diameter of approximately 300 microns. The general histological appearance of the proximal tubules, distal tubules and collecting ducts appears to be entirely comparable with that in man and other mammals. The distal tubule usually exhibits a well defined "macula densa" at its point of application to the vascular pole (afferent vessel) of the glomerulus. The present study agrees with the above.

2. Kolmer (1918) (cited by Bourne 1949) has reported very little lipoidal material in the cells of zona glomerulosa. Zona fasciculata was 3 mm. broad and was composed of fairly large cells completely filled with lipid. Cells of zona reticularis were very similar to the cells of zona fasciculata and they possessed a large quantity of lipoidal material. Both dark and light cells were found in the medulla.

Kohno (1925) (cited by Bourne 1949) has reported that zona glomerulosa was very small and the cells were 6–8 μ in diameter.

In this study, no lipoids are present in the cells of the cortex, as the gland is not functionally active. The cells of zona glomerulosa are columnar and it is difficult to explain why Kohno (1925) gives 6–8 μ as diameter of the cells. Zona glomerulosa is very wide containing arched columns of cells arranged in four tiers. Kolmer's reference to the presence of dark and light cells in the medulla refers to the extension of zona reticularis.

3. On the structure of the *temporal gland*, Eales (1925) has reported the tubules being lined by a double layer of epithelium. Ayer and Mariappa (1950) have reported a double layered epithelium lining the alveoli of the gland. The present study has established that the alveoli are lined by a single layer of cubical cells and the small ducts by a double layer of cubical cells. As the ducts increase in size, the epithelium becomes stratified squamous and finally multi-layered in the main duct. Hence the tubules referred by Eales and alveoli mentioned by Ayer and Mariappa are evidently ducts, the ductular system only having been developed at the early stage of the foetus.

4. Lymphatics and lymph glands are found in different parts of the body in all mammals. But in the elephant, lymph glands are substituted by haemolymph glands in different parts of the body and lymphatics are absent. Lymphatics and a few small lymph glands are found only in the mesentery.

Summary

1. The structure of lymph and haemolymph glands, thymus, spleen, parotid gland, submaxillary gland, buccal glands, oesophagus, liver, pancreas, lung, kidney, ovary, oviduct, uterus, vagina, thyroid, adrenal, harderian gland and sympathetic ganglion are similar to those of man and other animals in general, differing slightly in some of the details.

2. Oesophageal glands in the elephant are more numerous than those of other animals and the serous glands outnumber the mucous glands unlike in other animals where the mucous glands predominate.

3. Liver of the elephant shows the hepatic cords formed by five chains of hepatic cells that form the bile capillary, a condition seen in the viper (and pig probably). Lobulation is indistinct as in all mammals except the pig.

4. Acinar cells of the pancreas of the foetus do not exhibit the characteristic bipolar staining of the active functional gland. The islets of Langerhans are still in the form of detached buds staining deeply unlike those of the functional gland which are lightly stained, showing granules in their cytoplasm.

5. The foetal lung (12 months old) has passed the stage of *glandular type* and attained the structure of the *respiratory type* of viable lung.

6. The structure of the kidney is identical in every respect with that of man and other mammals.

7. Colloid of the thyroid vesicles is basophile unlike in other animals where it is acidophil.

8. Adrenal has a very wide zona glomerulosa and the cells of zona fasciculata do not show any lipoids in their cytoplasm which is seen only in the functionally active gland. Zona reticularis has "light cells" and "dark cells" as seen in man and other animals.

9. Harderian gland is very large and forms a watery secretion like the gland of the horse and other animals.

10. Temporal gland has saccular alveoli lined by a single layer of cubical epithelium and appears to be an *apocrine gland*.

11. Glans clitoris shows numerous pacinian corpuscles and tactile corpuscles in the dermis and a kind of nervomuscular endorgans in the form of groups of round laminated bodies in the cavernous tissue.

12. "Prehensile finger" of the proboscis is the most sensitive and tactile part of the organ. Numerous tactile corpuscles and groups of pacinian corpuscles are found in the dermis. Tactile or sinus hairs are present with an interrupted type of blood sinus round the root of the hair and pacinian corpuscles are in close relation to the sinus. In the dermal core are found bundles of striated muscle with groups of round laminated bodies (as in clitoris) close to them and the sinus hairs. They resemble muscle spindles of other animals and probably are a type of nervomuscular endorgans peculiar to the elephant.

13. A dense aggregation of *brown fat tissue* is found in the place of sublingual salivary gland, which has been mistaken by previous workers as the gland.

14. Ovary is covered by the *germinal epithelium* and shows numerous *primary follicles* and a few growing follicles in the cortex.

EXPLANATION TO FIGURES

- Fig. 1. Thymus (x 540, H & E). Medulla showing two corpuscles of Hassall with large central nucleated cells.
- Fig. 2. Spleen (x 60, H & E). M, malpighian corpuscle; R, red pulp;
- Fig. 3. Oesophagus. (x 60, H & E). M, mucous glands; S, serous glands; m, mucous membrane.
- Fig. 4. Liver. (x 120, H & E). V, central vein; H, hepatic cords; S, hepatic sinusoids.
- Fig. 5. Pancreas (x 270, H & E). B, islet of Langerhans between alveoli.
- Fig. 6. Lung. (x 60, H & E). A, atrium; a, airsac; p, pulmonary alveoli.
- Fig. 7. Kidney (x 270, H & E) Cortex. M, malpighian body; C, convoluted tubules.
- Fig. 8. Kidney (x 270, H & E). Medulla. C, collecting tubule; a, ascending limb; d, descending limb of Henle; b, blood vessel.
- Fig. 9. Kidney (x 60, H & E) Renal papilla. B, ducts of Bellini; Arrows show their openings.
- Fig. 10. Ovary (x 270, H & E). Cortex. A, primary follicles; B, growing follicle.
- Fig. 11. Oviduct. (x 60, H & E). M, muscular coat; m, mucous folds.
- Fig. 12. Uterus—horn. (x 60, H & E). M, myometrium, E, endometrium.

- Fig. 13. Vagina. (x 60, H & E). M, muscular coat; R, mucous ridges.
 Fig. 14. Glans clitoris (x 60, H & E). E, stratified squamous epithelium; P, group of pacinian corpuscles; C, cavernous spaces; V, blood vessels.
 Fig. 15. Glans clitoris (x 60, H & E). X, nervomuscular endorgans; d, core of dense tissue in the centre.
 Fig. 16. Thyroid. (x 60, H & E). R, reserve tissue between vesicles.
 Fig. 17. Adrenal (x 270, H & E). Cortex. g, zona glomerulosa; f, zona fasciculata.
 Fig. 18. Adrenal (x 270, H & E). Cortex. d, "dark cells"; l "light cells" of zona reticularis.
 Fig. 19. Harderian gland (x 60, H & E). H, hyaline cartilage of third eyelid; a, alveoli; c, conjunctiva.
 Fig. 20. Temporal gland. (x 60, H & E). d, ducts with alveoli allround.
 Fig. 21. Finger—Proboscis. (x 80, H & E). R, root of sinus hair; S, interrupted blood sinus; P, pacinian corpuscle; X, nervo-muscular endorgans; M, bundles of skeletal muscle.
 Fig. 22. Finger—Proboscis. (x 270, H & E). E, stratified squamous epithelium P, pacinian corpuscles.
 Fig. 23. Finger—Proboscis (x 60, H & E). M, bundles of striated muscle; X, nervo-muscular endorgans.
 Fig. 24. Sympathetic ganglion—lumbar. (x 270, H & E). N, nerve cells that are binucleate.

REFERENCES

1. Ayer & Mariappa (1950) ... "External characters of three foetuses of the Indian elephant", *Proc. Acad. Sci.*, XXXI, 193-210.
2. Bourne, G. H. (1949) ... *The Mammalian Adrenal Gland*. Oxford, Clarendon Press 1949.
3. Bohm, A. A. & Davidoff, M. V. (1904) ... *A Text-Book of Histology*. W. B. Saunders & Co., Philadelphia, New York, London.
4. Eales, N. B. (1925) ... "External characters, Skin and Temporal gland of a Foetal African Elephant". *Proc. Zool. Soc. London*, Part II, 445-456.
5. Grafflin, A. (1942) ... "Histological observations upon Thyroid gland, parotid and kidney of Indian elephant", *Journ. Morph.*, 70(2), 189-208.
6. Home, (1799) ... "On the structure of the teeth of Graminivorous quadrupeds, particularly those of the Elephant and *Sus aethiopicus*", *Phil. Trans. Roy. Soc. London*, Abridged, Vol. XVIII, 519-527.
7. Ijiri *et al* (1948) ... "Microscopic structure of teeth of Proboscidea". *Bull. Tokio. Sci. Mus.*, Ueno Park, Tokyo, Japan, 1-6.
8. Mariappa, D. (1955) ... "External characters of a Foetal Indian Elephant" *Ind. Vety. Jour.* XXXII, No. 1, 8-17.
9. Maximow, A. A. & Bloom, W. (1952) ... *A Text Book of Histology*. W. B. Saunders & Co., Philadelphia & London.
10. Trautmann, A. & Fiebiger, J. (1949) ... *Fundamentals of the Histology of Domestic Animals*. Bailliere, Tindall & Cox, London.
11. Weatherford, H. L. (1940) ... "Tusk of Indian Elephant—innervation of pulp", *Anat. Record*, 76, 81-92.
12. Wislocki, G. B. (1939) ... "Note on Hypophysis of an adult Indian Elephant", *Anat. Record*, 74, 321-328.

THERAPEUTIC TRIALS INVOLVING THE EFFECT OF 1-DIETHYLCARBAMYL-4-METHYL-PIPERAZINE DIHYDROGEN CITRATE FOR TREATMENT OF EYE WORM (FILARIA OCULI) OF HORSES

(With a note on Setariasis in India)

By

CHUSABURO SHOHO; Dip. Agri. (Vet.), D.V.M. (Japan)*

F. DARREL FERDINANDO; B.V.Sc. (Ceylon)**

K. CUMARASAMY; B.Sc. (Vet.) (Bombay)***

Since the discovery of etiology of cerebrospinal nematodiasis due to immature *Setaria digitata* of domestic animals (mostly imported breeds of abnormal hosts, such as sheep, goats and horses) in Korea (1939—1944) and Japan (since 1944) (see 22) the clinical treatment had been made mostly on lines of antimonial and arsenical compounds. No other drugs had been known to be effective against helminths in the body tissues or in the body cavity. The introduction of the new antifilarial drug, 1-diethylcarbamy-4-methyl-piperazine dihydrogen citrate* in those years after the war, gave the Japanese workers the opportunity to use the drug against cerebrospinal nematodiasis (C. S. N.). The lack of unfavourable reactions such as those occurring in human beings (11), the simple usage (per os) and the remarkable effect of the drug initiated its acceptance in the control of C. S. N. in Japan (21, 23). Studies of the pathology of the disease made in 1951 (9) revealed that the identical disease may exist in Ceylon and this opinion was strengthened by the finding of a nematode in the central nervous system of a goat (12, 25). Further trials proved that the Ceylon cases can be controlled by the same drug (18). Recent work showed that "Kumri" of horses in Ceylon has the identical pathology to that of goats (8).

There is some scepticism on this effect of the drug. It is derived from the paradoxical situation of neurology and neuropathology after the mechanical trauma and from the theoretical point of view of pharmacodynamics of anthelmintics. Experimental data have not supported the former (24), while the latter point of view that the developing

* Colombo-Plan Expert attached to the Vet. Res. Lab., Peradeniya (1955-1957)
 (Present Address: Nakayama-Soen Takarazuka Hyogo-Ken Japan)

** Veterinary Surgeon, Colombo, presently located in the institute of Anatomy, Faculty of Vet. Science, University of Ceylon.

*** Veterinary Surgeon, Moratuwa near Colombo.

* Caricide - American Cyanamid Company, New York, N. Y., USA.

stages of nematodes are more refractory to treatment than the adult worm, has not been demonstrated experimentally (15). In fact, we are dealing with the young, immature developing setaria in the cases of our C. S. N. To clarify such scepticism one of us (C. S.) has for a long time considered a plan to determine, if possible, the effect of the drug against the eye worm (*Filaria oculi*) of horses. In Japan, Ceylon, India or Europe these are now known to be mostly young immature worms of bovine setaria species, *S. Digitata* or *S. labiatopapillosa* (1, 7, 14, 20, 26). Trials along this line were already made on a horse suffering from "Kumri" with ocular setariasis in which the workers obtained negative results with Caricide, and simultaneously with Antimosan, Procaine-Penicillin, M. F. G., and the local application of Aureomycin chlortetracycline, ointment 3% (19).

Fortunately, two cases of ocular setariasis, but without symptoms of "Kumri", came into our hands for treatment. It is the general practice among veterinarians to remove the worm by surgery; but we took the chance of treating these cases with Caricide.

Observation and Treatment

Case I. About the end of September, 1956, a male horse, age unknown, kept on the west coast of Ceylon, had difficulty of urination and swelling of the four extremities, but these conditions gradually improved. Towards the end of October, there was a slight cloudiness of the aqueous of right eye, which intensified gradually day by day. The owner observed an actively moving worm in the anterior chamber of the animal's eye. At the request of the owner, two of us (C. S. and D. F.) examined the horse on the 27th of November. We confirmed the presence of a well-developed, actively moving nematode (presumably 3—3 cm. long) in the cloudy anterior chamber of the sick eye. No other symptoms suggestive of any other condition were found.

Treatment. Thirty gm., approximately 80 mg./kg. of body weight, of Caricide powder, was given. The animal was permitted to drink as much water as it desired, and on the following morning another dose of Caricide was administered. At this time the worm no longer was visible in the affected eye. No further treatment was prescribed.

Result. The result was confirmed by three successive visits.

December 1, 1956, no worm was visible but the cloudiness of the aqueous was still marked, though slightly better.

December 11, 1956, 13 days after treatment, the cloudiness improved, leaving several whitish spots along the upper medial aspect of the inner surface of cornea of the sick eye. No worm was visible. However, on both sides of the face there were small flat swellings which

were diagnosed as urticaria. According to the keeper, these had appeared on the previous day and had disappeared a few days later.

January 4, 1957,—the whitish spots had now concentrated towards the lower medial aspect of the cornea and since its disappearance the worm has not reappeared. Efforts to observe the remains of the worm in the anterior chamber were unsuccessful by flash light.

Remarks. Urticaria on both sides of the face may indicate an allergic reaction caused by the dead worm. Or there is the possibility that this may have been due to release of antigens by worms elsewhere in the body.

Case II. A male horse was kept at Kandawela estate near Colombo (controlled by one of us, K. C.). Since the estate lost many horses regularly because of "Kumri", a mosquito-proof shed was erected according to the suggestion of one of us (C. S.) but it was still impossible to protect completely the animals from the insect bites. The door, which was made of metal gauze, was closed about 6 P.M. to 6 A.M. the following morning. This was to protect the animals from the heaviest attacks of mosquitoes. Before keeping the animals in the newly established shed, a prophylactic dose of 40 gm. of Caricide, nearly 80 mg./kg. of body weight, was administered to each animal. On May 2 1957, two months after the erection of the shed, one of the horses developed cloudiness of the right eye abruptly. Closer examination by the owner revealed that a worm was actively moving in the anterior chamber of eye.

Examination. On the 5th of May, 1957, we observed that the patient was suffering from epiphora and photophobia, and we observed a worm (a little longer than the last one) actively moving in the slightly cloudy aqueous humour of the anterior chamber of the right eye.

Treatment. Single dose of 80 mg./kg. of body weight was given at 7 P. M. on the same day. This time animal resisted medication, but the drug was taken completely within 36 hours. At this time the animal showed no desire for water.

Results. May 6, 1957, at 9 A. M. no worm was visible.

May 7, 1957, at 9 A.M. the aqueous cloudiness was gradually clearing and there was no trace of the worm by flash light.

May 12, 1957, no worm was visible and the cloudiness cleared up completely.

Since this day until the 16th of July, 1957, when one of us (C. S.) left Ceylon after service, no worm reappeared and no other trouble was observed.

Remarks. This case suggests that in some instances the single dose of 80 mg./kg. of body weight is enough to cause remission of symptoms associated with the eye worm. No urticaria was observed in this case.

Discussion

It was not possible to determine the identity of the worms since they disappeared after treatment. From the existing literature (14), regarding the *filaria oculi* of horses in Ceylon, we might presume that these are immature *Setaria digitata*.*

The fate of the worms is also obscure, but we might postulate the following: From the ability of the migration of the young immature worms and the vivid movement in the anterior chamber of the eye, we need not think over the possible route of escape *via* blood vessels, just as in the case of penetrating route into the eye-ball. More plausible seems to us that the route of direct passage is through the tissues, but then there must be some signs of the mechanical wound of the eye, which should correspond to the surgical treatment. No such signs were observed by us. The fact that the worm disappears relatively soon after the medication, was already observed by other workers (19), but in their cases it reappeared in the anterior chamber after a considerable time. Our postulation thus is more inclined to the direct inactivation of the worm in the eye ball itself, was so intense that they could not revive any more. Flash light examination might have been insufficient to detect the trace of the dead worm. The absence of the reaction in the body cavity against the dead setaria is common. In the route of migration of the CNS by a setaria we find only the reaction against the destroyed tissue generally, but not against a wandering worm. The dead setarias in the peritoneal cavity are packed simply with the thin reactive tissue and their absorption proceeds only with the aid of Lympho-reticular tissue. All these considerations lead us to postulate that the worms were completely inactivated and caught somewhere at the inner surface of the eye, which we failed to detect by flash light. If this occurred behind the ciliary body or the lens, better methods of observation would not find out the worm. The period of disappearance of the worms since the medication is not clear in both cases, but we can say surely it is within 12 hours, because in both cases the medication was done in the evening and the confirmation of the disappearance of worms was made the following morning. The definitives on the fate of worms after treatment in case of complete disappearance as in our cases can be said first after the direct search on the enucleated eye, as shown by Wilder in *Nematodes endo-ophthalmitis* (1950).

* The private communication of Dr. Crawford, (Weybridge) to one of us (C. S., 1952) revealed that the worms, reported by Nicholls and Crawford (1925) were examined by Prof. Baylis, British Museum, and identified as immature worms of *S. digitata*.

Therapeutic Trials Involving the Effect of 1-Diethylcarbamy-4-Methyl-Piperazine Dihydrogen Citrate for Treatment of Eye Worm (*Filaria Oculi*) of Horses

BY

CHUSABURO SHOHO, F. DARREL FERDINANDO, AND
K. CUMARASAMY.

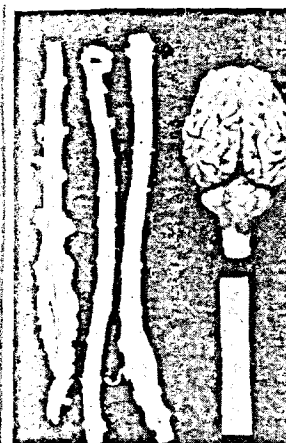


Fig. 1.

A representative case of one saanen stud goat. The brain and spinal cord are fixed in the large vessel with fixative, so as the materials may be fixed in stretched condition, which enables the later work easier and clean. After fixation the material may be cut in pieces for sending or preservation.

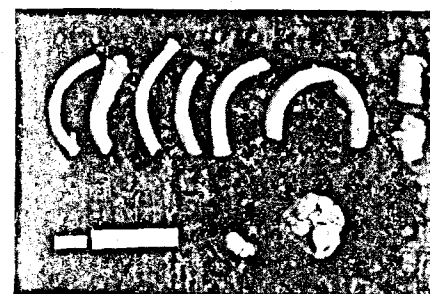


Fig. 2.

Spinal cord and a portion of the cerebellum of Rampur Bushair ewe (No. 48).

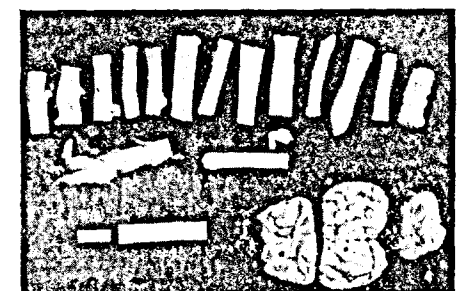


Fig. 3.

Material of the entire CNS of Bikaneri sheep (No. 227)

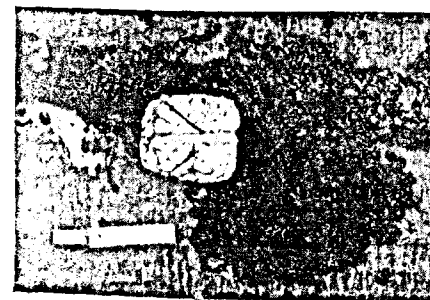


Fig. 4.

Brain of Rampur Bushair ewe (No. 48).



Fig. 5.

Microphotograph of a section of the spinal cord. Central canal dilated and obliterated with a worm and reactive cells (No. 227).

Laparo-Cystotomy in a Horse

By
M. N. MENON and U. MOHAN LINGAM



Fig. 1.

The calculus weighing 160 grammes of dimensions 6.19/5.65 c.ms. made up of phosphates and carbonates of calcium and magnesium. The calculus is shown divided in two halves.

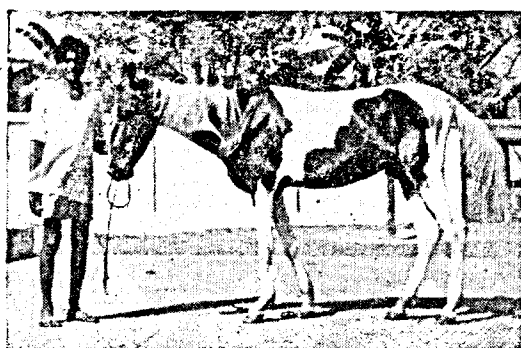


Fig. 2.

The Gelding at the time of discharge. Height 14 Hands.

[To face page 482]



Lt. V. H. SARDESHPANDE, B.V.Sc.,
First Graduate from the M. P. Veterinary College
to be Commissioned in the R.V.F.C.
(See News and Views)

In C. S. N., in which we have enough experiences for both prophylaxis and therapy by the same drug, we could draw conclusions indirectly about the effect of the drug on the worm only from the aggravation or improvement of the symptoms. Even when the animal is destroyed, it is not possible to determine whether the worm is alive or dead or paralyzed. Observation of the worm in the eye of the living host is preferable. And irrespective of definitive fate of the worm the worms disappeared from the anterior chamber and the sign of its living parasitism, namely cloudiness of the aqueous humour, also disappeared. No one has ever attempted to measure the rate of penetration of the drug into the eye. But its quick penetration could be expected by one of us (C. S.) because of its quick effect on the CNS. This medication of this drug to the animals, puppies, calves or goats will cause the drowsiness within relatively short time (5—10 minutes later). From this phenomenon quick appearance of signs of improvement in some cases of natural C. S. N. could be explained, because those signs could be understood as an indirect sign of the penetrating drug into the central nervous system. The earlier contrary result by workers (19) perhaps can be explained by the debilitated condition of the patient caused by "Kumri", which would have exhausted the natural defences including macrophages, or the condition may depend upon the possible anergic action of the simultaneously applied drugs. Even in their cases the disappearance of the worm was confirmed after each medication of Caricide. Once the belief was that Caricide could not only bring about a sedative action on the host, but it also exerted a paralytic action on the worm (4). Only in this way could we explain the effect of the drug against ascarids, such as *Ascaris lumbricoides*, *Neoascaris vitulorum*, *Parascaris equorum*, *Toxocara canis*, or *cati*. These worms are passed out in the living state and they can be kept alive for some time by changing the normal saline every day. In the intestine we could not expect the action of macrophages at all, as found in the mechanism of the destroying effect of the drug on micro-filaria (3). However, the hypothetical paralytic effect cannot be clearly observed on ascarid and setaria worms kept *in vitro* in normal saline solution, serum or aqueous humour of cattle at body temperature. Hetrazan appears to kill the adult worm of Loa (4), but Caricide was not effective in subcutaneous filariasis of dogs (caused by *Dirofilaria repens*) commonly found in Ceylon (16). Even microfilaria could not be controlled satisfactorily by repeated larger doses (3 or 4 times 60 mg./kg. of body weight) (17) within relatively short period of observation of three weeks. On the other hand the lethal action of Caricide on microfilariae of *Dirofilaria immitis*, heart worm of dogs, is well established (6). Even though our remarkable experiences of Caricide on the young immature worm of *S. digitata* the

adult worms in the normal parasitic location, the peritoneal cavity, of the normal host, cattle, cannot be affected at all (personal observations). Conflicting observations on various nematodes and various stages of their development lead us to the assumption that the drug efficacy depends upon the species of the worm, the type of host and the drug tolerance of the latter (4). In our results on young immature setaria the fact of abnormal parasitism should be reckoned with, because these immature worms in the eyes or the CNS of the abnormal hosts may die out sooner or later before their reaching maturity. Thus, the effect which the worms may get from the same drug, is not the same as the worms in the normal hosts may get.

From our experiences in the past the effect of the drug on larvae or immature worms of some nematodes other than *S. digitata* in the normal or abnormal hosts can be expected to some extent in reducing the number of the migrating larvae of *Toxocara canis* into the brain of the experimental mice or suppressing the parasitism of *Neoscaris vitulorum* of buffalo. This can be accomplished by combined Caricide-Piperazine adipate compound therapy within 10 days after birth (recent observation with Shanmugalingam in Ceylon). The successful observations by Hetrazan in the cases of Tropical Eosinophilic Lung may fall into the category of treatment on larval or young immature worms in the abnormal host (2, 3). The work on the nematodes endo-ophthalmitis (27), as well as studies on the worm in the eyeball of human beings (10), should be remembered; in both conditions treatment with the drug can be suggested from our experiences on the eye worm of horses.

Conclusion

Two cases of horses with *Filaria oculi* were treated successfully with Caricide. One or two doses of 80 mg./kg. of body weight were enough to bring about the worm's disappearance from the anterior chamber and to clear up the cloudiness of the eye. This drug is clinically effective on young immature developing *Setaria digitata* which are parasitic of the eye of abnormal host, horse. Our present observations harmonize well with our past experiences in the treatment of cerebrospinal nematodiasis, the condition of abnormal parasitism of *S. digitata* in the abnormal location, the central nervous system, of an abnormal host, such as sheep, goat or horse.

Acknowledgment

We are deeply indebted to Dr. C. P. Pillai, Veterinary Research Laboratory, Peradeniya, Ceylon, who provided us with all possible facilities.

Note for the Setariasis in India.

In connection with the report on the treatment of *Filaria oculi* of horses in Ceylon, some notes regarding setariasis in India are sent here below.

During the stay of one of us (C.S.) in Ceylon, the trial of the collaborative works on the subject of setariasis was made between him and some of Indian colleagues. He acknowledges with thanks the kind sendings of bovine setarias (all *Setaria digitata*) from Orissa by Mr. B. Patnaik, Research Officer, Lumbar Paralysis Scheme, Provincial Veterinary Laboratory, Orissa, Cuttack and also from Madras by Mr. M. Anantaraman, Madras Veterinary College. The latter had published already with Mr. Victor one article on the identity of bubaline setaria, by which they made us clear that all bovine and bubaline setarias in Madras are *Setaria digitata*. (The Ind. Vet. J., 34, 165 (1957).

Besides these two sendings of the worms, the brains and the spinal cords of paralytic sheep were sent to Peradeniya for histopathological examinations by Mr. R. D. Katiyar, Central Sheep and Wool Research Station Pashulok-Rishikesh (Dehra Dun). Among the materials of seven cases, composing of four month old Jamnapari kid, three Rampur Bushair ewes (indigenous in the hills of Himachal Pradesh and Uttar Pradesh), one Polwarth Ram (imported from Australia), one Lohi ewe (from Punjab), and one Bikaneri sheep (of Bharari Farm, imported from Rajasthan), only two were suitable for histopathological examinations, while all others were with much artificial damages or a small portion of the central nervous system, so that no satisfactory examinations could not be performed upon them. From these two cases, which were fixed relatively well in Formalin and with nearly complete set of the CNS the typical lesions, suggestive of nematodal invasion, and sections of a worm in the dilated central canal were found in the spinal cord.

Examinations were made, as already repeatedly stressed elsewhere in the earlier publications by cutting the brain and the spinal cord in 2-4 mm. thick slices. The cut surfaces were examined by magnifying glass, to detect any doubtful lesions. The portions with doubtful lesions were cut by freezing microtome and the sections were mounted carefully on slide glasses in the distilled water. Drying of sections was by filter-paper and droplets of absolute alcohol on the section. Before complete drying out, droplets of undiluted Giemsa stain was dropped to cover the whole section, and thereafter the same amount of distilled water is added. After settling down the dye granules (generally in a few minutes) the surplus of dye is carefully poured off and careful washing with absolute alcohol is repeated till the dye granules are

washed out and the red colour tune becomes evident in the stained tissues. (Too much washing will faint out the section completely). Droplets of xylol will stop the fainting, and then balsam and cover glass. The sections are now ready for the microscopic examination. The well stained preparations give very beautiful colours, but they do not keep long in this stain. This quick method was used in our cases to save time and some of the valuable portions were then later imbedded in paraffin for preservation. The microscopic examinations revealed that in one case of Rampur Bushair ewe (No. 48) the lesions were evident in the left half of the spinal cord, especially in the anterior column, throughout the entire length of the spinal cord. A softened area, stretching from the left posterior horn to the right anterior horn, was confirmed at the level of the 11th thoracic segment and this has communication to the outside through narrow streaks in the left lateral column. Below this level the lesions show more of secondary nature. From the histopathological diagnosis the animal should have suffered for long time with inability of standing. In another case of Bikaneri sheep the lesions were more restricted in the distal thoracic and lumbar segments, showing the lesions between the 11th thoracic and the fourth lumbar segment, mostly in the posterior column. The severest lesions were at the second lumbar segment. By ascending, another lesion was found at the 6th thoracic, namely the dilated and obliterated central canal. The histology revealed that the sections of a worm were found surrounded by the reactive cells in the central canal. The details of the histological findings will not be dealt with here, because they are identical with those, which we found in cases of sheep, goats and horses in Japan or in Ceylon. The histological syndrome, with the nature of the distribution of lesions and a worm in the obliterated central canal lead us to conclude that sheep lumbar paralysis in India is caused by a wandering nematode in the central nervous system, as already shown in goats (Innes: Brit. Vet. J., 109 (1953) and in horses (Innes and Pillai: Brit. Vet. J., 111 (1955) and Shoho and Kuraseigarum: Ceylon Vet. J., (in press). The exact identity of the worm could not be made in this case, because of imbedding in paraffin. It is highly recommended to search for the complete worm in a material of very early stage (perhaps still standing with some signs of weakness). In such cases the detection of the causal worm is easier as recently shown in one host in Ceylon (Shoho and Kuraseigarum: Ceylon Vet. J. (in press). For the pathology of cerebrospinal nematodiasis, the possibly perfect material of the CNS is the premise for the success of examination. The illustrations will show the importance of the dissection technic for further work of histo-pathology. The accumulating evidences of a nematodal finding in the CNS or in the subdural room will advise us to perform the clean histopathological examination for finding the convincing

lesions in the CNS, besides the finding of a worm, as repeatedly stressed by us in all earlier publications.

REFERENCES

- Crawford, M. (1951) ... Ann. Reports Govt. Vet. Surgeon, Ceylon.
 Beaver, C. B., and Danaraj, T. J. (1958) ... *Am. J. Trop. Med.*, **7**, 100.
 Danaraj, T. J. (1956) ... Proceedings Alumni Ass. Malaya, **9**, 172.
 Hawking, F. (1954) ... Personal communication.
 Hawking, F., Sewell, P., and Thurston, J. D. (1948) ... *The Lancet*, **255**, 730.
 Hewitt, R. L., Kushner, S., Stewart, H. W., White, E., Wallace, W. S., and Subba Row, Y. (1947) ... *J. Lab. and Clin. Med.*, **32**, 1314.
 Ichinose, K., et al. (1945) ... Soogo Juigaku, **11**, 69. (Japanese).
 Innes, J. R. M., and Pillai, C. P. (1955) ... *Brit. Vet. J.*, **111**, 223.
 Innes, J. R. M., Shoho, C., and Pillai, C. P. (1952) ... *Brit. Vet. J.*, **108**, 71.
 Lopez Neyra, C. R. (1953) ... *Revista Iberica de Parasit.*, **13**, 79.
 MacGregor, I. A., Hawking, F., and Smith, D. A. (1952) ... *Brit. Med. J.*, **11**, 908.
 McGaughey, C. A. (1951) ... *Brit. Vet. J.*, **107**, 449.
 Mochizuki, H. (1955) ... Personal communication.
 Nicholls, L., and Crawford, M. (1925) ... *Ceylon J. Sci.*, **1**, 147.
 Otto, G. F. (1953) ... *M. S. U. Vet.*, **16**, 1.
 Perera, S. J. E. (1956) ... *Ceylon Vet. J.*, **4**, 22.
 Idem. (1957) ... Direct consultation.
 Pillai, C. P., and Perera, S. J. E. (1953) ... *Ceylon Vet. J.*, **1**, 22.
 Pillai, C. P., and Seneviratne, P. (1954) ... *Ceylon Vet. J.*, **2**, 92.
 Railliet, A., and Henry, A. (1911) ... *Bull. Soc. Path. Exot.*, **4**, 386.
 Shoho, C. (1952) ... *Brit. Vet. J.*, **108**, 134.
 Idem. (1953) ... *Ceylon Vet. J.*, **1**, 16.
 Idem. (1954) ... *Vet. Med.*, **49**, 459.
 Idem. (1956) ... *Ceylon Vet. J.*, **4**, 6.
 Shoho, C., and Karaseigarum, P. (1958) ... (in press for *Ceylon Vet. J.*)
 Shoho, C. (1958) ... (in press for the *French Vet. J.*)
 Wilder, H. C. (1950) ... *Trans. Amer. Acad. Ophth. and Otol.*, Oct.—Nov., 90.

RENEW YOUR SUBSCRIPTION EARLY !

We appeal to our subscribers to clear their arrears, if any, and send us their renewal order in good time. Please note that subscriptions are payable in advance.

Editor I. V. J.

FURTHER STUDIES ON FREEZE DRIED RINDERPEST GOAT TISSUE VACCINE

By

S. SHANMUGHAM, G.M.V.C.,
*Special Officer, Freeze Dried Vaccines, Institute of Veterinary
Preventive Medicine, Ranipet.*

The work on freeze drying of Virus vaccines was started at the Institute of Veterinary Preventive Medicine Ranipet on an experimental scale during 1952 with the assistance of a F.A.O. Expert and the results of experiments and tests carried out both at this laboratory as well as in the field showed that the Rinderpest Vaccine prepared in the freeze dried form was quite safe and efficient.

By the use of Rinderpest Goat Tissue Vaccine prepared in the freeze dried form, it is now possible to combat this dreadful scourge among the livestock efficiently. A campaign for the eradication of Rinderpest has been undertaken in some of the States in the country and schemes are now in progress in various parts of the Union with a view to protect all the available cattle and buffaloes against this disease. The results of vaccinations carried out in the Andhra State particularly in scenes of actual outbreaks go to show that this product is capable of controlling the spread of the disease effectively and all the protected animals have developed adequate immunity against the disease.

As the vaccine produces practically no post-vaccinal reaction among the vaccinated animals and no inconvenience is felt by the livestock owners in their agricultural operations and other types of work which involve cattle power, the demand for this vaccine is gradually increasing every day and the product is getting more and more popular.

To meet the demand of this vaccine from the Madras State as well as from some other States participating in the Rinderpest Eradication Campaign, the Institute of Veterinary Preventive Medicine, Ranipet is manufacturing this vaccine on modern lines.

So far, 70 lakhs of doses of Freeze Dried Rinderpest Vaccine have been manufactured at this Institute and supplied to the various parts of India for protecting the valuable livestock against Rinderpest. Several outbreaks of the disease have been effectively controlled with the use of this vaccine and the protected animals are reported to be hale and healthy.

Details regarding the manufacture of Rinderpest Goat Tissue Vaccine in the freeze dried form have already been published in the Indian Veterinary Journal, Vol. XXXII, No. 1 during the year 1955.

The main object of this paper is to record some of the observations made during the course of the manufacture of this vaccine and the results obtained on the titration tests conducted on each and every batch of vaccine manufactured at this Institute, based on the reactions observed among the vaccinated animals and to analyse the observations made on the buffalo-calves used as controls for the virulent Rinderpest Virus.

Materials and methods

The study was made on the reactions observed on a total number of 3,825 goats utilised for the manufacture of 172 batches of Rinderpest Goat Tissue Vaccine in the freeze dried form at this Institute. Goats of either sex available locally were found to be quite suitable for the manufacture of this vaccine.

Healthy buffalo calves ranging between one and three years of age were utilised for conducting potency tests to assess the titre of individual batches of vaccine and also to study the nature of reaction set up in them when used as controls in the challenge tests.

Observations were made on 820 buffalo calves used for titration tests and on 198 buffalo calves used as controls.

Observations

In the primary drying, the technique of freezing spleen pulp by self evaporation or auto-freezing under vacuum is employed and this seems to be an ideal method as it takes only 6 to 8 minutes (in the majority of batches) for the material to get frozen. During this short period, the violent foaming and frothing of the material are controlled by letting in air as and when necessary by adjusting the combined vacuum break valve and drain cock, provided in older models of the Edwards Centrifugal Freeze Drying machines or by adjusting the air admittance valve in the later models.

Spleen pulp distributed in petri dishes with the lids on and arranged in the chamber for the primary drying becomes dry after a period of 20 to 24 hours and the dried material thus obtained after the first stage of drying presents a spongy and porous appearance. During the process of sublimation, the water vapour originating from the moisture contained in the solid product has to pass through the interstices in the material in order to reach the free space in the chamber and by adopting the technique of self-freezing, the scope for providing more area or surface in the frozen material for rapid evaporation is greater than when the material is in a pre-frozen state.

After the completion of primary drying by the above method, the dried spleen pulp in the glass containers when removed from the primary chamber is found to be very light and porous and the quantity and

quality of the powder obtained from the material after grinding and sieving is quite appreciable and satisfactory. As compared to this, the spleen pulp when subjected to primary drying while in the pre-frozen state, presents a flat solid cake like appearance and while powdering this material in a pestle and mortar, the difference in the nature of the powder obtained can be easily compared with that obtained by the former method. To be more precise, the moisture content of the material after primary drying is reduced to the minimum and the volume of powder obtained is more in the self or auto-frozen method than that obtained by the pre-frozen process.

From the observations made so far on several batches of vaccine prepared, the following points *viz.*,

- (1) the porous structure of the spleen pulp after primary drying,
- (2) the lightness of the material
- and (3) the increased volume of powder obtained

go to show beyond any reasonable doubt that in the primary drying the technique of self-freezing under vacuum is highly satisfactory and the percentage of moisture contained in the spleen powder after primary drying is reduced to the minimum possible extent.

TABLE I

Showing the quantity of spleen pulp processed, the time taken for the material to freeze and the temperature of the material in the frozen state.

Batch No.	Number of spleen processed.	Net weight of spleen pulp processed.	Time taken for the pulp to freeze.	Lowest temperature of the frozen material recorded in primary chamber.	Temperature of the primary chamber.
26	14	512 grams	6 minutes	-18°F	26°F
27	10	490 "	6 "	-12°F	26°F
28	13	529 "	6 "	-20°F	34°F
29	10	390 "	6 "	-8°F	30°F
32	19	870 "	8 "	-20°F	22°F
33	21	937 "	10 "	-20°F	32°F
38	22	793 "	8 "	-20°F	20°F
40	25	1296 "	14 "	-20°F	24°F
42	21	1094 "	12 "	-20°F	24°F
43	17	675 "	8 "	-20°F	24°F
44	19	931 "	8 "	-12°F	24°F
45	20	798 "	8 "	-20°F	24°F
49	20	789 "	8 "	-20°F	24°F
50	18	761 "	8 "	-22°F	24°F

From Table I it will be seen that in auto freezing the material (spleen pulp) to be freeze dried is cooled rapidly and brought to the frozen state to a temperature of -20°F in as short a time as 10 minutes, while in the pre-freezing process it requires a period of 5 to 6 hours to freeze the material to a temperature of -20°C in a deep freeze cabinet.

(2) To determine the amount of moisture removed from the freeze dried Rinderpest Vaccine (spleen pulp powder) when it is subjected to secondary drying, a study was made on a few batches of vaccine.

Details

The weight of one dozen empty glass ampoules was determined in the beginning. After filling them with the spleen powder obtained after primary drying in approximately 1/4 gram or 1/2 gram quantities, the weight of ampoules with the vaccine and dry cotton plug in each was noted down and the difference in weight gives the net weight of powder and cotton wool used. After making necessary constriction in the glass ampoules, they are subjected to secondary drying and finally the sealed ampoules with the glass bits left behind were weighed and the net weight of vaccine powder and the cotton wool after secondary drying was determined. The difference in net weight of the powder before and after secondary drying gives the amount of moisture removed. As the cotton wool used for plugging each ampoule is quite dry (sterilized in hot air sterilizer at 160°C) the moisture content of the cotton plug used is considered to be *nil*.

The above experiments were conducted on 10 batches of vaccine and the observations are recorded separately for each batch of vaccine.

TABLE II

Showing the amount of moisture removed from the Freeze Dried Rinderpest Vaccine when the spleen pulp powder is subjected to secondary drying.

Batch No.	Weight of 12 empty glass ampoules.	Weight of ampoules with F.D. Vaccine powder(after primary drying)	Net weight of Freeze Dried Vaccine.	Weight of sealed ampoules with F.D. Vaccine after secondary drying + weight of remaining portion of ampoules.	Net weight of vaccine after secondary drying.	Quantity of moisture removed Col. 3-5	Percentage of moisture removed.
1	2	3	4	5	6	7	8
20	34.568	37.800	3.232	37.493	2.925	0.307	9.5%
21	36.245	39.557	3.312	39.235	2.99	0.322	9.7%
23	35.218	38.863	3.645	38.595	3.377	0.268	7.3%
24	36.915	39.87	2.955	39.652	2.737	0.218	7.37%
26	36.315	39.418	3.103	39.150	2.835	0.263	8.6%
27	36.148	39.673	3.525	39.430	3.282	0.243	6.6%
28	34.113	36.863	2.750	36.655	2.542	0.208	7.5%
30	33.877	39.107	5.730	38.707	5.330	0.400	6.98%
29	37.09	42.818	5.720	42.375	5.277	0.443	7.7%
31	35.357	40.825	5.468	40.445	5.088	0.380	6.9%

From the study made and the results obtained it will be noticed that the moisture content ranging from 6.6% to 9.7% is being removed in the secondary drying process.

(3) To record the relationship between the live weight of goats from which spleens were harvested, the weight of spleen pulp processed and the final product (dry powder) obtained, detailed studies were made on several batches of freeze dried Rinderpest Vaccine produced during the past 3 years.

From the time of infecting the healthy goats till the final stage of production was reached, the following particulars *viz.*, the percentage of reaction in goats, the weights of goats that reacted, the number of spleen harvested and their weights, the net weight of spleen pulp in the wet stage used in the process of manufacturing and the final dry powder (vaccine) obtained after subjecting the material to different stages of drying were recorded at each stage for every batch of vaccine manufactured to get a clear picture of the changes noticed in the spleen pulp during the process of freeze drying.

The data collected during the process of manufacturing 172 batches of Freeze Dried Rinderpest Goat Tissue Vaccine during the period from 1954-55 to 1956-57 are summarised and the various particulars gathered during these 3 years are shown separately so that the information may be of scientific interest and educative value to the profession.

Note:—The author wishes to state here that full particulars for each and every batch of vaccine manufactured could not be published here for want of space.

During the year 1954-55, studies were made on 40 batches of Freeze Dried Rinderpest Goat Tissue Vaccine and the summary of the findings are as follows:

1. Total number of goats infected	...	827
2. Total number of goats that reacted	...	727
Percentage of reaction	...	87.9%
3. Average weight of goats sacrificed	...	60.37 lbs.
4. Average weight of spleen pulp obtained from each goat	...	43.03 grams.
5. Average weight of spleen powder obtained from each goat	...	8.62 „

During 1955-56, studies were made on 49 batches of vaccine and the following is the summary of the various particulars collected:

1. Total number of goats infected	...	1061
2. Total number of goats that reacted	...	1003
Percentage of reaction	...	94.5%
3. Average weight of goats sacrificed	...	55.1 lbs.

4. Average weight of spleen pulp obtained from each goat	...	39.36 grams.
5. Average weight of spleen powder obtained from each goat	...	7.64 „

A detailed study was made on 83 batches of vaccine produced during the year 1956-57 and the data collected are summarised and furnished below:

1. Total number of goats infected	...	1937
2. Total number of goats that reacted	...	1742
Percentage of reaction	...	89.9%
3. Average weight of goat sacrificed	...	56.6 lbs.
4. Average weight of spleen obtained	...	44.48 grams.
Ratio between the spleen weight and the body weight	...	1:577
5. Average weight of spleen pulp obtained	...	38.00 grams.
6. Average weight of spleen powder obtained from each goat	...	7.36 grams.

Titre of the Freeze Dried Vaccine manufactured.

It has been considered necessary by the experts that for protecting cattle against Rinderpest under field conditions adequate quantity of vaccine should be injected into the animals so that they may develop immunity to a satisfactory degree. Taking into consideration the various aspects that may probably affect the viability of the vaccine from the time it leaves a producing centre till it is reconstituted and injected into the animal, the safe and minimum requirement of dose of vaccine per animal has been fixed as 40 m.i.ds. (Minimum infective doses). The fixation of dosage of vaccine for every batch of vaccine prepared under varying atmospheric conditions during the different months of the year depends entirely upon the results of titration tests carried out for the particular batch of vaccine and unless separate tests are carried out for individual batches, it will not be possible to compute the required minimum of 40 m.i.ds in the dose of vaccine injected into each animal.

Keeping these facts in view, every batch of vaccine manufactured at this Institute has been tested for its potency and the dose has been fixed after studying the results of the titration tests.

Details of the titre of vaccine prepared each month are shown separately for the last 3 years and particulars regarding the tests carried out for individual brews are shown in Tables III, IV and V.

TABLE III

Results of tests conducted to assess the titre of the Freeze Dried Rinderpest Goat Tissue Vaccine manufactured at the Institute of Veterinary Preventive Medicine, Ranipet and the details of reaction observed on buffalo calves used as controls during 1954-55.

Brew No. of Goat Tissue Vaccine	Titre of the vaccine	Brew No. of Bull Virus used for challenging the vaccinated calves	Serial No. of buffalo calves used as controls	Type of reaction in the control calves			Remarks
1	2	3	4	5			6
				T	M	D	
1	1:4000	7 & 8	7	+	+	+	
			8	+	+	+	
2	1:4000	12 & 13	15	+	+	+	
			16	+			Destroyed for collecting spleen
3	1:8000	12 & 13	15	+	+	+	
			16	+			Destroyed for collecting spleen
4	"	18	22	+	+	+	Died R +
			23	+	+	+	Died R +
5	"	19	24	+	+	+	
			25	+	+	+	
6	"	20	26	+	+	+	
			27	+	+	+	
7	"	20	26	+	+	+	Died R +
			27	+	+	+	
8	"	24 & 25	30	+	+	+	Died R +
			31	+	+	+	
9	"	26 & 27	32	+	+	+	
			33	+	+	+	
10	"	26 & 27	32	+	+	+	
			33	+	+	+	
11	"	32 & 33	40	+	+	+	
			41	+	+	+	
12	1:4000	Spleen from calf No. 28	34	+	+	+	
			35	+	+	+	
13	1:8000	30 & 31	38	+	+	+	Destroyed for spleen
			39	+	+	+	Died R +
14	1:4000	30 & 31	38	+	+	+	Destroyed for spleen
			39	+	+	+	Died R +
15	"	35 & 36	47	+	+	+	Destroyed for spleen
			48	+	+	+	Died R +
16	"	34	42	+	+	+	No reaction
			43	+	+	+	Diarrhoea only
17	1:4000	Spleen from calf No. 38	44	+	+	+	
			46	+	+	+	Died on the 7th day due to other causes
18	"	"	"	"	"	"	
19	1:8000	35 & 36	47	+	+	+	Destroyed for spleen
			48	+	+	+	Died R +
20	"	"	"	"	"	"	"
21	1:4000	"	"	"	"	"	"
22	"	"	"	"	"	"	"
23	"	37 & 38	50	+	+	+	
			51	+	+	+	
24	"	"	"	"	"	"	
25	1:8000	40 & 41	52	+	+	+	Died R +
			53	+	+	+	Died R +

TABLE III—(Contd.)

TABLE 11 (Contd.)

1	2	3	4	5	5
				T M D	
26	"	"	"	" " "	"
27	"	"	"	" " "	"
28	"	42 & 43	54 55	+ - +	Died R +
29	"	"	"	" " "	"
30	"	44 & 45	56 57	+ - +	Died R + Died—Other causes
31	"	"	"	" " "	"
32	"	"	"	" " "	"
33	"	46 & 47	58 59	+ - SF	Destroyed for spleen Died R +
34	"	"	"	" " "	"
35	"	48 & 49	60 61	+ - SF	Died R + Died R +
36	"	"	"	" " "	"
37	"	50 & 51	62 63	+ + +	Died R + Died R +
38	"	"	"	" " "	"
39	"	52	64 65	+ + +	"
40	"	B. V. Sp'een from calf No. 58	66 67	T - D	Died R +
41	"	"	"	" " "	"
42	"	"	"	" " "	"
43	"	57 & 58	72 73	- - D	No reaction
44	"	"	"	" " "	"
45	1:8000	Spleen from calf No. 58	68	+ - +	"
46	"	"	"	" " "	"
47	"	59 & 60	74 75	+ - +	Died R +
48	"	57 & 58	72 73	- - -	No reaction
49	"	59 & 60	74 75	+ - +	Died R +
50	"	62 & 63	76 77	+ - +	Died R + No reaction
51	"	"	"	" " "	"
52	"	64	78 79	+ - -	"
53	"	65	80 81	+ - +	Died R + Died R +
54	"	"	"	" " "	"
55	"	"	"	" " "	"
56	"	"	"	" " "	"
57	"	66	84 85	- - -	No reaction Died R +
58	"	7 & 8	7 8	+ + +	Destroyed for spleen
59	"	4 & 5	3 4	- - -	No reaction Died R +

Summary

Total No. of buffalo calves used as controls	61	
Reaction: Temperature	53 (buffalo calves)	: 86.88%
Temperature and Diarrhoea	37 (34 — 3 SF)	: 60.65%
Temperature M. L. & D	10	: 16.39%
Diarrhoea alone	2	: 3.2%
Deaths +ve for Rinderpest	21	: 34.4%
Non-reactors	6 buffalo calves	: 9.8%
T: Temperature	D: Diarrhoea	
M: Mouth lesion	R+: Positive for Rinderpest	

TABLE IV

Results of test conducted to assess the titre of the Freeze Dried Rinderpest Goat Tissue Vaccine manufactured at the Institute of Veterinary Preventive Medicine, Ranipet and the details of reactions observed on buffalo calves used as controls during 1955-56.

Brew No. of Goat Tissue Vaccine	Titre of the vaccine	Brew No. of Bull Virus used for challenging the vaccinated calves	Serial No. of buffalo calves used as controls	Type of reaction in the control calves	Remarks
1	2	3	4	5	6
1	1:8000	32 & 33	29	T — M — D —	No reaction
2	"	15 & 16	30	+ — +	
3	"	17 & 18	17	+ — +	
4	"	"	18	+ — +	
5	"	"	19	+ — +	
6	"	19 & 20	20	+ + +	Died R +
7	"	"	"	" " "	"
8	"	"	"	" " "	"
9	"	"	"	" " "	"
10	"	"	"	" " "	"
11	"	21 & 25	31	+ — +	Died R +
12	"	26 & 27	32	+ — +	
13	"	31 & 32	33	+ — +	Died R +
14	"	28	34	+ — +	
15	"	29 & 30	39	+ — +	
16	"	"	40	+ — +	
17	"	31 & 32	35	+ — +	Died R +
18	"	33 & 34	36	+ — +	Destroyed for spleen
19	"	"	37	+ — +	Died R +
20	"	41 & 42	38	+ — +	
21	"	37	43	+ — +	Died R +
22	"	38	51	+ — +	
23	"	48 & 49	52	+ — +	Died R +
24	"	46 & 47	47	+ — +	Died R +
25	"	43, 44 & 45	48	+ — +	
26	"	46 & 47	59	+ — +	Died R +
27	"	48 & 49	60	+ — +	Died R +
28	"	"	55	+ — +	
			56	+ — +	
			59	+ — +	Died R +
			60	+ — +	Died R +

TABLE IV—(Contd.)

1	2	3	4	5	6
				T M D	
29	1:8000	51 & 52	63	— — —	Died R +
30	"	50, 51 & 52	64	+ — +	Died R +
31	"	Spleen from calf No. 54	61	+ — +	
32	"	"	62	+ — +	
33	"	"	65	+ — +	Died R +
34	"	55 & 56	66	+ — +	
35	"	57 & 58	67	+ — +	Died R +
36	"	59 & 60	68	+ — +	Died R +
37	"	"	69	+ — +	
38	"	61 & 62	70	+ — +	Died R +
39	"	63, 64 & 65	71	+ — +	Died R +
40	"	"	72	+ — +	No reaction
41	"	66	73	+ — +	
42	"	"	74	+ — +	Destroyed for spleen
43	"	68 & 69	75	+ — +	
44	"	1 & 2	76	+ — +	Died R +
45	"	73 & 74	77	+ — +	Died R +
46	"	2 & 4	78	+ — +	
47	"	1 & 2	79	+ — +	Died R +
48	"	"	80	+ — +	
49	"	"	81	+ — +	
50	"	"	82	+ — +	
51	"	"	83	+ — +	
52	"	"	84	+ — +	
53	"	"	85	+ — +	
54	"	"	86	+ — +	
55	"	"	87	+ — +	
56	"	"	88	+ — +	
57	"	"	89	+ — +	
58	"	"	90	+ — +	
59	"	"	91	+ — +	
60	"	"	92	+ — +	

Summary

Total No. of buffalo calves used as controls	...	55
Reaction : Temperature : 48 calves	...	87.27%
Temperature & Diarrhoea : 37 calves	...	67.27%
Temperature M L & D : 7 calves	...	12.7%
Deaths +ve for Rinderpest : 21	...	38.18%
Non-reactors : 7	...	12.7%

T : Temperature.
M : Mouth lesion.
D : Diarrhoea.
R+ : Positive for Rinderpest.

TABLE V

Results of tests conducted to assess the titre of the Freeze Dried Rinderpest Goat Tissue Vaccine manufactured at the Institute of Veterinary Preventive Medicine, Ranipet and the details of reaction observed on buffalo calves used as controls during 1956-57.

Brew No. of Goat Tissue Vaccine	Titre of the vaccine	Brew No. of Bull Virus used for challenging the vaccinated calves	Serial No. of buffalo calves used as controls	Type of reaction in the control calves	Remarks
1	2	3	4	5	6
				T M D	
1	1:8000	5 & 6	7	+	Died R +
2	"	3 & 4	8	+	Destroyed for spleen
3	1:4000	16 & 17	5	+	Died R +
4	1:8000	7 & 8	6	+	Died R +
5	"	"	17	+	Died R +
6	"	11, 12 & 13	18	+	Died R +
7	1:4000	"	9	+	Died R +
8	1:8000	"	10	+	Died R +
9	1:4000	28 & 29	13	+	Died R +
10	1:8000	14 & 15	14	+	Died R +
11	1:4000	28 & 29	"	+	"
12	"	30 & 31	29	+	"
13	1:8000	20 & 21	30	+	Died R +
14	1:4000	30 & 31	31	+	Died R +
15	"	30 & 31	32	+	Died R +
16	"	22 & 23	31	+	"
17	1:8000	24 & 25	32	+	"
18	"	26 & 27	23	+	Died R +
19	"	32 & 33	24	+	No reaction
20	1:8000	26 & 27	25	+	Destroyed for spleen
21	"	30 & 31	26	+	Died R +
22	"	32 & 33	27	+	Died R +
23	"	34 & 35	28	+	Died R +
24	"	42 & 43	29	+	Died R +
25	"	36 & 37	30	+	"
26	"	"	31	+	"
27	"	"	32	+	"
28	"	"	33	+	"
29	"	"	34	+	"

TABLE V—(Contd.)

1	2	3	4	5	6
				T M D	
30	1:4000	60 & 61	62	+	Died R +
31	1:8000	40 & 41	63	+	Died R +
32	"	42 & 43	41	+	Died R +
33	1:8000	"	42	+	"
34	"	"	43	+	"
35	"	52 & 53	44	+	"
36	"	45	54	+	Destroyed for spleen
37	"	46 & 47	55	+	"
38	"	"	45	+	No reaction
39	"	49	46	+	"
40	"	50 & 51	47	+	"
41	"	52 & 53	48	+	"
42	"	"	49	+	"
43	1:4000	60 & 61	50	+	Died R +
44	1:8000	56 & 57	51	+	"
45	"	"	52	+	"
46	"	60 & 61	56	+	"
47	"	52 & 53	57	+	"
48	"	56 & 57	62	+	Died R +
49	"	58 & 59	63	+	Died R +
50	"	"	58	+	Died R +
51	"	"	59	+	"
52	—	Conducted only safety test.	61	+	"
53	1:8000	60 & 61	62	+	Died R +
54	"	"	63	+	Died R +
55	—	Safety test only.	"	+	"
56	1:8000	62 & 63	64	+	Died R +
57	"	64 & 65	65	+	"
58	"	66 & 67	66	+	"
59	"	68	67	+	"
60	"	"	68	+	Died R +
61	"	"	69	+	Died R +
62	"	"	70	+	"
63	—	Safety test only.	71	+	"
64	1:8000	69	72	+	"
65	1:6000	"	73	+	"

TABLE V—(Contd.)

1	2	3	4	5	6
				T M D	
66	1:6000	71 & 72	76	+	—
			77	+	—
67	"	73	78	+	—
			79	+	—
68	"	"	"	"	"
69	"	"	"	"	"
70	"	74 & 75	80	+	—
			81	+	—
71	1:16000	1 & 2	1	+	—
			2	+	—
72	1:8000	"	"	"	"
73	1:16000	"	"	"	"
74	"	"	"	"	"
75	"	3 & 4	3	+	—
			4	+	—
76	1:8000	11 & 12	11	+	—
			12	+	—
77	1:16000	Spleen from buffalo calf No. 80	7	+	—
			8	+	—
78	"	"	"	"	"
79	"	11 & 12	11	+	—
			12	+	—
80	"	9 & 10	9	+	—
			10	+	—
81	"	13 & 14	13	+	—
			14	+	—
82	"	15 & 16	15	+	—
			16	+	—
83	"	"	"	"	"

Summary

Total No. of buffalo calves used as controls	...	82
Reaction: Temperature	: 77 calves	... 93.9%
Temperature and Diarrhoea	: 47 "	... 57.3%
T, M & D	: 10 "	... 12.2%
Non-reactors	: 4 "	... 4.87%
Deaths +ve for Rinderpest	: 25 "	... 30.8%

T: Temperature

M: Mouth lesion

D: Diarrhoea

R+: Positive for Rinderpest

From the data furnished in the following Tables (a) (b) and (c), it appears that the only solution to overcome the difficulty of getting inconsistent results in the titre of the vaccine manufactured under varying atmospheric conditions (which play an important part in the efficacy of the vaccine) is to provide an air-conditioned room maintaining a constant temperature of 65°F and by the processing of vaccine under this ideal condition, the desired maximum titre can be ensured and uniform titre of the vaccine can be obtained. During the latter part of the year 1956-57, the air-conditioning of one of the rooms of the Institute of

Veterinary Preventive Medicine, Ranipet was completed and batches of Freeze Dried Rinderpest Goat Tissue Vaccine manufactured in this room have been giving (in almost all the brews) a uniform titre of 1:16000 which is double the titre of the vaccine obtained when processed under ordinary atmospheric conditions.

TABLE (a)

Month-wise details of titration tests conducted on the Freeze Dried Rinderpest Goat Tissue Vaccine produced at the Institute of Veterinary Preventive Medicine, Ranipet during the year 1954-55.

Month	Number of brews manufactured	Titre of the vaccine		Room temperature
		1:4000	1:8000	
April	2	2	—	82°F to 98°F
May	1	—	1	80°F to 96°F
June	3	—	3	78°F to 96°F
July	2	—	2	76°F to 94°F
August	3	—	3	78°F to 94°F
September	8	6	2	80°F to 98°F
October	5	4	1	80°F to 98°F
November	8	—	8	80°F to 94°F
December	8	—	8	76°F to 92°F
January	9	—	9	76°F to 90°F
February	6	—	6	78°F to 92°F
March	4	—	4	80°F to 94°F

TABLE (b)

Month-wise details of titration tests conducted on the Freeze Dried Rinderpest Goat Tissue Vaccine produced at the Institute of Veterinary Preventive Medicine, Ranipet during the year 1955-56.

Month	Number of brews manufactured	Titre of the vaccine		Room temperature
		1:4000	1:8000	
April	—	—	—	—
May	—	—	—	—
June	8	—	8	82°F to 96°F
July	4	—	4	78°F to 94°F
August	4	—	4	80°F to 94°F
September	5	—	5	78°F to 92°F
October	4	—	4	78°F to 90°F
November	5	—	5	76°F to 88°F
December	7	—	7	76°F to 88°F
January	4	—	4	76°F to 90°F
February	4	—	4	78°F to 92°F
March	4	—	4	82°F to 94°F

TABLE (c)

Month-wise details of titration tests conducted on the Freeze Dried Rinderpest Goat Tissue Vaccine produced at the Institute of Veterinary Preventive Medicine, Ranipet during the year 1956-57.

Month	No. of brews manufactured	Titre of the vaccine		Room temperature	Remarks
		1:4000	1:8000		
April	7	2	5	80°F to 98°F	
May	8	5	3	80°F to 98°F	
June	9	1	8	78°F to 96°F	
July	2	—	2	78°F to 94°F	
August	5	1	4	78°F to 96°F	
September	8	—	8	76°F to 94°F	
October	7	1	6	76°F to 94°F	
November	6	—	5	76°F to 92°F	Safety test on one batch.
December	8	—	7	76°F to 92°F	
January	7 (4+3**)	—	3	76°F to 92°F	Safety test on one batch. ** All the three batches manufactured in the air-conditioned room at 65°F gave 1 in 16,000.
February	8**	—	1	65°F	
March	8**	—	1	65°F	

Note: ** Out of 19 batches manufactured in the air-conditioned room (at 65°F) 17 batches gave a titre of 1:16000.

Discussion

In the manufacture of Freeze Dried Rinderpest Goat Tissue Vaccine, the technique of self freezing while subjecting the material for primary drying seems to be ideal as the resultant product after the first stage of drying appears to be quite satisfactory and the moisture content is also reduced to the minimum as compared to the pre-frozen method. Further the time taken for the material to reach the frozen state in the auto-freezing is considerably short as compared to the pre-frozen process.

From the experiments conducted and results obtained the amount of moisture removed from the material in the secondary drying process is found to vary from 6.7% to 9.7%.

Data collected at different stages of freeze drying Rinderpest Goat Tissue Vaccine during the course of manufacture of 172 batches of vaccine during 1954-55 to 1956-57 are summarised and furnished separately.

In the titration tests carried out, there is a definite improvement noticed in the titre of the vaccine when the processing of the vaccine is carried out in an air-conditioned room.

A study was also made of the reaction produced by virulent Rinderpest bovine virus used in the Institute for challenging the vaccinated animals. The reactions produced in 198 buffalo calves used as controls in the titration tests have been analysed and recorded. The results show that the virus has produced a morbidity in about 90 per cent and mortality in about 35 per cent of the animals.

Summary

The advantages of adopting self-freezing in primary drying of spleen pulp are described. Gist of observations made during the process of manufacturing freeze dried Rinderpest Goat Tissue Vaccine is recorded. The freeze drying of the vaccine in an air-conditioned room at a temperature of 65° to 70°F definitely improves the titre of the Rinderpest Vaccine and maintains it at a more or less uniform level. The susceptibility of buffalo calves to the virulent Bovine Virus maintained at this Institute is analysed.

Acknowledgment

I am indebted to Dr. S. Vancheswara Iyer, Superintendent, Institute of Veterinary Preventive Medicine, Ranipet for his valuable guidance and keen interest in this study. Grateful thanks are also due to the staff attached to the Freeze Dried Vaccine Section of the Institute of Veterinary Preventive Medicine, Ranipet for their co-operation and technical assistance.

REFERENCES

1. Daubney, R. (1953) ... Booklet. The freeze drying of living virus vaccine for Veterinary use.
2. Edwards, W. & Company (London) Ltd., (1953) ... Instructions—Manual for Edwards Model 3 PS Centrifugal Freeze Dryer.
3. Edwards, W. & Company (London) Ltd., (1953) ... Vacuum. A review of developments in vacuum research and engineering. Vol. III Number 1. Jan., 1953.
4. Vancheswara Iyer, S. et al (1955) ... Studies on Freeze Dried Rinderpest Goat Tissue Vaccine—*The Indian Veterinary Journal*, XXXII (1) 28-39.
5. Uppal, D. R. and Seetharaman, C. (1957) ... Some observations on the large scale production of Freeze Dried Goat Adapted Rinderpest Virus Vaccine. *The Indian Veterinary Journal*, XXXIV (3) 157-165.

WEIGHT OF DIFFERENT ORGANS IN RELATION TO BODY WEIGHT IN INDIAN GOATS

By

M. L. KALIA L.V.P. (Hons) B.V.Sc.,
Research Assistant, Biological Products Section,
Punjab College of Veterinary Science & Animal Husbandry, Hissar.

This work was taken up in order to record observations on average weight of liver, kidney and testicles in goats. Study was also conducted to find out the correlation and regression of the weight of these organs with the object of estimating the weights of these organs in a living animal for manufacturing Biological preparations etc.

Review of Literature

Not much work has been done in goats in regard to weights of different visceral organs and their relationship with the body weight of the animal. Ostertag and Wilox (1907) recorded weight of liver in sheep and goats 375 to 875 gms. Broody & Kibler (1937) have done a large amount of work on the relationship between body weight and organ weight in different species of animals both in growing and adult stages. The authors showed that the relationship between organs and body weight in growing animals varied with the stage of growth, the regression value (b) tended to be lower for later growth. Martin (1947) reported average weight of liver in goat as 2-lbs and kidney as 2 ounces.

Sisson (1953) has mentioned the average weight of liver in sheep as 550 to 700 gms, kidney about 4 ounces and testicles as 250 to 300 gms. Bhatia and Sharma (1953) studied only the spleen weight in goats in relation to their body weight and evolved a formula for determining the spleen weight that is, $Y = 14.17 + 0.64 X$ where Y = expected value of the spleen weight in gms; and X = observed body weight of the animal in lbs. The average weight of the spleen in Indian goats as recorded by them was 35.26 gms.

Method and Materials

The data was collected from 450 goats used for the purpose of production of Goat Tissue Virus Vaccine (Goatis) at the Biological Products Section, Hissar. Out of these only 228 observations were recorded on the testicles. The supply of these goats was made from Bikaner tract. All the goats examined for this purpose belonged to the same age group (nine months to one year). Before the actual work was taken up, observation on the weight of a random sample of 50 goats were made. The weight of these goats was recorded before they were injected with

the Goat Tissue Virus Vaccine and were again weighed finally on the fourth day (1st day of inoculation is counted as zero day) before slaughtering. The data was statistically analysed and the value of 't' was found to be 0.43 at 98 d.f. which was not significant indicating that the weight of the goat before inoculation and three days after inoculation remained constant. The goats to be examined for study were weighed with a spring balance and the different organs were weighed with a Baranger balance.

1. Results

Body-Weight.—The average body weight as recorded in 450 goats was found to be 31.18 ± 0.32 lbs. The maximum weight recorded was 59 lbs. and minimum weight 20 lbs.

2. Liver

(a) The number of observations recorded was 450. The minimum weight of liver recorded was 175 gms and maximum weight 507 gms. The average weight observed was 292.86 ± 2.82 gms.

(b) *Correlation between body weight and liver weight.*—The correlation co-efficient (r) between body weight and liver weight worked out to be 0.69 was significant at 1% level.

Regression co-efficient (byx) of liver weight on body weight was 5.97 and the regression equation was $Y_e = 106.72 + 5.97X$ where X denoted the observed body weight in lbs Y_e = estimated value of liver weight in gms (graph 1).

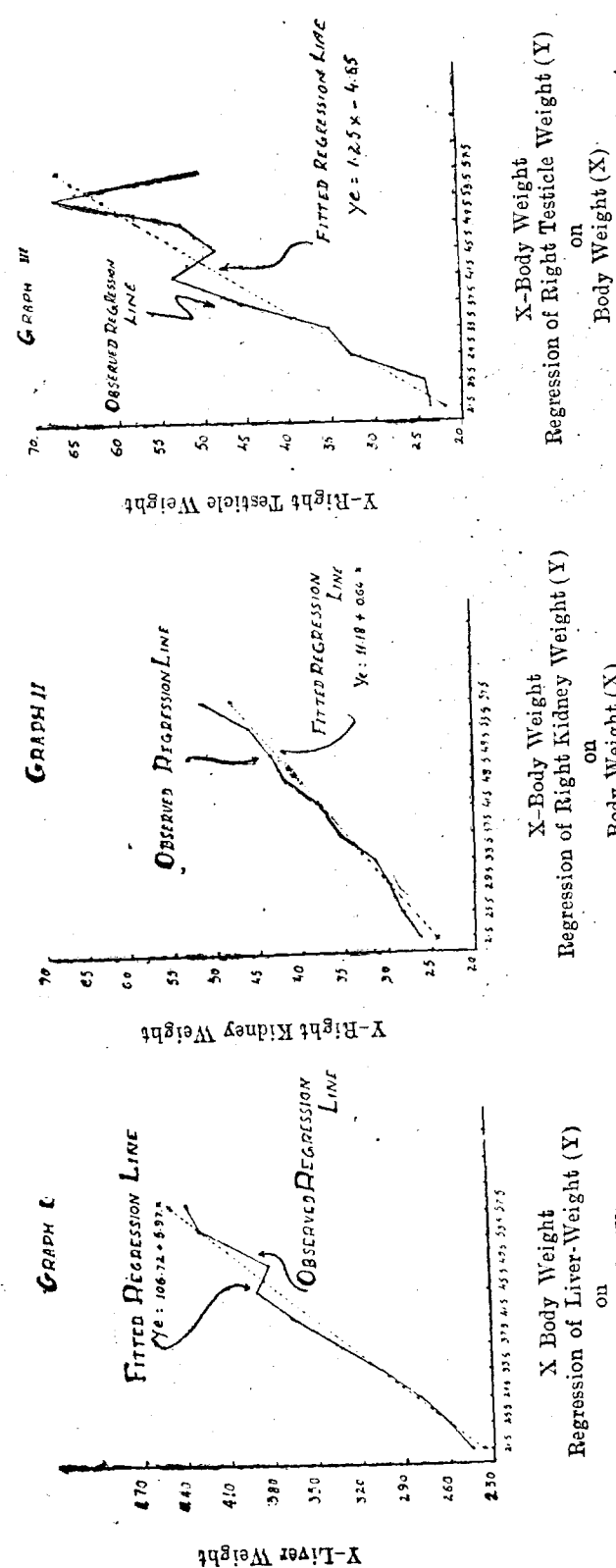
The mean square for deviations from linear regression was tested (table 1) and found to be non-significant denoting the regression to be linear.

TABLE I
Analysis of variance of liver weight.

Source	Degree of freedom	Sum of squares	Mean square	
Total	449	1163.6200		
Within arrays	440	755.9703	1.7181	
Between arrays	9	707.6497		
Linear regression	1	695.0714	695.0714	401.56
Deviations from linear regression	8	12.5783	1.5723	

3. Kidney

(a) *Average weight.*—The total number of observations recorded were 450. As no significant difference existed between the average weight of the right and left kidney hence analysis was worked out for



the right kidney alone. The details of the weight of both the kidneys were as under :—

	Left Kidney	Right Kidney
Minimum weight	15 gms	16 gms
Maximum weight	55 gms	57 gms
Average weight	31.07 ± 0.30 gms	31.14 ± 0.31 gms

(b) Correlation between body weight and right kidney weight worked out to be 0.68 was highly significant at 2% level.

(c) Regression co-efficient.—(byx) of right kidney weight on body weight was 0.64 and the regression equation was $Y_e = 11.18 + 0.64X$ where X denoted the observed body weight of animal in lbs and Y_e = estimated value of the right kidney in gms. (graph II).

The mean square for deviations from linear regression was tested (table II) and found to be non-significant denoting the regression to be linear.

TABLE II
Analysis of variance of kidney weight.

Source	Degree of freedom	Sum of squares	Mean square	F
Total	449	1192.9444		
Within arrays	440	640.5922	1.4559	
Between arrays	9	552.3522		
Linear regression	1	538.2053	538.2053	369.677
Deviations from linear regression	8	14.1469	1.7684	1.21

As the difference in the correlation co-efficient of left and right kidneys with the body weight was not significant, so the joint estimate of the above mentioned correlation co-efficient worked out to be 0.66 with one predicting equation as :— $Y_e = 11.78 + 0.62X$ where X is the observed body weight of the animal in lbs.

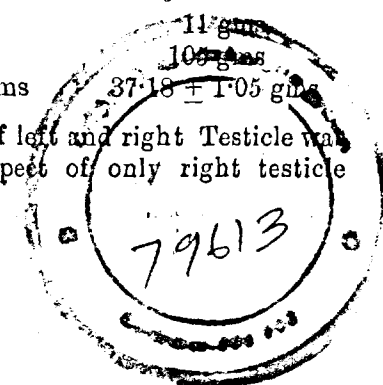
4. Testicles

(a) Average weight.—228 observations on testicles could be recorded with the range of weight as under :—

	Left Testicle	Right Testicle
Minimum weight	10 gms	11 gms
Maximum weight	105 gms	108 gms
Average weight	38.30 ± 1.06 gms	37.18 ± 1.05 gms

As the difference in average weight of left and right Testicle was not significant, hence the analysis in respect of only right testicle was carried out.

SL
KZ m2, n24
NS8.35-9



(b) Correlation between body weight and right testicle weight. The correlation co-efficient (r) between body weight and right testicle weight was 0.62 and was highly significant at 1% level.

The regression co-efficient.—(byx) of the right testicle weight on the body weight was 1.25 and the regression equation was $Y_e = 1.25 X - 4.85$ where Y_e denoted estimated value of right testicle in gms and X = body weight of the animal in lbs (graph III).

The mean square for deviations from linear regression was tested (table III) and found to be no non-significant denoting the regression to be linear.

TABLE III
Analysis of Variance (table III).

Source	Degree of freedom	Sum of squares	Mean square	F
Total	230	582.4156		
Within arrays	221	334.8948	1.5154	
Between arrays	9	247.5208		
Linear regression	1	224.1258	224.1258	147.90
Deviations from linear regression	8	23.3950	2.9244	1.93

Summary

1. A study based on 450 goats (from Bikaneri tract) revealed that their average live-weight was 31.18 ± 0.32 lbs and that of the liver was 292.86 ± 2.82 gms left kidney 31.07 ± 0.30 gms, right kidney 31.14 ± 0.31 gms., left testicle 38.30 ± 1.06 gms and right testicle 37.18 ± 1.05 gms.

2. No significant difference was observed between the weights of the right and the left kidneys and right and left testicles, hence analysis on the right kidney and right testicle was carried out.

3. The equations for the estimation of the value of different organs in relation to body weight were evolved as under :—

(a) Equation for estimation of liver weight in gms $Y_e = 106.72 + 5.97 X$ where Y_e = estimated value of liver weight in gms and X denoted the observed body weight of the animal in lbs.

(b) Equation for the estimation of the value of right kidney.

$Y_e = 11.18 + 0.64 X$ where Y_e = estimated value of right kidney weight in gms and X = the observed body weight of animal in lbs. As the difference between the weight of right and left kidney was insignificant, the conjoint equation for kidneys was worked out as $Y_e = 11.78 + 0.62 X$ where X was the body weight of the animal in lbs,

C., The equation for the estimation of the value of the testicles.

$Y_e = 1.25 X - 4.85$ where Y_e = estimated value of the right testicle in gms and X = body weight of the animal in pounds.

Acknowledgments

The author is grateful to Dr. N. D. Mallik of the Nutrition Division, Indian Veterinary Research Institute, Izatnagar and to Mr. M. L. Kohli Animal Geneticist Government Live-Stock Farm, Hissar for their valuable guidance in writing this paper. His thanks are due to Mr. S. Sen, Statistician, Indian Veterinary Research Institute, Mukteswar for the statistical analysis of the data.

REFERENCES

- Broody, S. and Kibler, H. M., (1924) ... Relation between organ weight and body weight in growing and mature animals. Res-Bulletin 67, Missouri College of Agriculture.
- Bhatia and Sharma, (1953) ... Spleen weight in relation to body weight in goats. The Indian Veterinary Journal, Vol. XXIX No. 5.
- Martin C. R. A., (1947) ... Practical Food inspection Vol. 1-18.
- Ostertag, R., and Wilox E. V., (1907) ... Hand Book of Meat Inspection III Ed. 172.
- Sisson S., (1953) ... The Anatomy of Domestic animals IV Ed. 482, 576, 601, W. B. Saunders and Co. London.

STUDIES ON PNEUMOCOCCOSIS IN DOMESTIC ANIMALS

(I) Isolation of *Streptococcus pneumoniae* from pneumonic lungs of sheep and goats

By

M. R. DHANDA

and

P. CHANDRA SEKARIAH,

Division of Pathology and Bacteriology,
Indian Veterinary Research Institute,
Mukteswar-Kumaon, U.P.

[Received for publication on 22-2-58]

Primary pneumococcosis or pneumococciasis in man is a syndrome characterised by a severe pyrexial illness. There is a sudden onset and a tendency towards recovery by crisis in non-fatal cases, associated with signs and symptoms of pulmonary involvement in which bacteraemia, a constant feature in severe cases, is frequently present during the initial phase of infections. In this definition we exclude secondary bronchopneumonias, following such conditions as

influenza or whooping cough. The pneumococcus is an important pathogen of man, giving rise to pneumonia of the lobar form, sinusitis, otitis media, and less frequently meningitis, suppurative arthritis, or peritonitis and occasionally other infections. Though extensive investigations have been carried out about pneumococcal infections in man, it is safe to state that no authentic information is available about the occurrence of pneumococci in various species of domesticated animal in health and disease.

Christiansen (1913) studied diplococci isolated from various pathological lesions in calves and labelled them as pneumococci on the basis of morphological and biochemical characters. It was not certain whether they were *Streptococcus pneumoniae* or the inulin-fermenting streptococci belonging to the other sub-groups. Hutyra and Marek (1927) referred to the occurrence of fibrinous pleuropneumonia in sheep and suckling lambs during the lambing period in the course of diplococcus infection. According to these workers, *Diplococcus ovis* causing this infection was a gram-positive, non-motile haemolytic coccus forming chains in media containing blood. It was saprophytic in healthy sheep, but appeared to develop pathogenic properties under conditions favourable for its growth, such as during parturition and sheering when later it might become infective for other animals in the absence of accessory causes. As detailed cultural characters and biochemical and serological reactions of this organism were not recorded by these authors, it would not be possible to decide whether the organism under reference was a pneumococcus or not.

It was not until 1949 that the importance of pneumococcal infections in domestic animals was realised when Vallee and Charbonner in France reported on the occurrence of cases of "Rubber Spleen" in calves (which appeared to have been met with earlier in Germany and Italy) as responsible for a considerable percentage of mortality in this species. The symptomatology of this condition appeared to be very peculiar in as much as these animals showed only dyspnoea and diarrhoea and died after 4 days of illness. On autopsy, pleurisy with costal adhesions, abundant pericardial effusion and severe congestion of the tissues around umbilical vessels were observed. The mesenteric glands were haemorrhagic and spleen was hypertrophied with sub-capsular haemorrhages and had a rubbery consistency. A pneumococcus belonging to type 23 was isolated from all lesions. The rubbery consistency of the spleen was due to changes in the spleen pulp in which invasion of the cytoplasm of the cells by a fibrinous mass was demonstrated.

Donald and Mann (1950) isolated *Streptococcus pneumoniae* type 3 in pure cultures from heart blood, spleen and liver of each of two

calves which were examined bacteriologically out of a group of young Ayrshire calves varying in age from 5 days to 5 weeks which died suddenly. On autopsy, diffuse inflammation of the small intestine with a small quantity of brown turbid fluid in the peritoneal cavity was noted. Attempts to isolate pneumococci from the milk of lactating cows in the herd were not successful. Hammer (1954) recorded the isolation of 364 strains of pneumococci over a period of 2 years from organs of sick calves which had died or had been slaughtered *in extremis*. Incidence was highest during winter and the age of highest susceptibility appeared to be during the third week of life. Respiratory infection was diagnosed in 73%, umbilical in 18% and intestinal in 9% of the calves. He also isolated pneumococci from 113 of 600 nasal, pharyngeal and tracheal swabs from clinically healthy calves in the same herd. Terpstra and Ackerman (1954) studied *Streptococcus pneumoniae* infection in domestic animals, especially in calves and pigs and reported on pneumococcal peritonitis, pleuritis and arthritis and following castration. No data are available on the exact serotypes of pneumococci encountered by these workers. Hammer (1955), continuing his studies on calf mortality, which was causing very severe economic losses during 1951-54 in the southern district of Baden, Germany, showed that death was due to infection with pneumococci in 75% of cases. More than 1200 cases of pneumococcal infection in calves were observed and 1088 pneumococcal strains were investigated serologically. In the majority of cases the higher types (4-46) were isolated and in only 1.1% were types 1, 2 and 3 found. Organisms of the homologous group could be recovered from respiratory mucosa of human carriers and persons suffering from otitis media, catarrh and those convalescent from pneumonia. Removal of human carriers considerably decreased the loss of calves from pneumococcal infections. Hammer attempted to control the losses by penicillin therapy of protracted cases and vaccination of dam and young without much success. Dabrowski and Paroszkiewicz (1955) found no differences in morphology, cultural reactions and biochemical behaviour between human and calf strains except for the higher pathogenicity of the latter for rabbits. According to these workers, carriers could be detected by means of an agglutination test and a titre of 1/25 was considered positive. The calf strains produced a thermolabile lysin which could be obtained *in vitro* after 3 hours of incubation at 37°C. Contrary to Hammer's experience with penicillin, Dabrowski and Paroszkiewicz reported on the successful use of this antibiotic in the treatment of pneumococcal infection in calves.

Stomatovic *et al* (1956) while investigating causes of 320 deaths among 2120 sheep on a farm reported the isolation of an unidentified diplococcus from heart, spleen, liver and intestines of two lambs that

died within 24-48 hours after the onset of first symptoms which included inappetance and diarrhoea, complicated by broncho-pneumonia and pleuritis. Filtered intestinal contents, when injected into mice, failed to reveal the presence of a toxin.

Lund (1956), in a personal communication to one of the authors, has stated that Ole Romer, a Danish Veterinarian, examined about 500 sheep without finding any pneumococcal strains. According to the same author (Lund, 1957) Romer (1948) and Fey (1957) carried out rather comprehensive pneumococcus examinations in Veterinary Medicine. From a review of the literature, it would appear that no pneumococcal infection in domesticated animals, especially in sheep and goats, has been reported either in India or abroad. We became interested in this condition, as we isolated during the course of our studies on the bacteriology of pneumonia in sheep and goats, a considerable number of strains of *Streptococcus pneumoniae* which were highly pathogenic experimentally for sheep and goats, irrespective of age, producing typical lobar pneumonia when injected intratracheally and septicaemia subcutaneously, intradermally or intravenously. The material comprising heart blood and lung exudate sealed in pasteur pipettes or pieces of internal organs such as pneumonic lungs, spleen, or liver in 20 per cent glycerol saline in sterile containers were received with a request for examination for pasteurellosis. During the course of our investigation, a total of 250 cases of pneumonia in sheep and 150 of pneumonia and sudden death in goats were subjected to detailed bacteriological examination and it is interesting that in 45% of cases in sheep and 25% in goats virulent pneumococci were isolated predominantly belonging to types 3, 28 or 28 A. It is proposed to pursue such studies further to recognise the presence or absence of pneumococcosis in other species of domestic animals in India.

The techniques and methods used in the biochemical and serological examination of the strains were those of Kauffmann *et al* (1940) and Lund (1944, 1949). The strains encountered were typical pneumococci: Gram-positive diplococci, showing a distinct capsule in India ink preparations and capsular reaction in homologous serum. Their growth in fluid media was diffuse. Colonies on 5% horse blood agar were smooth with alpha haemolysis. The strains were soluble in bile and sensitive to optochin (no growth in optochin in a dilution of 1:160,000). They did not grow at 45°C. and they were killed by heating to 60°C. for 1 hour. All the strains formed abundant amounts of pneumolysin in serum-free media.

Biochemical reaction: Fourteen 'sugars' were employed: arabinose, xylose, dulcitol, inositol, sorbitol, mannitol, glucose, galactose, lactose, sucrose, maltose, inulin, salicin and aesculin. The concentra-

tion of the sugars was 0.5% except in the case of aesculin which was employed in a 0.2% concentration. Hiss's serum water medium (one part of ox serum and two parts of distilled water) was employed as a base for fermentation reaction with Andrade's indicator. The final pH was about 8.0. The medium was steamed for about one minute before the addition of the sugars and then distributed into narrow tubes.

Two drops of a young culture in serum broth were added to each of 14 tubes and to a control tube with Hiss's medium. The tubes were shaken and incubated at 37°C. for five days and inspected daily. Only a distinct change of colour was reckoned as a positive reaction. Fermentation ended within 5 days and in most cases within 24 hours. The effectiveness of the inoculation was checked by subculture of the control tube. If the growth taken from the control tube 24 hours after the inoculation was poor, the fermentation test was repeated.

None of the strains fermented aesculin, mannitol, sorbitol, dulcitol, inositol, xylose or arabinose. They all fermented glucose, lactose, sucrose, maltose, inulin and salicin. In agreement with the findings of Lund (1949) there was no concordance between the serological types and their individual capacity for fermentation. The results of the biochemical behaviour of the strains of pneumococci are set out in Table I and Table I-a.

Pathogenicity.—The methods of examination of pathogenicity of the strains were those of Lund (1942).

Six highly pathogenic strains, two belonging to such serotype, were selected on the basis of mouse pathogenicity tests for trials on sheep and goats varying in age from 6 months to one year. These were inoculated sub-cutaneously with 0.5 ml. of an arbitrarily selected ten-fold dilution of 18-20 hour old ox serum broth cultures and were observed for a period of 14 days. It is interesting to note that all the three serotypes produced rapidly fatal septicaemia in sheep and goats. Detailed tests on the pathogenicity of all strains are in progress and will be reported in due course. The results with type 3 showed that mouse-pathogenicity is no index of pathogenicity for sheep and goats in concordance with the observations of Lund (1942).

Pathogenicity of the strains for mice was tested by intraperitoneal injection of swiss albino mice weighing 18-20 gm. with 0.5 ml. of undiluted and ten-fold dilutions of 18-20 hour serum broth cultures. The mice were observed for 14 days. The average lethal dose for mice of different strains of the three serotypes of *Streptococcus pneumoniae* isolated from pathological lesions in sheep and goats is shown below;—
Type 3:—*Sheep* strains: 0.5 ml. of 10^{-4} dilution of 18-24 hour old serum broth culture.

Goat strains: 0.5 ml. of 10^{-4} dilution of 18-24 hour old serum broth culture.

Type 28 (a) Sheep strains: } 0.5 ml. of 10^{-8} dilution.
(b) Goat strains: }

Type 28A (a) Sheep strains: } 0.5 ml. of 10^{-7} dilution.
(b) Goat strains: }

TABLE I

Setting out the biochemical reactions of *Streptococcus pneumoniae* isolated from the pneumonic lungs of sheep and goats.

Substrate	Sheep strains (115)			Goat strains (38)		
	Type 3 (30)	28 (67)	28 A (18)	3 (29)	28 (7)	28 A (2)
Catalase test	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Methylene blue reduction test	+(30)	+(67)	+(18)	—(29)	+(7)	+(2)
Methylene blue milk	A C p R	A C	A C	A C	A C	A C
Gelatin liquefaction	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Hydrogen sulphide	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Litmus milk	A C	A C	A C	A C	A C	A C
Ammonia	p R	p R	p R	p R	p R	p R
Indole	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Voges-Proskauer test	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Methyl red test	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Nitrate reduction	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Hydrolysis of urea	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Hydrolysis of arginine	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Citrate utilisation test	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Arabinose	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Xylose	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Dulcitol	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Inositol	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Sorbitol	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Glucose	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Galactose	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Lactose	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Sucrose	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Maltose	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Inulin	+(30)	+(67)	+(18)	+(29)	+(7)	—(2)
Mannitol	—(12)	—(22)	—(6)	—(12)	—(5)	—(2)
Salicin	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Aesculin	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Solubility in bile	+(30)	+(77)	+(18)	+(29)	+(7)	—(2)
Hydrolysis of sodium hippurate	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)
Optochin sensitivity (1:160,000)	+(30)	+(67)	+(18)	+(29)	+(7)	+(2)
Thermal resistance 50°C for 20 minutes	—(30)	—(67)	—(18)	—(29)	—(7)	—(2)

Key: + = Positive or acid but no gas,
— = Negative.

TABLE I A.

Showing fermentative reactions.

Author	Year	No. of strains	Fermentation		Negative or Positive
			Negative	Positive	
Christiansen	1913	38	du-so-mt.	gl-ga-la-suc-ma	in sal
Viktorow et al	1933	88	du-it-so ar and xy weakly positive	gl-ga-la-suc-ma	in + as a rule mt 27% + sal 82% +
Jurgens	1937	112	ar-xy-du-it-so	gl-ga-la-suc-ma	in 97% + mt 47% + sal 59% +
Langvad-Nielsen	1944	137	ar-xy-du-it	gl-ga-la-suc	in 62% + mt 34% + sal 92% +
Mørch	1948	150	ar-xy-du-it-so	gl-ga-la-suc-ma	in 60% + mt 20% + sal 71% + aes 23% +
Dhanda & Chandra Sekariah	1957	149	ar-xy-du-so-mt-aes	gl-ga-la-suc-ma	in 62% + sal 46% +

Key: ar = arabinose, du = dulcitol, it = inositol, so = sorbitol,
xy = xylose, gl = glucose, ga = galactose, la = lactose,
suc = sucrose, ma = maltose, in = inulin, mt = mannitol,
sal = salicin, aes = aesculin.

Serology

For purposes of comparative study, *Streptococcus pneumoniae* type strains were obtained through the courtesy of Dr. Erna Lund, Leader of the Pneumococcal Department at the State Serum Institute, Copenhagen, Denmark, as well as standard polyvalent and Factor anti-pneumococcal sera. The results of serological examination of the strains are mapped out in Table II. Serological typing of the strains was done on the basis of specific capsular reaction and capsular tube agglutination test. Of a total of 113 ovine strains examined, 67 belonged to type 28, 18 to type 28A and 30 to type 3. Of a total of 38 caprine strains, 29 belonged, to type 28A and the rest to type 28. It is interesting that type 3 was isolated from lambs and goats that died suddenly after a few hours' illness.

TABLE II

Mapping out results of serological examination of pneumococci.

Type sera	Sheep strains Types			Goat strains Types			Cross — reaction with
	3	28	28A	3	28	28A	
3	+(64)	—	—	+(128)	—	—	—
28	—	+(128)	+(64)	—	+(128)	+(64)	28A, 16, 23B
28A*	—	+(64)	+(128)	—	+(64)	+(128)	28, 16, 23B
16	—	+(32)	—	—	+(32)	—	28
23	—	—	—	—	—	—	—
23A*	—	—	—	—	—	—	—
23B*	—	+(32)	+(32)	—	+(32)	+(32)	28, 28A

* Sera prepared locally according to Lund (1942).

TABLE II A.

Showing results of agglutinin-absorption for types 28, 28A, 16 and 23B.

	Serum 28 Strains abs. with				Serum 28A abs. with				Serum 16 abs. with				Serum 23B abs. with			
	nabs.	28A	16	23B	na.	28	16	23B	na.	28	28A	23B	na.	28	28A	16
28	128	32	64	64	64	—	32	32	32	—	—	—	32	—	—	—
28A	64	—	32	32	128	16	128	64	—	—	—	—	32	—	—	32
16	16	16	—	16	—	—	—	—	128	64	128	128	—	—	—	—
23B	16	—	16	—	16	—	16	—	—	—	—	—	128	64	64	128

Key: The numbers following the sign + indicated tube agglutination titres.
+ in Table II shows a Positive Specific Capsular Reaction (Quellung reaction).

Discussion

Though primary pneumococcosis in man is a very well defined clinical and pathological entity, this is the first time that the disease has been recognised in domestic animals in India. Infections with *Str. pneumoniae* were found to be responsible for death to the extent of 75% cases amongst calves on a farm in Germany. Further, occasional references in the literature to diplococcal septicaemia and pneumonia in sheep and lambs (Rusnak, 1954; Stomatovic, *et al*, 1956) may be taken as references to pneumococcosis in this species of domestic animals. The results of this investigation have brought out the importance of the

hazard of pneumococcosis to the health of livestock and it will be interesting and fruitful to pursue these studies further to throw light on the vexing problem of carrier state in these animals as well as the role of pneumococci as the causative agents of mortality in other species such as cattle, horses and poultry. The problem of infection from man to animals and vice versa on farms where pneumococcosis has been observed to occur remains to be investigated. The problem is of mutual importance to veterinary and public health workers.

Summary

1. The isolation of *Streptococcus pneumoniae*, types 3, 28 and 28A is reported from cases of pneumonia and sudden death in sheep and goats.

2. In a total of 250 sheep and 150 goats suffering from pneumonia, 45% and 25% respectively were found to be infected with *Str. pneumoniae*. Of a total of 115 ovine strains of the organism examined 67 belonged to type 28, 18 to type 28A and 30 to type 3. Of the 38 caprine strains 29 belonged to type 3, 2 to type 28A and 7 to type 28.

3. The isolation of this organism from cases of pneumonia from these two species of animals opens a new field for investigation of the aetiology of pneumonia as a clinical disease entity to which these species are highly prone.

4. The problem also calls for investigation of the disease from the public health and animal health point of view with a view to study if infection is transmitted from animals to man or vice versa.

REFERENCES

- Christiansen, M. (1913) ... *Manedsskrift for Dyrlaeger*, 25, 1 (Quoted by Lund, 1948).
- Dabrowski, T. and Paroszkiewicz, M. (1955) ... *Med. Vet.*, Varsovie, 11, 397 (Abstract in *Vet. Bull.* 26, 14).
- Donald, L. G. and Mann, S. O. (1950) ... *Vet. Rec.* 62, 257.
- (a) Fey, H. (1952) ... *Schweizer Archiv fur Tierheilkunde*, 94, 636 (Quoted by Lund, 1957).
- Hammer, D. (1954) ... *Zbl. Bakt. I. (Orig.)* 161; 269 (Abst. in *Vet. Bull.* 26, 3).
- Idem* (1955) ... *Zbl. Vet. Med.* 2, 218 (Abst. in *Vet. Bull.* 26, 681).
- Idem* (1955) ... *Dtsch. tierarztl. wscrh.*, 92, 24 (Abst. in *Vet. Bull.* 26, 680).
- Hutyra, F. and Marek, J. (1927) ... *Special Pathology and Therapeutics of the diseases of domestic animals*, London, Bailliere Tindall and Cox.
- Jurgens, Axel (1937) ... *Acta Path. et microbiol. Scandinav.*, 14, 511.
- Kauffmann, F. *et al* (1940) ... *J. Immunol.*, 39, 397.

10. Langvad-Nielsen, A. (1944) ... Acta Path. et microbiol. Scandinav., **21**, 747.
11. Lund, Erna (1942) ... *Ibid.*, **19**, 497.
12. *Idem*, (1944) ... *Ibid.*, **21**, 142.
12. a. *Idem*, (1944) ... *Ibid.*, **21**, 747.
13. *Idem*, (1949) ... *Ibid.*, **26**, 709.
13. a. *Idem*, (1957) ... *Ibid.*, **40**, 425.
14. *Idem*, (1956) ... Pers. Communication.
14. a. Rømer, Ole (1948) ... Medlamsbled for den danske dyrlægeforening, **31**, 816 (Quoted Lund, 1957).
15. Rusnak, N. E. (1954) ... Veterinariya, Moscow, **31**, 32. (Abst. in *Vet. Bull.*, **25**, 2253).
16. Stomatovic, S. *et al* (1956) ... *Vet., Glasn.*, **10**, 99. (Abst. in *Vet. Bull.*, **27**, 333).
17. Terpstra, J. I. and Ackermann, ... Tijdschr. Diergeneesk., **79**, 141 (Abst. in *Vet. Bull.*, **25**, 3905).
18. Vallee, A. and Charbonner, R. ... *Rec. Med. Vet.*, **125**, 466. (Abst. in *Vet. Bull.*, **21**, 8).
19. Viktorow, L. K. *et al* (1933) ... *Zbl. f. Bakt. I. Abt. Orig.*, **130**, 24. (Quoted by Lund, 1949).

Clinical Article

LAPARO-CYSTOTOMY IN A HORSE

By

M. N. MENON, F.R.C.V.S., and U. MOHAN LINGAM, B.V.Sc.,

Veterinary surgery has made much headway during the last two decades and to-day experimental surgery has come to possess vast clinical possibilities, largely due to recent advances and newer concepts in asepsis and antisepsis, chemotherapeutic methods, anaesthesiology and antibiotic therapy. Even so the field of operative therapeutics in the equine patient has not widened to such a comparative level, though the percentage of successes in major surgical intervention in the horse is at least 50 per cent higher now than ever before.

Reference to available published work to-date has not provided any evidence to suggest that laparotomy in its strictest sense has been thought of seriously for an abdominal approach to the urinary bladder for removal of vesical calculi in the horse.

The following is a detailed clinical report of a successful laparocystotomy for extraction of a calculus from a cob-sized Indian gelding (Kathiawar) aged under five years purchased in the Punjab and owned by a circus company in the South of India. Ever since its purchase the animal has been reported to be suffering from difficulty in urination with occasional bouts of severe difficulty, when it passed highly blood stained urine and rank blood towards the end of the act. The animal

is reported to have been presented for attention as a non-resident patient at all the veterinary institutions where the circus company established its camp head quarters, with little or no benefit. Meanwhile the horse continued to suffer and get emaciated more and more.

It was at Karur (Tiruchirrapalli District) Veterinary dispensary that the Veterinary Surgeon in charge (U.M.L.) recommended detailed examination of the case and appropriate residential treatment. Accordingly on 21-12-1957 it was admitted as Case No. 1714 after a lapse of two months of known period of suffering without diagnosis.

The animal was placed under strict observation for 72 hours during which period it was put under large doses of procaine penicillin besides the usual diuretics and urinary antiseptics.

The observations fully confirmed the owner's version of the case history and a provisional diagnosis of vesical calculi was made. On examination per rectum the bladder was found to be semi-distended and entirely extrapelvic in disposition. Manipulation of the bladder caused the animal to flinch, strain and squirt small quantities of bloody urine. Further palpation revealed a hard rough stone-like mass of about the size of a tennis ball.

The seriousness of the case as well as the futility of further medicinal treatment were explained to the owner and he was advised to transfer the patient to Madras for immediate care and personal attention of the Professor of Surgery, Madras Veterinary College (M. N. M. now at the Kerala Veterinary College, Trichur).

On 28-12-1958 the animal was discharged from the dispensary and was admitted as horse ward Case No. 164 at the Madras Veterinary College clinic on 7-1-1958.

The condition of the animal on admission was far from satisfactory. Blood loss causing anaemia and emaciation had continued.

Blood count

Differential count:

Polymorphs	...	66.0%
Lymphocytes	...	28.0%
Eosinophiles	...	4.0%
Monocytes	...	2.0%

For three days after admission a daily dose of 300 c.c. of 5% glucose saline was administered intravenously and the animal was placed under strepto-penicillin protection.

Rectal examination confirmed the previous findings. The size and shape of the calculus was estimated to be that of a large duck-egg, freely moving inside the bladder. The bladder at no time was properly emptying itself as the stone moved towards the neck of the bladder on attempts at micturition causing great distress. Further the surface of the stone was felt to be rough and granular accounting for injury and erosion of the mucous membrane and consequent loss of blood.

100 c.cs. of 10% Cal. Borogluconas, were administered intravenously every other day and the diet was controlled avoiding all voluminous feed. The operation was fixed for 15-1-1958 and the animal prepared accordingly. A dose of 3000 units of A.T. serum, and streptopenicillin were administered on the evening prior to the date. The horse was starved of all solid foods for 36 hours and of liquids for 12 hours before operation.

Operative Procedure

Anaesthesia: A basal anaesthetic solution consisting of one ounce of chloral hydrate in ten ounces of distilled water mixed with one drachm each of sodium chloride and sodium citrate was administered intravenously by the slow gravitation technique. As the horse came to rest on the ground further administration of the solution was discontinued.

15 c.cs. of a 2% solution of Novocaine were then injected epidurally and the animal was placed on the dorsal recumbent position and secured in that position to a bale of hay on either side. The forelimbs were flexed at the knees and secured separately. The hind limbs were flexed at the hock and stifle, and similarly secured with thighs abducted so as to gain maximum exposure of the site for operation.

General anaesthesia was maintained with chloroform by the open inhalation method. The suprapubic surface of the abdominal wall including the sheath and its sides, the groin region and sides of the thigh as well as the scrotal and perineal areas were scrubbed up with plenty of soap and running water and dried with sterilized surgical towels. Two coatings of 1% acriflavine in 70% alcohol were applied over the area prepared and drapes were placed to limit the area of exposure.

A paramedian skin incision was placed parallel and to left of sheath extending from the pubis to a length of 8" forward, exposing the rich net work of the external pudental vessels supplying the sheath and posterior abdominal wall. By a process of blunt dissection the sheath and its contents were retracted to the right so that the linea alba was exposed to the extent of the skin incision without inflicting traumatic injury to any of the vital structures. An incision along the linea alba

to the extent exposed, revealed the distended urinary bladder. About a pint of urine had to be aspirated by a process of suction and syphonage before the bladder could be manipulated with safety and be reflected on its neck, so as to raise it to the level of the incision on the abdominal wall. The sides of the incision were now packed off with sterilised warm moist towels and the bladder itself isolated in a similar manner with thick packs. The calculus was then fixed *in situ* so that a mid line incision on the bladder wall could be made over it on the dorsal aspect away from the fundus and nearer to the neck. The initial length of incision made was only about 2". This had to be extended to 3" in order that the large gritty mass of the calculus — Fig. 1 — could be extracted without unduly traumatising the m.m. and the edges of the incision.

It was now possible to reflect the bladder outwards with ease and flush the inside with warm saline to remove loosened bits of gritty matter and organised clots of blood. The outside surface was then washed and mopped up. The incision on the muco layer was then closed by a continuous suture of double zero chromicised catgut mounted on a straight atraumatic needle. The incision on the layers including the serous membrane was closed by continuous Lembert's method of suturing to secure complete closure.

The incision on the linea alba was closed by a set of interrupted sutures reinforced by halsted pattern relaxation sutures at short interspaces. 10 lakh units of crystalline penicillin was deposited in the peritoneal cavity before it was finally closed.

The sheath was then restored to its position, the skin wound closed as usual and the suture line sealed off. A triangular bandage was adjusted for protection and 'moral support'.

The operation which commenced at 9 A.M. was thus completed by about 12 noon. The horse was on its feet by 1 P.M. and had half a bucket of oats gruel at 1-30 P.M. At 2-30 P.M. it passed some urine freely and later voided some dung without straining effort.

Strepto-penicillin was continued for four days thereafter. There was no febrile reaction or other disturbance during these days. Urine and dung of normal consistency were being passed normally and without straining efforts. A little swelling was noticed over the line of sutures on the 5th day on account of a pocket of inflammatory fluid. This was drained by releasing 2 sutures. The animal made an uneventful recovery which may be described as a pleasant anticlimax to disastrous consequences anticipated. It was fit for discharge by the end of the month though actual delivery for other reasons was made only on 11-2-1958 (Fig. 2).

Acknowledgments

We thank the Proprietor of the circus company for his continued interest in his newly acquired property, not mindful of the expenditure and inconveniences incurred. Our thanks are due in no small measure to the Principal, Madras Veterinary College and to the entire clinical staff of the college who to the last man were stimulated by the spirit of this new venture in equine surgery.

I (M.N.M.) particularly thank the students in the final year class who volunteered to improvise arrangements for aspirating urine under difficult conditions and I thank the Principal of the College for presenting the nucleus of the idea of aspiration by syphonage in the absence of facility for using a suction pump for the purpose. Finally I thank my colleagues in the departments of Clinical and Preventive Medicine for their unstinted support at all stages, and in this venture which was more or less my swan song in the service of the equine clinic at the Madras Veterinary College.

Abstracts

An Outbreak of Rinderpest Involving Cattle and Sheep—By R. H. JOHNSON
The Veterinary Record, Vol. 70, No. 22, May, 1958.

The author has reviewed the literature on the incidence of natural outbreaks of rinderpest in sheep and goats in different countries. The Indian literature on this subject form an important part of the review. An outbreak of rinderpest involving cattle and sheep in the Plateau of Northern Nigeris has been described. The disease was first observed in cattle and then apparently spreading to contact sheep. The syndrome observed in sheep was very similar to the typical rinderpest seen in the cattle and the disease was confirmed in both cattle and sheep by compliment-fixation test. There were 34 adult male cattle and in intimate contact were 110 sheep. As rinderpest started among cattle, the infected as well as the immediate in-contacts were slaughtered. Within a week after this, rinderpest was diagnosed clinically and confirmed serologically in the flock of sheep and 12 died of the disease. Ultimately the remaining infected and the in-contacts were slaughtered. Rinderpest in sheep was found to differ from that in cattle in respect of the following major points. Salivation, mouth lesions and ocular discharges were not common in sheep. The petechiation and erosion of the gall bladder lining seen in cattle was not a feature of the disease in sheep.

A. MUKERJI,

Clostridial Enteritis in Cattle—By G. N. SHIRLEY, *The Veterinary Record*
Vol. 70, No. 23, June, 1958.

The author has described his experiences of a new type of disease in England, what he called "Clostridial enteritis in Cattle", and draws attention of other workers to this problem. He came across 14 such cases and apprehends that many more cases of similar nature pass unnoticed every year. In the majority of case no symptoms are observed.—it is simply a case of sudden death. Again, in probably 80 to 90 per cent of cases it occurs very shortly after calving,—within the first 48 hours. In the less acute cases a condition closely resembling milk fever may appear. On post-mortem examination, the 4th stomach shows marked inflammation of the lining. Acute enteritis is seen sometimes in only a portion of the bowels, but more often it extends throughout the whole length of the intestines. This enteritis is diffuse and is usually so severe that the wall of the bowel resembling red-velvet, with the bowel contents fluid and blood-stained or dark brown in colour. Suspecting that the condition was one of poisoning, the intestinal contents and organ portions were sent to different laboratories for necessary examination, but all the reports were negative for poisons. It was then thought that since this disease had similarities with Braxy in sheep, the etiological agent might be a clostridial toxin and examination on this line led to the detection of toxin of *Cl. Welchii* type A. The author further suspects that this disease also occurs in pigs.

[P.S.—The abstractor wants to bring to the notice of the Veterinary Profession in India the probable existence of clostridial enteritis or Enterotoxaemia in cattle due to toxigenic Types of *Cl. Welchii*. Suggestive reports of such conditions in various States are now forthcoming, but none has so far been confirmed by toxin-antitoxin neutralization test. One of the reasons for this is the non-availability of the Type anti-toxic sera in diagnostic laboratories outside the I.V.R.I. A few more references on the subject may be pointed out here. Quesada (1954) gave on account of Enterotoxaemia caused by *Cl. Welchii* Type B in a group of 10 young cattle aged 8—12 months resulting in the death of 4. Griner *et al* (1956) reported that 3 calves, 7 to 10 weeks old, died with a clinical picture similar to that in lambs with Enterotoxaemia. *Cl. welchii* (Epsilon) toxin, Type D, was demonstrated in the intestinal contents by neutralization test in mice and by culture. An outbreak of suspected Enterotoxaemia in Shahiwal herd belonging to the West Bengal Agricultural College and located in the Campus of Jadavpur Engineering College was reported by the Abstractor at the D.I.O. and Research workers' Conference held at Izatnagar in 1956, and he subsequently recorded his observations in 1957.

REFERENCES CITED ABOVE

1. Quesada, A. (1954) ... Enterotoxaemia in calves. *Vet. Bull.* No. 9, Vol. 25, September, 1955. Abstract No. 2718.
2. Griner, L. A., *et al* (1956) ... *J. Amer. Vet. Med. Ass.* 129, 375-76. Reported in *Vet. Bull.* February, 1957.
3. Mukerji, A. (1957) ... Enterotoxaemia in cattle,—its probable existence in India, *The Bengal Veterinarian*. Vol. 4, No. 1, May, 1957.

A. MUKERJI.

News and Views

Dr. P. Seneviratna, B.V.Sc. (Madras), has obtained the Ph.D. (Lond.) and the M.R.C.V.S. In the latter examination he has come first in Surgery as well as in Medicine. He is expected to return to Ceylon at the end of July 1958 to resume duties as Lecturer in Veterinary Medicine and Parasitology in the University of Ceylon.

Shri Sardeshpande, B.V.Sc., a product of the M.P. Veterinary College, Jabalpur, is now a Lieutenant in the Remount Veterinary and Farm Corps. He is the first from that College to claim that distinction. We most heartily congratulate him and his *Alma-mater*!

Al-Haj Dr. G. Osman Khan, G.M.V.C., P.G. (Edin.), Retired Veterinary Officer from Malaya is appointed as Honorary Presidency Magistrate for Madras City for a period of two years from July 1958. We most heartily congratulate him and wish him all the best in his new sphere of work!

Fodder Development Scheme:—The Government (Madras) has sanctioned a scheme for the development of cattle feeds and fodder resources in the State at a cost of Rs. 51,000 during 1958-59.

The 100 acre farms are to be opened for raising cattle feeds and five 10 acre plots are to be developed into model pastures.

The Mail, July 26, 1958.

Modern Dairy for Trivandrum:—A modern dairy, equipped with the latest machinery for pasteurisation of milk, is nearing completion at Trivandrum.

Estimated to cost Rs. 5,50,000 the dairy will be equipped for processing and bottling 330 gallons of milk per hour.

The Union Government is meeting the entire capital expenditure, 60 per cent as grant and 40 per cent as loan.

The Scheme, when implemented, will provide employment to about 200 persons and subsidiary occupation to about 900 families.

The Mail, July 25, 1958.

* * * *

Fodder shortage in Anantapur (A.P.):—Shortage of fodder is acute in Anantapur district, and farmers are not able to buy their needs at fair prices. The district is in the grip of famine for the second time in succession due to absence of rain. Many farmers are selling their cattle for slaughter. Some others are keeping their cattle on starvation diet.

In many villages, ryots are not in a position to transport manure from other villages due to the poor health of cattle.

According to farmers, the situation will worsen if immediate steps are not taken to import fodder.

The Mail, July 25, 1958.

* * * *

A Giant Shark of Rare Species caught:—A giant shark, measuring about 25 ft. in length and 13½ ft. in girth and weighing about 5½ metric tons, was landed by fishermen at Irumeni, 12 miles from Mandapam, recently.

Mr. Virabhadra Rao, Fisheries Extension Officer at Mandapam Camp, said the shark, known as Rhincodon Typus, was one of the rare species. Hardly 90 of this variety had been caught during the past one hundred years.

The Rhincodon Typus has characteristic feeding habits, which are of scientific interest.

The Mail, July 24, 1958.

* * * *

Post-Graduate College in Animal Sciences:—A Post-Graduate College in Animal Sciences will be started at the Indian Veterinary Research Institute, Izatnagar, next month. The College will be affiliated to Agra University.

The Mail, July 24, 1958.

Block Development Corner

[Articles under this section, should be more in the nature of simple 'talks' to rural folks and village level workers, on Animal Husbandry matters, and not loaded with scientific terms and theories.]

THE COW VERSUS THE BUFFALO

By

T. VINAYAKA MUDALIAR, G.M.V.C.

Retired Livestock Development Officer, Government of Madras.

Not long ago, a piquant situation arose in our country, when PUNDITS well versed in animal husbandry matters, began discussing whether the GO-MATHA, the cow, could not completely displace the buffalo. They discussed and discussed and as it often happens in such cases, no decision was arrived at. It all happened in this way. The question arose whether schemes for development of buffaloes should be sponsored by the Government or not and whether all that money could not be more usefully spent on cows and bulls, to bring about a rapid improvement in the livestock wealth of our land.

The poor buffalo came in for a good lot of criticism—its ugly appearance, its dirty habit of wallowing in the mud, its lack of personal hygiene, its capacious appetite, its idiotic temperament etc., etc. The most amazing of all arguments was that its milk produced a "buffalo-mentality" in its consumers! That made my flesh creep as I had a partiality for buffalo's milk. Then I started ruminating on my own failures and foibles and finally murmured to myself 'That may be so'. The buffalo, of course had no say in the matter, otherwise it would have been interesting to know its opinion!

I know you do not require to be convinced of the value of buffaloes but it is better to know a few of the published facts. It has been estimated that India has for every 2½ cows, one buffalo-cow. The Pre-partition figures were 455 lakhs of cows and 203 lakhs of buffaloes of three years of age, mainly kept for milking and breeding purposes; but yet the buffalo-cow practically, produced nearly one-half of the total output of milk in India. The richness of her milk in fat content is *un-surpassed in the world*. I have heard it said by some of our young men who had been abroad for dairy training and returned, that they were sometimes questioned about "this wonder animal of India, whose butter-fat content ranged from 6 to 9 per cent ordinarily and in some individual cases went upto 12 per cent even!"

Here are a few good chits given to the buffalo from high quarters. The Royal Commission on Agriculture stressed the importance of she-buffaloes as "the chief milk producing stock in India". Dr. Norman C. Wright, M.A., D.Sc., Ph.D., Director, Hannah Dairy Research Institute, Ayrshire, Scotland, who came over to this country at the invitation of the Government of India, to assess the possibilities of Cattle and dairy industries here, says in his report, "It is indeed not difficult to explain the popularity of the she-buffalo. Her average milk yield is markedly higher than that of the ordinary village cow, the butter fat content of her milk is also higher, while she appears to possess a remarkable ability to convert coarse fodders into milk".

True it is that cows of certain breeds in India have responded remarkably well to scientific breeding, feeding and management and they easily exceed the buffaloes in their milk yield. But will they be able to beat the buffalo in butter-fat content? Judging from the experience of more advanced countries, we may venture to reply with an emphatic 'No'. Further, ours is a land of villages. Marketing of fluid milk from remote villages has its own hazards, combined with the tropical conditions of our land. Naturally therefore, the villager has wisely built up a fairly good business in ghee, in the fastness of his inaccessible village. It is this trade in ghee that furnishes his hard-worked house-wife, with the necessary cash-returns from time to time, to purchase various other necessities of life. In other words this much despised (not by the villager) buffalo makes it possible for the villager to command some currency for his day-to-day existence. This is an important factor not to be lost sight of in rural economy. Otherwise the usurer will fill up the gap with disastrous results. Such is the value of this buffalo in our land. Its potentialities for increased production of milk have not yet been fully exploited. This is not her fault. It is due to our defective planning. Let us not fail to appreciate the virtues of this placid looking animal while we are having her with us. If we displace her, we will certainly be throwing away the butter in our hand and then begin searching for ghee.

Under hard village conditions, with scarcely enough to eat and nothing better than in-nutritious straw and grass available on roadsides and bunds of fields, it is remarkable how well this buffalo thrives. She has been born and bred up in the midst of poverty-stricken conditions of rural India and she seems to be fully conscious of the low economic condition of her master, the Indian ryot.

As regards the chemical composition, the milk of both the cow and the buffalo is the same, only varying in degree and that too very slightly, in the *proportion* of its contents. The main difference is in its butter-fat content, the cow's being 3 to 4 per cent and the buffaloes

6 to 9 per cent. If anything, the buffalo's milk may need a little dilution to suit weak stomachs and nothing more. There is no other factor in it to be afraid of 'buffalo-mentality'.

What have you done in your Block Development area to improve the buffalo?

Farm News Release

I. C. A. R.

Brine-Curing of Hides—Better than Wet-Salting—Brining, or immersing cleaned hides in a saturated solution of salt, has been found to have greater advantages over wet-salting commonly followed in curing hides.

In brining, the hides are immersed in the saturated salt solution for 24 hours, after which they are drained over poles and spread out. Salt may or may not be applied again, and the hides properly piled till transported to the tannery.

Experience shows that brine-cured hides are superior to wet-salted ones. Brine-curing affords them greater protection under adverse conditions. Even during long storage, such hides do not get 'salt stains.' Again they do not need any washing prior to soaking them in the tannery. They also need much less of soaking.

Leather obtained from brine-cured hides has more fullness and a brighter grain side.—ICAR 40/58.

Association News

The All-India Veterinary Association

THE RESERVE FUND

An event of great importance to the Veterinary profession in India, took place in August 1924. It was the birth of the *Indian Veterinary Journal*. Circumstances were positively hostile and yet the profession took that bold step and the lion-heartedness of the early pioneers cannot be too highly praised. Ever since then, the *I.V.J.* has toiled hard under very adverse circumstances. The *I.V.J.* lives to-day so that the profession could prosper and science advance.

And now the hat is sent round so as to place this journalistic venture on a sounder and firmer basis. The *I.V.J.* is a priceless possession of our profession. It has placed the Indian Veterinary Surgeon, on the map of the scientific world. Just pause and ponder over, how much we owe to the Journal both individually and collectively. Is it too much then to expect the profession to respond to the appeal issued for a Reserve Fund? We hope not.

Some enquiries have come to us asking us to indicate the extent of help expected. We do not want to put the members of the profession to any undue financial strain in these hard days. At the same time, a certain amount of sacrifice is needed to make this fund a great success, so as to make it worthy of our profession. So we feel that the following scale of contribution will be quite reasonable. It could even be paid in two or three instalments.

Class I Officers	...	Rs. 100/- and above.
Class II Officers	...	Rs. 50/- and above.
All others	...	Rs. 25/- and above.

It is our ambition that no Veterinary Surgeon in this land should remain without contributing to this fund. Brick by brick, this great edifice of our's should begin to rise higher and higher. On the success or otherwise of this venture, the solidarity of our profession depends. "Pay and Prosper" is the slogan we pass on to the members of our profession.

Jai Hind!

T. VINAYAKA MUDALIAR,
Editor,
The Indian Veterinary Journal,
and
General Secretary, A.I.V.A.

THE I. V. J. RESERVE FUND

LIST OF CONTRIBUTORS

	Amount acknowledged in August 1958 issue	Rs. nP.
Dr. K. S. Nair, Principal, Vety. College, Trichur	...	1,510.80
" V. G. Patil Kulkarni, V. C. Bombay	...	100.00
" S. Krishnaswamy Chetty, Agl. College, Coimbatore	...	5.00
" R. Venkatakrishnan, M.V.C.	...	25.00
" S. Damodaran, M.V.C.	...	10.00
" K. R. Kodagali, Naswadi	...	25.00
" C. K. Velayudhan Nair, M.V.C.	...	10.00
" Rao Bahadur V. R. Phadke, Vice-President, A.I.V.A.	...	25.00
		50.00

	Rs. nP.
Dr. P. Chandrasekariah I.V.R.I.	2.00
„ Roshan Lall	2.00
„ B. R. Sen Gupta	2.00
„ N. P. Bhalla	2.00
„ (Miss) D. Montant	3.00
„ M. Natarajan	5.00
„ B. K. Kathuria	4.00
„ Gajindar Singh	3.00
„ P. Madhusudan	3.00
„ C. F. Mataney	5.00
„ G. B. Raichur, Karwar, 1st. inst.	10.00
	1,803.80

Cheques, money orders and all correspondence should be addressed to the Editor, *The Indian Veterinary Journal*, Madras-17.

THE MYSORE VETERINARY MEDICAL ASSOCIATION

The Silver Jubilee Celebration of the Mysore Serum Institute
and
The 13th All-India Veterinary Conference

NOTICE

It has been finally decided to have the Silver Jubilee Celebrations of the Serum Institute, Bangalore and the 13th All-India Veterinary Conference on the 6th November 1958 and the following days at Bangalore. Detailed programme will follow.

His Excellency the Governor of Mysore has kindly consented to inaugurate the function at 4 p.m. on 6th November, 1958.

Hebbal,
20th August, 1958

R. D. NANJIAH,
Hon. Secretary.

THE BIHAR VETERINARY ASSOCIATION

THE SEVENTH ANNUAL CONFERENCE

The above Conference met at the Veterinary College Campus, Patna, from the 8th to 10th February 1958. As many as 200 delegates besides distinguished visitors attended the conference.

Dr. R. B. Prasad welcomed the delegates as Chairman of the Reception Committee and after discussing the various developments taking place towards the onward march of the Animal Husbandry Science holding a key position in National Plan and designed to revitalise

Agriculture in India and build up the national prosperity, requested the chief guest the Hon'ble Sri Jagat Narain Lall, Minister for Animal Husbandry, Bihar, to inaugurate the Conference.

Sri Jagat Narayan Lall declaring the session open delivered his much awaited and learned address and discussed the role of Veterinary and Animal Husbandry workers in improving the wealth of livestock so vital for an agricultural country like India. Mr. Lall said that a Veterinary Surgeon should not rest content merely by treating an animal but should become a leader of animal kingdom and work for the betterment and improvement of the cattle wealth of the country. He assured that Government would do every thing to better the lot of Veterinarians in this State.

He added that Veterinarian had to play an important role in the reconstruction of the country as top priority was being given to food production.

Mr. Lall said that without cattle wealth the country could not progress. In Gandhian economy the tractors had no place in this country. Referring to the demands of the Association for nomination of a veterinarian in the State Legislative Council, Mr. Lall said that if the Medical profession could be represented, there was no reason why the Veterinary profession should be debarred from such representation in the State Legislature. He assured the members of the Association that he would advocate their cause with all emphasis at his command.

He was pleased to inform the members of the Association that the State Government proposed to set up a State Veterinary Council similar to the Medical Council to meet the long felt demands of the profession. He was further pleased to remark that the question of upgrading the pay scale of graduates passing the four year degree course from the Bihar Veterinary College, Patna was under the active consideration of the State Government. He made an appeal to the Animal Husbandry workers for missionary spirit of service to the country and concerted efforts to enrich the State's cattle wealth.

Sri B. M. Prasad, Deputy Director, Animal Husbandry, Chotanagpur Range, Ranchi and the President of the Bihar Veterinary Association who presided over the conference pleaded for opening another Veterinary College to relieve the strain on the Patna Veterinary College and to bring about improvement in the quality of students qualifying from this college. He suggested upgrading of the Patna Veterinary College for carrying out research work in some selected branches of Animal Husbandry science leading to Master degree.

He on behalf of the Veterinary association pleaded for redress of various grievances and requested the authorities to nominate at least one

Veterinarian to the State Legislative Council in consultation with the State Veterinary Association.

A vote of thanks to the distinguished guests was proposed by Sri V. R. Rajagopalan, Director, Livestock Research Station, Patna and was passed with acclamation. The conference then adjourned for Tea.

In the evening from 6-30 p.m. to 9-30 p.m. a cultural programme was arranged in which the students of the Bihar Veterinary College and a team of District social organisations entertained the delegates.

9th February, 1958.—The scientific session of the 17th annual general conference of the Bihar Veterinary Association was held in the forenoon of the 9th February, 1958 in the premises of the Bihar Veterinary College, Patna. Sri K. S. Raman, Chairman, Bihar Public Service Commission, Patna inaugurated the conference and emphasised the role of Veterinarian in the development of the country specially in the field of Agriculture and Food Production. He pointed out the responsibilities of Veterinarian in the improvement of livestock and prevention of various diseases and the necessity of increasing the several livestock products such as milk, meat, egg, wool etc. After the inauguration, several scientific papers were read which were followed by lively discussion.

Dr. A. K. Verma, Senior Research Officer, Livestock Research Station, Patna acted as convenor of this conference. Some of the papers read at this session were :—

- (1) Damage caused to skin by parasites by Sri D. N. Jadav, Assistant Disease Investigation Officer, Bhagalpore Range, Bhagalpur.
- (2) Tuberculosis among bovines and its control in Bihar by Sri T.S. Sharma, Research Assistant, Livestock Research Station, Patna.
- (3) Ascariasis with special reference to Bihar by Sri G. Saran, Research Assistant, Livestock Research Station, Patna.

The progress of the second five year plan of the Animal Husbandry Department duly initiated by Sri B. N. Sinha, Deputy Director, Animal Husbandry, Bihar, Patna was thoroughly discussed by the delegates present and many useful suggestions in the light of past experiences gained by them were suggested for speedy progress of the plan. The session came to a close with vote of thanks proposed by Dr. R. B. Prasad, Chairman of the Reception Committee and was passed with acclamation. Then the delegates moved to the various stalls specially arranged for the occasion by the Imperial Chemical Industries (India) Limited, Country Drug House, Patna and others.

The business session of the Association started at 2 p.m. with the presentation of General-Secretary's report who first read out the messages received from distinguished persons including the General-Secretary, All-India Veterinary Association, Madras with Sri B. M. Prasad, President, Bihar Veterinary Association in the chair. Sri R. Y. Pandey, Secretary, Bihar Veterinary Association in his annual report dealt with various activities of this Association including the achievements made by the efforts of this organisation. He informed the delegates that recommendation of this Association for filling up gazetted post in the Animal Husbandry Department to the extent of 75% by promotion and 25% by direct recruitment was being implemented by the State Government but unfortunately this principle has not so far been applied for filling up the vacancies in Class I post of the Animal Husbandry Department. Many genuine demands of this Association were still pending final decision of the State Government for which ceaseless efforts were being made to achieve the objective. He expressed his gratefulness to Sri S. K. Sen, Ex-President, Bihar Veterinary Association, Sri B. N. Prasad, President and to the other colleagues of the Executive Committee for their help and co-operation in the discharge of the duty as Secretary. He also conveyed his thanks to Dr. R. B. Prasad, Chairman, Reception Committee, Sri H. R. Kapur, Principal Bihar Veterinary College, Patna, the students of Bihar Veterinary College, the Warden and the Deputy Warden who rendered valuable services in making the stay of the delegates comfortable. The report of the Secretary was adopted unanimously. Sri B. Narayan, Treasurer, Bihar Veterinary Association then presented the account of the Association which was also adopted unanimously.

Then consideration of various resolutions forwarded by the members of the Association were taken up by the delegates and as many as 17 resolutions were passed unanimously after thorough discussion. Some of the more important resolutions are :—

1. Unanimously resolved that the All-India Veterinary Association be invited to hold its next session in Bihar on the occasion of the next annual general conference of Bihar Veterinary Association.
2. Resolved that in view of the increasing demand for qualified Veterinarians in the State and the increasing importance of Animal Husbandry in the future set up of the country, Government be moved to start a second Veterinary College in Bihar.
3. Resolved that Government be moved to nominate one member of Veterinary profession to the Bihar Legislative Council to safe guard the interests of the profession.
4. Resolved that Government be moved to upgrade the scale of pay of the degree holders of Veterinary Science and Animal Husbandry in this state from Rs. 125-8-205-EB-9-250 to Rs. 200-10-250-EB-15-325-10-450 and that Diploma holders of Veterinary Science and Animal Husbandry (G.B.V.C.) having at least five years of experience be treated on par with the degree holders and given the same scale of pay and same facilities as the degree holders.

5. Resolved that the death call be issued on the demise of any member of the association and premium of Rs. 2/- per call be paid by the member of the association which will go for the help of the bereaved family.

6. Resolved that as in the case of B.Sc. (Agr.) Government be moved to permit B.V.Sc. and A.H. of Bihar University for competing in the I.A.S. and the P.C.S.

7. The association considered Government letter No. 1938 dated the 19th September, 1956 and unanimously resolved that Government be moved to accord the recognition to the Bihar Veterinary Association of a single united body representing all ranks of the services in the State Animal Husbandry Department provided members forming such association possess due qualifications as laid down in the constitution of the association.

R. Y. PANDEY,
Secretary.

B. M. PRASAD,
President.

Next the following office-bearers were elected for the current year.

President: Dr. S. M. Hussain, G.B.V.C., (Pat) P.G. (I.V.R.I.) M.S., D.V.M., Deputy Director, Animal Husbandry, N.B. Range, Muzafferpur.

Vice-President: Dr. C.N. Singh, G.B.V.C., (Pat) P.G. (I.V.R.I.), M.S., Ph.D., Research Officer. Livestock Research Station, Patna.

Secretary: Sri R. Y. Pandey, G.B.V.C., (Pat) P.G. (I.V.R.I.), Senior Veterinary Assistant Surgeon, Monghyr.

Joint Secretary: Sri Anirudh Prasad, B.V.Sc. and A.H. Demonstrator, Bihar Veterinary College, Patna.

Treasurer: Sri B. Narayan, G.B.V.C., District Animal Husbandry Officer, Gaya.

Members

1. Sri T.S. Sharma, G.B.V.C., P.C. (Bact & Path.) Mukl. Research Assistant, Research Station, Patna.

2. Sri P. Narayan, G.B.V.C., P.G. (I.V.R.I.) Lecturer, Bihar Veterinary College, Patna.

3. Sri H. S. Sinha, B.V.Sc., & A. H. Demonstrator, Bihar Veterinary College, Patna.

4. Sri H. P. Gupta, B.V.Sc. & A. H. Veterinary and Animal Extension Supervisor, Mairwa (Saran).

In the evening a banquet was given by the delegates to Sri S. K. Sen, Director, Animal Husbandry, Bihar, Patna. In a short speech Sri B. Prasad outgoing President, Bihar Veterinary Association eulogized the services rendered to the cause of this Association by Sri S.K. Sen as President of this Association for a long time and pleaded for consideration of its demands with sympathy. The Director, Animal Husbandry, Bihar, Patna gave a patient hearing and promised to give

due consideration to genuine grievances of the members of the Association.

10th February, 1958.—Some of the delegates also visited Nalanda. Thus ended the glorious session of the conference.

R. Y. PANDEY,
Secretary,
Bihar Veterinary Association.

M. P. VETERINARY ASSOCIATION

Names of students who passed the Final B.V.Sc. Examination of the Jabalpur University from the M. P. Veterinary College in May 1958.

- | | |
|--------------------------------------|-------------------------------------|
| 1. Shri Arvind Bhasker Rao Gharpure | 20. Shri Dayashanker Katare |
| 2. „ Brijendra Prasad Pandey | 21. „ Diwakar Gangadhar Rao Telang |
| 3. „ Chandrashekar Marotrao Saharey | 22. „ Eknath Vinayakrao Tatwawadi |
| 4. „ Dilip Kumar Mitra | 23. „ Jagmohan Rai |
| 5. „ Laxman Jagannath Pawar | 24. „ Jawaharlal Gowamal Vegad |
| 6. „ Madhukar Ramchandra Chawak | 25. „ K. Ramachandra Pillay |
| 7. „ Mangilal Pyarelal Chandrawanshi | 26. „ Khes Dev Kumar Baxi |
| 8. „ Md. Ziaullah Khan | 27. „ Kunjital Soni |
| 9. „ Narayan Shrikrishna Taloker | 28. „ Madhukar Rambhan Kale |
| 10. „ Prabhakar Nathoba Khode | 29. „ Manohar Kesheo Goverdhan |
| 11. „ Raghubir Purushottam Deshpande | 30. „ Pandurang Kesheorao Goverdhan |
| 12. „ Rameshwar Prasad Verma | 31. „ Ram Dayal Dixit |
| 13. „ Ramesh Kumar Hirafal Gargava | 32. „ Ramkrishna Misra |
| 14. „ Abdul Gaffar Khan | 33. „ Rajinder Kumar Ghambeer |
| 15. „ Anand Kanderao Wadegaonker | 34. „ Shantiswaroop Kasatiya |
| 16. „ Anand Prakash Sachdeo | 35. „ Sharadchandra Chanpuria |
| 17. „ Anant Pandurangpant Labhsetwar | 36. „ Udhe Kumar |
| 18. „ Babarao Hariramji Mehare | 37. „ Vidyandand Shukal |
| 19. „ Balchandra Devidas Karanjkar | |

Jabalpur, }
23-7-58. }

M. N. JAMDAR,
Secretary,
M. P. Veterinary Association.

VETERINARY STUDENTS' ASSOCIATION

The Fourth Conference of the All-India Veterinary Students Association was held at Patna on the 8th and 9th January 1958.

The following is the summary of some of the more important resolutions passed:—

1. Standardisation of Veterinary Education in all Colleges. The Government is requested to send a touring Board of Experts to examine this question.

2. Students Union to be started in all Veterinary Colleges.
3. M. V. Sc. Course should be started in all Veterinary Colleges.
4. The U. P. Government should throw open their M.V.Sc., course to students from other States as well.
5. There should be N.C.C. (Veterinary Corps) in all Veterinary Colleges.
6. A Bi-monthly or quarterly magazine of the A.I.S.A. should be started.
7. The Jammu and Kashmir Government is requested to start a Veterinary College in Jammu and Kashmir.

Bihar Veterinary College,
P.O. Patna.
31st July, 1958.

B. SOMESWARA RAO,
General Secretary,
Final Year Student, New Hostel.

TO OUR SUBSCRIBERS

1. Please note that the I.V.J. is released punctually on the 5th and 6th of every month so as to enable you to watch the date and receive it safely, as otherwise losses are reported often which we are not able to account for.
2. Please report non-receipt of a particular issue *before that month closes*.
3. Please do not fail to intimate immediately any change in your address. Do not expect your Journal to be re-directed from your old address. It is rarely done. Please write legibly or in block letters.
4. Please note subscriptions are payable in advance. The official year of the Journal is the Calendar year.
5. Please note down our correct address, as many communications are still sent to our old address.

Veterinary Students' Aid Series

SRINIVASAN'S

1. Pharmacology, Materia Medica & Therapeutics the 4th revised edition, 800 pages ... Rs. 14
2. A Treatise on Treatment (Vol. I: Clinical Medicine) contains also synopsis of Jurisprudence & Toxicology ... Rs. 8
3. A Treatise on Treatment (Vol. II: Preventive Medicine) ... Rs. 8

SRI RAJSEKHAR BROTHERS,
PUBLISHERS & BOOK-SELLERS,
35, PATTAMANGALAM ST.,
MAYURAM (S.I.)

Copies can be had from:

S. NAGARAJAN,
C/o V. SRINIVASAN,
(P.O.) BIHAR VETERINARY COLLEGE,
PATNA.

ADVERTISEMENTS

DERMO-QUINOL

(4% & 8% Iodochloro-oxyquinoline in a vanishing cream base)

for

- ★ SEBORRHOEIC DERMATITIS
- ★ IMPETIGO
- ★ IMPETIGINISED ECZEMA
- ★ ATHLETE'S FOOT
- ★ MONILIASIS
- ★ CHRONIC PARONYCHIA ETC.

For further particulars, please write to:

EAST INDIA PHARMACEUTICAL WORKS LTD.,
CALCUTTA - 26.

VETERINARY BOOKS Just Received

	Rs.	np.
HOARE'S Veterinary Materia Medica & Therapeutics 1956rp.	...	26 25
GAIGER & DAVIES Veterinary Pathology & Bacteriology 1957rp.	...	26 25
MONNIG: Veterinary Entomology & Helminthology 1956. 111td.	...	26 25
DOLLAR'S Veterinary Surgery 1957rp. fully 111td.	...	26 25
BLACK'S Veterinary Dictionary 1956. fully 111td.	...	26 25
BODDIES: Veterinary Therapeutics 1952	...	11 25
LAPAGE: Veterinary Parasitology 1956 fully 111td.	...	39 37
UDALL'S Practice of Veterinary Medicine 1954 Sh. 721- 111td.	...	44 75
MERCK'S: Veterinary Manual 1957rp. 400p. thumb-indexed, 111td.	...	37 50

Order your requirements to-day

SARCOR BOOK COMPANY
PALLIARAKAV ROAD — COCHIN 2 — KERALA STATE

STANES MINERAL MIXTURE

Stanes Sterilised Fine Bonemeal for Cattle

The only Tonic at low prices with high tonic value. Prevents diseases due to deficiency in CALCIUM and PHOSPHORUS. Largely used by all the Agricultural Research Stations in Madras, and by the Veterinary Departments.

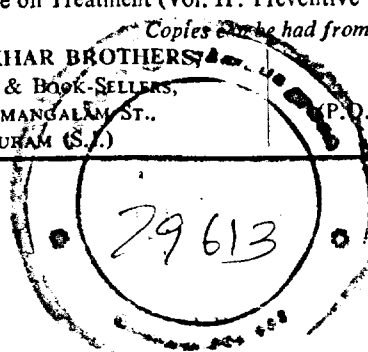
Sold in bags of 14 lbs., 28 lbs., for supply in the Madras Presidency.

For further particulars apply to:—

T. STANES & CO., LTD.,
COIMBATORE

When writing to advertisers, please mention *The Indian Veterinary Journal*.

KZ m2, 0124-
NSE-35-9



ADVERTISEMENTS

B. C. P. W.

NOVOLED

A PREPARATION FOR EXTERNAL APPLICATION
ON WOUNDS AND SORES OF ANIMALS

CONTAINS DDS AND ALLIED ORGANIC COMPOUNDS

*NOVOLED is an excellent fly repellent when
applied to wounds and sores. Specially useful
in the treatment of 'hump sore' and also
- 'foot sore' in Foot and Mouth disease. -*

USED EXTENSIVELY WITH CONSIDERABLE SUCCESS
IN BENGAL VETERINARY COLLEGE HOSPITAL

Available in Bottles of 4 ounce, 1 lb. and 10 lbs.

BENGAL CHEMICAL

CALCUTTA — BOMBAY — KANPUR

Move Forward in Veterinary

MASTISIN

An oral treatment cures all forms of mastitis; increasing quality and quantity of milk. Also
indicated in PASTEURILLOSIS, TRYPANOSOMIASIS, NASAL SCHISTOSOMIASIS etc.
Available in Cattle and Goat sizes, 2 lbs & ½ lb packing, with an ointment. Price: Rs. 6.25
& Rs. 2.25 respectively.

For Free Samples Remit 50 nP. Stamp.

CANCERINA lbs 6 & PRANAVA lbs 3 (For External Dressing)

Is a full course for one animal, specially indicated with success in CANCEROUS HORN.
Price Rs. 15.50

Rail route is cheaper for which give the nearest Rly. Station. Orders by Post must
accompany 50% advance to cover Postage etc.

DEE BEE BROTHERS

1706, KHADIA JALOWALI NAKA, AHMEDABAD-1

Books ON POULTRY SCIENCE

	Rs.	nP.
DE SAULLES: Pictorial Poultry Keeping 1955, 500 illus. &c.	12	00
DICKINSON: Poultry Enterprises 1950 424p. 251 illus. &c.	21	25
TWEED: Poultry Keeping in India 1957rp. illd.	10	00
ROGER-CAMPBELL: Profitable Poultry Keeping in India illd.	4	87
HOWES: Poultry Management illd.	4	87
KNADEL: Profitable Poultry Keeping 1951. 465p. illd.	25	00
CHARLES: Commercial Poultry Keeping 1950, 540p. fully illd.	24	75
MOLEUNIX: Culling of Poultry illd.	2	50
MARSHALL: Egg Incubation 1952 illd.	1	87
FERMOUR: Good Poultry Keeping 1955, 253p. illd.	4	80

Available from

SVASTIK SALES COMPANY,

VETERINARY BOOK-SELLERS
PAREL - BOMBAY-12

When writing to advertisers, please mention *The Indian Veterinary Journal*.

ADVERTISEMENTS

Telegram—CRESCENT

Telephone—34-3104

RINDERPEST ERADICATION SCHEME

BRAND VACCINATED ANIMALS WITH

"P.E.W. BRANDING INK"

Beware of Imitation.

Do not be misled by spurious makes.

A scientific chemical combination.

Produces a lasting and distinctly visible brand,
usable on Cattle and Buffaloes and other domesti-
cated animals. Application is very easy, quick and
absolutely economical. No wastage. Already in use
in all Indian States. Innumerable animals have been
branded in all States under Rinderpest Eradication
Scheme with success.

It permeates into the layers of the skin evenly
upto follicular layer over the branded area and forms
an antiseptic dry scab that peels off in a few weeks,
leaving a well defined visible brand mark. It does
not produce any open wound and thus prevents
extraneous infection.

ALREADY SUPPLIED TO ALL THE DIRECTORATES OF VETERINARY
SERVICES AND ANIMAL HUSBANDRY
IN INDIA.

TRY ON YOUR ANIMALS ALSO.

This can be supplied in any quantity on order.
Use our make special type of Branding Iron manu-
factured for the purpose.

G.T.V. SETS AND STAINLESS G.T.V. NEEDLES
ARE ALSO SUPPLIED BY US.

★

For further particulars, please apply to:

PAUL'S ELECTRO WORKS

39, JORAPUKER SQUARE

Post Box No. 11406

CALCUTTA-6

When writing to advertisers, please mention *The Indian Veterinary Journal*.