

Regd. No. M. 6953

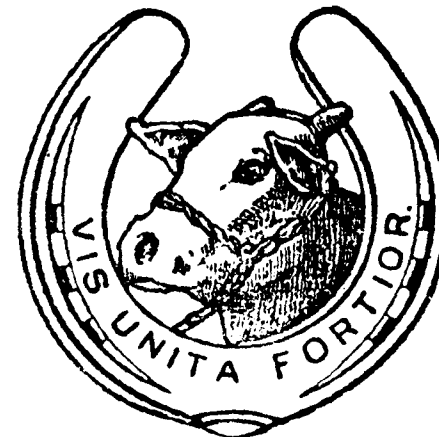
Vol. 38, No. 2

FEBRUARY, 1961

THE INDIAN VETERINARY JOURNAL

(The Journal of the Indian Veterinary Association)

*A Monthly Record of
Veterinary Science*



(ESTD. 1924)

OFFICE:

7, FIRST STREET,
VIDYODAYA EAST, T'NAGAR,
MADRAS-17, (S. INDIA)

TEL. NO. 88743

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE INDIAN 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:—7, First Street, Vidyodaya East, T'Nagar,
Madras - 17, (S. India)



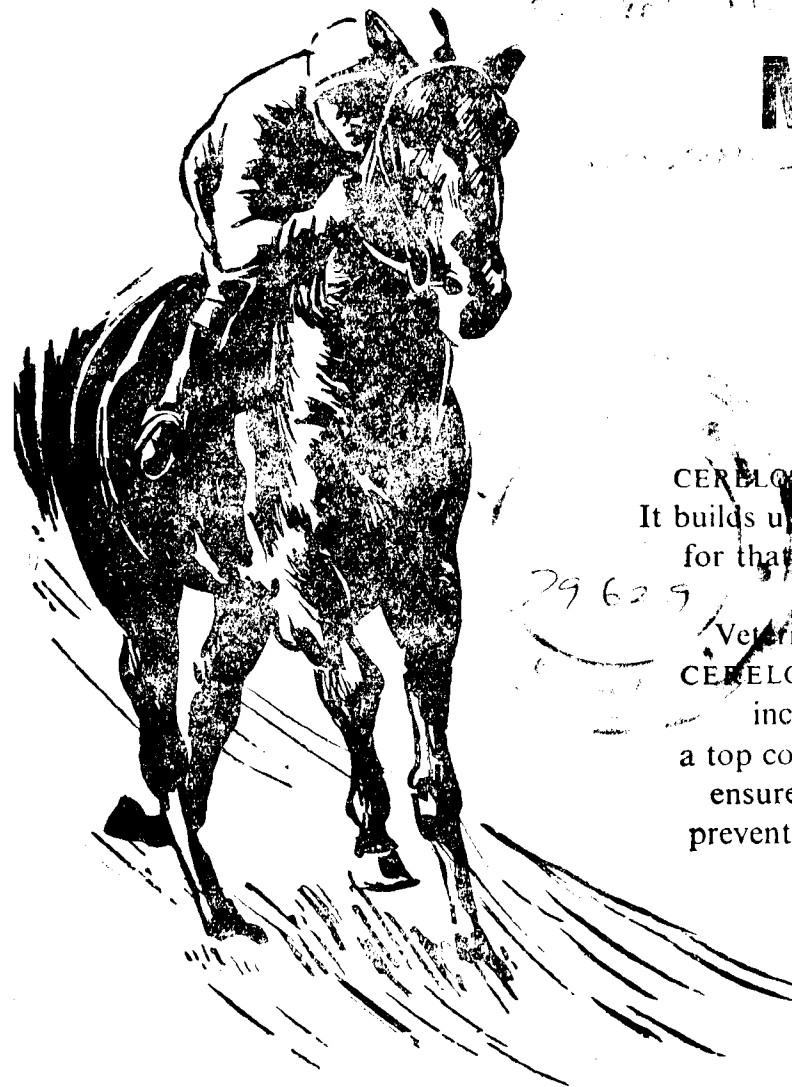
All communications should be addressed to the Editor.

Advertisements should be in the hands of the Editor on or before
the 1st of every month.

Subscription { Rs. 8.00 per annum to Members of profession.
payable in { Rs. 12.00 per annum to Government and all public
advance { 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 in block letters to the
Editor at once. Non-receipt of a particular issue should be intimated before
the close of that month.*

CERELOSE 'H'



MAKES A WINNER

Owners and Trainers say

CERELOSE 'H' is ideal for horses. It builds up large reserves of energy for that extra spurt and stamina.

Veterinary experts recommend CERELOSE 'H' for all animals—including domestic pets—as a top conditioner which not only ensures physical fitness but also prevents out-of-season coat loss.

CORN PRODUCTS CO. (INDIA) PRIVATE LTD., BOMBAY-1

Agents for India : Parry & Co. Ltd.



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

Let us stop Playing with the Life of an Animal

Some problems will solve themselves — on a "it's alright this will serve the purpose" sort of basis. Others can be swept under the carpet.

Unfortunately, the indiscriminate use of Veterinary Instruments and equipments supplied by untrained persons doesn't fall in either of these categories. It is definitely on the increase, as more and more suppliers are selling through professional and non-professional outlets.

We see this as a detriment to the livestock industry and to your chosen profession. Since we sell only to the practising veterinarian, we believe your position in this matter is the same as ours.

There is no place in livestock disease control for double talk and let us stop playing with the life of an animal. Frankly speaking, it's pretty much up to all of us as to what — if anything — can be done about this problem.

Muscles that aren't used atrophy; those that are used increase in size and strength. It is the same way with suppliers of veterinary products. ...and your orders are the only way we have of knowing which side of this issue you're on.

So the next time you place an order, ask yourself this question, "could this order help or hurt the future of my profession and the lives of our animals?"



Cirugia De Lux (Private) Limited

Branch Office :

17, GUNBOW STREET,
FORT, BOMBAY - 1.

Head Office :

24, CHOWRINGHEE ROAD,
CALCUTTA - 13.

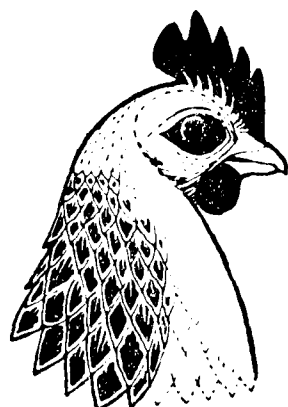
Gram: "SURGIQUIP"

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

Introducing

NEFTIN

the modern answer to **PULLORUM DISEASE**



'Neftin' is the modern answer to Pullorum Disease because it *kills* the Salmonella germs which cause the infection.

The introduction of 'Neftin' in India provides you with a new and powerful means of combating Pullorum and other Salmonella infections. It is used extensively in America and the U.K. in conjunction with blood-testing of adult stock, and in the treatment of young chicks exposed to infection.

PULLORUM OUTBREAKS CAUSE HEAVY LOSSES. WITH 'NEFTIN' YOU CAN PROTECT POULTRY FLOCKS SAFELY AND EFFECTIVELY.



'Neftin' is available in containers of 450 g. (1 lb.) and 3.2 kg. (7 lb.) from Pharmed Private Ltd., Bombay, Delhi, Calcutta, Madras.

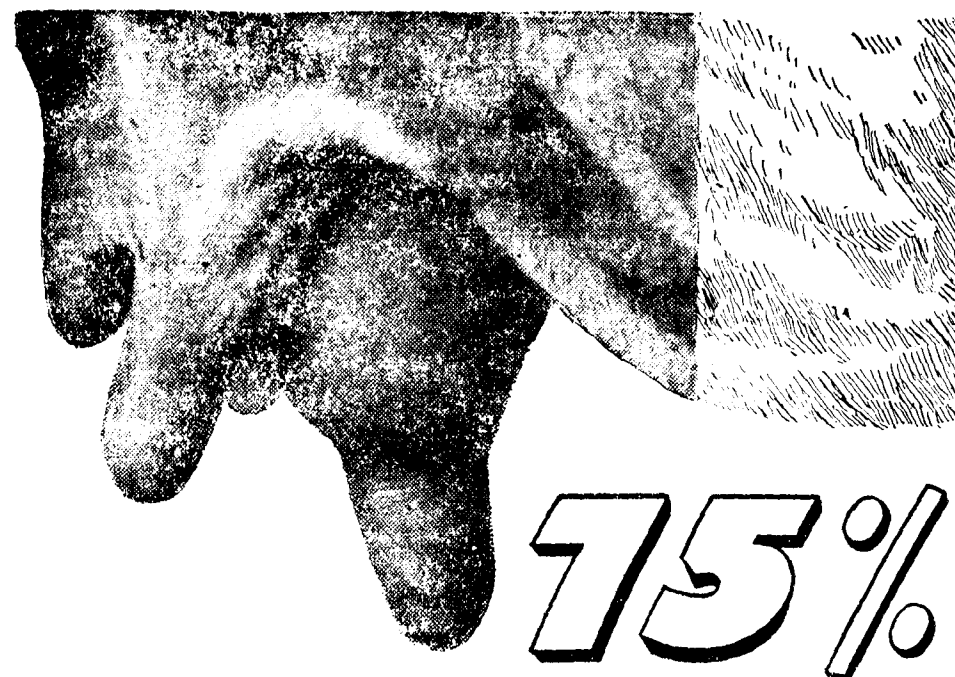
SK & F LIFE-SAVING NITROFURANS

Advisory literature and further information are available on request from:
Smith Kline & French (India) Ltd.
(Incorporated in England with limited liability)
141, Fort Street, Bombay I.

'Neftin' (trade mark) brand of furazolidone, Ind. Pat. Nos. 56634/56

NF: PA30 Ind.

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



75%
gone for ever !

**stop this
waste by**

**MASTITIS DETECTION
CARDS**

for field diagnosis

'UDOLAC' PASTE

WITH PENICILLIN

for intramammary
injection

Each tube now contains
100,000 i.u. Penicillin G.
Price unchanged.



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

ICV 293A

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

The Indian Veterinary Journal

(The Journal of the Indian Veterinary Association)

Vol. 38

FEBRUARY 1961

No. 2

CONTENTS

	PAGE
I. Editorial	
The Veterinary Profession in Gujarat	E. 3
II. General Articles	
Comparative Anatomy of the bony system of the camel (<i>Camellus Dromedarius</i>) Part III. Axial Skeleton (Vertebral Column)—By M. N. Jandav	53
Two new species of feather mites (Analgesoidea) from Poultry in India.—By J. Goud	65
Investigations on the antibiotic activity of Pyocyanine and its employment as a general purpose dairy germicide.—By Dr. U. K. Menon and B. Misra	71
Evaluation of Commercial Mashers.—By R. T. Desai, D. N. Pande and Earl N. Moor	79
A preliminary report on duck's yolk and coconut water as semen diluents.—By Dr. V. Venkataswami and C. Hanumantha Rao	84
Preservation of buffalo bull semen with whole egg containing diluents.—By N. S. Tomar and R. N. Desai	89
Seasonal variations in storage of buffalo semen: A preliminary field study.—By Rattan Singh Dyal, Dharampal	94
III. Clinical Article	
Antepartum partial prolapse of vagina in a bitch.—By P. D. Wilson, E. I. Rajendran and G. David	100
IV. Abstracts	
Virulence and toxicity of <i>Pasteurella hemolytica</i> in the experimental production of ovine septicaemia	102
Physiological properties of pathogenic and non-pathogenic <i>Vibrio</i> species isolated from cattle, sheep and chickens	102
Further studies on <i>Clostridium Chauvoii</i> infections and immunity in laboratory animals	103
Allergy studies on cattle vaccinated with killed <i>Mycobacterium paratuberculosis</i>	104
The use of Teoquil for the treatment of ringworm in cattle	104
V. News and Views	105
VI. Correspondence	108
VII. Association News	
The Indian Veterinary Association.—The I.V.A. Reserve Fund—List of contributors	112
VIII. Review	113
IX. In Memoriam	114

THE Indian Veterinary Journal

(The Journal of the Indian Veterinary Association)

Vol. 38

FEBRUARY, 1961

No. 2

Editorial

THE VETERINARY PROFESSION IN GUJARAT

The newly born State of Gujarat seems to be having more than the usual quota of infantile disorders, where the Veterinary profession is concerned. Our Office has been flooded with letters that make a sad reading. The whole picture is so grim and disheartening that we even seriously thought of making a visit to that far off place and learning at first hand what is exactly wrong with that State. But on second thought we felt that the new State has scarcely had enough time to put her house in order and it would not be fair to judge her prematurely. Gujarat is well-known as the home of business talent. She knows what is good for her and what is profitable both as a short term policy and as a long range programme.

There is a distinct advantage in having been born so late as a separate State. She can benefit by the lessons of elder States. She can avoid the pit-falls of those States and walk majestically with her own well-thought-out programme and policies. But is she doing it? Not so far, is what we gather from the information at our disposal.

First and foremost is the old and discarded policy of entrusting the administration of the Veterinary Department to the sister Department of Agriculture! It was all right at a time when problems were few; when the personnel under each section were fewer still and it was un-economic to run two Departments where one was enough. Even then it was a highly primitive method and in the wake of experience gained in all other States, separation of these two Departments as two different entities is a *sine qua non* if the progress of both the Departments is desired. Each is great in its own place and one would not like to be patronised as a poor relation. The Agricultural Department is too full with its own problems. The spurt given to Animal Husbandry matters in recent years cannot countenance the continuation of such an antiquated policy, if the progress of Science, nay, of the nation is desired. The sooner this anomaly is done away with, the better it would be for that enterprising State of Gujarat. All other

Ventral aspect of the bodies in the third, fourth, fifth and the sixth show on either side, slightly hollowed out basin like area which is rendered more conspicuous by an enormous development of the transverse processes, flanking on either side of this aspect of the vertebrae. Ventral aspect of the sixth is exceptionally scaphoid. Ventral spine is much less developed in the second, third and the seventh and faint or absent in the fourth, fifth and the sixth. Ventral spines of second to fifth end posteriorly in the tubercles.

Anterior articular processes are longer and project much in front of the arch and are inclined like the begging arms. The posterior articular processes are also correspondingly longer, shooting beyond the posterior ends of the centrum. Facets are oval and convex.

The transverse processes are plate like and bifid in the third, fourth, fifth and the seventh. In the sixth they are trifid. It may be remembered that the transverse processes are undivided in the seventh vertebra of the ox and horse. In all these the division into anterior and posterior parts are more distinct being marked off by deep notches of variable extent. The anterior divisions differ from those in the ox and the horse in being longer in width and plate-like. They are directed downward and outward and are larger than the posterior divisions so that when these vertebrae are placed singly on the ground, they (except the seventh) appear to rest like cannons or aeroplanes. Foramina transversaria are present in all except the seventh. They are comparatively shorter in their extent.

Posteriorly they open into the neural rings instead of on the outside of the arches which is in contrast to what is found in the ox and horse.

Atlas

Dorsal Arch:—It is longer anteriorly; it is slightly compressed dorso-ventrally being much less in height there than at the posterior part. Dorsal surface is wider and slopes gradually downward and forward. Dorsal tubercle is in the form of a faint rough area. Dorsal arch shows anteriorly a wide 'U' shaped notch and posteriorly a notch which is wide open.

Ventral Arch:—It is wider than the dorsal. Its ventral surface is extensive, smooth and slightly arched antero-posteriorly. In place of the ventral tubercle, there is a transversely placed, irregular rough area; this is bounded anteriorly by a semilunar ridge and posteriorly by a straight margin.

Anterior articular cavities project remarkably in front of the lateral masses and appear like a snout. In form, they resemble to an

Bony System of the Camel

Part III

By
M. N. JAMDAR

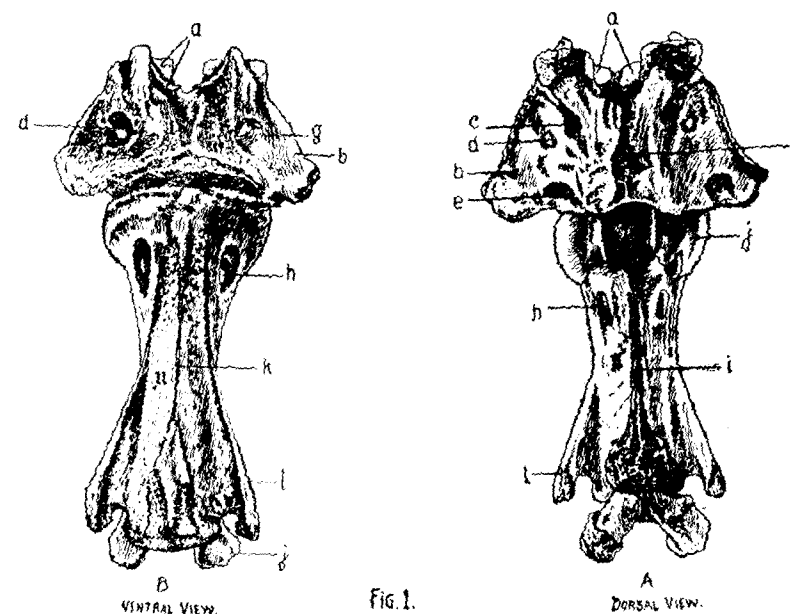


FIG. 1.

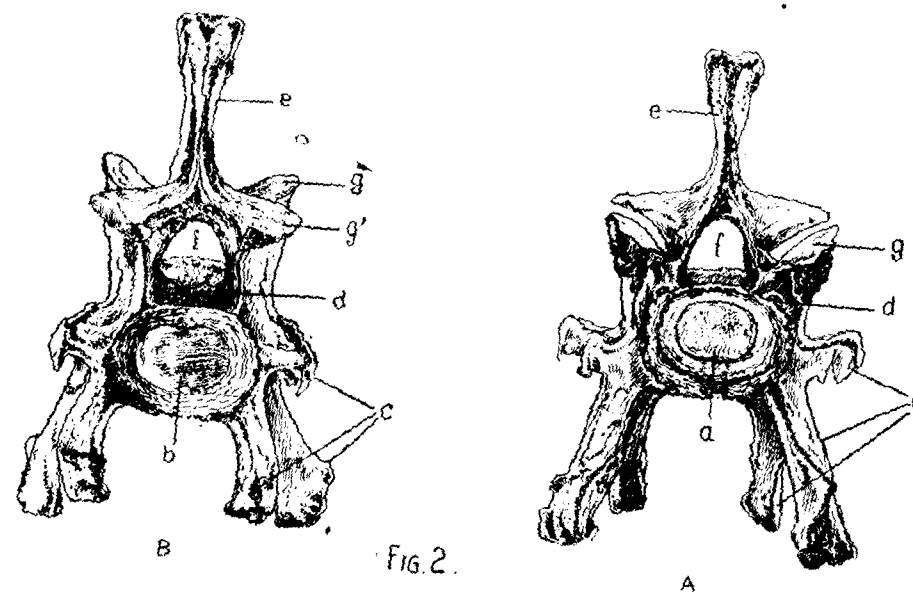


FIG. 2.

troubles follow naturally when the basic set up of administration is not what it should be. There cannot be adequate appreciation of proper values of problems that crop up from day to day, with the result only a policy of drift is possible. With problems like the South African Horse Sickness, poor Gujarat, must be facing a scientific void!

From the very beginning it ought to be the ambition of the newly born State not to let down 'standards' in the name of expediency. Stockmen, Compounders and Dressers have their own place in the scheme of things. We concede their pay and prospects deserve to be improved. But to promote them as fully qualified Veterinary Surgeons is an act which is untenable from any point of view. Above all is it in the interest of the country? When other countries are forging ahead with advanced courses of studies, is it proper to pull down the standard in our country, which the profession has so assiduously been building up at great sacrifice, during the past five or six decades? We emphatically say 'No'. Such acts will only create more and more problems, until we find ourselves in a quandary. It will be too late then either to mend or end. It is better to be forewarned. These men (Stockmen, Dressers, etc.) must only act as an 'annexe' to the duly qualified Veterinary Surgeons as was once expressed so pithily by the Prime Minister himself. But to raise them to the status of Veterinary Surgeons and post them in independent charge of major Veterinary institutions is too serious a matter, which both the Local public and the Indian Veterinary Council should not fail to take note of.

As a first step all the Veterinary institutions should be brought under the direct management of the State Government. It is only then all development policies and programme can be uniform and effective. The pay and prospects of the profession is very low there. If we remember right, it is Rs. 120/- to Rs. 250/-. The starting salary in these days in most of the States is Rs. 225/- or Rs. 250/-. This needs the immediate attention of the State Government. A Veterinary College may well be opened in this new born State as well as a Biological Products Institute. The next step ought to be a Veterinary Research Institute. That way lies the path of progress. We are sure that in the spacious days of the future, Gujarat will prove its worth and even march ahead of other States. Talent is there, money is there, what is needed is proper harnessing and handling. That would come only if the profession is granted an independent status in that State. We appeal to the Government of Gujarat to set matters right and thus provide for the advancement of Veterinary Science in that State so as to bring her in line with other States in our country.

General Articles

COMPARATIVE ANATOMY OF THE BONY SYSTEM OF THE CAMEL (CAMELLUS DROMEDARIUS)

By

M. N. JAMDAR,

Professor of Anatomy, Veterinary College, Jabalpur.

Part III

Axial Skeleton

(Vertebral Column)

Vertebral Formula

C7 T12 L7 S4 C18 — 19

Cervical Vertebrae

There are seven cervical vertebrae. On casual look they appear to resemble those of the horse in that the bodies are elongated; they are in fact exceptionally long. Morphologically they combine the features found both in Ox and Horse and thus markedly differ in details.

Second to Seventh Cervical Vertebrae

(Second will receive special consideration later).

The bodies are very much longer than in the Ox and about twice as long as the bodies of the corresponding cervical vertebrae of the horse. They are markedly flattened dorso-ventrally. The anterior ends are not strongly convex; they are elliptical in outline and their greater diameter is transverse in direction. Anterior convexities in the fourth and the fifth show a slightly dug out area above the centre. The posterior ends of the bodies of the second to fifth vertebrae show very slightly concave surface which feature becomes more defined in the sixth and the seventh. The posterior ends of the bodies thus widely differ from those in the Ox and Horse in which these ends show cotyloid cavities.

The arches and the superior spines are much longer as compared to the bodies. The superior spines, although resembling those of the horse are more developed in the camel being little greater in height and forming tuberculate ridges except in the sixth and the seventh, in which they are higher than long with tuberculate apex. Spine of the seventh is the highest.

Bony System of the Camel

Part III

BY M. N. JAMDAR

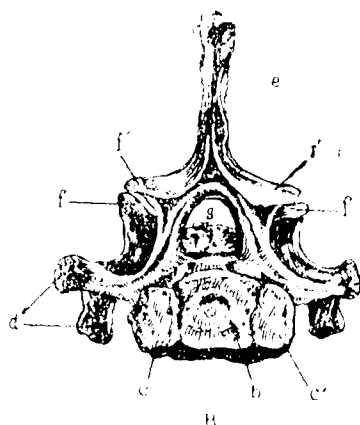


FIG. 3

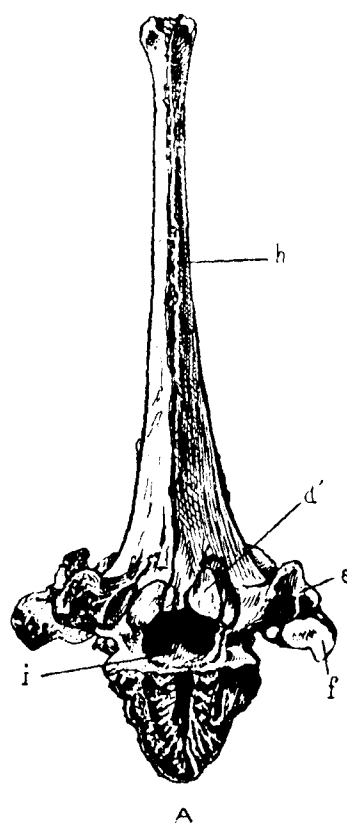
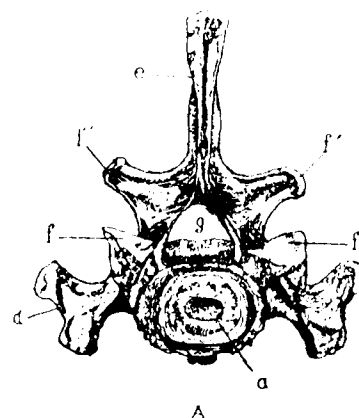
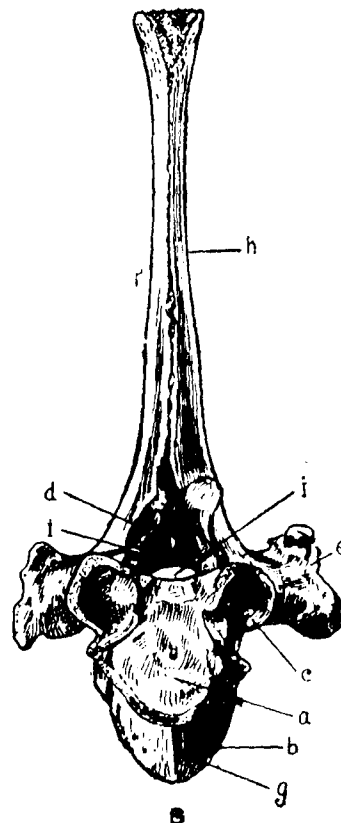


FIG. 4



extent those of the horse. Each is completely divided into a dorsal and ventral part by a nonarticular area. Posterior articular surfaces are slightly concave.

The wings are comparatively longer and are curved. They are divergent posteriorly. Their posterior ends form a projection of an inch or so beyond the articular surfaces. Fossa atlantis is shallow and wide open. Foramen transversarium is present; it traverses the base of the wing and is found opening anteriorly into the alar foramen at the fossa atlantis; thus it is in the form of a channel with anterior and posterior openings. The groove joining the intervertebral and the alar foramina is roofed over in part by a thin bony plate. The wing shows in its anterior part a prominent vascular impression leading outward and forward from the alar groove.

When placed on the floor, the atlas is seen to rest with its wings inclined downward and backward.

Axis

It is exceptionally long. The dens is longer; the articular surface of the bony flanking on it, is convex and is directed downward and forward resembling that in the horse. Anteriorly the arch is cut out in a manner as to expose the vertebral canal appreciably. Anterior end of the superior spine does not project in front of the arch (unlike in the ox); it subsides here gradually; posterior end of this spine shows a large expanded tuberosity. Foramen transversarium is present as in other cervical vertebrae but its anterior opening does not reach the anterior edge of the arch; it is a little below and behind the intervertebral foramen. The latter is large and oval. A strong bar of bone connects the two openings and thus extends over a large fossa found at this level.

Thoracic Vertebrae

They are twelve in number. The bodies are decidedly longer and massive than in the ox and horse; laterally they are much compressed. The dorsal faces of the bodies show a median ridge and lateral grooves except in the first two. The posterior facets on the bodies for articulation with the ribs are in the form of glenoid cavities. The superior spines are less inclined and are abruptly curved in their upper third except in the first two or three, they are wider and greater in height. Ventral spines are not distinct. Mammillary processes are large and distinct. The accessory processes were not in evidence even in the posterior series. The posterior notches on the arches are not converted into foramina.

Lumbar Vertebrae

There are seven lumbar vertebrae. The bodies are larger, longer and massive. The posterior concavity of the bodies is very slight. Articular processes are high and are surmounted by large mammillary processes; (these were not distinct in the sixth and the seventh vertebrae). Ventral spines are not distinct. Superior spines are wider and higher. The height gradually falls from before behind. The first five form a thick ridge at their summit. The first spine is narrow and the highest. Second or third to fifth or sixth are the widest and are slightly inclined forward. Fifth spine may be straight. Transverse processes are longer than in the ox and are curved in the posterior series, the concavity facing ventrally (opposite to that in the ox). The fourth to seventh processes are directed slightly forward. The length of the transverse processes increases from first to the fourth; thereafter it decreases. The sixth and the seventh transverse processes are very narrow; their tips curve forward and are to an extent overlapped. There are no inter-transverse articulations.

Sacrum

It consists of four sacral vertebrae which are fused together. It extends downward and backward (more obliquely placed in the body than in ox and horse) and is very wide dorsally and ventrally. Ventral face is concave (curved). Superior spines are not fused. First spine is narrow and tapers to a point superiorly. The summits of the spines from second to fourth are wide and tuberos. First and second spines are almost of the same height. The third, fourth and the fifth spines gradually fall in height. The first two spines are widely separated. The distance between the second, third, and fourth gradually diminishes. The second spine shows posteriorly at its tip two spiny projections separated by a deep notch; the third shows similar projections anteriorly. There are three linear-transverse markings on the four fused segments of the sacrum. There are three ventral sacral foraminae. The first one is the largest and oval; second and third foraminae are elliptical and diminish in order. Three dorsal sacral foraminae are present which communicate with the ventral ones. The lateral sacral crests are much pushed to the lateral side and almost surmount the lateral borders; they are in fact less distinct. Lateral borders of the sacrum are thicker and form distinct arches with the wings. Wings are quadrilateral in outline with rounded angles. Auricular facets are rough and irregularly depressed.

Coccygeal Vertebrae

Eighteen to nineteen Coccygeal Vertebrae were found in the specimens studied. In the first six or seven arches, tuberos spinous

Bony System of the Camel

Part III

By

M. N. JAMDAR

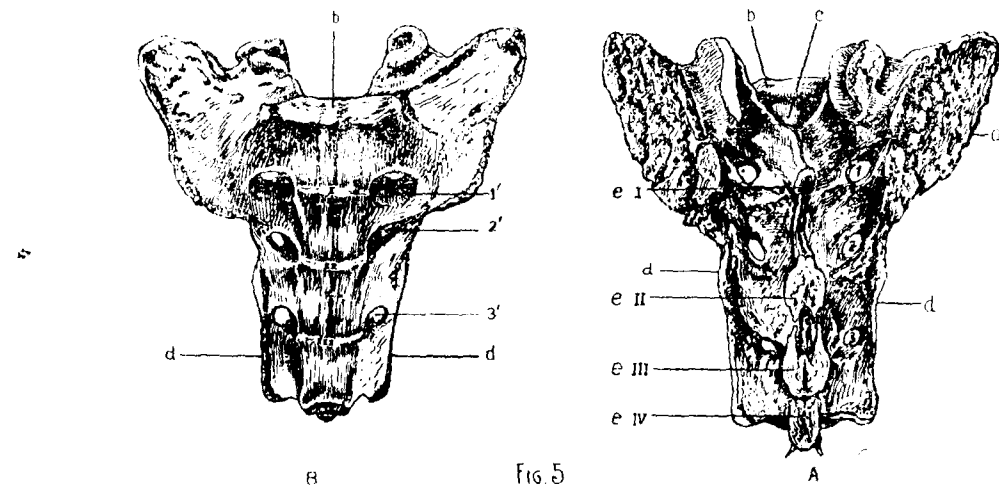


FIG. 6

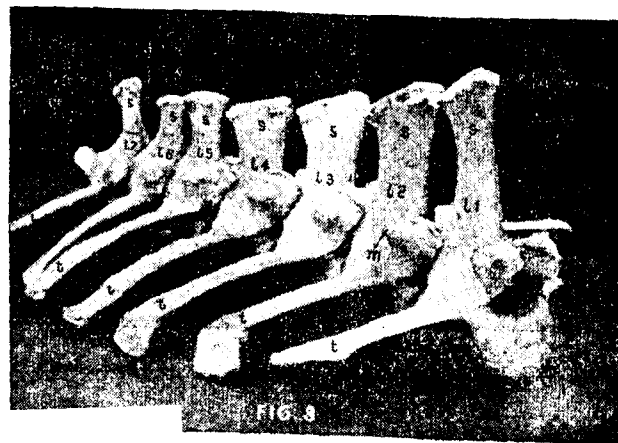
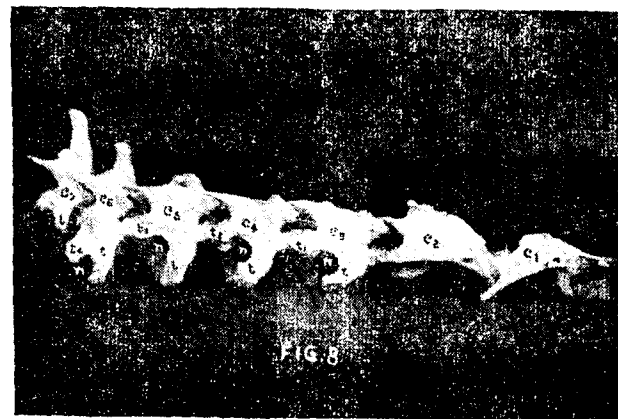
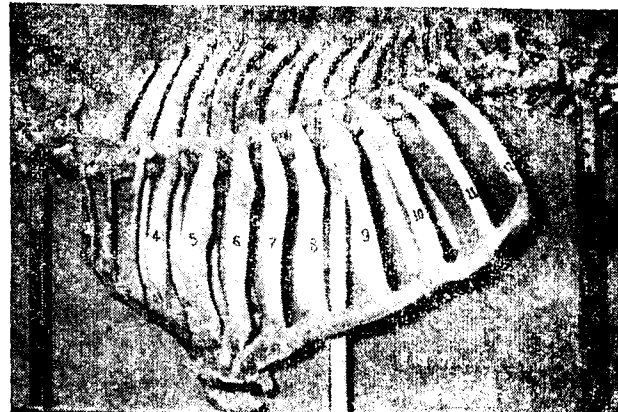


FIG. 6-A

Bony System of the Camel

Part III

BY M. N. JAMDAR



processes, anterior articular processes and transverse processes are present in a defined manner. The rest are in the form of a dumbel shaped masses diminutive in size.

Vertebral Column

It is much longer than that in the Ox and horse. The average length measured along the spine in the present instance was 135 inches (about one third greater than in the ox).

In the cervical part the concavity is dorsal. In the thoracic part there is a slight concavity which faces dorsally. The lumbar portion of the spine is decidedly arched with concavity ventrally. Tail portion of the spine is much shorter than in the ox since the length of the bodies of the coccygeal Vertebrae of the camel is considerably less.

The thoracic spines are less inclined than in the ox but they are abruptly bent backward in their upper third. The height of the spinous processes in front and behind the twelfth dorsal vertebra falls gradually for a distance so that there is a slightly hunched part at the thoracolumbar junction.

Sternum

It is comparatively very massive and longer than in ox and horse. It consists of seven segments fused together. The sternum presents dorsal and ventral surfaces, and two borders as in the ox. The borders are however much thinner. The dorsal surface is almost flat or slightly concave. It is wider, this feature being pronounced at its posterior most part (at the last three segments) where it also shows an abrupt downward slope. The ventral surface is irregular being flat or slightly convex anteriorly; posteriorly from the third segment backward this surface presents a ridged appearance thus effecting two lateral faces; ventral face of the last three segments has a large pad, the sternal callosity adherent to it in life.

In the anterior series, the sternebrae (first two or three) are distinctly wider, thinner and longer. But in the posterior series they are wider, longer and thicker. The first four sternebrae are octagonal in outline, the remaining being quadrilateral.

The first sternebra is not movably articulated to the second (unlike that in the ox). Costal facets are wider.

Ribs

There are 12 pairs of ribs. Out of these eight are sternal and four asternal. They are comparatively markedly shorter than in ox and horse. They are wider and less curved. The lower ends of the opposite ribs are placed wider apart when in articulation. The latter two features

render the floor of the thorax quite wide. The sides of the costal arch are almost straight.

The first rib is the shortest and the thickest. There is a gradual increase in the length of the ribs from the first to the eighth. The eighth, ninth and the tenth are almost of equal length. The eleventh and the twelfth are gradually reduced in length. There is a progressive increase in the width from the first to the fifth or the sixth. Thereafter the width gradually diminishes to the last. The costal groove is deep and well marked at the upper third, in the third to the tenth ribs. It is absent in the first and faint in others. Lateral surface of sixth to ninth ribs shows a groove nearer the anterior edge which is wider and shorter in the anterior set becoming longer and narrower in the posterior set.

The head and tubercle of each of the ribs are placed wider apart which is in sharp contrast to that in the ox and the horse. The necks are long and distinct except in the last two or three. The head and tubercle, are larger carrying larger facets. The head of the first rib shows a sharply cut notch (fossa) for the ligamentous attachment. Its tubercle has a saddle shaped facet. At the upper part of the anterior border, little external to the head, there is a roughened projection of a varying degree in the last two or three ribs.

The articulations of the first two ribs are wide apart both at the vertebrae as well as the sternal ends, the distance at the former being about four to five times greater than at the latter. This is in wide contrast to the features in the ox and the horse. Consequently the thoracic inlet is more quadrilateral than oval in outline with angles rounded off.

Costal Cartilages

The first seven are very much wider, as wide as the lower ends of corresponding ribs. The eighth to the twelfth become narrower and very much longer. The second to the third or fourth are directed downward and backward (opposite of that in the ox and the horse). All the rest are directed downward and forward. It may be remembered that in the ox all are directed downward and forward.

Thorax

It is longer, wider but is less in height. The length measured at the roof was however found to be equal to that in the horse. The thorax is less compressed laterally. The thoracic inlet is much wider and quadrilateral in outline as already noted before. The outlet of the dry thorax is wide open. The floor is distinctly wider, more so at its posterior part where the last three sternbrae form by their superior face a wide shield shaped structure.

KEY OF THE FIGURES

FIG. 1:— I—ATLAS. II—AXIS

A—Dorsal View B—Ventral View

- (a) Anterior articular cavity
- (b) Wing
- (c) Intervertebral foramen
- (d) Alar foramen
- (e) Foramen transversarium
- (f) Dorsal tubercle
- (g) Fossa Atlantis
- (h) Inter-vertebral foramen (Axis)
- (i) Superior Spine
- (j) Posterior Articular Processes
- (k) Ventral Spine
- (l) Transverse process

FIG. 2:— SIXTH CERVICAL VERTEBRA

A—Anterior View B—Posterior View

- (a) Anterior convexity of the body
- (b) Posterior Concavity of the body (glenoid cavity)
- (c) Transverse processes
- (d) Foramen transversarium
- (e) Superior Spinous process
- (f) Vertebral foramen
- (g) Anterior articular process
- (g') Posterior articular process

FIG. 3:— SEVENTH CERVICAL VERTEBRA

A—Anterior View B—Posterior View

- (a) Head
- (b) Posterior Convexity or Cotyloid Cavity
- (c) (C') Costal facets on 'b'
- (d) Transverse Processes
- (e) Superior Spinous Process
- (f) Anterior articular process
- (f') Posterior articular process
- (g) Vertebral foramen

FIG. 4:— FOURTH THORACIC VERTEBRA

A—Anterior View B—Posterior View

- (a) Posterior Concavity
- (b) Body
- (c) Posterior Costal facet
- (d) Posterior Articular Process
- (d') Anterior Articular Process
- (e) Transverse Process
- (f) Tubercular Facet
- (g) Ventral Spine
- (h) Dorsal Spine
- (i) Vertebral foramen

The posterior margin of the body is circular, with two pairs of large setae and two pairs of small ones. The anal opening is terminal, with the anal groove extending from dorsum to venter.

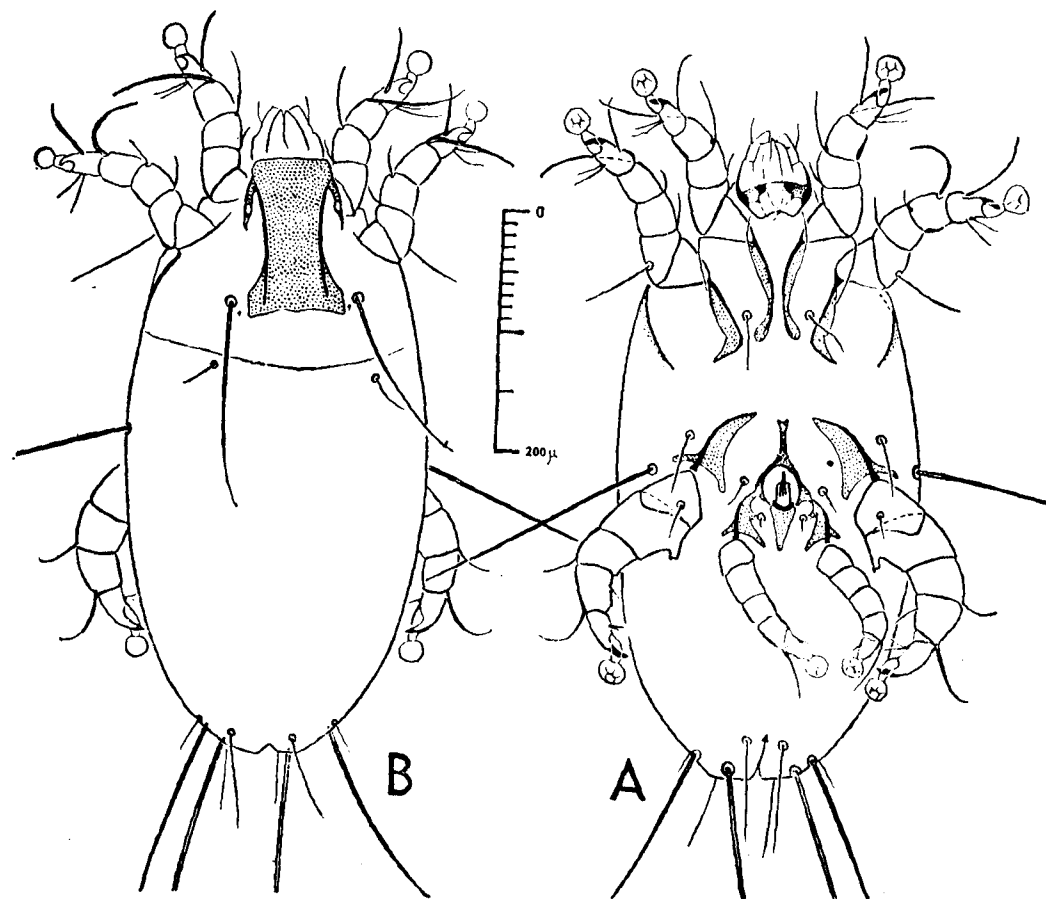


Fig. 1. *Dermoglyphus alwarti* n.sp., Male.

A. Ventral surface.

B. Dorsal surface.

On the dorsal surface there is only a single shield, which is roughly rectangular in shape, longer than broad, with a constricted portion in the middle and strongly sclerotized lateral margins. This shield is hairless. The scapular hairs are inserted on the cuticula bounding the posterolateral angles of the propodosomal shield. The outer ones are long and the inner ones very small and difficult to distinguish. There is one pair of noticeable dorsal hairs, which represent the anterolateral hairs, immediately posterior to the thoracic furrow.

On the ventral surface the epimera I are free. These epimera converge at a level approximately $2/3$ of the distance from the anterior end, diverging posteriorly, but not reaching epimera II as in *Dermoglyphus elongatus*. The penis is situated in the middle of the ventral surface of the idiosoma. It is short and anteriorly directed. An epiandrium, forming $3/4$ of a circle around the penis, extends into three ramifications: one directed anteriorly and extending to the level of the anterior ends of epimera III, the other two lateral and coalescing with the anterior ends of epimera IV. Posterior to the penis is a triangular shaped basal plate 30μ long and 10μ wide. There are six pairs of hairs on the venter, two of them exterior to epimera III representing the posterolateral hairs. The four other pairs are as follows: the "pectoral" pair between epimera I and epimera II; the "inguinal anterior" pair between III and epimera IV; the "inguinal posterior" pair between epimera IV and the triangular basal plate; the "adanal" pair flanking the ventral end of the anal groove. There are neither visible "subgenital" nor "central" hairs.

All the four pairs of legs are rather long and five jointed. Legs III are about $1\frac{1}{2}$ times as thick as legs I and II. Legs IV are slender and shorter. Legs I, II and III terminate in strongly chitinated short claws. Legs IV lack these tarsal claws. All the tarsi have a round shaped caruncle borne on a thick pedicle, interior to the tarsal claw. There is a two pointed tooth-like projection, posteriorly directed, on the inner margin of femur III.

The rostrum is about as broad as long; palpi long and slender; chelicerae short, strong, and chelate.

Female (Fig. 2)

The female is slightly longer and wider than the male ($600 \times 270 \mu$), but of the same shape. The hysterosoma extends far behind the posterior legs. The posterior margin of the body bears two pairs of large setae and two pairs of small ones. The dorsal surface is the same as in the male. On the ventral surface, the genital opening (tostome) is λ shaped, the posterior arms reaching the anterior ends of epimera IV. The epigynum is lacking. There are seven pairs of hairs on the venter, as indicated in the drawing, the two pairs exterior to epimera III representing the posterolateral hairs. All four pairs of legs are subequal in size and shape. All tarsi end in terminal claw and caruncle. The rostrum is the same as in the male.

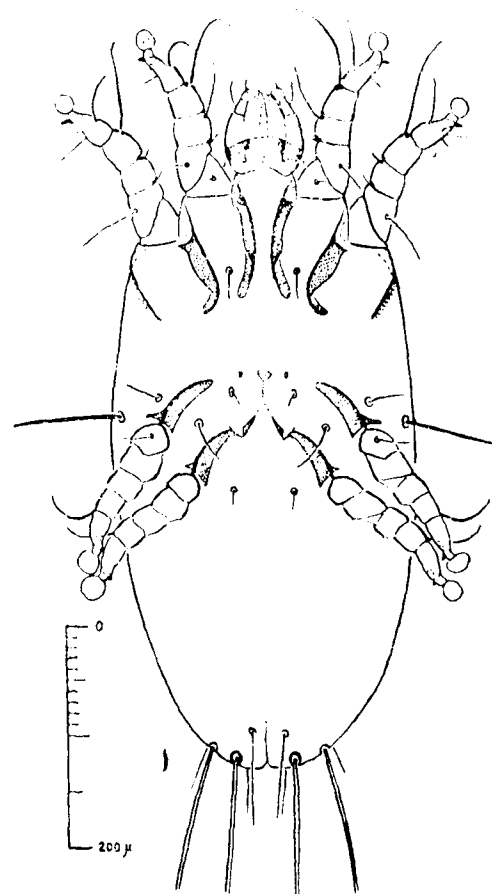


Fig. 2. *Dermoglyphus alwari*, female,
Ventral surface.

Megninia Bakeri N. SP.

This species is based on two males and two female nymphs taken from the domestic fowl *Gallus gallus domesticus* at Madras.

Male (Fig. 3)

Megninia bakeri resembles *M. columbae* in that it has a S-like chitinized band bordering each abdominal lobe, bent tarsi IV and unusually stout anterior inguinal hairs. Measurements of the type are as follows: total length, 300μ ; idiosoma length, 280μ ; propodosoma length, 80μ ; breadth at the widest part of the body, 210μ . The paratype is 300μ long and 200μ broad. The idiosoma is short and

orbicular in shape, with the posterior end divided into two diverging abdominal lobes. These abdominal lobes are rather short and roughly triangular in shape. Each one bears five hairs, one on the inner border and four on the outer border, the posterior two of these being the longest. There is a terminal hyaline membrane at the tip of the abdominal lobes extending on both outer and inner border, but much more developed on the latter. The anal opening is ventral.

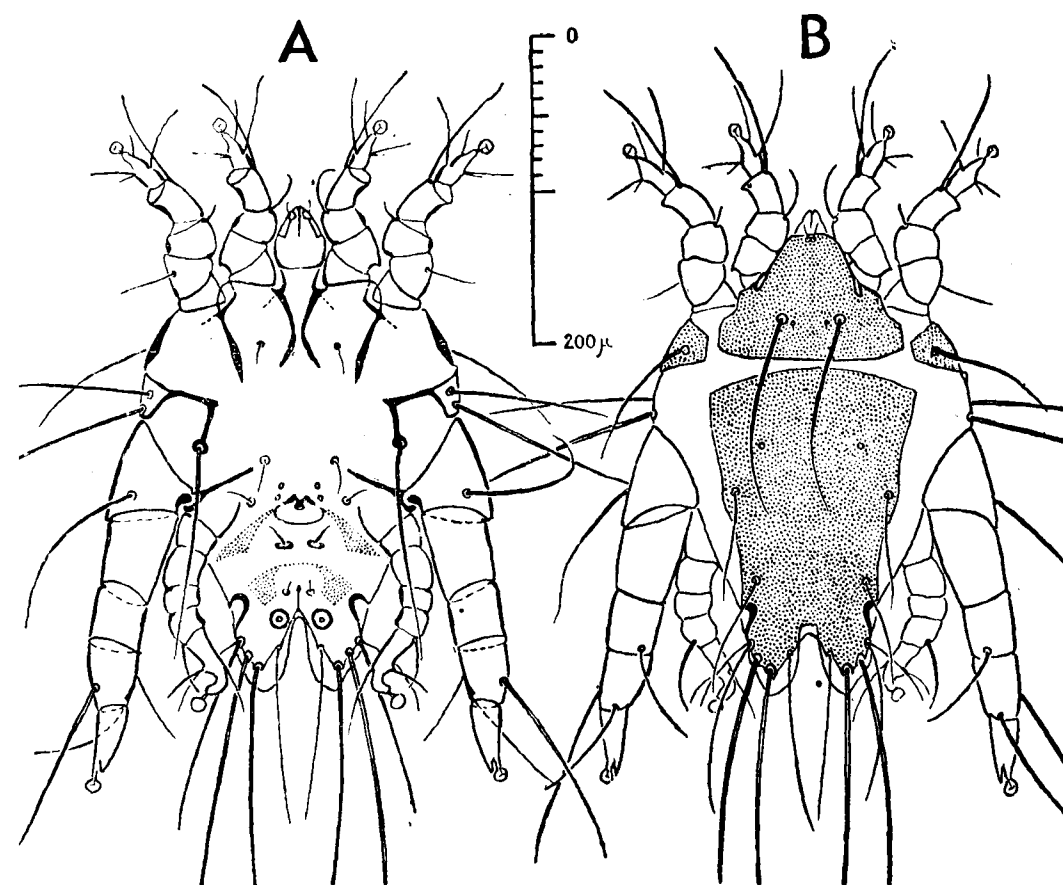


Fig. 3. *Megninia bakeri* n.sp., Male.

A. Ventral surface.

B. Dorsal surface.

On the dorsal surface there are two large chitinized plates. The propodosomal shield is triangular in shape with a convex posterior margin. It bears one pair of vertical hairs and two pairs of scapular hairs. Lateral to the propodosomal shield, but posterior to the thoracic furrow, there are lateral plates each bearing a long hair, the antero-

The milking pails usually brass vessels are cleaned and burnished with tamarind and wet earth to the point that they shine like "gold". It is therefore a paradox that the extraordinary care itself should be responsible for the high initial contamination; the better the brass pails are burnished the greater the number of sporulating heat resistant organisms. Any amount of propaganda or extension work is not likely to improve the situation as the procedure is strictly rooted to the custom prevailing from centuries. Other methods have therefore to be thought of in order to overcome the problem. This naturally leads to the question of finding a suitable germicidal 'Rinse solution' to be employed after the burnishing process. It must be cheap, non-toxic in the dilutions used and effective at ordinary temperatures against sporulating soil saprophytes. Chemical detergents and disinfectants are therefore automatically eliminated and what is left are the antibiotics. Here again the common antibiotics—Penicillin and Streptomycin cannot be employed because their presence is taken as evidence of contamination with mastitic milk. It was in this connection that Pyocyanine suggested itself as a possible antibiotic suitable for the purpose. Further investigations were therefore taken up to test out this proposition.

Review of Literature

Pseudomonas pyocyanea is widely known for two distinctive properties; the production of a blue pigment Pyocyanine and the ability to lyse or to inhibit the growth of other bacteria. It is in fact one of the first microorganisms shown to produce substances antagonistic to other bacteria. Bouchard (1888) observed that the injection of small quantities of a culture of *P. pyocyanea* prevented the development of Anthrax in rabbits that had been previously injected with a virulent strain of *B. anthracis*. Emmerich and Loew (1889) and Emmerich Loew and Korschum (1902) drew attention to the fact that old cultures of *P. pyocyanea* were highly bactericidal to many organisms. They also noticed that such cultures concentrated ten times in vacuo had the interesting property of causing quick and complete lysis of thick suspensions of *V. cholerae* and *B. anthracis*. They ascribed the effect to an enzyme Pyocyanase. While the antibacterial properties of old cultures of *Pseudomonas pyocyanea* were confirmed, the enzyme theory was contradicted by contemporary workers Klimoff (1901) Deitrich (1901), who considered the antibacterial substance to be incompatible with enzymic nature. Numerous papers on antibacterial preparations from *P. pyocyanea* appeared in the wake of these findings. Raubitschek and Russ (1928) attributed the antibacterial action to "lipoids" and Hosoya (1929) claimed to have obtained the lipoid in crystalline form. Wrede and Strack (1924, 1929) were the first to extract a Phenozonium

compound. This was also incidentally the first such compound discovered in Nature. They worked out the empirical formula of the substance as $C_{13}H_{10}ON_2$. Hettche (1933,34) obtained from *P. pyocyanea* a free acid which he called "Pyocyanic acid" and which had some anti-bacterial activity. In addition to these compounds another bactericidal substance present in *P. pyocyanea*—the blue dye Pyocyanine, the pigment of blue pus (Fordos 1860), was investigated by Hettche (1932) and Krammer (1935). Krammer found that chloroform and ether soluble Pyocyanine was active against a number of organisms including *E. coli*, *Bact. typhi*, haemolytic *Streptococci* and *Staphylococcus albus*. Schoental (1941) observed that *P. pyocyanea* produced three different antibacterial compounds: Pyocyanine, alpha L oxyphenazine and an almost colourless chloroform soluble oil that forms an insoluble salt with Calcium, Barium and other heavy metals. She also noted that the antibacterial activity was not affected either by boiling or by the action of Pepsin. She found that the active principles were dialysable, soluble in alcohol and capable of being quantitatively extracted with chloroform in crystalline form from 2—3 day old cultures. The interest in this compound which exhibited strong bactericidal activity *in vitro* (lytic action on *Vibrios* even in dilutions of 1:10,000) dwindled, due to its high tissue toxicity rendering it valueless therapeutically.

The use of antibiotics in the preservation of canned food and purification of water has been investigated by Foster *et al* (1953). In the U.S.A. some work has been done on the use of antibiotics to control mold growth on the surface of hard cheeses, (Rusoff *et al* 1952). Antibiotics offer some possibility of selective inhibition of undesirable microorganisms in dairy products (Foster *et al* 1958). Studies are currently made in Europe to control Butyric acid bacteria in Swiss and similar sweet type of cheese by incorporating either selected antibiotics or the organisms that produce these antibiotics, in the cheese during manufacture. Antibiotics have been suggested for improving the storage life of human milk in European centres, where such milk is distributed. Streptomycin is used in most instances, because it is inhibitory to the development of many types of bacteria (Foster *et al* 1958).

Materials and Methods

*I Platform tests:—1. Methylene blue reduction time:—*Freshly prepared Methylene blue solution was made by dissolving one Methylene blue thiocyanate tablet (supplied by M/s Larsen and Tubro) in 200 ml sterile freshly boiled water and kept in amber coloured bottles. One ml of this solution was added to 10 ml of milk and incubated in a water bath at $37 \pm 0.5^\circ\text{C}$ after short tempering at 40°C . The time required

for decolorisation was recorded. One shaking was made every 30 minutes.

2. *Resazurin reduction time*:—0.05% aqueous stock solution was prepared in sterile water and stored in amber coloured bottles. 0.1 ml. quantities were added to 10 ml of milk, and incubated at 37°C in the dark. The time taken for discharge of the pink colour was noted.

II. *Churns and pails*:—Were rinsed a number of times with 100 ml of sterile water diluted and plated on standard agar media used for total counts. After 48 hours incubation at 37°C all recognisable colonies on the plate were counted over the Quebec colony counter.

III. *Agar plate counts*:—Were made using the technique prescribed in the Standard Methods for Examination of Dairy Products published by the American Public Health Association.

IV. *Isolation of P. pyocyanea*:—(i) *Strains*:—Several strains of the organism isolated from ear swabs of dogs suffering from Otitis Externa were being preserved in the type culture section of this department. Seven of these strains were tested for production of Pyocyanine and strain VI was found to give larger yields. Stock cultures of this strain were maintained by subculturing every 10 days and preserved under refrigeration.

(ii) *Media*:—Schoental (1941) used the agar media recommended by Wrede and Strack (1924) to which was added 2% glycerine. She was able to obtain 60 mgms Pyocyanine per Winchester quart bottle as against 1 mgm per litre obtained by the earlier workers. Young (1947) reported profuse production of Pyocyanine in potato-glycerol broth. We used nutrient agar, made of Beef extract 500 gms, shredded agar 80 gms, peptone 10 gms, sodium chloride 5 gms in one litre of water as the basal medium at pH 8.4. This was enriched by varying percentage of glycerine (1—7%) and strain VI was tested on these media for Pyocyanine production. Glycerine at a concentration of 5% gave the best results. Thereafter in all subsequent work this strength of glycerine was used for enrichment of the basal medium.

(iii) *Inoculum*:—The inoculum was prepared by transferring the organisms from stock cultures to tubes containing 5 ml of Standard nutrient broth and incubated at 37°C for 24 hours. The growth from one tube was used for seeding one Roux flask. The charged Roux flasks were incubated at 37°C for 48 hours and kept for another 24 hours at room temperature before extraction.

(iv) *Extraction and Purification of Pyocyanine*:—The pigment was extracted from the Roux flasks, purified and crystallised by the method of Friedheim and Michaelis (1931). Indigo blue, needle shaped

crystals were obtained. (Melting Point 184°C). The Refractive Index measured on Abbes Refractometer against a ghee standard of 1.4590 in a dilution of 0.15625 mgm per ml was 1.5165. The compound had an ultra violet absorption maxima at 395 μ wave length. (Measured on spectronic '20' Bausch & Lomb).

(v) *Assay of Pyocyanine activity*:—Hays *et al* (1945) have assayed the different "Pyocompounds" by noting inhibition as an end point. In our experiments the antibiotic was assayed by the procedure of Grove and Randall using *B. subtilis* as the test organism employing the Standard cylinder-plate method. Concurrent tests were made using various dilutions of commercially available Crystalline Penicillin G (Dumex) in order to equate its antibiotic activity.

(vi) *Tests for activity as Rinse solution*:—Varying dilutions of Pyocyanine in 100 ml of sterile distilled water were used to rinse milking pails kept ready for use and discarded. The pails were subjected to regular churn rinsing tests and total counts were made. Simultaneously tests run on milking pails not subjected to rinsing with Pyocyanine dilutions served as controls.

Results

I. *Results on bacterial quality of Raw milk received at the Madras Co-operative Milk Supply Union*:—Analysis of 32 samples of raw milk revealed.

(1) *M. B. R. time*:—Under 2½ hours in all cases.

(2) *Resazurin*:—Under 2½ hours in 31 samples and under 2 hours in one sample.

(3) *Total count*:—Over 1 million per ml in 31 samples; over 80,000 per ml in one sample, Predominant type of organisms isolated: *B. subtilis* and *E. coli* (present in 0.1 ml in 30 samples).

II. *Results on bacterial quality of Pasteurised milk tapped from the post refrigeration lead of the plant.*

(i) *M. B. R. time*:—Over 4½ hours in 31 samples
Over 2½ hours in one sample.

(ii) *Resazurin*:— Over 5 hours in 31 samples
Over 3 hours in one sample

(iii) *Total count* — 45,000 to 62,000 per ml in all 32 samples tested.

Predominant type of organism isolated—*B. subtilis*. Coliform absent in 1 ml.

III. Results on bacterial quality of Pasteurised milk stored for a period of 4 to 6 hours in the cold storage maintained at 40°F

(i) M. B. R. time—Under 2½ hours in 31 samples
Over 2½ hours in one sample

(ii) Resazurin:— Under 2 hours in 31 samples
Over 2½ hours in one sample

(iii) Total count:—Over 1 million per ml in all samples.

Predominant type of organism isolated: *B. subtilis*. Coliform absent in 1 ml.

IV. Results of Churn rinsing tests:

(i) on milk cans:—Standard churns (scrubbed and steam dried).

Results of 36 tests:—34 cans averaged over 9 lakhs/ml
2 cans „ „ 48 lakhs/ml

Predominant type of organism isolated *B. subtilis*.

(ii) On milking pails ready for use by producers:—(scrubbed and burnished with wet earth and tamarind rinsed with water and air dried)

Results of 36 tests:—36 pails averaged over 1 million/ml
34 pails—coliforms present in 0.1 ml.

Predominant type of organism isolated: *B. subtilis*, anthracoids and coliforms.

V. Results in Pyocyanine production:—63.9555 mgms of Pyocyanine crystals were obtained from the growth in one Roux flask. (one litre).

VI. Results of assay of Pyocyanine activity:—1,000 I. U. of Penicillin Sodium G. was found equivalent in activity to a dilution of 0.15625 mgms of Pyocyanine per ml.

VII. Results of tests on activity of Pyocyanine in various concentrations as Rinse solution:—

No.	Concentration of Pyocyanine in mgms/ml	Colony counts on rinsed pails	Colony counts on unrinsed pails
1	0.6250	Nil	over 1 million } in all cases. }
2	0.3125	Nil	
8	0.1563	Nil	
4	0.0781	4000/ml	
5	0.0391	8000/ml	
6	0.0195	15000/ml	
7	0.0098	24000/ml	

Consideration of Costs

The cost of production of Pyocyanine for 63.9555 mgms under the conditions of the experiment works out to Rs. 5.88. Compared to Penicillin at 0.25 nP. per 1,000 I.U. the cost of an equivalent strength of Pyocyanine works out only to 0.1865 nP with the added advantage of being effective against both Gram positive and negative organisms.

Conclusion

The poor bacterial quality of stored Pasteurised milk, contributing to its short shelf-life is due more than any other single cause, to the initial contamination of the milk pails at the producers end. The local practice of burnishing brass milk pails using wet earth and tamarind actually introduces large numbers of sporulating thermophilic organisms although presenting a false appearance of cleanliness and hygiene. The problem could be overcome by the employment of suitable dilutions of Pyocyanine as a Rinse. Possibilities also exist for employing this rinse solution as a general purpose dairy germicide to disinfect plant and machinery contaminated by processing milk with high thermophilic counts. Since the cost of production is less than that of Penicillin it is presumed that it would have a special appeal for commercial employment for this purpose.

Summary

1. The bacteriological quality of milk handled by the Madras City Co-operative Milk supply union has been studied.
2. The source of contamination with thermophilic organisms has been located.
3. The assay of Pyocyanine and possibilities for its use as general purpose dairy germicide has been discussed.

Acknowledgments

The authors wish to express their thanks to the T.C.M. authorities for the supply of numerous equipment that have been used in this work. They also record their thanks to Dr. Bertie A.D'Souza, Principal, Madras Veterinary College for all the encouragement given.

BIBLIOGRAPHY

1. Bouchard, C. (1888) ... *C. R. Acad. Sci. Paris*, **108**, 713.
2. Deitrich, (1901) ... *Z. Hug. Infektkr*, **37**, 115.
3. Emmerich, R. and Loew, O. ... *Zbl. Bakt*, **26**, 237. (1889)
4. Emmerich, R., Loew, O. and ... *Ibid*, **31**, 1. Korschum, A. (1902)
5. Fordos (1860), cited by ... *Brit. J. Exp. Path*, **22**, 137-147. Schoental, R. (1941)

6. Porter, M. J. Palmer, C. M. ... Antialgal properties of various antibiotics. *Antibiotics and Chemother.* **3**, 505.
7. Foster, E. M. Nelson, F. F. ... Dairy Microbiology. Macmillan & Co., Ltd., London, pp. 76-78.
8. Friedheim, E. and Michaelis, L. (1931) ... Potentiometric study of Pyocyanine. *J. Biol. Chem.*, **91**, 355-368.
9. Grove, D. C. and Randall, W. A. ... Assay of antibiotics. A laboratory manual. Antibiotics Monograph 2. A publication of Medical Encyclopedia Inc., 30 East 60th Street, New York, **22**, N.Y.
10. Hays, E. E., Wells, I. C., Katzman, P. A., Cain, C. K., Jacobs, F. A., Thayer, S. A., Doisy, E. A., Gaby, W. C., Roberts, K. C., Muir, R. D., Carrol, C. J., Jones, I. R. and Wade, N. J. (1945) ... Antibiotic substances produced by *Pseudomonas aeruginosa*. *J. Biol. Chem.*, **159**, 725-750.
11. Hetteche, O. H. (1932) ... *Arch. Hug. Berl.* **107**, 337.
12. Idem (1933) ... *Klin. Wschr.*, **12**, 1804.
13. Idem (1934) ... *Z. Immun. Forsch.*, **85**, 499-506.
14. Hosoya (1929), cited by Schoental, R. (1941) ... *Brit. J. Exp. Path.*, **22**, 137-17.
15. Klimoff, J. (1901) ... *Z. Hug. Infektr.* **37**, 120.
16. Krammer, H. (1935) ... *Z. Immun. Forsch.* **84**, 505.
17. Laboratory Manual ... Methods of analysis of Milk and its products. Milk industry Foundation, 1625, Eye Street, Washington-6.
18. Raubitschek, H. and Russ, V. K. (1908) ... *Zbl. Bakt.*, **48**, 114.
19. Rusoff, L. L. and Gelphi (Jr.), A. J. (1952) ... Manufacture of Cheese, U.S. Patent 2585501.
20. Schoental, R. (1941) ... The nature of antibacterial agents present in *Pseudomonas pyocyanea* cultures. *Brit. Jour. Exp. Path.*, **22**, 137-47.
21. Wrede, F. and Strack, E. R. (1924) ... *Hoppe. Seyl. Z.*, **140**, 1.
22. Idem (1929) ... *Ibid.*, **181**, 58.
23. Young, G. (1947) ... Pigment production and Antibiotic activity in cultures of *Pseudomonas aeruginosa*. *J. Bact.*, **54**, 109.

EVALUATION OF COMMERCIAL MASHES

BY

R. T. DESAI

Lecturer, Nagpur Veterinary College,

D. N. PANDE

Manager, Central Poultry Farm, Nagpur

and

EARL N. MOORE

TCM Poultry Specialist.

Much of the success of the poultry industry depends on the use of a balanced diet. Scientific knowledge and availability of guaranteed feed stuffs are the prerequisites in the computation of such rations. An average poultry breeder not only lacks the scientific background but finds great difficulty in even procuring the ingredients, much apart the guaranteed quality of feed stuffs. It will be a boon to a small poultry breeder if a reliable readymade poultry mash is made available at a reasonable price. This would not only save him the trouble of procuring the ingredients but guarantee him a balanced ration prepared under expert guidance. Most of the poultry breeders in Western countries depend on the manufactured mash and a healthy competition has developed amongst the manufacturers. Legislation guaranteeing the quality and the periodic checks at official level help in maintaining the quality. A few firms in India have started manufacturing poultry mashes. It is essential to judge their quality and ensure even standards by periodic checks. There is no agency in India today undertaking the task in this field.

The present trial has been undertaken with a view to judge the efficacy of the mashes manufactured by different firms. Two American mashes namely "Poultry Feed" and "Broiler mash" have been received through the courtesy of World Agriculture Fair. The Shaw Wallace and Company of Madras supplied their star brand poultry chicken mash. The Chelsea Chemicals Laboratory of Poona and Akbarally Stores, Bombay also supplied mashes for feeding trials. The chicken mash manufactured by the Livestock Equipment Company of Madras was purchased from their wholesale dealer in Nagpur. This mash was tried previously and had given very good results. Mash which is being used at present at the Central Poultry Farm, Nagpur was also tried along with an experimental mash being evolved at the Nagpur Veterinary College. The composition of the above two mashes is given below:—

STANES MINERAL MIXTURE

Staness Sterilised Fine Bonemeal for Cattle

The only Tonic at low price 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

TABLE II
Table showing average weekly weights of chicks in grams.

Mash	American Poultry Feed Mash	American Broiler Mash	Experimental Mash	Central Poultry Farm Mash	Chelsea Chemical's Mash	Commercial Mash No. 1	Commercial Mash No. 2	Commercial Mash No. 3
1st Day— Mean S. D. S. E.	36.66 2.57 0.50	38.32 1.74 0.33	37.89 2.69 0.51	38.33 2.27 0.44	36.93 2.92 0.56	38.00 2.60 0.55	37.69 2.41 0.47	37.85 2.33 0.45
7th Day— Mean S. D. S. E.	64.44 6.20 1.19	61.79 5.61 1.06	64.86 5.50 1.04	55.15 6.08 1.17	67.26 7.90 1.52	56.05 7.06 1.32	51.46 6.52 1.28	51.59 6.89 1.33
14th Day— Mean S. D. S. E.	127.22 15.70 3.07	114.21 12.21 2.31	104.32 9.61 1.82	83.66 11.64 2.24	111.22 11.70 2.25	72.00 13.09 2.52	70.38 10.82 2.12	76.78 15.23 2.93
21st Day— Mean S. D. S. E.	199.66 23.29 4.48	186.64 21.84 4.13	167.25 14.76 2.79	126.30 18.99 3.65	168.52 16.46 3.17	117.93 16.71 3.22	99.81 15.56 3.05	107.41 22.14 4.26
28th Day— Mean S. D. S. E.	290.74 28.88 5.55	274.71 31.86 6.02	233.18 22.74 4.30	178.93 25.44 4.90	214.56 27.57 5.31	181.87 28.61 7.39	149.85 26.04 5.11	140.52 24.58 4.73
Gain in weight— Mean S. D. S. E.	251.07 28.06 5.40	236.39 31.59 5.97	195.29 23.80 4.50	140.59 25.04 4.82	177.63 26.94 5.13	144.20 28.35 7.33	112.15 25.81 5.06	102.07 24.43 4.70

Amongst the Indian mashes the experimental mash has given better performance. But even then it is far inferior to Poultry Feed Mash and needs further improvement. The likely shortcomings may be due to (1) powdery condition of the mash (2) quality of ingredients used (3) Comparative high fibre and low energy value of mash. The quality of ingredients available in the market is very uncertain. Moreover, great damage is done by weevils and insects during the storage of cereals, in the godown. Better results should be obtained by reducing fibre and increasing the energy value of the mash.

Amongst the mashes manufactured by Indian firms the Chelsea Company's mash has given good result. The mash is granular in condition. It has a sweet taste and odour which may be due to the use of cane molasses as a source of energy. The mash was laxative in its effect but it did no harm to chicks.

The mash being used at the Central Poultry Farm, Nagpur has given much poorer results. The ingredients used for this mash and the experimental mash were drawn from the same stock in godowns. The better results with experimental mash may be due to (1) use of antibiotics (2) a better combination of animal proteins and (3) non use of damaged wheat as a source of energy. Damaged wheat may be having an adverse effect on growth though it needs experimental confirmation.

Commercial mash No. 1 is more powdery in condition. The percentage of wheat bran also appears to be very high. Riboflavin deficiency was observed in commercial mashes No. 2 and 3 towards the beginning of the 4th week. In the absence of any other clinical evidence of deficiencies no further comments for improvement are possible without knowing their composition.

Summary

8 different mashes have been tried. Amongst the mashes manufactured by different firms the "American Poultry Feed mash" has given the best results. Amongst the Indian mashes the experimental mash being tried at the Nagpur Veterinary College has given good results. Still further efforts however are needed to improve the quality. The Chelsea Chemical's mash is next in order. The Central Poultry Farm mash and Commercial mash No. 1 are intermediate in effect. Commercial mashes No. 2 and 3 have produced poor results.

Further efforts are needed to improve the quality of Indian mashes and to maintain consistency of quality.

A PRELIMINARY REPORT ON DUCK'S YOLK AND COCONUT WATER AS SEMEN DILUENTS

By

DR. V. VENKATASWAMI, B.A., B.V.Sc., M.S., Ph.D. (Minn.)
Reader in Dairy Science, Madras Veterinary College, Madras

and

SRI C. HANUMANTHA RAO, B.V.Sc.

Developments in semen diluents for preserving the fertilising capacity of spermatozoa have made possible the extensive application of artificial insemination for livestock improvement. Without suitable diluents the technique would not have attained the present day status.

Blood serum was used by early workers (Hirokawa, 1909; Champy, 1913). Phillips (1939) discovered the value of hen's egg-yolk as semen diluent. Attempts were made to reduce the cost of yolk by the use of whole egg (Dunn *et al*, 1950), but the whole egg-citrate has given fertility results lower than yolk-citrate (Dunn *et al*, 1953; Hendrikse and Joling, 1954; O'Sullivan and Smith, 1952). Thacker and Almquist (1953) reported first the use of milk and its products as successful diluents. Cream and Skim milk (Adler and Resebach, 1956) gave 5% higher conception rate than yolk-citrate. Reconstituted skim milk powder at 9% level is as satisfactory as, if not better than, yolk-citrate (Melrose, 1956). A major advance in semen storage has been the introduction of buffers in diluents. Phosphate (Phillips and Lardy, 1940) and sodium citrate (Salisbury *et al*, 1941) still continue to be the commonly used buffers.

Many recommendations have been made to improve the yolk-buffer diluents by inclusion of various additives. Modifications of yolk-buffer diluent include addition of glucose (Salisbury and Knodt, 1947), fructose (Kok, 1952), gelatine (Knoop, 1941), glucose-bicarbonate (Kampschmidt *et al*, 1951) and dialysed yolk (Tosic and Walton, 1946 a) to provide additional substrates. Beneficial effects by glycine addition are well established (Knoop and Kraus, 1944; Tyler and Tanabe, 1952; Roy, 1955; Gabriel, 1955), while contrary results are also reported (Adler and Rasbech, 1956; Ström, 1956). The beneficial effects of glycerol addition to liquid semen in improving the fertility are reported by Holt (1953) and McLean (1956).

Duck's egg is cheaper and yields larger amounts of yolk than hen's egg. In places, especially in duck rearing areas it is easily procurable and sometimes it is the only kind available. Duck's yolk is slightly different chemically from hen's yolk (Romanoff and Romanoff,

1949), which has been recommended by Philips (1939). The present investigation is mainly intended to study (i) the suitability of duck's yolk as a substitute to hen's yolk; (ii) the beneficial effects of adding pH adjusted tender coconut water to semen diluter and (iii) the relationship between resistance and storability of semen of bulls and buffaloes.

Methods and Materials

Semen samples used in the study were collected once a week from bulls maintained at the Madras Veterinary College. A total of 36 samples from 9 bulls and 16 samples from two Murrah bulls were studied in the present investigation. Each sample was split and extended in each of the of the different diluents in the proportion 1 : 4

Hen's yolk was mixed with 3% Sodium citrate in the ratio 1 : 1 and duck's yolk in the ratio of 1 : 1 as well as 1 : 2. Tender coconut water, the initial pH of which ranged from 4.8 to 5.0, was adjusted to 6.7 by using 3% Sodium citrate. Equal parts of pH adjusted coconut water was mixed with each of hen's and duck's yolk 1 : 1 Sodium citrate. Six diluents viz., (i) hen's yolk 1 : 1 Sodium citrate (ii) Hen's yolk-citrate 1 : 1 coconut water (iii) duck's yolk 1 : 1 Sodium citrate (iv) duck's yolk-citrate 1 : 1 coconut water (v) duck's yolk 1 : 2 Sodium citrate and (vi) Coconut water alone, were used in the experiment as diluters. Percentage of motile spermatozoa soon after dilution and following storage at 5°C was scored at regular intervals. Using 1% Sodium chloride to arrest the progressive movement of spermatozoa, the resistance was determined from the formula $R = \frac{V}{V_0}$ (Milovanov, 1934), to study the relationship between resistance and storability of semen.

Results and Discussion

It may be seen from the tables I and II that duck's yolk, as diluent, is as satisfactory as hen's yolk both for bull and buffalo semen. The average percentage of motile spermatozoa calculated for four days is 55 in hen's yolk 1 : 1 Sodium citrate and 50.4 and 54.8 in case of duck's yolk-citrate in the dilutions of 1 : 1 and 1 : 2 ratio respectively for bulls. The corresponding values are 50.3, 50.7 and 51.7 for buffalo bulls calculated for two days. Duck's yolk-citrate diluted at 1 : 2 is found to give better than 1 : 1 ratio.

In case of bull semen, inclusion of pH adjusted coconut water to hen's yolk-citrate has given an average of 60.4 percent of motile spermatozoa and is significant at $P < 0.05$ level when compared to the hen's yolk-citrate diluent without it. Similarly, in duck's yolk-citrate-coconut water diluent, the average percentage of motile spermatozoa is

60.4 and is significant even at $P < .01$ level when compared to duck's yolk-citrate. With buffalo bull semen no significant difference is observed in-between the diluents used and addition of coconut water does not improve the storability of yolk-diluents as it does for bull semen. On the basis of the available data coconut water alone is not a satisfactory diluent either for bull or buffalo semen.

TABLE I

Showing the average percentage of motile bull spermatozoa in different diluents.

Days	Hen's yolk 1:1 Sod. cit.	Hen's yolk-citrate 1:1 coconut water	Duck's yolk 1:1 Sod. cit.	Duck's yolk-citrate 1:1 coconut water	Duck's yolk 1:2 Sod. cit.	Coconut water
	%	%	%	%	%	%
Initial motility on dilution ...	92	93	93	95	95	73
1st day ...	72	82	67	78	74	44
2nd day ...	59	63	50	61	55	37
3rd day ...	31	38	26	39	31	30
4th day ...	21	26	16	29	19	32
Average ...	55	60.4	50.4	60.4	54.8	43.2

TABLE II

Showing the average percentage of motile spermatozoa of buffalo bulls in different diluents.

Days	Hen's yolk 1:1 Sod. cit.	Hen's yolk-citrate 1:1 coconut water	Duck's yolk 1:1 Sod. cit.	Duck's yolk-citrate 1:1 coconut water	Duck's yolk 1:2 Sod. cit.	Coconut water
	%	%	%	%	%	%
Initial motility on dilution ...	79	80	81	83	80	53
1st day ...	44	44	47	45	48	42
2nd day ...	28	34	24	33	27	33
Average ...	50.3	52.0	50.7	53.7	51.7	42.7

Table III indicates the average number of hours the diluents maintain not less than 60% motile spermatozoa in different breeds.

TABLE III

Indicating average number of hours the different diluents preserve not less than 60% motile spermatozoa in different breeds.

Breeds	Number of bulls	Number of samples	Diluents					
			Hen's yolk 1:1 Sod. cit. hrs.	Hen's yolk-citrate 1:1 coconut water hrs.	Duck's yolk 1:1 Sod. cit. hrs.	Duck's Yolk-citrate 1:1 coconut water hrs.	Duck's Yolk 1:2 Sod. cit. hrs.	Coco-nut water hrs.
Ongole ...	2	21	60	72	60	84	72	16
Gir ...	3	5	60	60	48	48	48	12
Sindhi ...	4	10	48	48	36	48	48	5
Average ...	...	...	56	60	48	60	56	11

It may be seen from the table that addition of coconut water maintains desirable level of motility in all breeds slightly longer than the diluents without its inclusion. Also duck's yolk-citrate 1:2 ratio is as efficient as hen's yolk-citrate 1:1. Duck's yolk-citrate 1:1 is least efficient.

Further, the beneficial effects of coconut water depend on the quality of raw semen. The maximum effect is noticed on the semen of high quality and decreases with the semen of decreasing quality. The maximum beneficial effect is seen with the Ongole bulls which produce semen of high quality. Semen from Gir bulls is good and that of Sindhi bulls is fair. Addition of coconut water to good or fair quality semen has little or no effect in enhancing the efficiency of dilutors. Irrespective of the quality of raw semen, 16 samples from two Murrah bulls, indicate that all the diluents are less satisfactory with or without addition of coconut water as they are able to preserve not less than 60% motile spermatozoa only for a day or less.

The following table indicates the relationship between resistance and duration of viability of spermatozoa.

TABLE IV

Showing the relationship between resistance and duration of viability of spermatozoa.

Animals	Number of samples	Resistance		Duration of viability	
		Average	Standard deviation	Average viability (days)	Standard deviation
Bulls ...	24	15,177	9050	3.25	1.90
Buffalo bulls ...	16	9,025	4161	1.00	0.87

The resistance of bull spermatozoa with 24 samples ranges from 2750 to 42,500 with an average of 15,177 and a standard deviation of 9,050. With 16 buffalo semen samples it ranges from 1250 to 15,000 with an average of 9,025 and a standard deviation of 4162. The duration of viability of bull semen ranges from 1 to 7 days with an average of 3.25 days and a standard deviation of 1.90. It ranges from 0 to 3 days in case of buffalo bulls with an average of 1.00 day and standard deviation of 0.87. The data suggest that higher the resistance to 1% Sodium chloride, longer is the duration of viability as noticed with bulls and shorter the period if the resistance is lower as noticed with buffalo semen. Spermatozoa of buffalo bulls seem to be inherently weak with low resistance and hence viability under storage conditions is considerable shortened.

Summary

- (i) Duck's egg-yolk as a substitute to hen's yolk, is as satisfactory a semen diluent as hen's yolk both for bull and buffalo semen. Duck's yolk-citrate in the ratio of 1:2 is better than 1:1 ratio.
- (ii) Addition of tender coconut water of pH adjusted to 6.7 either to hen's or duck's yolk has significant beneficial effect especially with semen of high quality.
- (iii) As the resistance of spermatozoa to 1% Sodium chloride increases, the duration of viability also increases. The spermatozoa of buffalo bulls are least resistant and hence the duration of viability also is short in all diluents.

Acknowledgment

The authors are indebted to Dr. Bertie A. D'Souza, Principal, Madras Veterinary College, for providing the necessary facilities, and to Dr. Kerala Varma, Professor of Dairy Science, for his valuable suggestions.

REFERENCES

1. Adler, H. C., and Rasbech, N. O. ... *Nord. Vet. Med.*, **8**, 497. (1956)
2. Idem, (1956) ... *Ibid*, **8**, 632.
3. Champy, C. (1913) ... *C. R. Soc. Biol. Paris*, **74**, 72.
4. Dunn, H. O. and Bratton, R. W. ... *J. Dairy. Sci.*, **33**, 430. (1950)
5. Dunn, H. O. Bratton, R. W. and ... *J. Dairy. Sci.*, **36**, 524. Henderson, C. R. (1958)
6. Gabriel, R. W. (1955) ... *M. Sci. Thesis, Univ. Minnesota, St. Paul.*

7. Hendrikse, J. and Joling, K. F. ... *A. B. A.*, **22**, No. 955. (1954)
8. Hirokawa, W. (1909) ... *Biochem. Z.*, **19**, 291.
9. Holt, A. F. (1953) ... *Vet. Rec.*, **65**, 624, 679.
10. Kampshmidt, R. F., Mayer, D. T. ... *J. Dairy, Sci.*, **34**, 45. Herman, H. A., and Dickerson, G. E. (1951)
11. Knoop, C. E. (1941) ... *J. Dairy. Sci.*, **24**, 891.
12. Knoop, C. E. and Krauss, W. E. ... *J. Dairy. Sci.*, **27**, 657. (1944)
13. Kok, J. C. N. (1952) ... *A. B. A.*, **21**, No. 1260.
14. Mc Lean, J. M. (1956) ... *N. A. A. B. News*, March-April, 1956: 13.
15. Metrose, D. R. (1956) ... *A. B. A.*, **24**, No. 1656.
16. Milovanov, V. K. (1934) ... *Principles of Artificial Insemination, Moscow Leningrad: State publishing house.*
17. O'Sullivan, K. and Smith, G. F. ... *Rep. Prod. Div. Milk. Mktg. Bd. No. 3*, 24-26. (1952)
18. Phillips, P. H. (1939) ... *J. Biol. Chem.*, **130**, 415.
19. Phillips, P. H. and Lardy, H. A. ... *J. Dairy. Sci.*, **23**, 399, 873. (1940)
20. Romanoff, A. L., and Romanoff, A. J. (1949) ... *The avian egg. John Wiley & Sons. Inc., New York.*
21. Roy, A. (1955) ... *Vet. Rec.*, **67**, 330.
22. Salisbury, G. W. and Knott, C. B. ... *J. Dairy. Sci.*, **30**, 361. (1947)
23. Salisbury, G. W., Fuller, H. K. ... *J. Dairy. Sci.*, **24**, 905. and Willett, E. L. (1941)
24. Strom, S. (1956) ... *A. B. A.*, **24**, No. 1674.
25. Thacker, D. L., and Almquist, J. O. (1953) ... *J. Dairy. Sci.*, **36**, 173.
26. Tosic, J. and Walton, A. (1946 a) ... *J. Agric. Sci.*, **37**, 69.
27. Tyler, A., and Tanabe, T. Y. (1952) ... *Proc. Soc. Exp. Biol., N. Y.*, **81**, 367.

PRESERVATION OF BUFFALO BULL SEMEN WITH WHOLE EGG CONTAINING DILUTORS*

By

N. S. TOMAR, M.V.Sc. & R. N. DESAI, M.S., Ph.D.

U. P. College of Veterinary Science and Animal Husbandry, Mathura.

Few workers have tried the whole egg contents (egg yolk and albumen) for the preservation of bull semen (Dunn *et al*, 1950; Hendrikse and Jolling, 1954; De Silva, 1954). The workers reported that the whole egg-citrate was equally well or better than the egg yolk-citrate medium in supporting the spermatozoan motility.

Materials and Methods

Semen was collected from the 8 Murrah bulls and was evaluated for pH, motility, normal and live percentage of spermatozoa and also

for the sperm density. The egg yolk and the egg albumen were taken in separate containers. The yolk membranes and the chalaza were discarded. The albumen portion was stirred thoroughly and then was added to the egg yolk. The two ingredients were thoroughly mixed prior to use. The dilutors used were as given in Table I.

TABLE I
Compositions of the whole egg containing dilutors.

Sl. No.	Sodium citrate dihydrate (3% W/V solution)	Sodium bicarbonate (1.3% W/V solution)	Glucose anhydrous (4% W/V solution)	Fructose (5% W/V solution)	Whole egg	pH
1	—	—	40 parts	20 parts	40 parts	7.2
2	—	10 parts	50 "	20 "	20 "	7.6
3	25 parts	—	30 "	15 "	30 "	7.5
4	50 "	—	30 "	—	20 "	7.55

*The data for this paper have been taken from the M.V.Sc. Thesis (April, 1959) of Shri N. S. Tomar.

The semen was diluted with the dilutors at the rate of 1:10. 10 semen samples were studied and each sample was given two observations. The motility ratings were studied daily (each plus 1 = 20% motile sperms).

Results and Discussions

The whole egg-glucose-fructose, which had no added electrolyte contents gave the best result and was significantly superior to the other media (Table V, VI). One of the semen samples maintained the motility for 48 days in this medium.

The other three dilutors did not prove well in supporting the progressive motility of the sperm but they could maintain the livability for fairly longer periods (Table, II).

It was observed that the whole egg-glucose-fructose medium did not allow a sharp decline in the motility and could sustain about 40% motile sperm for a period of 10 days (Fig. 1).

pH—The whole egg-glucose-fructose medium showed a pH of about 6.3 in 7 days of preservation period. The pH values of other dilutors were maintained around 6.6.

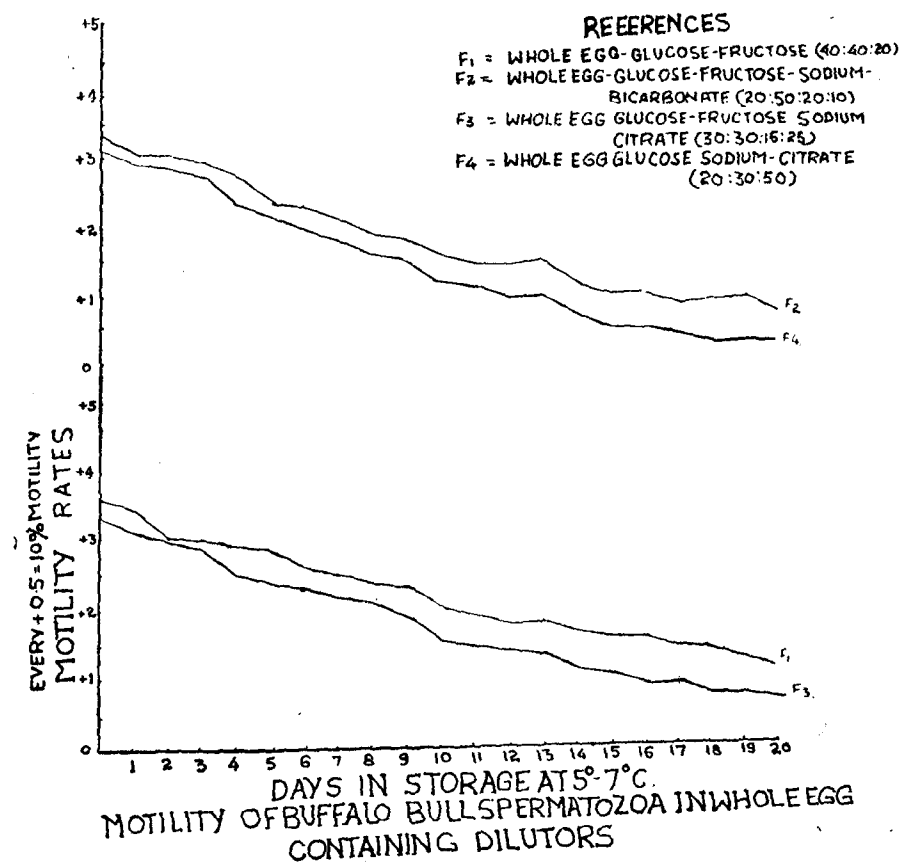


Fig. 1

TABLE II
Keeping quality of buffalo bull semen in whole egg containing dilutors.

Sl. No.	Names of the dilutors	+ 3 motility maintained in days	whole life maintained in days
1	Whole egg-glucose-fructose ...	4.9 ± 0.215	27.95 ± 0.807
2	Whole egg-glucose-fructose-sodium bicarbonate ...	8.4 ± 0.112	24.1 ± 1.448
3	Whole egg-glucose-fructose-sodium citrate ...	3 ± 0.051	22 ± 1.142
4	Whole egg-glucose-sodium citrate ...	2.9 ± 0.011	19.3 ± 1.076

From the present experiment it was revealed that the addition of electrolytes to the whole egg-glucose-fructose medium reduced the progressive motility and also the whole life of the sperm (Table II, V, VI).

TABLE III
Analysis of variance of the + 3 motile life of the buffalo bull spermatozoa.

Sources of variation	D.F.	M.S.S.
Total	79	
Between the dilutors	3	18.133 **
Within the dilutors	76	0.439

TABLE IV
Analysis of variance of the whole average life of the buffalo bull spermatozoa.

Sources of variation	D.F.	M.S.S.
Total	79	
Between the dilutors	3	266.812 **
Within the dilutors	76	39.038

** P < 0.01

TABLE V
Significance of the differences in maintaining the + 3 motility of the spermatozoa.

Dilutors	Whole egg-glucose-fructose	Whole egg-glucose-fructose-sodium bicarbonate	Whole egg-glucose-fructose-sodium citrate
Whole egg-glucose-sodium citrate ...	2 **	0.5 *	0.1 N.S.
Whole egg-glucose-fructose-sodium citrate ...	1.9 **	0.4 N.S.	
Whole egg-glucose-fructose-sodium bicarbonate ...	1.5 **		

Critical difference for 't' value at 5% = 0.408
" " " 1% = 0.538

TABLE VI
Significance of the differences in maintaining the livability of the spermatozoa.

Dilutors	Whole egg-glucose-fructose	Whole egg-glucose-fructose-sodium bicarbonate	Whole egg-glucose-fructose-sodium citrate
Whole egg-glucose-sodium citrate ...	8.65 **	4.8 *	2.7 N.S.
Whole egg-glucose-fructose-sodium citrate ...	5.95 **	2.1 N.S.	
Whole egg-glucose-fructose-sodium bicarbonate ...	3.85 N.S.		

Critical difference for 't' value at 5% = 3.865

1% = 5.089

** P < 0.01; * P < 0.05; N.S. = Not significant

The pH of the electrolyte added dilutors was comparatively higher (7.5 to 7.6). Whether the higher pH has affected the motility and/or glycolysis cannot be answered definitely. Salisbury and Kinney (1957) have reported that at higher pH levels there was an increased rate of fructolysis by the spermatozoa. Willet and Ohms (1957) have also observed that at an alkaline pH the egg yolk-glucose-sodium bicarbonate dilutor maintained the livability of the bull spermatozoa poorly as compared to the egg yolk-sodium citrate, but in an acidic medium the livability was maintained equally well. They hypothesized that the higher metabolic rate in an alkaline medium might be the cause of the shortened life of the bull sperm.

The explanation for the decrease in the progressive as well as in the whole life of the buffalo bull spermatozoa may also be discussed in the same light that the higher pH and the electrolyte probably played a part in bringing about this ill effect on the motility and longevity of the buffalo bull spermatozoa.

Summary

Whole egg (egg yolk and egg-albumen) was used with glucose, fructose, sodium citrate and sodium bicarbonate. The whole egg-glucose-fructose (40:40:20) preserved the buffalo bull semen for longer periods (+ 3 motility for 4.9 days, whole life for 27.95 days).

It was concluded that the alkaline pH of the whole egg dilutors (7.2 to 7.6) was disadvantageous for maintaining the progressive motility of the buffalo bull spermatozoa.

The whole egg containing dilutors supported the livability of the buffalo bull spermatozoa for longer periods (19.3 to 27.95 days). It seems that the alkaline pH does not affect the livability of the sperm.

Acknowledgment

The authors are thankful to Shri C. V. G. Choudary, Principal of the College for kindly providing the facilities.

REFERENCES

- De Silva, P. L. G. (1954) ... *Anim. Breed. Abstr.*, **23**, Abstr. No. 660.
 Dunn, H. O., Bratton, R. W. ... *J. Dairy Sci.*, **33**, 434.
 and Collins, W. J. (1950)
 Hendriske, J. and Jolling, K. F. ... *Anim. Breed. Abstr.*, **22**, Abstr. No. 956.
 (1954)
 Salisbury, G. W. and Kinney, ... *J. Dairy Sci.*, **40**, 1343.
 W. C. (1957)
 Willet, E. L. and Ohms, J. I. ... *J. Dairy Sci.*, **40**, 1324.
 (1957)

SEASONAL VARIATIONS IN STORAGE OF BUFFALO-SEMEN; A PRELIMINARY FIELD STUDY

By

RATTAN SINGH DYAL, DHARAMPAL,
Government Livestock Farm, Hissar.

Introduction

It has been observed in the field that preserved buffalo spermatozoa show short survival in winter season which obviously necessitates too frequent collections. Dharampal (1956) reported that the maximum services in buffaloes viz., 92.35 per cent were recorded in autumn and winter (autumn 54.89 and winter 37.46 per cent) against 7.65 per cent for the rest of the year. Thus 37.46 per cent buffaloes come into heat in winter months (November to February) when the preservation quality of buffalo-semen is at its lowest and obviously it poses a problem for the application of artificial insemination (A.I.) in these animals during this period. The present work is in pursuit of this study.

Review of Literature

A good deal of work has been done to assess the storage period of bull semen but no relevant data on buffalo (Buff.) semen is available in this respect. The variations due to fluctuations in season have also not been reported.

Vandemark and Sharma (1957) referred to the use of bull semen in egg yolk citrate upto 3 days and in Illini variable temperature diluent (IVT) upto 7 days with good results, on non-return to service basis.

According to Moupouine and Verain (1957) spermatozoal survival time of bull semen diluted in Egg-Yolk-Citrate (EYC) and subjected to ultrasonic waves for 10 minutes in 3 applications of 5, 3, 2 minutes respectively was 10 days against 6 days in untreated diluted semen.

Jakowaski (1958) reported that bull semen kept at room temperature (temp) when diluted with the Illini diluent remained usable (more than 50 per cent motile spermatozoa) for approximately 163 hours (hrs.) against 38 hrs. for control semen kept at room temp., 119 hrs. for control semen kept at 4°C, and 72 hrs. for control semen in thermos flask.

Material and Methods

(a) Two Buffalo-bulls numbered S₂ and S₉, aged 11 and 6 years, which were the only bulls stationed at A. I. Centre, Phillaur (Punjab), formed the subject of study. The observations were commenced in October, 1957 and concluded in September 1958. The collections were made in artificial vagina (FAO-pattern) at the morning time and all necessary steps as per standard practices were duly observed in collection, dilution, handling of semen etc. Egg Yolk citrate (EYC) and egg Yolk Phosphate (EYP) were used as diluents in rotation for each alternate collection, from either bull to make comparative study of sperm survival possible in two bulls.

(b) The schedule of collections was planned on the requirement basis depending on the number of females coming in heat, at any time. This procedure was considered more apt and systematic than any other alternative based on mere arithmetically levelled up intervals, as physiological stress on bulls due to incidence of oestrus under natural conditions could better be assessed this way.

(c) The preserved semen was examined morning and evening for sperm motility and motility was rated on 0.5 score as per standard practices. The semen was reckoned as viable for one day if it was found usable (more than 50-60 per cent sperm actively motile) at at both morning and evening microscopic examinations. In case it was not subsequently found usable at evening examination, its viability was reckoned as half day only.

(d) The maximum (max.), minimum (min.) temperature and other meteorological data relating to Ludhiana were obtained from the Director, Meteorological Centre, Lodhi Road, New Delhi as data for Phillaur was not maintained by the said institute. Ludhiana was only 9 miles from Phillur and situated on the other side of River Sutlej and consequently the environmental conditions did not differ much from Phillaur. The data for Ludhiana were, therefore utilised for the purpose of this experiment.

Observations and discussion

The observations in respect of atmospheric data as related to sperm survival were collected on day to day basis, but for the purpose of simplification and ready reference, those have been summed up as monthly averages and are reproduced in the table given below :—

TABLE
Monthwise averages of maximum and minimum temperature, relative humidity and their relation to the viability of usable semen (50-60 per cent actively motile spermatozoa).

Months	Mean		Mean Min. deg. C	Relative Humidity percentages		Rainfall (Milli- meters)	Viability average (days)		Overall viability for the 2 bulls (days)
	Max. deg. C	17-30 hrs.		08-30 hrs.	17-30 hrs.		Bull S ₂	Bull S ₉	
October	34.0	17.2	62	55	19.5	2.00	2.10	2.05	
November	28.1	11.2	71	59	25.4	1.00	0.93	0.96	
December	21.8	8.4	85	70	34.3	1.07	0.91	0.99	
January	20.0	7.9	83	63	17.3	1.00	1.00	1.00	
February	24.2	8.2	65	43	7.9	1.03	1.08	1.05	
March	31.7	13.8	47	30	6.8	2.33	2.25	2.29	
April	39.4	21.0	37	25	0.88	2.16	2.00	2.08	
May	40.7	22.8	37	Doubtful reading	0.0	2.25	2.33	2.29	
June	42.6	26.9	35	20	0.84	2.50	3.00	2.75	
July	35.1	26.7	80	67	108.6	2.66	2.25	2.45	
August	34.9	25.4	80	65	128.6	2.66	2.25	2.45	
September	32.5	24.2	78	72	419.4	2.50	2.37	2.43	
Average viability for months from November to February						1.0 day			
Average viability for rest of the year						2.35 days			

(i) The table above indicates that overall mean sperm survival of usable semen was 1.0 day for months from November to February against that of 2.35 days for the rest of the period of the year.

(ii) The average max. tem. range varied from 20.2°C to 28.1°C in the period from November to February and from 31.7 to 42.6°C for the remaining months of the year. The average max. tem. range from November to February approximated to the average minimum temp. range of certain months in the period from March to October. This wide variation in the max. temperature had obviously little effect on sperm survival.

(iii) In the above table the relative humidity at 08.30 hrs. and 17.30 hrs. for the period from November to February varied from 65-85 and from 43-70 percent respectively. For the rest of the year, these figures were respectively 37-80 and 20-72 per cent. This wide variation in relative humidity within the months from March to October was not followed by any appreciable fluctuation in the survival time of buffalo spermatozoa.

(iv) The rainfall varied from 6.8 to 419.4 millimeters within the months from March to October with obviously no effect on storage time of the semen.

(v) The storage period of buff. semen in the two diluents (EYC) and (EYP) also showed no appreciable variation.

(vi) The storage period, however, showed a sharp decline in months from November to February when the min. temperature range fell down to 11.2°C or below. Again with the average min. temperature having come up to 13.8°C in the month of March the storage period of usable semen showed an appreciable improvement to 3.29 days against 1.0 day in months from November to February. It was also observed that with further upward trend in min. temperature range from 13.8 to 26.9°C (March to October months), no significant improvement in storage of semen was noticeable (Figure I and II refer).

(vii) Dharampal (1952) working on thermo-regulatory incompetence in buff. stock reported that a good percentage of buffalo calves under one year of age showed distressing symptoms and rise in body temperature in summer months. The adult buff. stock, however, maintained their body temperature alright throughout the year.

In this set of observations, the co-existence of min. temp. range (11.2°C or below) with poor sperm survival in November to February months has been brought out as a constant feature and is a noteworthy conclusion. It appears that scrotum, being outside the body, is affected by extreme weather conditions in this class of animals, resulting in poor quality of spermatogenesis presumably due to the incompetence of thermo-regulatory mechanism of the scrotum itself.

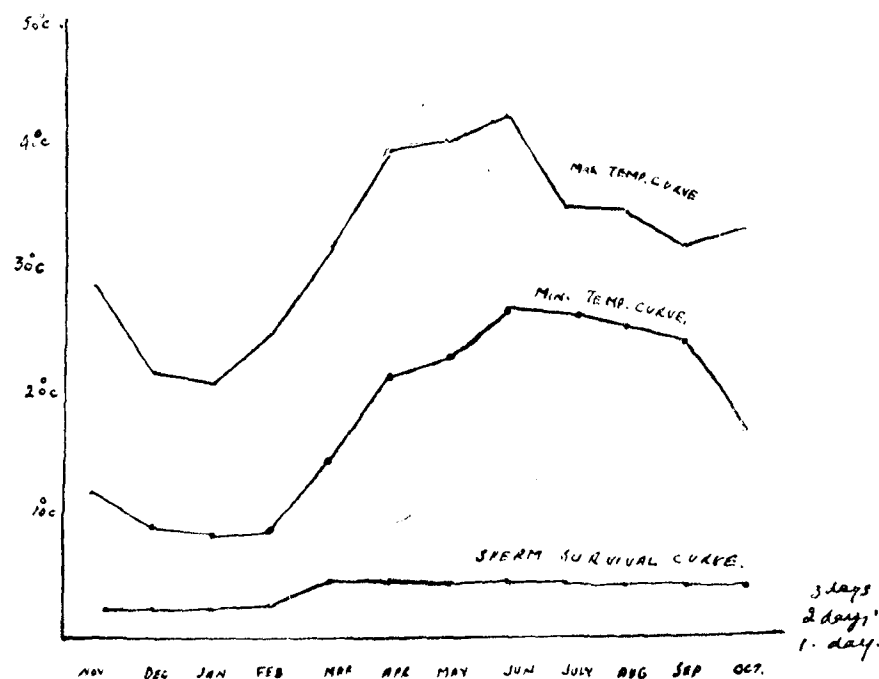


FIG 1. CURVE RELATIONS

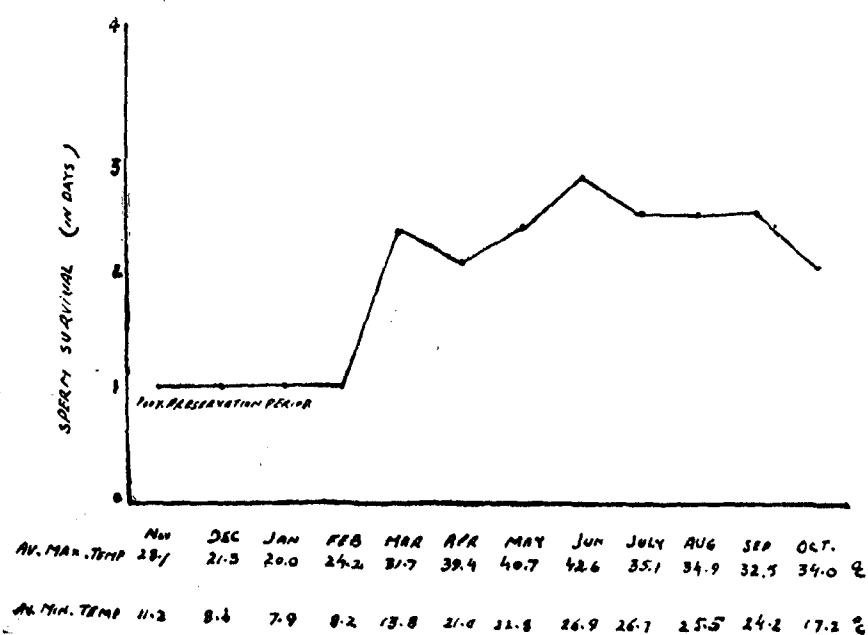


FIG 2. SEASONAL SPERM SURVIVAL

Summary

1. Seasonal variations in viability of preserved buff. semen from October, 1957 to September, 1958 were studied. The period from November to February showed poor sperm survival (1.0 day) against an average of 2.35 days for the rest of the period of the years. The co-existence of this poor sperm survival in November to February months with the min. tem. range (11.2°C or below) was a constant feature and a note-worthy conclusion.

2. The max. tem. relative humidity and rainfall (under conditions studied) had no appreciable effect on sperm survival.

3. The storage period of semem did not vary much with the use of either diluent (EYP or EYC).

4. The poor preservation of buff. spermatozoa in winter months poses a problem for A.I. and the field worker should make sure that he is introducing live semen only.

5. The present observations composed a preliminary study from the field workers point of view. The trend of results obtained however, were of valuable utility in the technique of A.I. These could be of considerable help to other workers having additional laboratory facilities to supplement their findings towards a full scale investigation on the subject.

REFERENCES

1. Jakowaski, L. (1952) ... Investigations on preservation of bull semen. A. B. A. Sept., 1958.
2. Kushwaha N. S., Mukerjee D. P.... Seasonal variations in semen quality of Buff. bulls. Ind. J. of Vet. Sc. and A. H. Dec., 1956.
3. Maupouine R. and Verain (1957)... Effect of ultrasonics on bull spermatozoa. A. B. A. Sept. 58.
4. Vandmark N. L. and Sharma U. D. (1957) ... Results of preservation of Bovine semen at room temp. (65-80 F) J. of Dai. Sc. Apr. 1957 Vol. XI. Pages (438-39).
5. Dharampal (1956) ... Some Interesting observations on cattle breeding under Key village Scheme. Ind. Vet. J. (July 56).
6. Dharampal (1952) ... Effects of summer on temperature of Buff. calves. Ind. Vet. J. (Nov. 52).

Clinical Article

ANTEPARTUM PARTIAL PROLAPSE OF VAGINA IN A BITCH

By

F. D. WILSON, E. I. RAJENDRAN

and

G. DAVID,

Department of Surgery, Madras Veterinary College

Introduction

Prolapse of the vagina in the canines is not common. In America its occurrence is rare, but has been noticed in some Boxers. In the United Kingdom the condition is common in Grey-hounds and St. Bernards. The condition however must be differentiated from venereal sarcoma seen commonly in Madras State. In this condition there is a slight eversion of the lips of the vulva.

Case History

On 16-11-1960 a black non-descript bitch aged six years, was admitted as an out patient in the small animal clinic (and later transferred as an inpatient) with the history of vaginal prolapse for the past four days. The general condition of the animal was poor.

Symptoms

Detailed examination of the rectum revealed no abnormality. Palpation of the abdomen indicated advanced pregnancy. Foetal heart sounds were audible on auscultation. The vagina, with the wall relaxed, had the prolapse around the inferior three fourths of the lips of the vulva. The cervix was closed, with the mucous seal intact.

Treatment

The prolapsed mass was cleansed and reduced but could not be retained by suturing the wall to the skin of the vulval lips with interrupted sutures. Daily the animal was under strict observation for signs of whelping. Auscultation of foetal heart sounds was done at frequent intervals. The vaginal passage was cleansed and bland oil dressing was applied daily.

On 19-11-1960 the animal whelped a live pup in the early hours of the morning. At 8-30 a.m. no foetal heart sounds were audible and as the uterus was inert, $\frac{1}{2}$ c.c. of Pitocin was injected intra-muscularly. Roentgenogram of the abdomen revealed a foetus at the pelvic brim.

After half an hour, as no improvement in the uterine tone was felt, the foetus was extracted with the forceps. As the prolapse persisted after parturition it was resected and sutured.

Technique

The vagina was cleaned and 2.cc. Novotox was infiltrated around the base of the prolapse. A sterile catheter was introduced into the urethral meatus and kept in position. Halstead suturing was performed around the base of the prolapsed mass after avoiding the urethra. The sutures were $\frac{1}{2}$ cm. apart and they effectively arrested haemorrhage and apposed the mucous membrane. After covering the base completely with the sutures the tissues caudad were dissected out with negligible haemorrhage. Glycerine was applied on the mucosa. As neither straining nor prolapse occurred during the next two days, the animal was discharged on 21-11-60. The result of histopathological examination of the excised tissue was "Vaginal wall with surface necrosis and inflammatory reaction in muscles seen."

Discussion

During the period of oestrus and after parturition especially when the bitch is out of condition, the vaginal mucosa becomes relaxed and in some cases it will protrude from the vulva for a considerable distance. The prolapsed membrane tends to become tumefied in course of time and the presence of a lump in the vagina leads to irritation and straining.

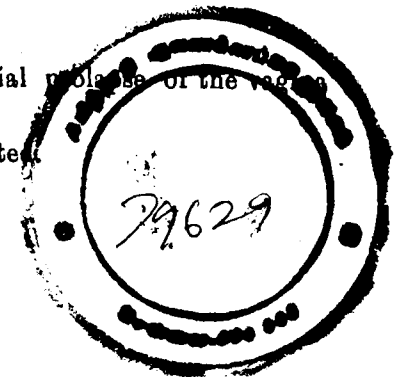
Eversion during the oestral phase with vaginal hyperplasia or oedema has been met with in brachycephalic breeds as Boxers in America.

There is the possibility of congenital insufficiency of the tissues that support the external genitalia in which case the condition occurs early in life. Frequent pregnancy is one of the reasons for the muscles to lose their tone in the late life. The development is gradual and prolapse can occur due to any contributory factor as Cystocele, Rectocele and Pregnancy when the vaginal walls are unable to bear the strain due to lack of tone. In the case under study pregnancy, age and number of past pregnancies may be the contributing factors resulting in the prolapse. Since the condition is likely to recur, radical treatment is indicated.

Summary

- (i) A rare case of antepartum partial prolapse of the vagina in a bitch is reported.
- (ii) The operative treatment is indicated.
- (iii) The condition is discussed.

JL
KZ m 2, n 2 4
n 61-38-2



Acknowledgment

The authors thank the Principal, Madras Veterinary College for the kind permission granted to publish this article and the Department of Pathology for their kind cooperation.

REFERENCES

1. McGunn, James, (1953) ... Hobdays Surgical diseases of the Dog and Cat. 6th Ed. 328-329.
2. Roberts, S. J. (1956) ... Veterinary Obstetrics and Genital Diseases.
3. Shaw, Henry Newton, (1934) ... The Practitioners library of Medicine and Surgery, Vol. VI. 778-780.

Abstracts

Virulence and Toxicity of *Pasteurella haemolytica* in the Experimental Production of Ovine Septicaemia:—By G. R. SMITH. *Jour. comp. Path. and Ther.*, Vol. 70, No. 4, October 1960.

This paper records experiments on *Past. haemolytica* designed to investigate further its pathogenicity in relation to the septicaemic infections of older lambs described by earlier workers. Information is presented on the virulence by intravenous inoculation of a freshly isolated Type T strain in 7 month-old lambs and adult sheep. The implications of using large doses are discussed in the light of an experiment on toxicity of the organism. The tissues of 6-month-old lambs which died from natural septicaemic infections of *Past. haemolytica*, Type T, were shown to contain large numbers of viable bacteria. Very high intravenous doses of a freshly isolated T strain produced death in 7-month-old lambs and adults, but smaller doses were not fatal. Smaller doses did, however, demonstrate a relationship between age and resistance in that bacteria were eliminated more rapidly from the peripheral circulation of adult than of lambs. The lethal dose of heat-killed broth culture for lambs by intravenous inoculation was only a low multiple of the lethal dose of living culture.

A. MUKERJI.

Physiological Properties of Pathogenic and Nonpathogenic *Vibrio* Species isolated from Cattle, Sheep and Chickens—By J. T. BRYRNS and A. G. SMITH, *The Cornell Veterinarian*, Vol. L, No. 3, July, 1960.

The present report contains the results of a study of series of *Vibrio* cultures from aborted fetuses and reproductive tracts of cattle and sheep and from avian hepatitis. The results reported here establish a reasonable basis for a biochemical system leading to separation of *Vibrio* species isolated from cattle and sheep into two

groups. They illustrate that *Vibrio* species isolated from pathological processes in cattle, sheep and chickens possess at least two physiological properties serving to distinguish them from the morphologically indistinguishable nonpathogenic types. The two most reliable criteria for identification of pathogenic *Vibrio* species from cattle, sheep, and chickens are their ability to decompose hydrogen peroxide and their inability to grow in a medium containing 4 percent NaCl. Hydrogen sulphide production or the inability of a given isolate to produce this gas has little, if any, correlation with pathogenicity. The ability of a *Vibrio* culture to tolerate and reduce 0.1 percent sodium selenite is correlated at least in the 17 cultures from bovine fetuses with the ability of the culture to produce hydrogen sulphide. The ability of cultures from bovine fetuses to tolerate a concentration of 1 percent Ox gall is a useful distinguishing characteristic of the isolates. The Ox gall tolerance of *Vibrio* isolates from ovine sources did not prove to be a useful additional characteristic for separating pathogenic and nonpathogenic isolates. Both catalase-positive, salt-sensitive and catalase-negative, salt tolerant cultures from sheep grew profusely in ox gall medium.

A. MUKERJI.

Further Studies on *Clostridium Chauvoei* Infections and Immunity in Laboratory Animals—By M. S. COOPER, F. V. MARTINI and G. R. PERSONEUS. *The Cornell Veterinarian* Vol. L, No. 3, July, 1960.

The present paper deals with further studies to characterize the nature of the virulence of pathogenicity of *Cl. chauvoei* in laboratory animals. This report also includes the relationship of spore numbers of *Cl. chauvoei* and calcium chloride concentration in the challenge suspension to pathogenicity for susceptible guineapigs and the effects of spore numbers on the survival of immunized mice. Normal guineapigs were injected with various numbers of washed viable *Cl. chauvoei* spore in several concentrations of CaCl_2 . The latter compound was used as a tissue debilitant and under certain conditions may foster a fatal infection, whereas the same number of spores in distilled water are innocuous. The results indicated that when 2.5 percent CaCl_2 was used, 98.4 percent of the guineapigs died after injection with as few as 10 spores whereas reduction of the CaCl_2 concentration to 0.5 percent did not kill many of the injected guineapigs even when 12,700 spores were injected. Some differences in virulence were observed between strains of *Cl. chauvoei*. The second experiment investigated the effects of viable spore numbers (in the challenge) on survival of immunized mice

after challenge. In this study the authors have shown that variation in the range of 10^3 had no significant bearing on the severity of challenge when the concentration of tissue debiliant was kept constant.

A. MUKERJI.

Allergy Studies on Cattle Vaccinated with killed *Mycobacterium Paratuberculosis*—BY A. B. LARSEN and T. H. VARDAMAN. *Amer. Jour. Vet. Research*, Vol. 21 No. 84, September, 1960.

Since young cattle are very susceptible to infection, a vaccine that would protect young animals and not interfere with diagnostic test procedures for tuberculosis and paratuberculosis would be useful in the United States, even if the immunity were lost by the time they became adults. The authors planned experiments mainly on the above lines. 8 calves were vaccinated intradermally with a 0.1 ml dose of killed *Myco paratuberculosis* and 8 were given 0.3 ml. dose. Nodules which developed at the vaccination site were removed from half of each group of animals. All were given Johnin and Tuberculin intradermally in both the cervical region and the caudal folds at intervals during a 22 month periods. It was observed that the size of the vaccinal dose or the removal of the nodule had very little effect on the degree of sensitivity or the rate at which it was lost. The sensitivity decreased in 20 months to a point where 8 of the animals had no reaction to the tuberculin test in the caudal folds. The Johnin reactions were larger than the tuberculin reactions in both the caudal folds and the cervical region in 160 tests out of a total of 204. 6 cattle vaccinated with *Myco, paratuberculosis* and subsequently vaccinated with killed *Myco tuberculosis* Var. *bovis* had larger tuberculin than Johnin reactions in 3 out of 6 instances in the caudal fold and 5 out of 6 in the Cervical region.

A. MUKERJI.

The use of Teoquil for the treatment of Ringworm in Cattle—BY FORENBACHER, S., HAJSIG, M. and SERTIC, V. (1960). *Vet. Rec.*, 72, 1062-63.

One hundred and twenty five cattle infected with *Trichophyton verrucosum* var. *album* and *discoïdes* were successfully treated with topical application of a 0.25% solution of Teoquil marketed by Allan & Hanburys, Limited, London under the name of Tinevet. The affected areas were painted with the solution 2 or 3 times at 48 hour intervals. The drug was also found efficacious against experimental infection in guinea-pigs with *T. verrucosum* and *T. mentagrophytes*.

V. S. A.

News and Views

A Gracious Queen :—Queen Elizabeth II is with us, with her consort, His Royal Highness Prince Philip. The spontaneity and exuberance of welcome accorded to them is something unrivalled and unforgettable. A more charming pair it is hard to conceive of. As one paper puts it "It is as a woman with all the womanly qualities of personal charm, tenderness and sympathy for the suffering that Elizabeth the Second has won her way into the hearts of all" in this country. Our Prime Minister has put it nicely when he said "The tremendous reception is due partly to the tradition of hospitality of India, partly due to the old ties and above all for a charming young lady whom they want to welcome".

We most heartily join with the rest of India in extending to these Royal Visitors our welcome, our greetings and our good wishes. May God bless this Royal couple and their little family!

* * * *

The New President of the U.S.A. :—Mr. John F. Kennedy has assumed charge of the high office of the President of the United States of America. Though young, he is quite experienced and has come out with an inspiring message to all parts of the globe. "Ask not what your country will do for you - ask what you can do for your country" is a message meant not only to his fellow Americans but to all citizens of the world. How buoyant ring his words when he says "Together let us explore the stars, conquer the deserts, eradicate disease, tap the ocean depths and encourage the arts and commerce". We merely say 'Amen'. We wish him God-speed in his efforts to go all-out in quest of Peace in this strife-stricken world.

* * * *

A Soldier Speaks out :—General K. M. Cariappa considers that every able bodied man of our land between the ages of 20 and 40 years must receive military training compulsorily. This, he says, is not for raising an army to fight wars with bullets and bayonets but to fight other wars on the economic, industrial, mental, moral and health battle fields. We are lacking in mass discipline and a national character". People will then develop "good soldier-qualities of team spirit, loyalty, sense of duty, value of time, dignity of labour, selflessness and a spirit of good fellowship regardless of our communities".

"To the soldier, it is duty first and then his food, rest and so on. He does not go in quest of opportunities to gain personal power, nor to amass wealth, both of which, alas, are the real curse of our land to-day". These home-truths may not be palatable to many but they are facts which India will be forced to face sooner or later.

A righteous indignation :—The Soviet Prime Minister, Mr. Khrushchev at a discussion on agriculture in his own country, burst out "It is a crime to fake crop figures. Such people should be brought to trial whoever they are." What he said is true of all scientific data in all countries and at all times. It is not merely criminal but something sub-human or demonish to fake up scientific data. It must be exposed wherever found and the person or persons concerned should be mercilessly dealt with.

Electricity in all villages in Madras :—"All the 45,000 villages of Madras State will get electricity by the end of the Third Plan Period" says a press report. It is something to be thankful for. But more than electricity, people would like to have food at reasonable cost. The price-level is soaring higher and higher every day!

Sleeping or waking giant ? :—Mr. Ellis Bunker, U. S. Ambassador paid very flattering tributes to India, recently. "India in the past has sometimes been described as a sleeping giant. The giant is awake now. His sinews are tightening and his imagination is aflame with new ideas. And what is best about this giant is that he is a peaceful giant, a democratic giant, a gentle giant with a generous disposition and winning personality. He is a giant bending to the work at hand with determination and courage and a stout heart." How we wish we deserve all these encomiums! Yes, bend to work. Are we doing it? If we do that, Mr. Bunker would prove himself to be an infallible prophet.

The Ancient plough :—"The world has changed tremendously, but our peasant still uses the plough his fore-fathers used centuries ago" said Prime Minister Nehru at the last Congress session. "It bewilders me why the Government has not evolved a new plough and given it to the peasant." "Why" answers the echo! "Bend to work" is our difficulty. Similarly which State has made a start to evolve a new type of cow for dairy purposes which would thrive well in our tropical conditions?

Limitations of Democracy :—"To say that democracy will solve all problems is utterly wrong. Problems are solved by intelligence and hard work" said Mr. Nehru at the last Congress session. "Democracy is good. I say this because other systems are worse." Nothing can be an un-mixed blessing in this imperfect world.

Discipline through uniform dress :—"Uniforms for school children would help improve discipline. A uniform dress is practically and psychologically of very great importance. A uniform itself is a measure

of discipline," said Mr. Nehru. We agree. But the uniform should be of practical utility and well suited for each type of work or study. But we are afraid there are fanatics in this field also as in the fields of languages, provincialism etc.

Free Education :—"In Madras State there is no village without an elementary school. After independence, 9350 schools have been opened in the State and from 1961-62, free education will be given upto Sixth Form," claimed the Director of Public Instruction recently. We hope there will be no dearth of right type of teachers. The low pay offered does not attract proper men.

Promptness of Mr. Nehru :—"If you have any doubt, write to him (Mr. Nehru) to-day and you will get his reply in 48 hours", said that the Praja Socialist Leader, Mr. Asoka Mehta recently. We consider it as an elementary virtue that ought to be found in every individual who is duty-conscious towards his or her fellow beings. Slovenliness or callous indifference, so much in evidence in these days, is a crime against society and the motherland.

New device to aid Surgeons :—"A technique of dyeing malignant tumours to assist in surgery has been developed at the Moscow Neurosurgery Institute.

Mice with brain tumours have been injected with a chemical substance which, in a short time, becomes localised in the tumour.

As a result, the operating surgeon has been able to see the malignant growth with the naked eye and remove it completely."

The Hindu,
23-1-1961.

A Request :—We are doing our utmost to cope with the increasing volume of work. To help us in our task we have issued an elaborate Notice to Contributors for their strict observance. But most of them fail us in very many respects and yet keep on asking us when their articles will be published. We have no elaborate Editorial staff to re-cast their articles on approved pattern, correct all their spelling mistakes, decypher their corrections and over writings, abridge their lengthy treatises, ask for a duplicate copy of their article and convince the Referees of the necessity of concouraging rising Scientists and yet maintain and improve upon the present standard. Added to these we have to keep on reminding and reminding for arrears of subscription. We appeal to one and all to put up with our shortcomings.

Correspondence

[The views and opinions expressed in correspondence are those of the writers themselves and are not always endorsed by the Editor.]

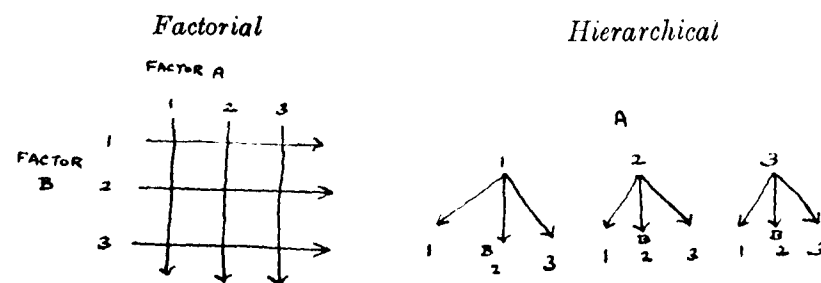
SOURCES OF VARIATION IN SKIN THICKNESS AND ITS RELATIONSHIP WITH MILK YIELD IN MURRAH BUFFALOES

Dear Sir,

I am sending you the following remarks prompted by the paper "Sources of variation in skin thickness and its relationship with milk yield in Murrah Buffaloes" by G. C. Taneja and D. S. Bhatnagar, published in your Journal issue of November 1960, pages 551-556.

Hierarchical vs. Factorial

The two classifications, Hierarchical and Factorial are apt to be confused. An experiment involving multiple factors is not necessarily a factorial one which requires that the factors A and B criscross to form the treatment combinations. If the factors do not criscross but one factor nests inside another, then such an experiment is called a hierarchical one. Example for factorial experiment is one involving, say two kinds of fertilisers A and B at different doses. Here two factors at different doses are superimposed on each other to form treatment combinations and this is typical of factorial experiments. Consider a set of data relating to measurements of skin thickness, classified as in the paper referred to above, as Determinations in different Regions and different animals. Such a tabulation may appear to be factorial but is really of hierarchical classification. Diagrammatically the factorial and hierarchical experiments can be illustrated as follows :



The methods of analysis for hierarchical and factorial are numerically related and are therefore apt to mislead the experimenter to conclude that the method of analysis for a given set of data is arbitrarily

chosen. The method of analysis is to be determined by the method by which the experiment has been carried out or by the physical meaning of the experiment and not by the appearance of the tabulation of the data.

With reference to the paper by G. C. Taneja etc., in your Journal issue of November 1960, pages 551-556, the tabulation of data (p. 552) for skin thickness measurements could be more appropriately regarded as a hierarchical type. The authors have taken skin thickness measurements in three regions of twenty animals. Three determinations were apparently taken at random in each region. Here region is a natural classification of an animal, and unless the experimenter feels that there is definite advantage in regarding the region as a factor superimposed on another factor namely animal, it can be considered as a hierarchical classification inside 'animal'. At any rate, the three independent determinations have nothing in common in different regions (as one to one correspondence) and it would therefore be meaningless to regard the determinations (observations, as the authors call them) as a factor. The Analysis of variance as a hierarchical type, can be carried out as follows :

Source	D.F.	M.S.	E. (M.S.)
Animals ...	19	A	$\sigma^2 + 3 \sigma_R^2(A) + 9 \sigma_A^2$
Regions within Animals ...	40 $\{ 20 \times (3-1) \}$	R	$\sigma^2 + 3 \sigma_R^2(A)$
Determinations within Regions and animals ...	120 $\{ 20 \times 3 \times (3-1) \}$	D	σ^2
Total ...	179		

The testing of the components will be against one immediately below it, as will be seen by the expressions in "Expected Mean Square". Repeatability, taken as an intraclass correlation (*i.e.*) an average correlation between determinations in the same region is given by $\sigma_R^2(A) / \sigma^2 + \sigma_R^2(A)$

R. S. GANESAN,
Assistant Research Officer (Statistics),
Statistics Section, I.V.R.I.,
Izatnagar (U.P.).

REPLY

Dear Sir,

The comments of Mr. R. S. Ganesan on our paper "Sources of variation in skin thickness.....in buffaloes" (I.V.J. 37: 551) have been brought to our notice. We disagree with Mr. Ganesan that our data require a hierarchical classification. We are prepared to convince him and others who may be reading our paper and relevant correspondence on it, that our data have been rightly analyzed on factorial design. We are presenting here a detailed account of our design of experiment to clear the doubts.

We selected to study the skin thickness of 3 distinct regions of 20 animals. In our procedure, we measured the skin thickness of neck, shoulder and belly areas of one animal and then proceeded to measure the similar 3 regions of another animal in the same manner and then still another, till we completed 20 animals. After having done so in about 30 minutes, we repeated the operation in another about 30 minutes and again did exactly the same thing a third time. We called this "series of observations" (I.V.J. 37: 552, line 6). Therefore, a time factor is involved. We thought this time factor may be important and we might not be consistent in our measurements taken during these 3 times. Therefore, we decided to estimate the variation between series of observations. In an earlier experiment conducted by one of us (Ind. J. Vet. Sci. 29: 87-90) a similar situation was observed. In that particular experiment on body measurement, the author observed significant variation between series of observations and regarded the series as "factors" for the purpose of analysis. This significant variation was interpreted as due to inconsistency in reading the scale.

It is true that the variation between series of observations (I.V.J. 37: 552, line 6, and p. 553, Table II) is a part of the error variance, and in the normal course one would expect it to be pooled with the error variance. However, our data indicated highly significant interaction between animals and series of observations (I.V.J. 37: 553, Table II) and therefore we decided to present the estimate of the variance between series.

In our experiment on skin thickness, we had specifically selected to study 3 particular regions which were quite distinct from each other, although they were on the same animal. It is just like measuring 2 distinctly different bones on the same animal as done by one of us in previous experiment (J. Genet. (56: 103), and Ind. J. Vet. Sci. 28: 87). These 3 regions of the skin that we studied are distinctly different from each other with respect to the rate of skin folding, number of sweat glands, amount of sweat secreted, fat deposition and so on. (Please see series of papers on "sweating in cattle", J. Agric. Sci. 50: 73, 52: 50,

52: 62, 52: 168, 55: 109). Therefore, the skin region is taken as a distinct factor. If one were to measure the skin thickness at random at any place, assuming that all places on the skin with respect to its thickness and other characteristics under study are alike, we would imagine that a hierarchical classification of analysis would have perhaps been desirable. These different regions of skin are on the same animal but not "inside" the animal in the sense used by Mr. R. S. Ganesan. Let us take an example of a plot of soil on the hill sloping towards north. If, on account of water erosion, the fertility of north region is different than that of the south, the two areas will be regarded as distinct factors for analysis. On the other hand, if the entire plot is on the even level, the experimenter would have no reason to reward north and south areas as distinct regions. Assuming that in a situation as the one explained regarding the plots, would an experimenter consider it a hierarchical classification? The answer is "No". In conclusion, since we selected to study 3 distinctly different regions of the skin, our analysis was essentially of factorial design.

The estimate of repeatability that we calculated is the ratio between σ_a^2 which is the variance among true values of buffaloes, and $(\sigma_a^2 + \sigma_c^2)$, where σ_c^2 is the error variance. In terms of population genetics, σ_a^2 here contains variances due to: (1) additive effects of genes, (2) dominance, (3) epistasis, and (4) interaction of additive genetic variance with the environmental variance, plus permanent environmental factors. The purpose of estimating repeatability in this manner is to determine precision of measurement. The advantages of estimating repeatability have been discussed in our paper in question.

If this letter does not convince Mr. R. S. Ganesan or any other reader we would be only too pleased to answer any further queries in this connection. We believe that any constructive criticism is bound to help us in advancing our knowledge. We sincerely hope that our arguments have enough weight to convince Mr. R. S. Ganesan about the validity of our design and approach to our factorial classification of analysis. We congratulate him for the spirit with which he has commented on our paper.

G. G. TANEJA,
Animal Research Institute,
Central Experimental Farm,
Ottawa, Ontario, Canada.

D. S. BHATNAGAR,
M. P. Veterinary College,
Mhow, India.

Association News

The Indian 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 ours 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*.

THE I. V. J. RESERVE FUND

LIST OF CONTRIBUTORS

	Rs. nP.
Amount acknowledged (Jan. 1961 issue)	... 4,948-97
Dr. W. F. Guard, Columbia, U.S.A. (\$ 25.00) Amount realised	... 116.78
„ N. Satapathy, Maryland, U.S.A. (\$ 5.00) Amount realised	... 23.30
„ V. N. Pargaonkar, Vety. College, Hyderabad, A. P.	... 10.00
„ R. L. Deb, D.V.O., Aijal, Assam.	... 10.00
„ Jagdish Rai Mittal, Ferozepore City, Punjab	... 2.00
„ S. B. V. Rao, I.V.R.I., Izatnagar, (3rd instalment)	... 10.00
„ C. T. V. Tilak, I.C.I., Madras (1st instalment)	... 25.00
Total	... 5,146.05

Errata:—Read Dr. P. P. Krishna Iyer for Dr. R. P. Krishna Iyer in December 1960 issue.

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

Review

Veterinary Medicine:—By D. C. BLOOD, B.V.Sc. and J. A. HENDERSON, 1012 pages, 13 tables: Price 84sh. Postage 2/9. Bailliere, Tindall & Cox, Ltd., 7 and 8, Henrietta St., London, W.C.-2.

This is a welcome addition to the already available literature on Veterinary Medicine. As one goes through its pages, there is ample evidence that the book has been written primarily for the benefit of students of Veterinary Medicine. The authors, however, anticipate that it will also be of value to practising Veterinarians and other field workers. A large number of references provided at the end of each chapter extends the usefulness of the book to research students as well.

The book has been arranged in two sections. The systemic medicine is dealt with in Part 1 under the heading of General Medicine. Specific diseases including metabolic, nutritional and diseases due to physical and chemical poisons are dealt with in Part 2, Special Medicine. The arrangement of facts under General Medicine is quite appropriate. Under diseases of a particular system a general review about the cardinal signs and the principles of treatment is given followed by specific diseased conditions of the organs. As one engaged in teaching I have always felt this method of dealing with systemic diseases is much easier to communicate than the more orotodox and conventional way. Sections on metabolic diseases and diseases caused by nutritional deficiencies are

dealt with exhaustively and in lucid language, giving the latest findings on biochemical and tissue changes.

Though the book is designed to provide basic instructions in the diseases of farm animals, it is surprising that diseases as Theilariasis and Surra are omitted under diseases caused by protozoa. The authors admit that the exotic diseases which are restricted to limited geographical areas have not been covered. Yet, a short description of these diseases would have definitely enhanced the value of the book. Q fever, in view of its Public Health importance should have found a place (under Rickettsiosis) in a text book of this standard.

We have no doubt that this Text Book on Veterinary Medicine will be received by the Veterinary Profession as a whole, with warm appreciation.

M. S. GANAPATHY.

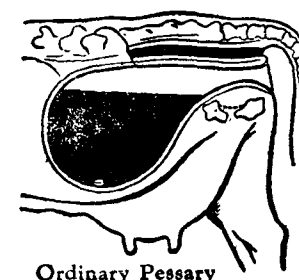
In Memorium

MR. HILTON BROWN
PASSES AWAY

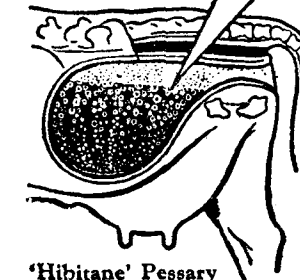
We are grieved to hear of the sad demise of Mr. Hilton Brown, I.C.S. (Retired) at Nairobi on the 15th January 1961. He was a well-known civilian officer in Madras State, who loved India for what she is and who even settled down at Kotagiri in the Nilgiris from 1954. He was a prolific writer being a regular contributor to the *Hindu* and the *Mail*. He was an author of several books with Indian back-ground. He loved Hosur Cattle Farm so much that he often used to come and camp there. He even wrote to the newspapers how well it is being maintained and very much improved upon, in the post-independence days. He is survived by his two sons, Mr. Leslie Hilton Brown, Deputy Director of Agriculture, Kenya and Mr. George Huntley Hilton Brown, a District Commissioner in Kenya, both of whom we are happy to note, were by his side when he died and at his desire had his body cremated. He was 70 years of age at the time of his death.

We salute this Englishman who took so much of interest in India and in the Animal Husbandry Department and we offer our heartfelt condolences to the members of the bereaved family.

**The effervescent action of
'Hibitane' pessaries takes this
unique bactericide to all
parts of the uterus**



Ordinary Pessary



'Hibitane' Pessary

'HIBITANE' pessaries are the most convenient and effective means available of preventing and treating metritis and endometritis in large animals. The active agent, 'Hibitane', is an entirely new 'broad-spectrum' antibacterial compound, and is another outstanding I.C.I. discovery.

The pessaries readily disintegrate in uterine fluids, and by their effervescence distribute a suspension of 'Hibitane' throughout the uterus.

SPECIAL ADVANTAGES

HIGH ACTIVITY against Gram-negative and Gram-positive organisms and *Trichomonas foetus*.

PERSISTENT EFFECT: Antibacterial activity is retained in the presence of blood, pus, and uterine fluids. The low solubility of 'Hibitane' ensures prolonged action.

EXCELLENT DISPERSION of the active agent in the uterus. The effervescent action of the pessaries spreads 'Hibitane' through the uterine fluids and over the surface of the endometrium.

PHYSICAL CLEANSING: The effervescence of the pessary within the uterus converts the fluid contents into a bulky mass of foam and thus helps considerably in the removal of infected material.

LOW TOXICITY: 20 Gm. of 'Hibitane' have been placed in the uterus of cattle post partum with no harmful effect.

ADAPTABILITY: The pessaries are equally useful in treatment whether the cervix is open or closed.

'Hibitane'
P E S S A R I E S

The effective
treatment for metritis
and endometritis



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

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



OMNIASIM

(Caffeine, Ephedrine, Sodium benzoate and Dextrose)

I
N
T
H
E
S
E
R
V
I
C
E
O
F
L
I
V
E
S
T
O
C
K

- * valuable in *emergencies* like, Shock, Collapse, Heat-stroke, Heat-exhaustion, Surgery and Post-obstetrical collapse;
- * very useful as a supplementary treatment in,
 - + Milk-fever, Acetonemia, Azoturia, Myoglobinuria, etc., (few mls. of 'OMNIASIM' can be added to the Calcium gluconate or Dextrose solution)
 - + Acute septic and gangrenous mastitis, Septic metritis and retained placenta;
 - + Congestion, Oedema, Pruritis, Urticaria, Serum allergy;
 - + Infectious diseases like, Foot and Mouth, Pneumonia;
- * distinct advantages :
 - Speedy recovery and restoration to normal activity,
 - Easy administration (subcutaneous or intravenous),
 - Small doses with maximum action,
 - No side effects.
- * available in 30 ml. vials.



GLUCOTAMINE

A well balanced solution with the essential factors, namely Calcium, Magnesium, Phosphorus and Dextrose, *plus* Amphetamine which counteracts the circulatory and respiratory depression, makes it a complete formula of choice in the treatment of Milk-fever, Acetonaemia, etc.;

Please write for detailed literature or
for your requirements.

OMNIA PHARMA

RAM BAUG, GUJARATI MANDAL ROAD

VILE PARLE — BOMBAY - 57

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

Veterinary Specialities



"Bayer"

Leverkusen, Germany

- ANTIMOSAN** : An injectable organic antimonial specific for bovine schistosomiasis. Also indicated in stephanofilaria in cattle, haemorrhagic filariasis in horses, lungworm in cattle, sheep and goats and dirofilariasis in dogs.
Bottles of 500 cc. Boxes of 5 bottles of 50 cc.
- CATOSAL** : Injectable organic phosphorus compound for acute disturbances of the metabolism, in exhaustion and weakness. For increasing physical power. For the stimulation of the central nervous system in unconsciousness.
Bottles of 100 cc.
- MASTICILLIN** : A penicillin ointment (100,000 I.U.) for the treatment of streptococcal mastitis.
Boxes of 6 tubes of 7.5 g. each.
- MASTICILLIN "M"** : An ointment containing Masticillin and a broad-spectrum sulphonamide for treatment of chronic and complicated cases of mastitis.
Boxes of 6 tubes of 7.5 g. each.
- NAGANOL** : The renowned remedy for surra. For prophylaxis, can be applied i.m. in combination with hyaluronidase.
Bottles of approx. 14 g., 28 g., and 100 g.
- ODYLEN** : A specific for skin diseases, especially mange, itches and eczema. Also effective against body vermin. Irritation is relieved almost at once after application.
Bottles of 100 cc.
- PROLAN ad. us. vet.** : Regulator and activator of the sexual functions in males and females. Indicated in the absence of heat or feeble heat (frigidity) due to ovarian hypofunction. Lack of sexual desire in male animals.
Boxes of 2 amps. of 250 I. U. each + 2 x 5 cc. amps. of dist. water.
Bottles of 25 cc. oily suspension of Prolan contg. 200 I.U. per cc.
- PROLAN-E-OIL ad. us. vet.** : PROLAN with addition of vitamin E.
Bottles of 25 cc.

Sole Importers in India :

CHOWGULE & CO., (HIND) PRIVATE LTD.

P. O. Box 1478, Bombay-1.

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

Telegram — CRESCENT

Telephone — 34-3404

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 domesticated 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.

Approved by

**CENTRAL RINDERPEST CONTROL COMMITTEE,
NEW DELHI.**

**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 manufactured 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*.

ADVERTISEMENTS

IDEAL VETERINARY REMEDIES

- ★ WORMIX - For eradicating Roundworms and Threadworms in Livestock, Poultry and Dogs. Bottles of 2 oz. and 16 oz.
- ★ SULPHAMIX - Ideal treatment for coccidiosis in Poultry and bowel infections in livestock and Dogs. Bottles of ½ oz. and 4 oz.
- ★ MINIMIX - Well balanced Mineral Mixture for milk producing cattle. Promotes growth and increases milk. Packings of 1 lb. and 25 lbs., & 100 lbs.

Manufactured by the Anidiet Brand famous
Dog Biscuits and Poultry Food Manufacturers:

CHELSEA CHEMICAL LABORATORIES

Hadapsar Industrial Estate, Poona-1. PHONE : 4453



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. 10/-
Rail post 50% extra for which give the nearest Rly. Station. Orders by Post must accompany 50% advance to cover Postage etc.

DEEBEE BROTHERS

1706, KADIA JALOWALI NAKA, AHMEDABAD-1

A New Year Offer

The Silver Jubilee Number of the Indian Veterinary Journal, (July 1949) is offered to the members of the profession and students at a concessional rate of Rs. 3/- (Reduced from Rs. 5/-) extra. Only a limited number of copies are available. Hurry up to avoid disappointment! It contains the genesis and growth of (1) all the State Veterinary Departments in India and Pakistan; (2) all the Veterinary Colleges in India; (3) the Indian Army Remount and Veterinary Services; (4) the I.V.R.I., (5) the A.I.V.A., (6) the Indian Veterinary Journal, as well as highly complimentary messages from all over the world.

There are special professional articles by Dr. G. Lapage; Dr. J. O. L. King; Dr. S. Datta; Dr. M. R. Dhanda and Dr. V. R. Rajagopalan; Dr. S. G. Iyer and Dr. C. S. Balakrishnan and Dr. S. N. Yeravdekar.

It is a historical document of great value which ought to be in the Library of every Veterinarian.

LOOK SHARP!

LOOK SHARP!

Apply to the Editor I.V.J.

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

JL
KZm 2, N24 N61-38.2