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General Articles

ARTIFICIAL INSEMINATION IN THE LIVE-STOCK

BY

J. D. SAMPATH KUMARAN, L.V.P., Mem. N.I.R.D.

Manager, Rayanakere Palace Dairy Farm, Mysore.

Of recent years, the impetus to improve the live-stock in our country and to raise the animal power in the bulls, as well as the milk yielding standards in the cows, has been very great and encouraging. My recent tour to Palestine and the Middle East, has given me an opportunity to see the immense potentiality of Artifical Insemination for the improvement of live-stock. It is hoped that the application of this method in India will be of considerable value.

In the natural copulation, the semen is introduced into the female genital tract by the male external organ, which penetrates as far as the proximal end of the vagina, and large numbers of spermatazoa are deposited round the external os of the cervix. From here the actively motile spermatozoa penetrate the uterus and ascend the fallopian tubes to the site of fertilization, near the ovaries. Only a small portion of the spermatozoa actually gain acess to the uterus or ascend the

tubes; the surplus is absorbed or extruded. Artificial Insemination differs from the natural process in so far as the semen is introduced into the genital passages of the female by means of special instruments. This practice was being done even in antiquity by the Arabs as a means to combat sterility, in some of their costly and pedigreed stud mares. In Europe, the first successful experiments in the slut have been reported and duly placed on record by an Italian Priest *Spallanzani* at the end of the 18th century. In the course of the 19th century this method has been adopted by medical men, Veterinarians, Zootechnicians, and biologists with a lesser or greater degree of success, but it was not accorded a general recognition. But at the end of the last century and in the beginning of the present century, a series of brilliant works by the Russian, Austrian, and English scientists have placed this method as an outstanding one and of proved utility in the economy of live-stock production. During the present post war period the utility and economic value of this method as applied to animal husbandry have been irrefuteably proved by the field work which has been conducted on an enormous scale throughout the World, and especially in Russia, Japan, U. S. A., Canada, England, Australia and Palestine.

The Advantages of this Method.

Artificial insemination could be recommended in cases of sterility from inflammatory conditions of the cervix, abnormal vaginal secretions, closure of the os, postcoital extrusion of the semen and also as a method of choice in the prevention of Dourine and Infectious Vaginitis.

But the greatest benefit is derived by the application of this method in animal husbandry works. This could be used not only in large farms but also in smaller farms and holdings where the number of animals belonging to each individual is limited. Since it is widely practiced in Russia it should not be imagined that this is not practicable in our country where the holdings are very very small.

In dairy cattle breeding, the advantages are very great. Owing to the short time that a cow remains on heat, each farmer must have a bull on the spot or in the immediate neighbourhood, if he is to ensure having his cows in calf at the desired time. The result is far more bulls are kept than are absolutely necessary. Further when a large number of bulls exist, their potency and high strain will be of doubtful value. If semen could be distributed from one centre, the number of bulls could be reduced with great advantage. Recent researches have shown the importance of breeding from proven sires. The transport of semen and artificial insemination would ensure this to be done. From the undiluted seminal fluid received from a single mating, six to nine cows could be artificially inseminated without lowering the normal rate of conceptions; while dilution of a single ejaculation permits an effective insemination of 18 to 64 cows. It is, therefore, self evident that this zootechnical method affords means whereby the excessive sexual exploitation of noted sires might be easily obviated, and their reproductive usefulness could be greatly prolonged and extended to the enormous benefit of the country. It has been experimentally proved in Russia and elsewhere that anything upto 2000 calves could be annually sired by a single bull if artificial insemination is applied in the breeding practice.

Artificial insemination is a paying proposition in our country since the need for rapid improvement of live-stock is very great and there is a corresponding scarcity of noted sires.

The Technique of Artificial Insemination.

The methods of obtaining sperm :—

1. *The Sponge method.* This is a very ancient method.

2. *The Vaginal Method.* This consists in the collection of the sperm from the anterior end of the vagina after mating.

3. *Artificial Vagina.* This consists of a cylinder made from different materials and simulating the genital passage of the dam. At the moment of mating it is placed over the penis,

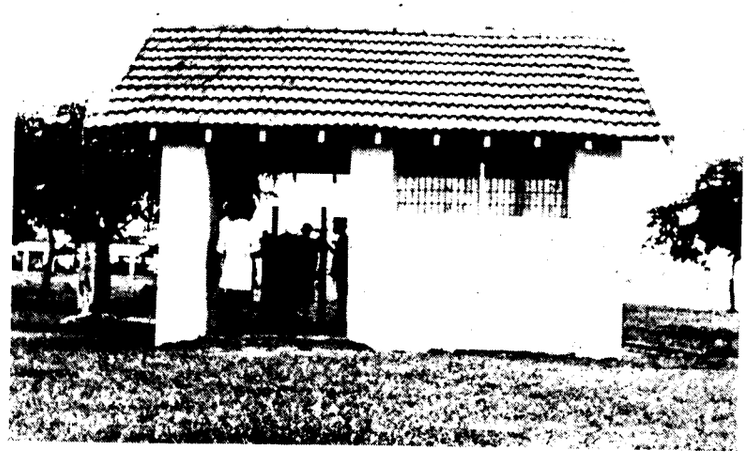
and the ejaculation is thus collected in the glass receptacle. This method is the most popular one on account of its efficiency. A greater detail will be given about this later.

4. *Sperm Collector.* This consists of a special apparatus which is inserted into the vagina of the dam and from which the ejaculate is collected after mating.

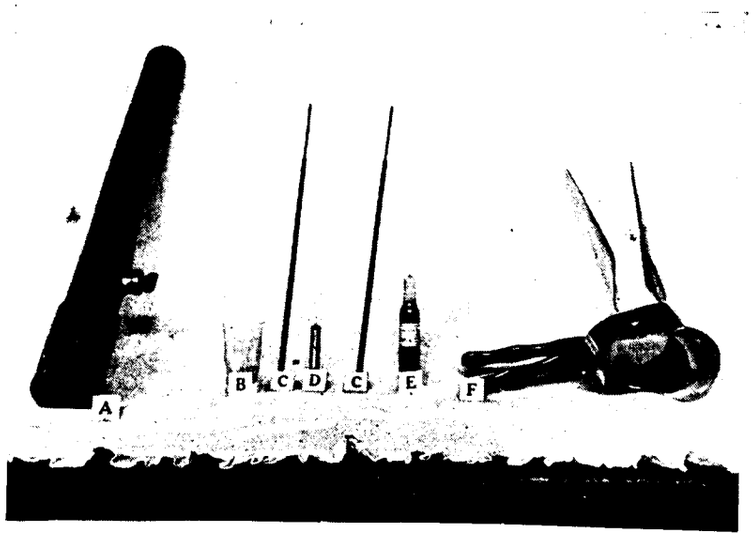
In the bulls, semen may also be collected by rectal manupulation. This method has proved very successful in some cases, and a very good sample of semen is obtained for storage and transport purposes. The method requires considerable skill and practice and all bulls will not respond.

Efficiency of Various Methods of Sperm Collection.

	Sponge method.	Vaginal Method.	Artificial. Vagina	Sperm Collec.
Number of spermatozoa in one C. C. (Millions)	23·74	474·72	412·00	958·95
Degree of density				
Dense.....	0·0	78·0	57·0	95·0
Medium.....	17·0	16·5	14·0	4·8
Thin.....	83·0	5·5	29·0	0·2
Degree of activity				
Highly active.....	0·0	0·0	0·0	19·0
Active.....	61·0	79·0	57·0	71·5
Less active.....	17·4	21·0	43·0	9·5
Dead.....	21·6	0·0	0·0	0·0
Duration of Life after collection. (Hours)	58·0	—	96·0	106·6
Volume of sperm in a single mating,. (C.C.)	6·4	3·2	3·5	3·6
Number of Spermatozoa from one mating....	240·76	1704·7	1654·8	2351·3



Artificial Insemination Station in the Mysore Palace Dairy Farm.



Instruments :—(A) Russian Model Artificial vagina for Bulls. (B) Sperm Receptacle. (C) Rigid vulcanite nozzle. (D) Cow inseminating syringe 2 c c (E) Dilutor for Bull sperm, Moscow Formula. (F) Russian Model cow Speculum.

Examining the Os Uteri

Inseminating a Cow.

The sperm collected by non-sponge methods contain 20 to 40 times more spermatozoa than sperm obtained by the sponge method. The highest concentration per unit volume is obtained with the sperm collector. The sponge method never gives very active sperm, and in 20 per cent of cases it is immotile. On the other hand the sperm collector gives a highly active sperm in 20 per cent of cases, and in no single instance is the sperm immotile. The duration of survival of the spermatozoa outside the organism is twice as great in the non-sponge as in sponge method. This factor is very important in the preservation and transport of the semen. In respect of quantity, the non-sponge methods are also superior in the sense that the true volume of the sire's ejaculate could be judged.

For practical purposes the methods offer certain advantages since by means of instruments a small quantity of semen can be placed with accuracy within the cervix, a higher proportion of spermatozoa gain access to the uterus, resulting in greater certainty of impregnation and considerable economy of spermatozoa. Artificial insemination may therefore be used to increase the certainty of conception, and may even prove successful when repeated normal matings had failed. Since one single ejaculate of the male can be used to impregnate several females, the number of young sired by a given male during a given period of time can be very greatly extended. It has been experimentally proved in Russia and elsewhere that anything up to 2000 calves could be annually sired by a single bull if artificial insemination is applied, in breeding practice. In the case of rams no fewer than 50 ewes, or 4000 ewes for a season of 40 days, taking two matings per day, could be inseminated.

Storage, Transport and Dilution of the Semen.

The collected sperm from the cup of the A. V. (Artificial Vagina) is transfered by means of a fine pipette to a small sterilized storage tube. The air space is completely filled with medicinal paraffin and the cork inserted. The tube is then

wrapped in cotton wool and placed in a container tube which is also tightly stoppered. The whole container is now placed in a thermos jar half filled with water cooled to 10 degrees C. by adding some ice. It is then transferred to another bigger thermos flask containing chipped ice and then is ready for transport. For transmission through post the flask is rolled in several thicknesses of corrugated cardboard. The cooling of the sperm is for the following reasons. The spermatozoids when cooled will then be in a state of sleep and again wake up when warmed. This state of sleep is called "Anabiosis". The longer the anabiosis lasts, the longer can we preserve the semen. The most important precaution to be strictly observed is the preventing of the solidification of the semen. If the semen is too cold it will solidify. The tested temperature should be only 10 degrees centigrade.

On arrival the container is removed and allowed to stand unpacked for about half an hour to acquire the room temperature gradually. The duration of the survival of the sperm varies in different animals as hereunder. The sperm of the ram stored in the above method will remain fertile for about four days; the sperm of the bull stored will remain fertile for about three days; owing to the short life of the horse spermatozoon, transport is not recommended except for quite short distances. If the semen is protected with paraffin and slowly cooled to 10 degrees centigrade it can be kept for some hours, but the fertilizing capacity rapidly falls off. Recent laboratory experiments, however, have shown that the semen can be kept outside fertile for about 24 hours. But this cannot be so easily applied outside the laboratory.

The technique of dilution has been an important factor in the success of the huge experiments which have been conducted in Russia during recent years, in which 1000 and more calves have been obtained from one bull. There are absolutely no technical obstacles to obtain from 1200 to 1500 calves from one bull during a 60 days' breeding season. For each type of animals there are ready made Dilutors in 20 c.c. ampoules

prepared as per the Russian formula. The following may also be prepared.

Aqua distillata.....gm. 100.
Glucose.....gm. 2·85
Sodium phosphate.....gm. 1·7
Potassium phosphate.....gm. 0·07
Sodium sulphate.....gm. 0·07 This solution is diluted four times the semen.

In case of cows and with the stock dilutor the following method is to be adopted. With the dilutor a small ampoule of glucose powder will be sent. Dissolve the glucose in a clean specimen tube with the dilutor; note the volume of the sperm in the A. V. cup, then, with a pipette, transfer to the specimen tube and with the same pipette add an equal quantity of dilutor. The dilutor should be added slowly, drop by drop, and mixed gradually with the sperm by very gentle shaking. Now rinse the syringe with two charges of dilutor and then take up just over ½ ml. of diluted sperm. Get rid of the air bubble in the syringe and nozzle leaving just ½ ml. in the syringe which is the volume required for each cow.

In case of the ewe, the volume of the dilutor to be added is three times that of the sperm. The quantity to be administered to the ewe of this diluted sperm is 1/10 ml. The dilution should be used as before.

In case of the mare, the method varies since the semen of the stallion consists of two portions; one is the "sperm serum", a watery fluid somewhat opaque and containing in the normal fertile animal a large number of active spermatozoa. This portion is the first ejaculated. The second portion is a glairy mucous secretion which comes from the seminal vesicles and is ejaculated after the other. In the uncontaminated condition it contains no spermatozoa and its main function appears to be mechanical, serving to flush the sperm serum along the urethra of the stallion into the uterus or vagina of the mare. When exceptionally large volume of semen is ejaculated, it is usually this fluid which is in excess. As it contains few

spermatozoa and is a hindrance by blocking the lumen of the insemination syringe it is best removed as soon as possible, since if left in the semen it soon becomes penetrated with spermatozoa. For this purpose the semen from the collecting bottle is poured into a small clean and dry glass or china bowl containing sufficient medicinal paraffin to cover the semen and protect it from exposure to the air. The bowl is then tilted until the semen almost runs over the edge. With a clean glass rod the glairy portion is picked out and allowed to run over the edge into a separate bowl. In Russia this is diluted twice its volume. The quantity inseminated is 10 ml.

Control of Animals for Semen Collection with the Artificial Vagina (Russian Model and Method),

And the Technique of Insemination in Different Animals.

Bulls can be handled as for normal controlled matings, *i.e.*, led from the box up to the cow with a halter. The yard in which the collection is made should be large enough to allow ample room for turning. The floor should be level. Concrete is not suitable owing to the danger of slipping. It is of great advantage if the same yard is used for all services and collections so that the animal becomes thoroughly accustomed to the surroundings and when led into the yard aniticipates service. The cow used for collection should be on heat. Preferably a quiet cow known to stand well should be chosen. The cow can be held with a halter or loosely tied to a rail or post. Service Stocks can be used provided they are of a special design that they do not obstruct the use of the artificial vagina.

Apparatus; (1) Artificial Vagina with rubber tube inside.
(2) Russian Model Vaginal Speculam.
(3) All glass 2 c. c. syringe.
(4) Two ounce glasses.
(5) Ebonite Uterine Nozzle.
(6) Long sterilized swab for A. V.
(7) Sterilized gauze.
(8) White vaseline or medicated paraffin.
(9) Physiological normal saline solution.
(10) Dilutors.

The mode of collecting the Semen from the Bull.

Taking out the Semen from the Artificial Vagina.

KHAN SAHEB AHMED ISMAIL SHAIKH, G.B.V.C.
Retired Professor, Bombay Veterinary College, who died on 20th September 1939.

J. D. SAMPATH KUMARAN, L.V.P. (Hons.), Member of the National Institute for Research in Dairying
who was deputed to Palestine by His Highness The Maharaja of Mysore for studying Animal Husbandry and Dairying and who acquired a consignment of Acclematised Holstein-Freisian animals.

Procedure :—When ready to make the collection, the A. V. and all glass ware should be thoroughly sterilized, cleaned and dried. Glass-ware, apparatus and instruments should be laid out on a clean dry table covered with a sheet of clean white blotting paper. The hands of the operator should be clean and dried without any trace of soap or disinfectant. When a Veterinary Surgeon does this, he should not have handled any case previous to doing this operation. Heat water in a vessel to about 55 deg. centigrade and fill the A. V. holding it horizontal. Insert the stopper. With a clean glass rod smear a thin coat of vaseline over the whole surface of the inner lining. Care should be evinced in doing this; if too much of vaseline is applied there will be small lumps sticking. Such sticking of vaseline in lumps will not allow the semen to flow freely into the glass receptacle. Insert a clean dry thermometer into the end of the A. V. furthest removed from the stopper and leave in position while the glass cup is being placed in position at the other end and secured with the rubber strap. Before inserting the cup about 2 ml. of medicinal paraffin should be placed in it. Now read the thermometer. The temperature should be not more than 45 degrees centigrade nor less than 42 degrees centigrade. If too cold, empty out some water and replace with hot water. If too hot, allow the apparatus to cool before using it. As there is always a slight delay between preparation of the apparatus and actual collection, allowance has to be made for a slight fall in temperature during the interval. The correct temperature at the actual moment of collection should be between 40 and 45 degrees centigrade. When the correct temperature is attained the pressure must be adjusted. Hold the A. V. vertical with mouth downwards and open the stopper; any surplus water will run out. Now replace the stopper and wipe off any drops of water from the A. V. with a clean towel. This procedure insures a standard pressure with the apparatus and is that normally used. Occasionally, however, one finds that in use the pressure is too great and the cup may be blown out with the bull's thrust. In this case the standard pressure may be reduced by slightly tilting the A. V. from the vertical

and allowing more water to run out before inserting the stopper. When the apparatus is ready the bull is led up slowly directly behind the cow. The collector follows the bull on the right hand side holding the A. V. by the middle mouth downwards in his right hand. As the bull mounts, the A. V. is interposed behind (not inside) the bull's forelegs, against the flank of the cow and with the opening directed towards the penis, at an angle of about 45 degrees. The penis is diverted into the opening by means of the left hand applied to the sheath of the penis. The penis itself should not be touched as this may cause the bull to retract the penis and dismount. As soon as the penis comes in contact with the warm lubricated surface of the A. V. the bull thrusts upwards into it and ejaculates sperm into the glass cup or upper end of the A. V. As soon as this has occured the A. V. should be turned mouth upwards and the semen will run to the bottom of the cup and be quickly covered with a layer of medicinal paraffin. The cup may be removed and then examined. The normal ejaculate of the bull measures 4 ml. and is a thick milky-white suspension of living spermatozoa. A drop under the microscope shows the spermatozoa to be very active and in the undiluted condition characteristic turbulent wave movements are seen. During examination and until ready for insemination the sperm should be kept under paraffin in the cup. It should be kept cool. The optimum for freshly collected sperm is about 10 degrees centigrade. It must neither be exposed to the sun nor to a very low temperature unless it is meant for transport or storage.

Insemination:—The cow should be tied with a halter preferably in a stall with good light directly behind. As this is not always possible it is of great convenience to use a focussing forehead lamp. The vulva of the cow should be wiped clean with cloth. If water is used the vulva should be carefully dried. Disinfectants should not be used owing to the risk of contaminating the sperm. The syringe is held in the right hand. The speculum is held in the left hand with the closed blades vertical and the handle horizontal and to the left. It is inserted very slowly into the vulva with slight pressure forwards and upwards

until it passes over the pelvis. The speculum is then given a quarter turn bringing the handle down vertically, and is opened with gentle pressure. If the operation has been performed quietly and easily the cervix should be clearly visible at the end of the speculum, or will appear on slight adjustment. It may happen however that the insertion of the speculum has caused the cow to arch her back and strain. This can generally be rectified if an attendant presses his knuckles between the vertebrae, but sometimes it may be necessary to withdraw the speculum and start again. When the cervix is clearly visible the syringe is introduced about 1½ cm. into the lumen and the syringe plunger pressed gently and slowly. The whole of the sperm should remain in the cervix and not run back into the vagina. The syringe and speculum are now gently withdrawn, care being taken not to nip the vagina between the blades of the speculum. Both the syringe and the speculum must be washed and disinfected with alcohol or the speculum scalded or flamed immediately after use and before another cow is inseminated.

The shape and size of the A. V. differs for different animals since the shape and size of the penis is not the same in the bull and the stallion. But the general technique of handling and inseminating is the same as the one described above.

A successful mating or insemination must be carried out at a definitely fixed period of "Heat" limited in the first place by the time during which an active spermatozoon reaches the upper third of the oviducts on its way from the vagina or uterine os, and on the other hand by the time at which a ripe ovum liberated from the ovary also appears in the same portion of the oviduct. The cow can be inseminated while on heat or a few hours (upto about eight) after the end of heat. In case of the mare the heat period is very variable lasting from 2 to 3 days to as long as 14 days or even longer. The normal average is about seven days. It is established that the ovulation occurs more frequently about 24 hours before heat ends, so that the most fertile time for service or insemination is about 1 to 2 days before the end of the period. Insemination

on the first day of heat or on the last day is not likely to produce offspring. A mare should therefore be inseminated towards the end of the heat period, and if after this she still remains on heat for three days should again be inseminated. The processs may be repeated if necessary at three-day intervals until the end of the heat.

In the case of the ewe the chances of fertility are greater towards the end of the heat period, but in practice it is seldom possible to determine how long heat is likely to continue, hence all ewes which show heat should be inseminated at once.

Organisation of Artificial Insemination Stations in Different Parts of India.

(*a*) Since the Animal husbandry work has been entrusted to the Veterinary department, the staff for conducting the artificial insemination could be combined as a part work to the veterinarians already in charge of Hospitals and Dispensaries. This scientific and zootechnical method requires for the Veterinarian special theoretical and practical training prior to being allowed to conduct the field and experimental work. One should undergo some training under an experienced artificial inseminator.

(*b*) Careful selection of outstanding sires and their proper management and care.

(*c*) Proper equipment of each station or herd with all the necessary instruments and apparatus.

(*d*) Scientific and skilful feeding, management and care of animals.

The microscopical examination and evaluation of seminal fluid is essential. For this a good microscope with 1/12th objective, substage condenser and mechanical stage is required, and in addition a haemocytometer (Fuchs–Rosenthal ruling depth 0·20 m.m.) for making sperm counts. For occasional insemination a microscope is not essential, but where insemination is carried out regularly or when transport of sperm is intended, a microscope is required. By such examinations it is possible to

exclude sterile sires and dams from the herd or stud and prevent an unnecessary economic loss. The seminal fluid of imported and locally bred valuable sires should be examined microscopically and their purchase or use for breeding purposes should only be completed only after it has been proved to have no defects. Faulty diet or regime are known to affect the reproductive health of sires and dams, and a timely advice given on the strength of microscopical examination would very often prevent trouble or loss. Apart from the above considerations, the cattle owners should be encouraged to come forward to adopt this method. There should be also sufficient number of cattle in an area in which a station is established. It has been proved that the introduction of artificial insemination into general use would reduce the present costs of breeding very much, apart from the fact that the progeny would be of better value, this depending on the kind of sire used. Thus, from whatever angle we look at the proposition, its practical and economic value in India appears to be unassailable.

Conclusion.

I owe a deep debt of gratitude and humble loyalty to His Highness the Maharaja of Mysore, whose keen interest in the improvement of live-stock is unparalleled, for having deputed me to Palestine for studying the conditions of live-stock and to aquire an experimental consignment of acclematised Holstein animals. I am highly grateful to the Huzur Secretary T. Thambu Chetty Esq., B.A., O.B.E., K.S.G., and to the Assistant Huzur Secretary M. Rama Rao Esq., B.A., B.L., for valuable help, encouragement and guidance. To my Colleagues Dr. S. Caspi, D. V. Sc., M.R.C.V.S. and Dr. Krumholtz. Dr. Med. Vet. (Berlin), with whom I worked in Palestine, I am also thankful.

THE ECONOMIC VALUE AND MANAGEMENT OF CATTLE IN ASSAM

BY

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(Continued from Page 82, I. V. J. Vol. XVI, No. 2.)

Management of Cattle

Before proceeding with the subject it will perhaps be of interest to mention a little about the breeds of cattle in Assam. The cattle in Assam may be divided into three classes namely :-- Wild cattle, Hill cattle, and Plains cattle.

The wild cattle :— They are found in the deep forests of Assam. They are of two varieties (i) gaur or beson (Gonaeus Gaurus) and (ii) gayal or mithun (Gonaeus Frontalls). The former is the most handsome and the largest of all the living species of wild cattle and is found in the extensive dense forests of the province. It has never been domesticated nor does it cross with the domesticated cattle. The latter are also beautiful specimens of wild cattle and are found in large numbers in the hills. They come under domestication, cross freely with the domesticated hill cattle, and are smaller than the gaur. They are used for the purpose of beef only by the hill tribes. Wild buffaloes are also found in the swampy terain of the Assam Valley. They are of two distinct varieties : One with circular horns named "Spirocerus" and the other with straight horns named "Macocerus." They never come under domestication, but a wild male buffalo at times takes possession of an entire herd of domesticated buffaloes and covers the cows.

The hill cattle — The hill cattle are those of the Manipur Valley and the Naga, Khasi, Garo, Lushai and the Bhutan Hills. The cattle of Manipur are of a distinct breed and their bullocks are superior animals for traction purpose, but the cows are poor milkers. The buffaloes of Manipur are beautiful specimens of the species. They are fairly big and strong animals. Their milking capacity is not so good, but they are

superior animals for traction. The Naga cows are more or less, of the same type as those of Manipur. The bulls are never castrated nor used for ploughing or carting purposes. The Naga cows are often crossed by Mithun bulls resulting in much better issues which command a high price. Khasi cows are poor milkers, but the bullocks are very sturdy animals. Cattle in this hill are neither kept for milk nor for cultivation but, for their dung to be utilised as manure. There is a particular breed of cattle in the Garo-hills. The Garos purchase young bulls from the adjacent plains districts and keep them stall-fed on "Machans" (bamboo platforms), to make them fatty to be slaughtered for beef. The Lushai cattle are a small hardy breed of animals. These animals are neither used for milk nor for cultivation, but for sacrifice before God or dowry on the occasion of a marriage. The Bhutia cattle are fairly big animals. The cows are not so good milkers, but the bullocks are better draught animals. They, however, do not well stand the hot climate of the plains and many of them die in the first year of their import. Milk is not used by the hill tribes, nor cultivation with plough is possible in those places, so the cattle are utilised for meat purpose only. Even in those places cattle hold good their importance in the economic condition of the people. There also the wealth of a man is ascertained by the number of cattle he possesses. Marriage, transaction of business, etc. are carried on by exchange of cattle and even in the law courts of the frontier tracts the hill men are often fined with a liability of payment by cattle which is their only wealth.

The plains cattle of Assam :— They are the chief concern in this article. The cattle of Assam bears a marked contrast to the fine specimens of its buffaloes. They are poor both in milk yield and in draught quality. Cultivation of the province, however, is entirely carried on with the local cattle, but for heavy work and cart traffics a considerable number of Behari and Mauringia bullocks are annually imported. From the cattle census of 1912 it would appear that out of a total number of 14,83,547 bullocks 1,84,892 were imported animals (J. R.

Blackwood — A survey and census of the cattle in Assam). Assam is greatly dependent on outside sources for its cart bullocks, and not to a less extent also for its buffaloes as annually many Bhangor buffaloes from Bihar are imported. Bullocks and buffaloes from Manipur are also imported to the plains of Assam in considerable number. The province has no external trade in cattle traffic.

The Assam cattle are very much degenerated animals and the cause of the degeneration is more than one. The chief causes are:— (i) *Climatic influence in conjunction with the physical condition of the province,* (ii) *insufficient and improper feeding* with overwork, and (iii) *indiscriminate and improper breeding. The climatic influence* :— The climate appears to be the chief factor in determining the production of superior or inferior animals. Assam represents the poorest animal in India. If one moves westward from Assam the cattle are gradually found to be of better type. Bengal cattle show a slight improvement, in Bihar they are distinctly superior, and in the Punjab they are vastly superior to any. The damp relaxing climate of Assam is perhaps detrimental to the production of good breeds of cattle and has also deteriorating influence on the better type of animals kept here. The climate of a place has immense influence on all its living beings and particularly on animals; and if it is unfavourable any lasting improvement of the existing stock by crossing them with an improved foreign breed is practically impossible. In such breeding some improvement will surely be noticed in the beginning, but if the process is not repeated again and again with the pure improved breed, which has its ill effects too (which will be discussed later), the stock is sure to go back, more or less, to its former condition. So in determining the improvement of cattle in a particular place its climatic influence should not be overlooked. Moreover, excessive rainfall and swampy soil of the province are unfavourable for the development of a good breed of cattle. Besides that in humid area and particularly the sub-mountain tracts, as Assam is, the animals are exposed to so many debilitating diseases that a very few of them can develop satisfactorily. The above conditions, however, are not so unfavourable for the buffaloes which are a good type of animals here and thrive well.

Insufficient and improper feeding :—Although there are vast areas of waste land in Assam, most of them cannot be called grazing fields in the proper sense of the term. Majority of them, where good grass grows, remain under water for the greater part of the year. Many are covered with scrubs and bushes unsuitable for cattle grazing. Almost every common grazing ground in villages is overstocked. The high lands offer grazing only for a few months during the year. Though such places do not become inundated, the grass which grows there becomes overmatured, fibrous and dry with the cessation of rains, and remains in that condition until the monsoon breaks again. Hence they remain absolutely barren of herbage for cattle grazing for several months. There may be good grazing lands in forests, but being far away from villages they are not available to the village cattle. In many thickly populated places cattle are to travel a long distance to reach the common grazing grounds which are usually overstocked. In such places often the nutrition which the cattle derive from the scanty grazing there, is not commensurate with the loss sustained in going and coming. Stall-feeding is unknown in the province nor any fodder grass or fodder crop is grown. Only paddy straw is stocked by some villagers which is given to the cattle in small quantity generally in the evening on their return from the so-called whole day's grazing. The quantity of straw usually kept is not sufficient for a year and the cattle get it as long as it lasts and then they are to live on grazing only. The working bullocks only receive a little attention from the owners for their feeding, but the lot of the cows, young stock and those animals not in work is miserable. They are to remain satisfied with whatever they get in the grazing ground, or uncropped land or in the jungle. The sucking calves in many cases do not get sufficient milk from their mothers and consequently their growth becomes stunted, from their calfhood. The vast area of waste land in Assam as grazing ground is doing more harm than good to the

cattle. People here believe that there is enough of grazing land and the cattle are getting sufficient food but actually the case is just the reverse and the animals are living almost on famine-food year after year. Had there been less waste land for the purpose of grazing the people perhaps would have paid attention to stall feeding of their animals at least to some extent and care would have also been taken of the grazing lands in keeping them as far as possible in suitable grazing condition by guarding against overstocking or overgrazing, and allowing periodical rest to the fields for the grass to grow by regulating grazing in rotation. In respect of the actual condition of grazing fields Dr. Wright's opinion is quoted here " It should be emphasised that the period during which there is any considerable growth of herbage on grazing lands is strictly limited. For 3 to 4 months such lands can only be looked upon as exercise grounds providing indeed an excellent training ground for young draught cattle, but no source of nourishment. In any event grazing under Indian condition cannot be looked upon as satisfactory source of nourishment for milking cattle ". If waste land means good pasture then Assam has plenty. But most of such areas are either unavailable or remain unsuitable for grazing, being inundated or covered with scrubs, bushes, or very long coarse and fibrous grass unsuitable and injurious to cattle, during the greater part of the year. This is the main reason why the cattle in Assam are so week and emaciated and continued existence of under-feeding for generations must have contributed considerably to their degeneration.

Indiscriminate and improper breeding :—It is the common practice in Assam that all good bulls are castrated before they are matured to turn them to suitable bullocks. The weedy and immature bulls only are left uncastrated and they freely move with the village herd and become sires of the future generations. Such breeding cannot but bring dengeneration. It goes without saying that the cattle in Assam are very much degenerated, but how to check the degeneration and improve the stock is the question. Castration of all weedy bulls leaving the better ones for breeding purpose will no doubt check further degeneration.

That the cattle of Assam require improvement must be admitted by all, but how and in which direction the improvent is to be brought about is a vexed question and deserves serious consideration. The opinion on this point from Colonel Morgan, once Inspector General of the Veterinary Department, India, may be quoted here: —" Experience has proved that cattle and sheep of one part of India will not thrive if removed to another and the sending of bulls of one breed with a view to improve another is fatal and any attempt at working on these lines is to be condemned. Our main object should be to improve each indigenous breed without attempting any violent outcross or the introduction of blood which will be unsuitable for the district and in which no permanent chance of permanency is to be hoped for. The native breeder never attempts to outrage the laws of nature, as he knows full well that failure will inevitably result from such proceeding ". This opinion is as sound now as it was more than a quarter century ago when it was first expressed. Since the opinion was given various cross breeding experiments on cattle all over India and elsewhere had been carried out and from the results of the experiments, the experts have come almost to the same conclusion. Mr. F. A. Stockdale, writing on conditions at Nigeria (Africa) states that " The introduction of strains from outside will only add to the complications which already exist and produce an even more heterogenous collection of animals than at present exist.....In my view a policy of rigid selection from the local cattle would be more calculated to produce results of lasting value than could be achieved by the introduction of the blood strains of cattle from outside " (Colonial Advisory Council Publication). The experiments on cross breeding of cattle in the province have perhaps, already given indication of the same result and attempts are now being made to improve the stock with better bulls of the indigenous breed of animals as far as possible and also with bulls from the neighbouring provinces where the climate and other environments are not much different from those of this province. If any permanent improvement is to be obtained the measures

adopted must be in strict conformity with the natural conditions of the place and never against it, as in the latter case some improvement may be obtained in the beginning, but finally all will be lost and nature will predominate. Then again in deciding the question of improvement of the stock we are to ascertain what sort of improvement the people actually want, otherwise we cannot expect any co-operation from them without which it can never be made successful. Do the people of Assam really desire improvement of their cattle? If so, to what extent and in which direction? It may be said that generally the best indigeneous animals in a province are the animals which the ordinary cultivators of the province want for their own purpose. The reason for this can be attributed to the fact that the indigenous cattle are the animals which countries of natural selection have produced as most suitable for the conditions in which they have to live and as such they can be maintained with the least possible care and attention. It will not perhaps be wrong to say that for cultivation only the cultivators of Assam are quite satisfied with the type of animals they have now and that no other type would suit them better specially in consideration of the care they are taking of their cattle now. What they really want is some bigger and stronger bullocks for their carts and better milk yield from their cows. But here comes the question of greater attention for better animals and until they are ready to do that nothing could possibly be expected in that direction. However, in the present circumstances the best course would be, I believe, to improve the cattle by local selection and also by cross breeding with selected bulls imported from the neighbouring provinces of Bengal and Bihar where the cattle are distinctly of a better type of animals. This will, no doubt, solve the draught question and also the milk question, to some extent. An attempt at solving the milk question by crossing the local cattle with bulls of high yielding breeds of a quite different place is fraught with danger. Here the opinion expressed in Dr. Wright's report may be quoted: "The immediate results (of such breeding) are certainly striking. With further crossing the results have not, however, been so successful. Mating half-bred to half-bred is of very questionable value, even if a fixed type could ultimately be obtained (which is doubtful) the amount of "Culling" of unsatisfactory animals would make the method extremely expensive. Back crossing improves the constitution, but reduces the milk yield. Forward crossing on the other hand while maintaining milk yield is liable to result in a deterioration of the physic and in high mortality particularly among the calves." Again improvement of cattle for dual purpose to any considerable extent is practically impossible as increased milking quality is often obtained at the sacrifice of draught quality and draught quality at the cost of milking capacity. However, certain improvement in both the qualities in the same breed may be possible and that should be the idea of improvement of the cattle in Assam for the present.

Feeding, Keeping and Breeding of Cattle:—The feeding of cattle is taken first into consideration as it is most important either in getting the fullest amount of cattle products in the shape of milk and labour or in improving the breed. In breeding improvement feeding has a great influence. Distribution of good bulls practically means distribution of good animal seeds. But as mere distribution of good seeds in agriculture cannot produce good crop without proper care and nourishment of the plants grown thereof, so also mere distribution of good bulls cannot produce good stock without proper feeding, keeping etc. "No substantial improvement in the way of breeding is possible until the cattle can be better fed":—*Royal Commission Report.* It has already been said that grazing alone what they get in Assam, cannot keep the cattle in condition. Inadequate nutrition is the main factor in accounting for the poor milk yield of the village cattle. If the milk production is to be increased the provision of a better and adequate food supply is essential. Milking cows should be given sufficient fodder suitable for milk production. It may be said with certainty that it is useless to increase the food supply of milking cows with coarse dry fodder. For milk production the nutritive ratio (*i.e.*, the ratio between the digestible crude protein and the combined digestible carbohydrates and fats) of the ration must not be wider than 1 : 10, and higher the milk

yield the narrower the ratio should be. Dry fodder, such as, paddy straw has nutritive ratio of over 1 : 40, and is therefore obviously unsuitable for milk production. Green grass has nutritive ratio of 1 : 10, to 1 : 15, and is therefore reasonably better fodder for milch cows. The ideal fodder for milk production is the leguminous crops with nutritive ratio between 1 : 4, to 1 : 6. In Assam, where cattle are solely kept on grazing which is invariably insufficient in quantity and inferior in quality, the need of protein rich concentrates, such as linseed, cotton-seeds, or mustard cakes is all the more great here. " About 325,000 tons of oil cakes and more than 1,000,000 tons of oil seeds are annually exported from India. If the extracted cakes from these two sources were retained in India the available quantity of protein rich concentrates would have been greatly increased." A large quantity of mustard is produced in Assam and many oil mills are also in existence here, but out of ignorance and indifference the people do not take the advantage of using the oil cakes in feeding their cattle particularly the milch cows and working bullocks. The only use of oil cakes here is for manuring purpose and that also in the tea gardens. Experience has proved that European rationing systems are not suitable for the Indian cattle and buffaloes. The Indian cattle have a greater capacity of digesting coarse fodder and it must be particularly greater in Assam cattle. It has been rightly said that " European cattle have been bred to digest and assimilate the largest possible quantity of food and Indian cattle possess character which enable them to make the most efficient use of the smallest quantity of food ". This must be the reason as to how a vast majority of the cattle in Assam though getting a little food can still maintain life. Apart from protein and other nutrients in the ration, if it lacks in mineral constituents and vitamins, pathological conditions, such as deficiency diseases of the bones and joints, stunting of growth, unthriftness, sterility, premature falling off of milk production, etc., would result. These deficiencies are no doubt, far more common than supposed to be and are a source of serious economic loss. In consideration of the economic condition of the average

regarding feeding of the cattle. For the milch cows — grazing as much as available, concentrates in the morning and evening consisting of chopped straw, rice bran, oil cake soaked in water and common salt. Boiled "Khuddi" (broken rice) or boiled 'matikalai' with rice bran and salt will be a better substitute for the evening concentrates specially for the cows in milk. For the comparatively heavy yielders some green fodder for the night should also be arranged. For bullocks — grazing, if sufficient grazing is not possible to be allowed, green fodder should be provided in the shed, concentrates consisting of chopped straw, oil cake soaked in water, soaked gram or boiled 'Matikalai' morning and evening when in work and when not in work, plenty of grazing and the allowance of concentrates once in the evening. If, however, the grazing is not sufficient, the concentrates may be given twice daily in a comparatively less quantity. Straw as already said is very poor in nutritive value and its use is mainly for adding bulk to the food. Growing calves require sufficient protein in their food and so also the mineral constituents. In urban areas, where there is good market for milk, calves are often allowed very litttle milk which is their essential food and this results ih stunting of their growth or even in death. Calves should really have the first claim on their mother's milk and on no account they should be deprived of it. Buffaloes thrive on coarse and swampy grazing and there is plenty of such grazing in Assam. It is not advisable to keep these animals in places where such grazing is not available. With plenty of suitable grazing they do not require anything more than a daily allowance of common salt to maintain their health. This is the reason why the professional graziers in Assam prefer buffaloes to cattle. The cream percentage of buffalo milk is much higher than that of the cows' milk and the production of ghee here is almost entirely made from it. Suggestions of still better feeding of higher nutritive value or of well balanced food could be made, but in view of the economic condition of the village people and the amount of care and attention they usually pay to their cattle, it is considered to be useless at present, as that is more

likely to remain in theory than to be utilised in practice. The concentrates suggested are almost all available in every village house as products of cultivation, so the people are not required to spend money towards their purchase which cannot possibly be expected from them, as they are now.

Cattle shed :— Here also any suggestion for improvement to be made must be considered with its suitability or otherwise under the present adverse economic condition of the village people. With some improvements and modifications the existing thatched 'Kacha' sheds will be quite suitable. In this sub-tropical climate thatched sheds with enough of open space for ventilation is just what is required. But the 'Kacha' floor of most of the sheds requires considerable improvement. The floor should be made of tenacious earth with proper gradation. If pits are formed on the floor it should be refilled with fresh earth. Dung and urine should be removed to a safe distance and put in a pit with a shed over it. The dung, as already said, is a good manure and may be profitably utilised in fertilising fields.

Breeding :—Enough has already been said about it. The first and most important step towards breeding improvement is to castrate all weedy bulls before they attain maturity. In Assam all cattle are allowed to move freely in herds, so if such bulls are allowed to become mature, there remains every possibility of undesirable reproductions by them. With the idea of improving the cattle in Assam and preventing their further degeneration the Department (Civil Veterinary Department, Assam) is doing the castration work for several years and has already made immense progress in it. In the last year and year before, 28,297 and, 25,334 weedy bulls respectively were castrated in the province. Where such bulls are castrated the best ones among them are always left uncastrated with instruction to keep them for breeding purpose. So the Department is practically doing the entire breeding improvement work, at least in those places, in so far as improvement of the stock by local selection is concerned. It is to be regretted

that the villagers often get such bulls castrated by the village quacks. This can no doubt be checked at once by legislation, but if that is to be adopted at all it must be done as a last resort. What is required now is to educate the people about the benefit of keeping good bulls and for that considerable propaganda work is necessary. As already said improvement of the stock by local selection is the safest. Many good bulls decidedly of a better type than the local cattle are available in the Nepali Khuties of the province. Some of them might have some foreign blood of Bihari or Maurungia bulls, but it matters little, when they are thoroughly acclamatised. They are not too different either in size or in other characters from the local cows and will best suit the purpose for the present. Bulls from Bengal and Bihar will be the best suitable animals for the production of cart bullocks. A dual purpose improvement of the stock which is really wanted in the province, can possibly be expected from these animals; but the improvement, I think, will be more in draught quality than in milking capacity. The question of milk supply in the province is also a very difficult one, but the present situation can be considerably improved at once if more attention is paid to the proper feeding of the existing cows; until and unless the people have learnt about the proper feeding and keeping of the animals, any attempt at improvement of the stock by better breeding only is sure to meet with a failure. The saying that "Cow's milk is in her mouth" is true to the letter. How can we expect to get the most nutritious product as milk from a cow if she is not provided with nutritious materials in the shape of fodder and concentrates? Her duty is to convert the unsuitable and inassimilable food materials present in the fodder into the most suitable and best assimilable food as milk, but unless she gets the materials how can she be expected to do it? Here also the people require education and for that considerable propaganda work is necessary. The education Department, can render much help in this direction by introducing these subjects in the school books. Cattle shows and fairs are also of considerable help in this direction.

Summary.

As in other parts of India, cattle are of great economic importance to the people of Assam, and in the absence of any industrial development in the province their importance is by far greater here as agriculture is the only occupation on which a vast majority of the people depends for subsistence. But for the cattle agriculture would have been impossible and without agriculture the people would have been nowhere. Even in the present wretched condition of the cattle they are of immense value and a source of considerable economic gain to the people, owing to the adverse physical condition of the province and partly also to the adverse economic condition of the people, even in these days of mechanised vehicles the cattle in Assam hold good their importance in transport and conveyance. The cattle in Assam have no doubt considerably degenerated which appears to be mainly due to their insufficient and improper feeding for generations and not to a less extent also to indiscriminate breeding. Cattle are kept on grazing only and stall-feeding is practically unknown here. Although the province has vast areas of waste land, most of them offer only scanty grazing and that also for a certain period of the year. Low lying areas such as 'Hawors', 'Pathars', or 'Chapories', etc., where good fodder grass grows remain available for grazing only for a few months as during the greater part of the year such places remain under water. High grazing lands on the other hand give grazing only during the rainy season after which they become dry and barren. Good grazing lands are available in the forests, but being far away from villages they cannot be availed of by the village and only a few professional graziers keep their stock in such places. The common village grazing grounds are mostly covered with scrubs, bushes and other coarse fibrous grass of very low nutritive value. Moreover, such lands being overstocked and kept constantly under grazing no time is ever allowed to the grass to grow and as such cattle do not practically get any grazing there except a certain amount of exercise. So the idea that Assam has plenty of grazing is not tenable, and in fact, waste lands in the name of grazing grounds are doing more harm than good to the cattle.

An instance may be cited here to give an idea of how the cattle of the province are living on grazing alone which is considered by many to be sufficient. Once there was a severe outbreak of Rinderpest in the 'Hakaluki Hawor' in the district of Sylhet where majority of cattle from its three sub-divisions are kept for grazing from March or April, when its water usually subsides with a luxuriant growth of 'Dub' and other fodder grass, upto May or June when it becomes inundated again and remains under water for the remaining part of the year. During the time it remains available for grazing cattle from distant villages are kept there for pasturing. From such villages cattle are usually sent there alternatively in batches so that the cultivation of the early crops may not suffer and this necessitates movements of cattle from the 'Hawor' to villages and from villages to the 'Hawor.' I was deputed there to control the epidemic and the first step to check further spread of the disease was to suspend all cattle movements. This was suggested to the owners many of whom appeared to be sensible and intelligent men. But the reply which they gave to me was that they fully understood my advice, but it was not possible for them to follow it as from grazing in the 'Hawor' for these months their cattle pick up condition which enables them to carry on their life for the rest of the year with the scanty grazing available in the village grazing lands. So if the animals are not sent to the "Hawor" they will die of starvation and if sent may die of the disease. They however, preferred the latter and the result can better be imagined than described. The disease practically spread all over the district and took a very heavy toll in cattle mortality. This is exactly what is the grazing condition all over the province and if the cattle get any grazing it is only for a few months during the year.

For cultivation people of the province prefer local bullocks as centuries of natural selection have turned them out to be the best suitable animals. If with proper feeding and keeping their condition is improved they may prove quite efficient and sufficient for the purpose. Animals bigger and stronger than the local bullocks are required for cart traffic and for that bulls

from Bengal or Bihar may be imported for breeding purpose. Milk production in Assam is miserably inadequate, but until the people are educated in proper feeding and keeping of the cows no improvement in the situation can be expected. The milking capacity of the Assam cows is not so poor as it appears to be in their present wretched condition. If fed properly they are sure to give at least double the quantity of what they are giving now. So educating the people in proper feeding and keeping of cattle is by far of greater importance than any attempt at improving the breed by mere distribution of good bulls which will be something like pouring water on a tree after it has been cut at its root.

FOWL TYPHOID

A Brief Résumé of the Literature

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Among the septicaemic diseases of poultry, fowl typhoid is undoubtedly considered to be a highly virulent infection. It is an acute, occasionally subacute or chronic, highly infectious septicaemic disease of fowls characterised by rapid spread and high mortality. Leaving aside the various names given to it by different workers, the disease has been described in Veterinary literature under three common appellations, namely, "Fowl Typhoid," "Klein's Disease" and "Infectious Leukemia." Further investigations on the disease have revealed that although leukemia of the blood is invariably present in birds affected with fowl typhoid, it is not in itself a disease entity.

Distribution.

The disease is widespread throughout the various countries of the world, recognised as a particularly virulent one. Although

fowl typhoid was investigated as early as 1888 by Klein in England and 1897 by Moore in America, it was for the first time recorded in India by Cooper and Naik in August, 1930. The existence of this disease, which was first mistaken for fowl cholera was observed in a flock of poultry at Bhowali (U. P.). The same authors in the course of the description of the outbreak, stated, that some outbreaks of fowl typhoid might have been mistaken for fowl cholera and hence "the failures of serum and vaccine to give necessary protection in the prevention and control of fowl cholera." From the foregoing statement it can safely be presumed, that at least, a certain percentage of the disease diagnosed to be fowl cholera was in reality fowl typhoid. This opinion is also shared by Kaupp and Dearstyne (1925), regarding the incidence of the disease in America. These authors have stated that there is a great similarlity between these two diseases and a very close resemblance between their causal organisms and hence some epidemics of the disease, which were originally studied and described as cholera, were later found actually to be infections with *Sh. gallinarum*. te Hennepe (1921) stated that fowl typhoid caused more serious losses than cholera among fowls in the Netherlands.

Etiology.

The causal agent, *Shigella gallinarum* was first discovered and studied by Klein in England in 1888 and is known by his name in Europe. Cooper and Naik (1930) isolated an organism from an outbreak of the disease in Bhowali and proved its morphological and cultural identity with the English strain of *Sh. gallinarum*. The organism is not very resistant. Kaupp and Dearstyne (1925) observed that the organism could not survive for more than 24 hours in direct sunlight, and disinfectants such as phenol and bichloride of mercury killed it in dilutions of 1 : 1,000 and 1 : 20,000 respectively. When kept in water away from light, or buried in the soil the organism may remain alive for some time.

Susceptibility.

The disease is commonly met with in fowls particularly chicken in a severe form. Pigeons, turkeys and pheasants are no

exceptions. Johnson and Anderson (1933) reported an outbreak of fowl typhoid in Guinea fowls and concluded that the causal organism isolated from the outbreak was indistinguishable from *Sh. gallinarum*. Hinshaw (1930) stated that in California fowl typhoid appeared to cause greater losses among turkeys than blackhead. Taylor (1916) recorded an outbreak of fowl typhoid in adult as well as baby chickens in California. Beaudette (1925) isolated *Sh. gallinarum* from baby chickens in New Jersey. Rettger and Koser (1917) pointed out that chicks were not very susceptible to fowl typhoid infection except during the first few days of their life and that the disease was common in adult fowls.

Dissemination.

The disease spreads through the soil, feed and water contaminated by the droppings of infected birds. The natural method of infection is by ingestion, but the susceptible birds can also be infected by subcutaneous or intravenous inoculation. Komarvo (1932) made observations on the outbreaks of fowl typhoid in chicks and concluded that infection had most probably passed through the egg. Doyle (1924) isolated *Sh. gallinarum* from the disease ovary of a hen and pointed out that transmission of the organism from the infected hen through the egg was possible, but in his view fowl typhoid was not transmitted naturally by this method. Beaudette (1925) isolated fowl typhoid organisms from the unabsorbed yolk of a chick and in another instance from the ovary of a hen and suggested the possible transmission of the infection through the egg. The disease may be introduced into a flock by newly purchased fowls or by wild flying birds.

Symptoms.

The clinical manifestations of the disease are fever, listlessness, ruffled feathers, comb and wattles pale and accelerated respiration. There is great dullness and depression from the very beginning and the affected bird appears indifferent to its mates and surroundings. A characteristic feature of the disease

is a profuse diarrhoea with sulphur-coloured droppings. Death is usually preceded by great prostration.

In acute cases the duration of the disease is from 1 to 10 days. The period of incubation varies from four to six days.

Post-Mortem Appearances.

Comb, wattles and visible mucus membranes are highly anaemic, and according to Bargar and Card (1935) this condition of the membranes is invariably seen at autopsy. No marked lesions are found under the skin. The heart is enlarged and has a parboiled appearance. The liver is congested, friable and enlarged. Gaiger and Davies (1932) has stated that a "bronze discolouration" of the organ when seen in fowls defintely points to the presence of *Sh. gallinarum* infection. Spleen and kidneys are also enlarged. The intestines are haemorrhagic and congested with yellowish contents.

Mortality.

Mortality in fowl typhoid varies from one outbreak to another. In some outbreaks only a few birds die, while in others losses are great. The death-rate is about 50 per cent., but in newly-invaded flocks it is heavier. Cooper and Naik reported that 13 out of 16 fowls artificially infected at the laboratory, succumbed in 5 to 10 days.

Differential Diagnosis.

Clinically fowl typhoid is differentiated from fowl cholera by paleness of comb and wattle and sulphur coloured discharge in the former, and darkening of face, comb and wattles with the dropping being flaked with red in the latter. Cholera is usually the more acute disease. The bipolar staining character of *P. Avicida* differs from the peripheral staining of *Sh. gallinarum.*

To distinguish the disease from *Salmonella pullorum* infection in adult fowls cultures are made from liver and from these cultures subcultures are made using litmus-milk and maltose. Agglutination test is not sufficient to differentiate between fowl typhoid and pullorum disease as the birds recovered frem fowl typhoid react to test both with *Sh. gallinarum* and *S. Pullorum.*

Fowl plague is differentiated by the presence of haemorrhages in the proventriculus, inflammation of intestines, respiratory distress and absence of growth of any micro-organisms in cultures. Moreover the disease has not yet been recorded in this country.

Treatment and Control.

Medicinal treatment of fowl typhoid is of no avail. Some workers have tried Epsom salts in drinking water, but the results obtained are not encouraging.

Vaccination against this disease has been carried out in America and Europe, using the killed or attenuated cultures. The results obtained vary and have been claimed to be excellent in Britain. Bushnell and Patton (1924) made observations on vaccination against fowl typhoid, fowl cholera and roup, and observed that the number of deaths in vaccinated fowls was as low as one-fifth of that occurring in fowls which were not vaccinated. Runnels and Thorp, Jr. (1927) carried out experiments on vaccination against fowl typhoid and concluded that the fowls inoculated with vaccine once and those inoculated twice, gave positive results to agglutination test for periods not extending beyond 36 days and 65 days respectively.

For effective control of fowl typhoid strict hygienic measures are of utmost importance. Disposal of all ailing birds by burning, thorough and frequent disinfection of houses and utensils, daily removal and burning of droppings and removal of all healthy birds to a clean place are highly essential. The food and water troughs should be placed in such a position that they do not get contaminated with droppings.

To prevent the introduction of infection into a healthy flock all newly-purchased birds and those returning from shows and fairs should be isolated for a week or 10 days, and other measures such as keeping away wild birds and visitors, supply of clean food and water from a reliable source should be adopted to minimise the danger of infection. Hinshaw (1930) has stated that a highly important factor in the prevention of fowl

typhoid in turkeys is to keep them quite separate from chickens and chicken range, as chicken help to spread infection to turkeys.

REFERENCES

Barger, E. H. and Card, L. E. (1935) Diseases and Parasites of Poultry 122-125.

Beaudette, F. R. (1925) *J.A.V.M.A.*, LXVII, 741-745.

Bushnell, L. D. and Patton, J. W. (1924) Referred to in *J.A.V.M.A.* LXXII, 92.

Copper, H. and Naik, R. N. (1930) *Ind. Jour. Vet. Sci. Ani. Husb*, I. 99-103.

Doyle, T. M. (1924) *Jour. Comp. Path. Therup.* XXXIX, 137-140.

Gaiger, S. H. and Davies, G. O. (1932). Veterinary Pathology and Bacteriology 178.

Hinshaw, W. R. (1930) *Vet. Med.* XXV, 514-517.

Johnson, E. P. and Anderson, G. W. (1933) *J.A.V.M.A.* LXXXII, 258-259.

Kaupp, B. F. and Dearstyne, R. S. (1925) *J.A.V.M.A.* LXVII, 249-259.

Klein, E. (1888), Cited by Kaupp and Dearstyne.

Komarov, A. (1932) *Vet. Rec.* XII, 1457.

Moore, V. A. (1897) Referred to in Diseases and Parasites of Poultry.

Rettger, L. F. and Koser, S. A, (1917) *Jour. Med. Res.* XXXV, 443.

Runnells, R. A. and Thorp, Jr. F. (1927) *J.A.V.M.A.* LXXI, 90-105.

Taylor, W. J. (1916) *J.A.V.M.A.* XLIX, 35-49.

te Hennepe, B.J.C. (1921) Rept, World's Poult. Cong. 1921.

MUSTH OR THE EBULLITION OF THE SEXUAL TIDE IN ELEPHANTS

BY

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Mangalore.

In my last article on eye diseases I stated that sex repression may be a contributory cause of eye diseases. The statement was based on the phenomenon of musth and its effects on the temporal glands. The following is a brief summary of the evidence in support of the conclusion that musth is closely connected with the vital functions.

Incidence.

1. All mature males get musth.
2. No immature nor senile males get it.
3. Well fed, unworked, temple elephants leading lonely lives get it more often and most severely. Working elephants enjoying partial freedom and society of their kind do not get it so often nor so severely.

Symptoms.

4. The symptoms of musth are, stage by stage,

(i) A feeling of exhilaration, desire for the company of females, unusual appetite.

(ii) Frequent erectation of the sex organ even when not standing still or passing urine.

(iii) Dripping of the seminal fluid by itself or mixed with urine, recognised by the peculiar smell.

(iv) Exhalation of this peculiar smell from all over the body.

(v) Swelling of the temporal glands and watering of the eyes. Blood shot eyes.

(vi) Discharge from the temporal glands and madness. The discharge smells of the seminal fluid.

5. Among the ordinarily cared for and fairly worked animals, musth generally stops with the first two stages due to work, or with opportunities for sexual intercourse, or both. Among temple elephants it runs its full course. Intermediate stages are reached by a few supervitals among working animals.

6. The last two stages only are commonly recognised. But experienced mahouts and those who know the symptoms can recognise the earlier stages, particularly (iii) and (iv). The first two may often go unnoticed.

Treatment.

The following are the steps indicated to arrest or cure musth and usually adopted by Indian Veterinarians who practice treatment of elephants.

(i) Increase of work and reduction of food, to reduce vitality, augmented by drugs if necessary.

(ii) Give facilities for sexual intercourse if possible. This is dangerous when the musth has reached the later stages and for that reason it is seldom ventured.

(iii) When musth is advanced powerful stimulants are given to hasten the end. After it is over, tonics are administered containing mostly agents promoting sex vitality.

Theory.

Modern medical researches have established a surprisingly close co-relation between the various glands in the body of animals. It is now becoming more and more apparent that the health of an animal and its resistance to disease is largely governed by the due performance of glandular functions and maintenance of glandular equilibrium. The exact location and corelation between the various glands (duct and ductless) in an elephant have not yet been established. But from the symptoms aforesaid and from the fact that the sex glands of an elephant are internal one may presume that there is some intimate connection between the sex and temporal glands. Atrophy of the

one may react on the other; likewise repression or excessive stimulation.

It may be asked if there is not sex repression in man and other domestic animals and why they do not react similarly. Man has a will, he has various preoccupations, and for ages he has been evolving on more or less unnatural lines. The other domestic animals have likewise gone through ages of domestic evolution. That is not the case with by far the majority of domestic elephants. They have come to us straight from the wild. There cannot be any comparison therefore between the two in a matter like this.

Authority.

The elephant is not new to India. Indians have captured and tamed and used him for centuries past. Naturally, they have learned in their own way (which may not always be capable of scientific explanation) to care for and treat him. There are books in Sanskrit wholly devoted to the care and treatment of elephants. They are unanimous in attributing musth to abnormal sex life. Until we could disprove it, the authority of centuries of human experience as recorded in these books must carry some weight.

THE

Indian Veterinary Journal

Vol. XVI NOVEMBER 1939 No. 3

Editorial

INERTIA

The strength of the flock lies in the sheep and
The strength of the sheep lies in the flock.

It is a matter for sincere regret and deep pain that the All-India Veterinary Association has, in recent years, lapsed into a state of suspended animation. It is some years now since its voice was heard. Latterly, nothing is known of its existence. True, this *Journal*, as its recognised organ, is trying its best to maintain contact with its members. But, is that enough ? Is it a sufficient sign of its real activity? What about the periodical meetings and conferences which afforded such splendid opportunities for exchange of views and thoughts ? Are they not necessary for real advancement ? Are these not matters of great importance for the serious consideration of the profession ? Is not regular and periodical stock-taking necessary for keeping abreast with the advancement and changing times ? Frankly and candidly, this apathy towards the activities of the Association is indeed disheartening, and there is no use in disguising the feeling.

The last Conference of the Association was held in the month of December 1936. Since then, much valuable time has been lost. Great changes have taken place in the country.

The most important of them is that, in many of the Provinces, the Government is in the hands of the Congress, which represents the masses. These Governments are naturally anxious to push through various measures for the amelioration of the condition of the ryots who really constitute this country. The Veterinary Department is one of those which is intimately associated with the welfare of the ryots. As such, the All-India Veterinary Association, as the only organisation of the Veterinary Profession in this country, should be up and doing in helping the ryots to protect their animals which is the mainstay of agriculture. But what do we find? The Association has assumed a state of deplorable inactivity. It has, in fact, gone hibernating. Is it not sad? Is it not pitiful that such a state of inactivity should have set in at a time like this when it should be intensively active? We feel sure that it will wake up sooner or later—sooner, we hope, than later—and work harder after the rest it has had. It is a pity that it has missed many an opportunity for the advancement of the profession during the period it rested.

The Association was started a decade and a half ago. In its early life it did yeoman service and continued to do so till recently. It rallied together the members of the profession in the different parts of the country; it helped in the formation of branches all over the land; and it contributed a great deal to rid the profession of the inferiority complex from which it was suffering. Having done all this work so enthusiastically and well, it is very sad to see that it should suddenly be in a state of inertia at a time when important changes are taking place all around.

We are often told that the cause of this inertia is not solely due to the inactivity of the men at the helm of affairs but that it is greatly due to the apathy and indifference of the constituent members. This appears to be true. We personally know of at least one Province wherein the President of the Branch Association has been trying very hard to hold a Conference, but the response has been poor. He could not succeed simply because the members of the Association have not been quite so keen about it. Further, from the feeble way in which this *Journal* is being supported by the members of the Association and from the manner it is being famished for Notes and News from many a Province, we are forced to concede that the co-operation of the members is not forthcoming in as abundant a measure as it should. Our duty to our profession, our duty to the country and our duty to posterity, expect that each and every one of us should feel the cause as our own and act accordingly.

It is probable, nay, it is quite possible that this feeling of apathy and indifference amongst the members might be a direct sequel to a condition of their continued under-feeding and overworking. But that is exactly the very reason why they should all join together, pool their resources and find out the ways and means of improving their lot. A mere fatalistic acceptance of the existing order of things, and a meek submission to them without even an effort to improve them, displays, a spirit of defeat. More often than not, the child has to cry, and cry hoarse too, for his quota of milk or sweets; otherwise, his silence is often mistaken for contentment. This is such a simple everyday experience in life that there is no need for us to expatiate further on it. In unity lies our certain strength; in disunity and isolation, our sure road to failure.

In recent years, there have been in the various Provinces some retirements of Veterinary Officers from Government service. These Officers have intimate knowledge of men and things in their localities, and they are best suited to serve the profession and ryots with more freedom than it was possible for them when they were in harness. Such service will naturally help the activities of the Association suited to the local requirements. Many important problems cry for solution. The control of contagious diseases, especially Rinderpest, is still far from satisfactory. Opinions are very varied about Goatvirus vaccinations. The transfer of Animal Husbandry Section to the Veterinary Department in some Provinces has necessitated the formulation of policies for its successful working. Veterinary Education is still another. These problems cannot possibly be solved by the Government, alone and unaided.

It is not even fair to expect it. Public opinion has a fair share in shaping it and has to be consulted. For all these, it is indispensable that the Association and its various Branches in the different Provinces should be up and doing for the benefit of all concerned. The Association lives in its members and the members live in their Association. Realising this bare truth, we expect that each and every member of the profession wakes up to his responsibilities and makes the organisation a live one. Let us once more remind them that each is for all and all are for each, by which alone we will realise our motto "Union is strengh."

Clinical Articles

IZUKA'S TEST FOR OSTEOPOROSIS IN HORSES*

BY

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During the last few years, a number of cases of Osteoporosis in horses have come to my notice. A few of them were in an advanced stage of the disease with serious alterations of bony structures and there was, therefore, no difficulty in diagnosing them. A good number, however, did not show any clinical signs of the disease beyond a vague sign of lameness in one or more of the limbs and a stiff gait behind. But the postmortem findings of these undiagnosed cases were very interesting in that they showed extensive osteoporotic condition of the skeleton. The diagnosis in these cases was, therefore, only postmortem as there were no definite means of detecting the disease durin life.

Recently, in one of the issues of the Journal of th American Veterinary Medical Association, there was an articl

* Received for publication on 9-10-1939.

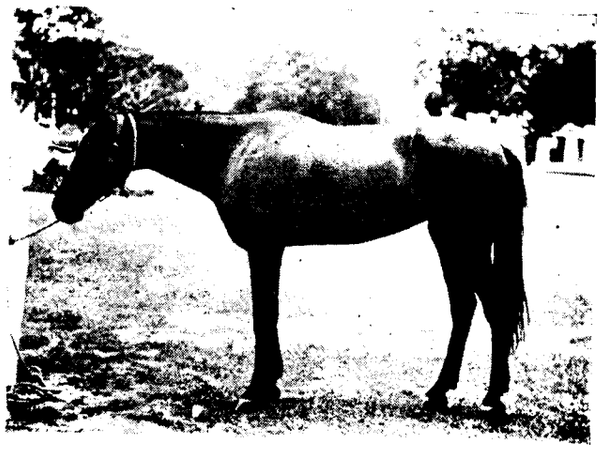

Fig 1. Izuka's Test for Osteoporosis.
Stylet in position, in positive case

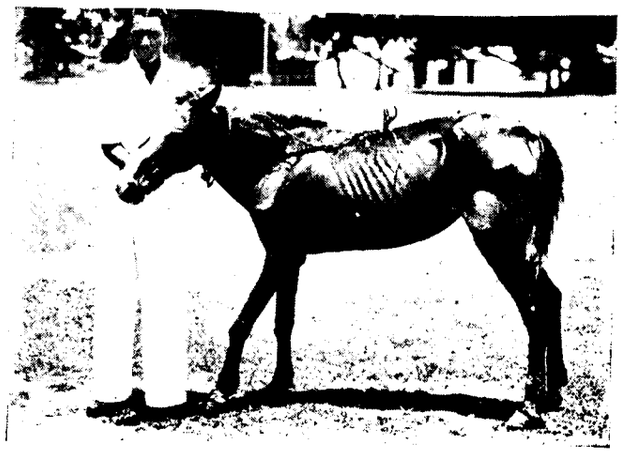

Fig 2. Izuka's Test for Osteoporosis.
Stylet slanting, in negative case.

which gave a simple test for diagnosing cases of osteoporosis in the early stages. According to Professor Izuka, the author of this test, it is the facial bones that first become affected in osteoporosis and, even among the facial bones, it is the left frontal bone that becomes primarily involved. To find out the condition of this bone, Professor Izuka has invented a small stylet 2 m. m. in diameter and 3·5 c. m. in length attached with a nut to the handle. This stylet is inserted into the frontal bone. A positive test is indicated by the ease with which the instrument enters the bone on moderate pressure. In negative cases, the stylet does not enter the bone.

With a view to find out how far this test was useful, I tested 26 ponies and horses during the last one month. Four of these animals gave a positive reaction. Out of these four, one was a clinical case of osteoporosis, another was a suspected one because it had a stilty gait all round. The third and fourth cases had not any signs of bony diseases and they were, to all appearances, free from osteoporosis.

The test was carried out in the following manner:—The horse was held by the head collar and steadied by the ears. The site of operation was arrived at, as given by Professor Izuka, by drawing a line joining the two inner canthi and bisecting it by the median line. To the left of this point, Tr. Iodine was painted and the stylet inserted. The stylet used by me was something like the ordinary teasing needle in a laboratory, only this was a bit stronger and stouter. With ordinary pressure, the needle penetrated the bone in positive cases; in one of the unsuspected cases, the needle went in far too easily. When once the bone is penetrated, the stylet stands fixed in the bone; otherwise it falls flat, its hold being only the skin. The accompanying photos show a positive and a negative reaction.

The bones of one of the non-clinical cases which still gave a positive reaction were examined after destroying the animal and these showed an extensive osteoporotic condition. There was navicular disease of all the four limbs with extensive rarefying ostitis of the pedal bones.

The test is a very simple and instructive one. From the way in which positive reactions have been obtained even in unsuspected cases, it appears reasonable to suggest that, in future, an examination for soundness of horses should include a test for osteoporosis also.

A SIMPLE AND PRACTICAL TEST FOR THE DIAGNOSIS OF EQUINE OSTEOMALACIA*

BY

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College of Veterinary Science, University of Philippines, Manila, P.I.

Equine osteomalacia is quite prevalent among horses in the Philippines, particularly among racing ponies. The early detection of incipient cases is essential in order that preventive measures may be instituted, thus protecting horse breeders and owners from financial loss. At present, the diagnosis of incipient cases is difficult. Diagnosis at best is only presumptive in mild or moderate cases where pathognomonic symptoms are absent. The object of this paper is to present a very simple and practical test for diagnosis.

Materials and Methods

Last April, when the senior author went to Tokyo to visit scientific institutions, he met Dr. Akio Iizuka, of the Veterinary Laboratory, Ministry of Agriculture and Forestry. Dr. Iizuka has done and is doing a great deal of research work on equine osteomalacia. Through his kindness, the senior author had an opportunity to visit his well-equipped laboratory. While there, he was given a very simple instrument which we think is of practical value in the diagnosis of this disease.

The instrument consists of a pointed stylet measuring 2 mm. in diameter and 3·5 cm. in length, attached with a nut

Read in the Congress of the Philippine Veterinary Medical Association held in Manila on February 17-18-'38. Received for publication on March 26, 1938.

to a handle that is similar in appearance to an ordinary trochar, as shown in figure 1. To use this instrument, the head of the horse is held by the halter and the stylet, which is allowed to protrude 1·5 cm. from the handle, is inserted with a steady and moderate pressure into the frontal sinus. The proper point for insertion is near the middle of an imaginary line connecting the inner canthi of the eyes. A positive test is indicated by the ease with which the stylet can be inserted into the bone. In negative cases, the insertion cannot be made. Besides, the animal shows evidence of pain not found in positive case. Sometimes a negative test may be obtained on the right side of the median line but not on the left.

(1)

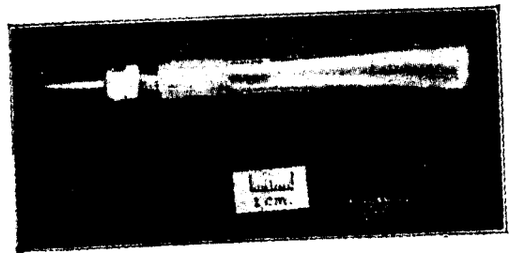

Fig. 1. Dr. Izuka's stylet ready for use.

(2)

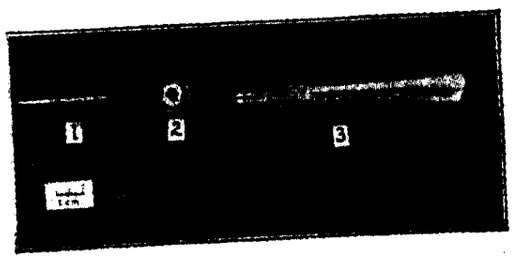

Fig. 2. Dr. Izuka's stylet showing construction.

At the time of writing, we have performed this test on a total of 112 horses; 55 males and 57 females, ranging in age from 1 year to 18 years. We now use this instrument in our college clinics as a routine method of diagnosing incipient and positive cases of osteomalacia.

As shown in table 1, of 112 horses examined, 48 positive cases were found, 22 of which showed swelling of the facial bones,

thickening of the ramus of the mandible, chronic stumbling and obscure lameness. Some animals showed but one of these symptoms, others two or more. The other positive cases showed no apparent symptoms. Of the 64 negative cases, four showed lameness, one a thickening of the ramus of the mandible and a slight swelling of the facial bones. The other negative cases showed no symptoms related to osteomalacia.

With regard to the 22 positive cases showing no apparent symptoms, we believe that they were in the initial stage of the disease, because a majority of them later developed typical symptoms of osteomalacia. On the other hand, the single case which was negative, notwithstanding the presence of swelling of the ramus and maxillary sinuses, is one in which we believe that the disease had been arrested or cured. This opinion is confirmed by osteomalacia cases that have been cured with the calcium carbonate treatment. When retested by the new method, they gave negative reactions.

Case : Female, dark bay, 6 years old, 46 inches high. Slight swelling of facial bones and slight thickening of mandible. On May 12, 1938, she gave a positive reaction. Off May 13, 1938, she was given 50 cc of polysan subcutaneously and, once daily, 1 tablespoonful of calcium carbonate with the feed. On May 17, 1938, another dose of polysan was given. On June 22, 1938, she gave a negative reaction when tested. On June 23, 1938, was placed on the pasture and the administration of calcium carbonate was stopped. On August 20, 1938, the animal was still negative. On August 21, I938, 50 cc of polysan was given intravenously.

As noted in the above protocol, we have introduced, in addition to the usual treatment, the use of polysan or colloidal magnesium hydrate. This drug is administered at the rate of 50 to 100 cc of a 1 per cent solution, either subcutaneously or intravenously, in conjunction with daily administration of 1 tablespoonful of calcium carbonate, mixed with the feed. The additional injection of polysan seems to hasten recovery, as magnesium is known to help the absorption and retention of

calcicum in the bones. Further studies on the adjuvant action of magnesium hydrate in conjunction with the administration of calcium carbonate are in progress.

Discussion

The bulging of the maxillary sinuses and the rounding of the superior border of the mandible lateral to the molar teeth are the pathognomonic symptoms upon which a conclusive diagnosis of equine osteomalacia is now made. In incipient cases showing intermittent or shifting lameness only, particularly when accompanied by exostoses or other pathological conditions, diagnosis is difficult. Kintner and Holt used X-ray examination of the metacarpal bones for this purpose and claimed that this method affords accurate means of diagnosing osteomalacia. This method, however, is expensive. The chemical examination of the blood of osteomalacia horse cannot be depended upon for a conclusive diagnosis, since the changes in the serum calcium and inorganic phosphorous are not constant throughout the course of the disease.

The simple and inexpensive test herein described and introduced by Dr. Iizuka in the diagnosis of equine osteomalacia affords us a very practical method of detecting, with a relatively high degree of accuracy, the early stages of this disease. The test is based upon the observation that the bones of the skull, particularly the frontal bones, are the parts of the skeleton that are affected first. Sumulong, after careful study of the bones of incipient, mild, moderate and severe cases of equine osteomalacia, found that rarefication of bones occurred in the following order : (1) skull (2) vertebrae and ribs, (3) flat bones of the extremities such as the scapula and os coxae and (4) long bones of the extremities.

The test, which is harmless and easily performed, can be periodically applied to all the horses in a stable in order to pick out those animals which may need calcium treatment and thus arrest further progress of the disease. It can also be used to determine whether or not a cure has been attained.

Conclusion

A simple and practical test, as an aid in the clinical diagnosis and prevention of equine osteomalacia is described.

"*Journal of American Veterinary Medical Association*,"
Vol. 46, No. 4, October, 1938.

TWIN CALVES REMOVED FROM A CASE OF DYSTOKIA

BY

RAMRAO JOTI, G. V. SC.,
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Case No. 56 dated 8-6-1939.

Subject:— Grey cow, country bred, age 8 years.

History:— The cow was reported by the owner to be evincing labour pains since morning of the 8th June 1939. This was the fourth parturition of the cow and the three previous parturitions had passed off without any difficulty.

Symptoms:— There was discharge from the vulva which was swollen and congested; temperature 103°F; the animal was restles and straining very badly.

Technique of operation:— With the usual antiseptic precautions, the lubricated hand was introduced into the uterus. The os was found fully dilated. The tail and croup of the foetus presented first with hind legs bent under the body. After some manipulation one of the hind limbs was secured, a rope was tied to it and, with a sharp push, the foetus was pushed back so as to obtain sufficient room to get at the other limb. This was also obtained and after securing both the hind limbs well with the rope and placing in position, with gentle traction the foetus was pulled out and a cow-calf delivered.

I passed my hand in to remove the placenta and to give a douche. To my great surprise I found one more foetus presenting with the hind feet. Securing the hind limbs, the second cow calf also was delivered without much difficulty.

The cow was given a warm antiseptic douche and a stimulant mixture with Ergot was drenched. The animal was properly rugged up and kept warm. 5 c.c. of camphor-in-oil was injected as the cow was much exhausted.

The animal regained its normal condition within a week's time. Both mother and the new borne calves are in good health.

TETANUS IN A BUFFALO-COW

BY

MANOHAR LAL SHARMA L.V.P. (PUNJAB).

A brown buffalo cow, aged about 10 years, was admitted in the Punjab Veterinary College Hospital, Lahore on the 11th March, 1939.

History:—She calved about 2 months back and parturition was normal. About a week back the owner noticed that she was disinclined to move and there was general stiffness. The animal was partially off-food.

Examination:—Examination revealed general tonic spasm of the body and particularly the neck and all the four legs. Ears and tail showed partial movements and were drawn up.

When disturbed, slight spasms of the abdominal and thigh muscles were observed. On tapping the chin, there was protrusion of the membrana nectitans over both eyes. Trismus was well marked. The animal could walk with difficulty due to spasm of the muscles of the legs. Respirations were accelerated and difficult. Lungs and heart could not be auscultated due to hypersensitiveness of the animal. Mild tympanitis was also present and animal was constipated. No wound over the body was found. Report of urine analysis was as follows :—

i. Colour.....yellow.
ii. Specific gravity. 1·028
iii. Albumin.....present (0·2%)
iv. Indican.....Present in excess.

The quantitative test of albumin was carried out by Esbach's method.

Blood examination showed an increase in the poly-morpho-nuclear cells which reached 90% of the total white blood cells.

Treatment :—(1) The animal was put in a dark stable with saw dust bedding.

(2) Innoculated subcutaneously with 24 c.c. of saturated solution of Magnesium Sulphate morning and evening.

(3) ℞

Ext. Cannnabis Indica.	ʒii
Ext. Belladona Sic.	ʒi
Pot. Chloras	
Ammon Chloride	āā ʒiv
Pulv. Glycerrihza	ʒi
Excepient	Q. S.

M. ft. Electury.

Sig. to be given twice a day.

(4) Luke warm water enema given.

(5) Attempts to feed the animal were not successful.

12-3-39. 9 a.m. Condition same as yesterday.

Electuary and saturated solution of Mag. Sulph. repeated. Enema given.

4 p.m. Condition worse. Tail and ears only slightly moving. Saturated solution of Mag. Sulph. injection repeated.

13-3-'39. 9 a.m. The animal is lying down in semi-conscious state.

Mag. Sulph. injection repeated.

Animal died at 2 p.m.

Post Mortem. Nothing of pathological interest found.

Discussion :—This is the first case of tetanus in a buffalo-cow seen at this College and from the study of available literature it appears that no case has so far been recorded in a buffalo-cow in India.

The seat of infection in this case could not be discovered. Probably the buffalo caught the infection at the time of parturition through the genital organs.

Translation.

"ASVAVAIDYAKAM"

BY

SRI MAHASAMANTA JAYADATTA.

Translated from the original Sanskrit with Notes and Commentaries.

BY

NRIPENDRA NATH MAJUMDAR

(*Late of Veterinary Service*).

Continued from Page 123, No 2, Vol. XVI.

CHAPTER XI

Drabyamātrājñanam — Knowledge of Articles and their doses.

Sl. 1. (Now) the articles (and their) doses are being stated according to rules for administering them to the horses, in special reference to the locality, season and strength of the Good, Medium and Inferior (animals).

Sl. 2. It has been said that eight ripe Gunjās — (ripe seeds of Abrus precatorius) make one Māṣā; sixteen māṣās make one Karṣa; and four Karṣas make one Pala.

Sl. 3. Four palas make one Kuḷaba; sixteen palas make one Prastha; sixty-four palas make one Āḷhaka.

Sl. 4. The learned in the klowledge of measurements have said that two hundred and fifty-six palas make one Droṇa.

Sl. 5. The doses given for dry substances should be doubled in case of wet[1] substances. (But)

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1. Represented in Tabular form it will be :—

			8 Guñjās or Ratis	...	1 Māṣā.	
128	Guñjās	...	16 Māṣās	...	1 Karṣa	... 1⅓ tola
512	Do.	...	4 Karṣas	...	1 Pala	... ½ powa.
2048	Do.	....	4 Palas	...	1 Kuḷaba	... ¼ seer
8192	Do.	...	4 Kuḷabas	...	1 Prastha	... 2 seers.
			4 Prasthas	...	1 Āḷhaka	... 8 Do.
			4 Āḷhakas	...	1 Drona	... 32 Do.

The above differ from the weight current in the bazars (80 tolas a seer) and also from those used by the Kavirajus (Ayurvedic physicians) which is 64 tolas a seer. One guñjā is equal to one Rati and 96 gunjas or ratis go to make one tola (Rupee weight). According to Kaviraji measures, 1 māṣā consists of 12 gunjās or ratis, whereas this Asvavaidyaka weight is 8 guñjās a māṣā, *i.e.*, 2/3rd of the Kaviraji weight. Current Bazar seer is 80 tolas, or 80 into 96=7680 guñjas or ratis. But according to this book, 1 seer is equal to 4096 guñjās or ratis, *i.e.*, 4096=96=42·2/3 tolas. By a rule of thumb method, therefore, the As'vavaidyaka seer may be taken as half of the current Bazar seer, or 2/3rd of the Kaviraji seer. The Kavirajas calculate their māṣā at 12 gunjās, so their Karṣa comes to 192 gunjās or 2 tolas and their seer, therefore, comes to 64 tolas. But the Karsa, as given in this book, is 128 gunjas only and is, therefore 128=96=1·3 tolas only.

These facts are to be borne in mind when calculating doses.

1. Wet here means substances in their fresh or crude state.

There are some substances which should always be taken fresh and they should be taken in quantities as prescribed here, and not double the doses. They are exceptions to the Rule and are as follows :—

Vasaka (Justicia adhatoda), Nimba (Neem — Melia azadirachta), Patal (Parwal — Trichosanthes dioica), Ketaki (Pandanus odoratissius), Barela (Sida cordifolia), Kusmanda (pumpkin — Beninkasa cerifera), Satamuli (Asparagus racemosus), Punarnava — (Beerhaavia diffusa), Kurchi (Kurchi — Holarrhena antidysenterica), Asvagandha (Withania somnifera), Satapuspi (Sulfa — Peucedanum graveslens), Hastikarnapalas (Butea superba — Hasti — elephant, Karna — ear, the leaves are very large and somewhat resemble the ear of an elephant, hence the name), Pita barela (Yellow barela — Sida rhombifolia), Nagabala (Sida spinosa), Jhintika (Barlara cristata), Guggulu (Balsamodendron mukul), Hingu (Asafoetida — Ferula alliacoa), Ardraka (Zingiber officianale), Gur (Molasses or treacle), Sarkara (Sugar), and Mansa (Meat or flesh). — Paribhasa.

it is to be remembered that in the case of roots[1] , they are equal.

Sl. 6. In a single day a horse should be given 4 aḷhakas[2] of good barley without husks.

Sl. 7. Feed one-fourth less according to (class) Good[3] , Medium or Inferior. (But) for well-boiled feeds one-fourth[4] less of an Aḷhaka should be given.

Sl. 8. For Sali[5] rice give half (of above doses), but the small sized animals (ponies), the Inferior animals[6] should be given half of that even.

1. The doses prescribed for roots — fresh or dry — are the same.

2. One Alhaka is 8 seers. Therefore 4 alhakas = 32 seers. Practically this is about 16 seers. This is meant for Good horses which are said to be 18 hands high. (See Chapter III. Sl. 182-194 ante). For ordinary ponies which may be classed under Inferior, the dose should be half of that of good horses. It, thefefore, comes to 8 seers. Even then, this seems to be much, but then, this is meant for one full day.

It should be remembered that for ordinary ponies, the dose should be one-fourth of what had been mentioned here. For, the Asva-vaidyaka seer is half of Bazar seer ; again, for small-sized animals— being classed as Inferior — the dose should be half of what is prescribed here.

3. The doses, as has already been stated, are for Good horses ; Medium horses should be given one-fourth less and Inferior horses *i.e.*, ponies should be given another one-fourth less. Thus it comes to half of what has been prescribed here.

4. That is — where 4 alhakas have been prescribed, three alhakas should be taken.

5. Sali includes all kinds of paddy that ripens in winter.

6. Here the Inferior class is meant. Horses have been divided into three classes — Good, Medium and Inferior. See Chap. III, Sl. 183-184.

Sl. 9. Gram, Urid[1] (Phaseolus radiatus), and the other Vrihis[2] should be given in quantities, half of that of Barley, or according to the practice or custom prevalent in the locality.

Sl. 10. For feeding with Mudga (Mug — a kind of pulse — Phaseolus mungo), give three Prasthas (6 seers) ; fats[3] — 3 Kuḷabas[4] (1½ seers) and salt — 1 Kuḷaba (½ seer).

Sl. 11. When mixed feeds are given to horses, oil and salt are to be given according to above scale, but Urid is to be given in quantity equal to that of Mudga[5] (Mug).

Sl. 12. As a drench, the expert should give Ghee [6], in one Prastha (2 seers) doses, honey — in one Kuḷaba (½ seer) doses and Phanita — equal to honey.

1. Urid is Maskalai.

2. Vrihi is that kind of paddy known as Oryza sativa, but as the word has been used in its plural form, it possibly means the Vrihi class including lentils also.

3. Fats are oils and ghees.

4. These measures are given for one full day's consumption and not for one feed only.

5. In sloka 9, it had been stated that Urid is to be given in doses half of that of barley (16 seers), while sloka 10 says that Mug is to be given — 6 seers only. These measurements are to be adopted when one kind of food only is given, but when a mixed feed (e.g., Urid, Mug, Oil, Salt &c.) is given the quantity of Urid is to be reduced to that prescribed for Mug, *i.e.* 6 seers.

6. In sloka 10 it has been stated that fats (which include ghee) should be given in 3 Kuḷaba doses, but here ghee is prescribed in one Prastha *i.e.*, 4 Kuḷaba doses. The former is the dose for mixed feeds while the latter is the dose when it is to be given as a drench only.

Sl. 13. The intelligent physician should give Sarkara (unrefined sugar) Khanda (molasses) and Matsyandika (sugar-candy) in quantities equal to that of Phanita[1] .

Sl. 14. As a Pratipana[2] — drink after feed give wine or arrack — one Prastha (2 seers), oil — ½ prastha and treacle — 8 palas (1 seer).

Sl. 15. The intelligent (should give) salt, powder or ball in one pala doses[3] (*i. e.*, ½ powa or 1 chittack of the Bazar weight). For licking, drinking or with food, ghee (should be given) in 4 pala doses.

Sl. 16. The clever physician should take 10 palas (1¼ seer) of the ingredients prescribed for a Niruha enema and an Aḷhaka (8 seers) of any decoction or infusion.

Sl. 17. Where enema or injection of milk has been prescribed, the quantity to be taken should be what has been given above; for giving enema to horses, the quantity of oleaginous substances should be 1 prastha.

Sl. 18. Massage or rubbing of oil should be continued till sweat comes out in drops; it has been said that the quantity of decoctions when to be given as a drench, should be 2 prasthas (4 seers).

1. Phanita is a kind of sugar-plum rather big in size, commonly known as Pheni batasa.
2. Pratipana — counter drench or a drink after food. The quantities prescribed here are for Good horses. For ordinary ponies, which are classed as Inferior, should be half of these. Sl. 1 to 14, the doses given are for the whole day ; from Sl. 15 onwards, the quantities are for a single dose at a time.
3. This also is meant for Good horses. Halve it for ponies.

Sl. 19. Where soup has been prescribed as a drench, (the substance to be taken) is 1 pala (½ powa) and the soup (itself) should be twice the quantity (*i. e.*, 2 palas). The wise should give juice of sugar cane in half aḷhaka doses (*i. e.*, 4 seers).

Sl. 20. Where Peya[1] is prescribed, the rice to be taken is 1 prastha (2 seers) and twice the quantity in case of Yabagu[2] . It has been stated that as as drink after food, wine should be given in 1 prastha doses[3] .

Sl. 21. For preparing rice-water [4] (where it is prescribed), take rice one prastha — (2 seers). The rice-water may also be given with the residue (left in preparing) Yabagu[5] and Manda.[6]

1. Peya is a dripk prepared by boiling rice in 14 times the quantity of water. The thing is to be given whole *i. e.*, without straining it through sieve or cloth.
2. Yabagu is also a drink prepared by boiling powdered rice or barley-meal in 6 times its quantity of water. Also to be given whole.
3. This has been said in Sl. 14, and has been repeated here possibly to emphasise that the single dose also is the same.
4. Rice-water is prepared in the following way :—Take sunned rice-coarsely powdered 2—seers. Put them in a stone pot and add four times its quantity of water, *i.e.*, 8 seers. Rub them all in the pot with the hand and take the water only. This is Tandulodaka or Ricewater.
5. Yabagu has already been explained in Sl. 20.
6. "Rice is cooked in 5 times, its quantity of water : Vilepi in four times, Manda in 14 times, and Yabagu in 6 times its quantity of water" Peya is also cooked in 14 times its quantity of water, but the difference is that Peya is given with all the residue left in the pot, while Manda is strained through a cloth and the residue is thrown away or given separately with rice-water.

Sl. 22. For preparing Suttoo[1] gruel, take 2 prasthas of suttoo. Gur (treacle or molasses) should be given in 8 pala doses and water in aḷhaka doses.

Sl. 23. Guḷodaka (sherbet or sweet drinks) for drinking, should be given in same doses as prescribed for juice of sugar cane (*i.e.*, in 4 seer doses). For drinking after food, the dose of any substance (where prescribed) to be mixed with the wine or arrack,[2] is one pala.

Sl. 24. It has been said that the dose for oleaginous substances (oils and ghees) to be administered through the nose is one Kuḷaba (½ seer). Make it one-fourth less (when it is prepared with) very hot, pungent or cathartic drugs.

Sl. 25. Where ears are to be filled with oleaginous substances, their doses should be the same as those prescribed for the nose. For purging the head,[3] (drugs) are to be given in ½ Kuḷaba doses.

Sl. 26. One pala of the medicines is to be given. Asafoetida (where prescribed, should be given) in one Masa doses. When powders are to be administered through the nose of a horse,[4] give one Karsa only.

1. Suttoo is flour or powder of barley or some other kind of pulse, first fried and then ground. Generally, barley suttoo is used. In preparing gruel, 4 seers of water for every seer of suttoo are to be taken. This may also be given with a seer of Gur added to it.
2. This dose of arrack is 2 seers. See Sl. 20.
3. Purging the head *i.e.*, to clear the sinuses of any accumulation of phlegm etc.
4. For the above purpose, viz, clearing the sinuses, the drugs to be used should be half a powa each, but if asafoetida has to be used it should be used in 1 masa *i.e.*, 8 rati doses.

Sl. 27. For fumigation, the powders should be 3 karsas (4 tolas) and ghee — 1 karsa. It has been said that where no mention of any quantity of any extract, then (it should be boiled down to) one-fourth its quantity.

Sl. 28. Where any drug is mentioned without giving any weight or measure, one pala is to be taken; where so prescribed, 8 seers of blood is to be taken.

Sl. 29 & 30. Where meat soup is prescribed for the good of horses, Jangal[1] meat *i.e.*, meat of animals coming from jungle tracts, should be taken and the expert should cook it in (16 times the quantity of) water. This is to be given in pala measures, 60 palas, 80 palas or 100 palas according to the class of horses.

Sl. 31. It has been stated that the Torpoise, otter, crocodile, iguana, frog, crab, conch, turtle and oyster etc. are aquatic animals.

Sl. 32. Gavaya[2], rhinoceros, elephant, boar, buffalo and a kind of deer known as Ruru and

1. Jangal country is that in which there are little water and grass, but abounding in heat and corn. Jangal meat has been described in Ayurveda to be of 8 kinds :— (1) Janghal — animals that march quickly, deer &c. (2) Vilastha or Vilesaya — those living in a hole or burrowing into the ground like hare &c. (3) Guhasaya — those living in caves or cavern (4) Parnamrga — those living on branches of trees like monkeys, squirrels &c. (5) Viskir — fowls that scatter their food with their claws before eating. (6) Pratuda — game birds that pick up their food with their beaks or kill their prey with their beaks. (7) Prasaha — birds or beast of prey. (8) Gramya — literarally means, derived from a village (Gram — a village) hence domesticated. The actions produced in animal body after eating the different kinds of meat are also different as mentioned in Ayurveda.

Gavaya is an animal like the ox, but without dewlap. Bos Gavaeus.

other animals that live in an Anupa tract, are called Anupah.

Sl. 33. The black antelope, hare or rabbit, tiger, lion, hyaena, sambar deer, (elk) antelope, the white footed antelope, ox, camel, goat, Avika[1] sheep and wild goats;

Sl. 34. All these and others that live on land, have been classed as Jangala animals. Of these, the meat of hare or rabbit is the most easily digestible and that of the Avika sheep is the most difficult to digest.

Sl. 35. It has been said that low lying tracts abounding in water and where the Jamun tree, the cane plants, the Hintal[2], The marshy date tree, the banana tree, the Nala reeds[3] and the bambooo grow are called Anupa tracts.

(To be continued).

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1. Avika sheep are those from whose hairs blankets are made.— Commonly known as Ram-bhera.
2. Hintal — Phoenix paludosa.
3. Nala reeds — Arundo karka.

Notes.

We draw the attention of our readers to an interesting article on "Artificial Insemination" published in this issue of the *journal*. The extensive successful adoption of this method of inducing conception in animals in foreign countries should be a sufficient inducement to the Veterinary Profession to give it a trial in this country. There are of course various practical difficulties in this country which are not felt quite so much in other countries: the chief one of them, being the small size of the holdings where the number of cows maintained is limited to 2 or 3. As the cows are necessarily to be on heat at the time of Artificial insemination, the question of the storage of the semen for long periods, over long distances, without any loss of potency, should be deeply considered. We would be very glad to publish from time to time the views and experiences of the members of the Profession on this subject as collected in the different parts of this wide continent.

* * * * *

Two articles on the subject of diagnosing cases of Equine Osteoporosis in its early stages are published in this issue. The diagnosis is based on a simple test carried out in a very easy way and without any elaborate preparation. It should be quite an easy matter hereafter to detect this fairly common disease of equines long before clinical lesions appear.

One of these two articles contains an interesting account of cases Osteoporosis successfully treated with Calcium Carbonate and polysan or colloidal Magnesium Hydrate and we would like this treatment to be given a fair trial by the profession and the results recorded in the pages of this *journal* from time to time.

* * * * *

We learn that an appeal has been issued to the Veterinarians in Bombay Presidency for the raising of a memorial fund for the late Khan Sahib Ahmed Ismail Shaikh, G.B.V.C., Retired Professor of the Bombay Veterinary College and on the day of

the condolence meeting, over Rs. 250/- was subscribed on the spot. We hope that every Veterinarian will contribute liberally and make it possible for the Memorial Committee to commemorate the memory of the departed professor in fitting way.

* * * *

We learn that the Bai Sakarbai Dinshaw Petit Hospital for Animals attached to the Bombay Veterinary College has now employed from October 18, 1939, an experienced female nurse (full time) to look after and nurse the in-patients (only for dogs) the first of its kind in India. This premier City has a large clientale of canine fanciers and as such this is in the right direction. The daily average in-patients of dogs are at least forty.

* * * *

Animal Husbandry Training

The following communique has been issued :—

A post-graduate training course in Animal Husbandry and Dairying was instituted at the Imperial Dairy Institute, Bangalore, in 1923, in order to enable selected candidates to qualify for higher appointments in that special branch of agricultural science in India. The question of according formal recognition to that course has been considered and the Government of India have decided that those who have in the past satisfactorily completed the course or who may do so in future should be designated as Associates of the Imperial Dairy Institute. This title will be denoted by the Abbreviation 'Association I.D.I.' which the successful post-graduate students will be entitled to affix to their names.

Hindu, October, 13, 1939.

* * * *

Dairy Utensils and Germs—Best Method of Cleaning—Investigations at Dairy Institute

Investigations have lately been made at the Imperial Dairy Institute, Bangalore, to find out the comparative efficiency and utility of the various methods ordinarily followed in India for cleansing dairy utensils. The importance of investigations lies in the fact that one of the biggest problems of dairymen to-day

is that of cleaning their utensils and making them sterile soon after use at the lowest possible cost. Cans, if not thoroughly cleaned, add thousands of germs to milk.

In the West and even in India the practice with dairies run on more or less up-to-date lines is, after preliminary scrubbing and cleaning to sterilise the utensils by steam, boiling water or dry heat. Where these facilities are not available, chemical sterilisation with what is known as "washing powder" is adopted.

Rural Methods.

In rural India, the use of steam, artificial dry heat, chemical sterilisers or washing powders for cleansing milk utensils is practically unknown, nor can it be afforded by small producers. The common practice is to scour the utensils with wood ash and fine mud and after the final wash to expose them to strong sun. In the absence of sunlight the utensils are kept inverted on an open fire or smoked a little before use.

This practice which has come down from time immemorial is not without technical significance. The abrasive and chemical action of mud and ash and the lethal action of sunlight and heat render the utensils clean and sterile. But owing to its apparent primitiveness a casual observer wonders whether the method is effective.

The efficiency of a cleansing agent is judged by the extent to which it reduces the number of bacteria. As brass utensils are commonly used in rural areas and tinned steel utensils in dairies, these two were selected for experiments.

Utensils were scoured with the respective cleansing agents with sterilised coconut coir, and rinsed out with water. They were then placed on a drying rack in an inverted position and dried in sun for half an hour.

Most Effective Agent.

The most effective cleansing agent for reducing the number of bacteria and destroying coliform bacteria was found to be soda ash. Wood ash came next followed by mud.

Another point of interest was the noticeable difference between bacterial contents of the control utensils made of brass or tinned steel. The brass utensils showed 12,450 and the tinned steel 33,780 organisms per ml. A possible explanation is that either the surface of brass utensils when exposed to the sun had a more destructive effect than the dull tinned steel surface or that the brass metal exercised a mildly toxic effect on the organisms.

The high bacterial contents in the control samples suggest that mere washing of milk utensils by water alone is of little value. If it is desired to lengthen the life of the initial milk contents, further cleansing of utensils is needed besides washing.

Wood ash is a cheap and useful cleanser and nearly approaches soda ash in efficiency. As it carries the oxide, hydroxide and carbonate forms of calcium and also much potassium carbonate and a little phosphoric acid, its components along with the securing properties of other constituents evidently help its cleansing efficiency.

Indian Express 27-9-29.

* * * *

Indian Drugs for Cattle.

Research Schemes.

The Imperial Council of Agricultural Research has sanctioned three schemes, at a cost of over a lakh of rupees, for research in Indian drugs to be used in the treatment of cattle. The schemes will cover investigations into the cultivation of medicinal plants, the efficacy of indigenous drugs and the indigenous treatment of cattle.

Lt.-Col. R. N. Chopra of the School of Tropical Medicie,n Calcutta, has been granted Rs. 62,860 for a five years' scheme. The researches under this scheme cover the survey of medicinal plants which can be grown in India, chemical analysis of their pharmacological and therapeutic action and an investigation of food poisons, particularly in cereals. The work would be carried

on in close co-operation with the Agricultural, Forest, Medical and Veterinary Departments.

The second scheme which will be a study of poisonous plants and of their doses required in veterinary practice, will be controlled by the Surgeon-General of Madras. This will be a three years' scheme and will cost Rs. 39,000. The object of the scheme is to examine how far indigenous drugs can take the place of the imported ones.

The third scheme was sponsored by the Premier of Orissa at a meeting of the Governing Body of the Imperial Council of Agricultural Research. It is for the collection of literature about cattle treatment by indigenous drugs. It has been sanctioned initially for a period of six months at a cost of Rs. 4,500. Information from manuscripts and other sources is being collected and collated. Studies are being made of the treatment in selected areas in Orissa and Travancore.

College News

PUNJAB VETERINARY COLLEGE

List of students who passed the L.V.P. Course from the Punjab Veterinary College, Lahore, in June 1939.

1. Mohindar Singh
2. Hira Lall
3. Madan Lal Kalia
4. W. G. Harding
5. Prem Raj
6. Mohd. Sarwar
7. Fazalud Din
8. Mahohar Lal Sharma
9. Kidar Nath
10. Nagina Singh
11. Vidya Sagar
12. Sukhbir Singh
13. Hari Mohan Bhatia
14. Ghulam Mohd.
15. Mukhtar Ahmad
16. Jagdish Chandar
17. Abdul Qadir Khan
18. Devi Dayal
19. Vir Singh
20. Mohd. Sadig
21. Dhanna Singh
22. Bashir Mahomed
23. Abdul Shafiq
24. Indar Singh
25. Brahm Dutt
26. Gurdip Singh

Extracts.

CAROTENE (OR VITAMIN-A) DEFICIENCY AND SOME COMMON UNSOUNDNESS IN HORSES

Edwards, J. T. (*J. Roy Army Veterinary, Cor.*, 9, 1, 1 and *ibid.* 9,2, 60).

This article which is well illustrated, contains an excellent review of the literature on vitamin A deficiencies in animals and the possible relationship of this deficiency and some of the common unsoundnesses, *e.g.*, shivering, stringhalt, partial paraplegia, roaring, impaired vision and sterility in horses, as suggested by Mitchell, has been stressed.

The tissue changes in animals suffering from carotene deficiency are caused by a degeneration in the body cells generally, characterised by keratinization of the epithelium, demyelinization in the nervous tissue, and probably loss in function of cells in other organs such as the liver, spleen and kidney. In the various species the changes are exhibited clinically by manifestations that are differently localized. Thus, for example, in the less severe forms, in the pig and the dog, the most prominent symptoms are ordinarily those of nervous incoordination, in the sheep those of urinary calculi; in the

fowl and ox those of xerophthalmia. But in severe cases all symptoms may appear. Sterility is a very common sequel even in mild cases. Symptoms related to changes in the respiratory and alimentary tract are common. All the changes seen in other animals in vitamin-A deficiency arise in fowls almost simultaneously and are described under nutritional roup in fowls. The occurrence of pasty eyes in ducklings illustrates rather typically some of the effects produced upon the offspring when the diet of the mother has been deficient, in vitamin A. It is likely that some of the defects which in ignorance are spoken of as constitutional are probably as much due to the effects of prenatal nutrition as to true heredity, *e.g.*, deficient growth of embryonic intestinal tissue in the developing chick in the absence of vitamin B1, in the mother and the defective development of embryonic nerve tissue as a result of maternal deficiency of vitamin A. There is the well-known cumulative effect of malnutrition, the effects of which in experimental animals have been found to extend to at least three or four generations.

Hemeralopia or night blindness, which is an inability to see in dim light, is a common early symptom of vitamin-A deficiency in some species, such as human beings, cows and sheep. Its prevalence during the war among army horses, and camels in Persia and rarely mules has been described. It was believed that it was caused through exhaustion of the sensibility of the retina by the glare of the sun. Recent studies have shown that in the absence of vitamin-A, the retina is unable to synthesize a substance called visual purple (*rhodopsin*) which is bleached by strong light and the absence of which causes this condition. Some cases of night blindness may probably be coupled with a slight degree of optic nerve degeneration in adult cows, a condition from which the animals recover completely after ingestion of adequate vitamin A. In the congenitally blind calves, however, the degeneration of the optic nerve would have progressed to a stage beyond repair. In such cases the pupils become widely dilated and a rather characteristic greenish, instead of the normal yellowish colour, is thrown from the retina on looking through the cornea with the animal facing the light or better with the help of an ophthalmoscope. Clouding of the cornea appeared in the later stages of the deficiency.

Experiments were carried out upon horses in the Finnish Army which had shown rather wide-spread and typical malformations of the hoof wall that were suspected to be of dietary origin. No greens were supplied to these horses and no vitamin-A could be found in the samples of hay that was fed to them. A marked improvement, in decreasing order of effectiveness, was brought about by supplementary grazing, A. I, V. silage (acidity below *p*H4), and cod-liver oil and a vigorous growth of healthy horn started from the coronary band.

With the exception of yellow maize, cereals are deficient in carotene or vitamin-A. Certain cereals, such as oats, were particularly liable to 'sop up' vitamin-A in the body and cause symptoms to appear. These symptoms were intensified by the addition of ergot to the cereal diet but could be prevented by including in it adequate carotene or vitamin-A. On extending this work to lathyrism in dogs it was observed that the neurotoxin of Akta became effective in the absence of vitamin-A and carotene. Symptoms of poisoning caused by cotton seed meal and certain other similar meals — convulsions, stiffness and blindness — in cows could be prevented by including in the ration sources of adequate vitamin-A.

Failture of reproduction has been reported as a common symptom of vitamin-A deficiency and it has been observed in range cattle even in the milder forms of this deficiency. In the female there is complete failure or delayed occurrence of oestrus, keratinization of the vaginal epithelium and if conception takes place, depending upon the degree to which the uterine epithelium undergoes changes, there is either death of the foetus and resorption, or abortion or prolonged gestation and difficult partutition. Likewise, marked degenerative changes take place in the seminiferous tissue of the testes in the male and these changes take place earlier than in the case of vitamin-E deficiency. It has been observed in Germany that in cattle there was a close relationship between the breeding ratio and the number of days annually spent grazing. It has long been the experience of trainers and breeders that the chances of mares holding to service are increased if service is delayed until there is grazing available.

The deficiency of vitamin-A (anti-infective) lowers individual resistance to bacterial infections, *e. g.*, brucellosis in cattle, and helminthic infestations of the respiratory and intestinal tracts and other parts of the body *e. g.*, Strongylosis in horses. It may be due to the histological changes with the resulting loss of function in the cells of epithelial surfaces through which the bacteria or in proximity to which the worms reside. Probably the cells of the internal organs — liver, kidney and spleen — are also damaged so that they are unable to suppress the secondary bacteraemia which occurs after invasion.

It has been observed in French Indo-China that, when the ration of horses and mules was changed from normal to one that was deficient in vitamin-A, they lost condition very severely until they suffered from extreme emaciation. A number of these animals developed eye trouble. Substances rich in vitamin-A or its precursor produced a marked and lasting curative effect very quickly but treatment with arsenical preparations produced only a temporary improvement. Cabbage pulp, sterilized cod-liver oil and egg-yolk were tried and the last named substance in 10 c. c. doses injected subcutaneously once daily was found to be the most satisfactory.

A herbivorous animal under natural conditions should carry a reserve in the liver of not less than 1,000 " blue units " or " Moore's units " per grm. In seventy-eight horses examined it was found that the livers of 37 per cent contained less than 100 B.U, per grm.—in some cases merely a trace ; 13 per cent less than 200 ; 28 per cent less than 500, while only 6 per cent contained 1,000 or more. Furthermore the nerve lesions described are somewhat similar to those described in dogs and rabbits fed on a known vitamin-A deficient diet, *i.e.*, myeline degeneration followed by sclerotic changes in the nervous system especially the afferent (sensory) side. These changes in the peripheral nerves were found to occur in patches, the fibres above and below these patches appearing normal. Young animals, particularly showed a wider distribution of these changes in the body. In detailed *post mortem* examination of horses suffering from shivering, partial paraplegia and various other localized conditions, the pathological findings were the same — widespread bone and joint lesions and disseminated local degeneration of peripheral nerves.

In view of the high proportion of very low reserves of vitamin-A which may be completely depleted during pregnancy or lactation or infectious

diseases like influenza and strangles, the very low carotene content of the usual rations fed to horses, *e.g.*, oats, bran and hay, especially if the hay has been badly cured, and the similarity of nerve lesions and clinical symptoms to those produced by vitamin-A deficient diet in pigs and other animals, *e.g.*, impaired vision, extreme neuro-muscular incoordination, spasms (stringhalt action), partial paraplegia, irregularity in the oestrus cycle, abortions, etc., the hypothesis that vitamin-A deficiency is the cause of some of the common unsoundnesses, collectively termed as "Rheumatic disease", in horses is entirely tenable. Symptoms of shivering could be concealed and the horse enabled to pass a veterinary examination if it was placed in a loose-box or a paddock for three weeks or a month and fed well.

The vitamin-A requirement of animals is related to body weight rather than to energy requirement but the requirement of birds is considerably higher than that of mammals. The daily ration of a horse of 1,000 lb. average weight, ought to contain well above 15 mg. of carotene. An adequate supply would be obtained by grazing 10 to 16 ounces of pasture grass daily. The vitamin-A potency of hay is associated with the degree of green colour (chlorophyll). By means of rapid artificial drying in the dark the potency of the fresh grass remained almost unchanged, but on the contrary if exposed to sun and rain for about a week the loss reached 96 per cent. (R.L.K.)

Ind. J. Vet. Sci. and Ani. Husb. December, 1938.

THE PRESENT POSITION OF HEMP-DRUG ADDICTION IN INDIA

BY

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AND

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(*Drug Addiction Inquiry. Indian Research Fund Association.*)

Summary and Conclusions

1. The resin obtained from *Cannabis sativa* being an insoluble organic compound its pharmacological action is difficult to test.

2. One of the most striking features about the action of Indian hemp is the extreme variability of results obtained. Equal quantities of the same preparation administered to two similar animals of the same weight and under almost identical conditions may produce depression in one case and stimulation in the other. The effects also vary considerably in different species of animals,

3. It is difficult to say whether the repeated use of the drug leads to true addiction and increased irritability and development of abstinence symptoms following the cessation of the use of the drug, in the same way as in case of opium and morphine. The experiments in laboratory animals so far appears to show that the irritability of albino rats as recorded by their struggle response to a uniformly uncomfortable situation is increased after an abstinence of 24 hours.

4. The effects of *Cannabis sativa* on the central nervous system can be divided into three stages, firstly, the stage of primary stimulation and excitement, secondly the stage of general depression and anaesthesia, and thirdly the stage of secondary stimulation or excitement, observed only in case of toxic doses or in animals showing marked idiosyncrasy towards the drugs.

5. The drug as a hypnotic is not reliable and is inferior to many others in use now. It tends towards listlessness, lack of concentration of thoughts and ideas, and sometimes may give rise to amnesia. The drug does not stimulate higher faculties nor does it paralyse them. On account of its marked effect upon the imaginative faculties, the drug may be of some interest to psychologists and phycho-analysts. The mental effects are not marked in the lower animals in whom the faculties are neither stimulated nor dulled or paralysed as in case of higher mammals and man.

6. It is difficult to say whether the drug has any direct effect on the heart and circulation. The respiration is slowed during early stages and quickened and deeper during the later stages.

7. The physiological activity of the hemp plant varies with the locality in which it is grown. It has been suggested that the ganja from Bombay and the Central Provinces is definitely inferior to that from Bengal. An attempt was also made to standardize different British Pharmacopœial preparations of *Cannabis sativa*. It was found that the dried extracts freshly prepared were physiologically active in doses of 153 mg. per kilo body-weight by the subcutaneous route, and in 80 mg. per kilo body-weight through the intraperitoneal route, in cats. Fresh specimens of fluid extract made from the plant grown in Bengal produced incoordination of movements in cats in doses of 0.5 minim per kilo body-weight. In cases of the tincture made from the same extract it required as much as 6 minims per kilo body-weight to produce similar effects.

8. The minimum fatal dose by the mouth of charas, ganja and bhang works out to be 2,000 mg., 8,000 mg., and 10,000 mg. per kilo body-weight, respectively.

9. *Cannabis sativa* has marked diuretic action which lasts for 12 to 14 hours.

"*Indian Medical Research Memoirs*", *Memoir No. 13 July, 1939.*

DISSEMINATION OF ANTHRAX INFECTION THROUGH DIRTY STAGNANT POOLS*

BY

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ANTHRAX is a disease of great economic importance as it is enzootic in various parts of India and is responsible, during certain seasons, for heavy losses chiefly among horses, cattle, sheep and goats. It is also of importance in comparative medicine as it is transmissible to human beings through handling of infected materials.

A study into the prevalence of this disease during the last thirty years in the Bombay Province reveals that it is enzootically prevalent in almost all districts of the Province and that there was a sharp rise and fall in the mortality curve during certain years, the cause of which is still unknown. It is prevalent throughout the year causing heavy mortality from April to September and in the month of December. In this connection, it would be interesting to note that as an infection in the soil it is quite natural for Anthrax to break out in an epizootic form during the grazing season which, in most of the districts, begins from the latter half of June. The source of infection during the months of April and May, when practically no grazing is available, has, however, remained a mystery. It is not uncommon to find stall-fed draught animals also succumbing to Anthrax during the summer season and here again the source of infection was unknown.

During the summer season of 1936 when green grazing was not available, a number of outbreaks of an undiagnosed disease was reported from the Ratnagiri district. Investigation which was carried out at the actual scene of these outbreaks revealed that the disease was Anthrax. The writer also detected a bullock which in spite of being daily yoked to cart and fed on dry foodsteps had fallen a victim to this disease. A careful search for the source of infection was, thereupon, made with the results that stagnant pools formed in the beds of nullahs and rivulets appeared to be the only probable source as there was clear history that animals which had died of Anthrax were daily driven to such pools for watering purposes. An examination of these stagnant pools showed a thin layer of shiny brittle scum floating on the surface and dirty brownish water containing putrefying vegetable matter. Samples of water were collected from two pools, one at Lanja and another at Wilavade, and 5 c. c. of each sample were injected into a guinea-pig. The guinea-pig injected with the water sample of Lanja died within three days and its heart blood gave rise to a pure culture of *B. anthracis* on agar medium.

*Paper read at the 24th Session of the Indian Science Congress, held at Hyderabad (Deccan), 1937.

This, it would appear, is a very important finding in the epizootiology of Anthrax, in as much as water from stagnant pools has been proved to be the source of natural infection of the disease perhaps for the first time in India and that it will now be possible to check the occurrence of the disease especially during summer by adopting suitable preventive measures.

This work has been carried out under the auspices of the Imperial Council of Agricultural Research, New Delhi. The writer desires to express his gratefulness to Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Province, Poona, under whose guidance this work has been carried out. Thanks are also due to the Director, Imperial Veterinary Research Institute, Mukteswar for the confirmation of the strain of *B. anthracis* isolated by the writer from the stagnant pool.

Ind. J. Vet. Sci. & Anim. Husb. September, 1938.

Review

Hobday's Surgical Diseases of the Dog and Cat. Fourth Edition by JAMES McCUNN, M.R.C.V.S., M.R.C.S., L.R.C.P. (Professor of Veterinary Anatomy, Royal Veterinary College, London). Pp. vii 398. 311 illustrations. Price 21 s. net. Postage 1 s. London: Bailliere, Tindall & Cox.

In these days when Veterinary Practitioners are interesting themselves more and more in the treatment of small animals, this revised edition of the popular hand book of the late Professor Hobday will be a welcome one. Many of the chapters have been rewritten and brought up to date while the chapter on Radium in Veterinary practice is a very useful and instructive one. The re-editing has been ably done by Professor McCunn whose sketches are very delightful and illuminating. This is a book which should find a place on the table of every Veterinary Practitioner and student alike.

Obituary

We regret, we have to record the demise of Khan Saheb Ahmed Ismail Shaikh, G.B.V.C., retired professor, Bombay Veterinary College on 20th September, 1939. He leaves behind him his widowed wife, three sons and two daughters. We tender our heartfelt condolences to the members of the bereaved family.

The Late KHAN SAHEB AHMED ISMAIL SHEIK, G.B.V.C.,
Retired Professor, Bombay Veterinary College

AN APPRECIATION

(CONTRIBUTED)

The tall impressive figure, in Faiz cap, of Khan Saheb Ahmed Ismail Shaikh, mostly seen in the class rooms and Dog wards, walking shoulder to shoulder during the last Great War with his superiors, cannot be forgotten even today, by those who have had the luck to be with him, either as a student or colleague, at the Bombay Veterinary College. It was little thought that it would fall on our shoulders to pen the life history of this illustrious professor, so soon.

Born on 1st of June, 1877 and graduating from the Bombay Veterinary College in 1896, he entered Government service as Veterinary Inspector in the Glanders & Farcy Department on 5th June of the same year. His amiable character and intelligent interest in his duties quickly elevated him to the post of Inspector of the vernacular class at the Bombay Veterinary College. His profeciency in teaching, further elevated him to the posts of Assistant Professor and then first Assistant Professor, which post he held till the time of his retirement, on 31st July 1930.

Anatomy and Physiology were the subjects that he taught for several years and all those who had the luck to learn these subjects under him can boast of having learnt them under a genius.

The Bombay fanciers of Canine race and his disciples who learnt under him will never forget the late Khan Saheb Shaikh as the only man of his days who was worth the name of Canine Surgeon.

Mr. Ahmed Ismail Shaikh was awarded the honour of Khan Saheb for the invaluable services he rendered to the Military Veterinary Department during the last Great War, particularly to the Cavalry and Artillary horses stationed at the Varsova, Parel Government House, Santa Cruz and at other camps.

Above all, Khan Saheb's hospitality cannot be forgotten by all those who came in contact with him while at his house or in his chambers at the college.

Though he has departed from this mortal world on the 20th September 1939, his name and memory will be written in letters of Gold in the heart of everyone of his friends and students. His sad demise is a great loss to the Veterinary Profession in India. May his soul rest in peace.

He leaves behind him a widow, 3 sons and 2 daughters.