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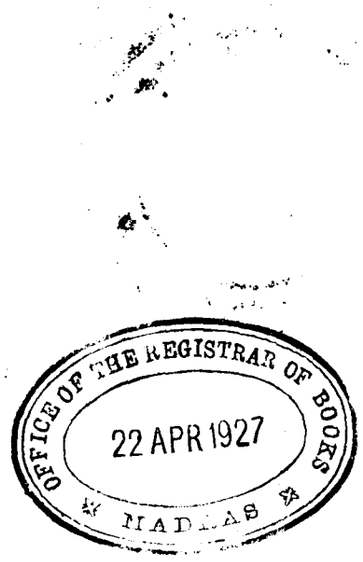

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NOTICE

The Indian Veterinary Journal.

A quarterly record of Veterinary Medicine and Surgery devoted to the cause of the Veterinary Profession.

PUBLISHED FOR THE ALL-INDIA VETERINARY ASSOCIATION.

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2. All Editorial communications, reports and books for review and exchange, should be addressed to the Editor.

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4. Members who do not receive the journal regularly or who find it wrongly addressed are requested to communicate correct address to the Editor at once.

The Indian Veterinary Journal

(The Journal of the All-India Veterinary Association.)

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G. T. D'Silva Esq., G. B. V. C.
Asst. Principal, Madras Veterinary College.

THE

Indian Veterinary Journal

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BIOGRAPHY.

MR. G. E. D'SILVA AND THE MADRAS VETERINARY COLLEGE.

"A larger and more distinguished gathering than is usually met with at the annual athletic and social events in the Madras Veterinary College attended the celebrations that took place in this successful and deservedly popular institution on Friday." Such was the description by the 'Madras Mail' of the great gathering of ladies and gentlemen who assembled at the Madras Veterinary College on 25-2-27, as a mark of their esteem and love towards its Assistant Principal, Mr. G. E. D'Silva whose portrait was unveiled on that date as he intends retiring before the end of this year.

We admit to a sense of filial tenderness, for it is nothing less, as we sit down to chronicle the life sketch of this great teacher of the Madras Veterinary College. Having been a student of Mr. D'Silva for full three years and known him rather closely for nearly a decade and a half now, the writer of this article feels embarrassed at the thought of bidding farewell to such a "friend, philosopher, and guide" of the Veterinary profession in Madras. We know we are not alone in this pang of separation from our *guru*; the whole Madras C. V. D., is behind us. We owe it to our readers and to ourselves to record here of what we know of Mr. G. E. D'Silva.

Born on the 19th June, 1874, at Buxar in Bengal, Mr. D'Silva came out of a good Anglo-Indian family and was educated at Wood's Academy Mussorie, Bishop Cotton School, Simla, and Boys' Diocisan School, Nainital. Previous to joining the Bombay Veterinary College he underwent a course of practical training at Babugarh, in the Stallion Depot of the C.V.D. United Provinces. Later he joined the Bombay Veterinary College and graduated from it in 1895, in first class and heading the list of 'passes' of that year. He set up private practice at Meerut in 1896 and a year later was appointed as the Senior Lecturer of the Bengal Veterinary College, which office he could not hold long due to ill-health and had to resign. Early in 1900, he was appointed as the Veterinary Overseer of the Stallion Depot of the C.V.D. United Provinces at Babugarh. In the beginning of 1903, his services in the same capacity were transferred to the Army Remount Depot; but in December of the same year he was appointed as the Assistant Principal of the Madras Veterinary College, a post which he holds even to this day. In 1921, Mr. D'Silva went to England on study leave and underwent a post-graduate course of studies at the Royal (Dick) Veterinary College, Edinburgh. In 1922, he was raised to the Indian Veterinary Service as acting Professor of Surgery, to the supreme joy and satisfaction of the rank and file of the profession. But it was short-lived as the acting period lasted only for a year.

It is on this point the profession even to-day remains dissatisfied. Mr. D'Silva's capabilities and record of services are such that he would have enhanced the reputation of the Indian Veterinary Service if he was a permanent member thereof. But it was not to be. We do not know if it was due to that absurd rule that a man must have 10 years of service before him to be raised to the Imperial cadre or for some other reason best known to the powers-that-be, that Mr. D'Silva retires to-day in

the same office as he first set his foot in Madras. We cannot congratulate the Government of Madras on such a glaring piece of injustice to a man who has given his all to the Veterinary profession in Madras. If there was one man all these 24 years who laboured hard to build up the reputation of the Veterinary Profession in Madras, if there was one man who was sought after eagerly by the large clientele of the Madras Veterinary College, if there was one man to whom the profession looked up with confidence for help and guidance, it was Mr. D'Silva. Yet such a man is not to prosper in the world as he ought to. Such is the world. It is no wonder then that Mr. D. A. D. Aitchison, Veterinary Adviser to the Government of Madras should have made such a feeling reference to Mr. D'Silva in unveiling his portrait. We publish that excellent speech in full in the following pages.

Not only Mr. D'Silva but the family from which he hails had a long and honourable connection with the Veterinary Department. To trace it we must go back to the days when the Veterinary Department was known as the Stud Department, when his grandfather was employed in it at Buxar. Later when it was known as the department of Horse breeding operations in India, Mr. D'Silva's father began his career in it and retired as the personal assistant to the Inspector General of the Civil Veterinary Department, liked by all who knew him.

Coming out of such a parentage, Mr. G. E. D'Silva was in every way a 'chip of the old block' and he took to his profession like fish to water. It did not take him long to establish a name as an efficient and successful Veterinary Doctor in Madras, a reputation which he fortunately enjoys even to this day. As a teacher he was all that could be desired, instructive and illuminating, kind and yet firm. In 1922 the profession did him the honour of requesting him to preside over the Second Veterinary Graduates' Conference held at Vellore, when he gave

utterance to a thoughtful address. We refrain from adding anything more, as the speech of Mr. D.A.D. Aitchison deals with every other aspect of Mr. D'Silva's life.

We are glad Mr. D'Silva's photo will adorn the central hall of the Madras Veterinary College to serve as a source of inspiration for high professional merit and lovable nature to generations yet unborn. That it will be looked upon with much reverence by all his students is indisputable. The little souvenir of a gold cigarette case presented to him on the occasion carries with it the good wishes of the entire profession for a happy and contented retired life to Mr. D'Silva. May God be with him!

It is a happy idea which Mr. F. Ware, the Principal Madras Veterinary College, conceived in clubbing this function with the 'College-day' celebrations of this year. Mrs. Ware deserves the heart-felt thanks of the profession for the excellent 'social' got up by her and the manner in which she managed the unusually large number of visitors this year. We congratulate all concerned on the success of the entire function.

In unveiling the portrait of Mr. G.E.D'Silva, Mr. D.A.D. Aitchison, Veterinary Adviser to the Government of Madras, made the following speech:—

Ladies and Gentlemen,

The members of this Committee have done me the honour of asking me to unveil the portrait of Mr. D'Silva and I would like to express to you in the first place the very real pleasure my part in this ceremony affords me.

It is difficult for me to realise that more than two decades have passed since I first set foot in this College. To some, that may seem a long while ago, but it falls short of the time during which Mr. D'Silva has given of his best to the College. (Cheers)

Also, it is interesting to me to remember that Mr. D'Silva was the first representative of the Veterinary profession whom I met on my arrival in India. In those

days, he was, as he is now, Assistant Principal but without gazetted rank, and it is a pleasure to me to be able to state that he has since then risen to be the senior gazetted officer in the Madras Veterinary Service. At the time of my arrival Col. Gunn was Principal and Superintendent of the Civil Veterinary Department and I recollect that he was absent from Madras on tour and that it was with Mr. D'Silva I first visited this College, which, later I was to hold the principalship of for nearly 17 years. I think you will agree with me that such a period of time is sufficiently long for me to know something of Mr. D'Silva's many qualities. Personally I have frequently thought that the College was fortunate in its Assistant Principal, and that equally fortunate have been the many patients which have gone through this hospital in having a man of Mr. D'Silva's ability and experience on the spot to attend to them in their hours of serious illness. (Cheers.) As a teacher, Mr. D'Silva is specially gifted, being endowed with great patience, as well as with the ability of imparting to others knowledge possessed by himself. To gain the confidence of his students has seemed always easy to him, and popular to an unusual degree he has won the esteem equally of staff and students alike.

It may surprise many people to know that the Madras Veterinary College may be considered to be practically self-made. Mr. D'Silva is the sole survivor of the staff as originally constituted. Of the present staff the three Lecturers, the two Assistant Lecturers, the two Laboratory Assistants and the House Surgeon are graduates of the College and all of them have been students of Mr. D'Silva, and I may also state, and I hope with as much pleasure to Mr. D'Silva as to myself, that a member of the Imperial Staff was also a student of his. When one remembers that of the 211 Veterinary Assistant Surgeons who compose the Madras Veterinary Department, all but about five of them are graduates of this College, one gets some appreciation of the good work which Mr. D'Silva must

have accomplished, work which is daily of considerable service to the ryots and cattle owners of this Presidency.

There are no doubt many present who would be interested to know more about Mr. D'Silva. Well, in his case he does not 'hail' from the North of the Tweed, but from Northern India. It was there where he gained his first insight into Veterinary work, and gained much of it in the good school of "practical experience." He was first sent to the Civil Veterinary Department, Horse breeding depot at Babugarh for training for one year before entering the Bombay Veterinary College from which he graduated in 1895. For 2 years after that he gained further experience in private practice in Meerut, which place even until to-day is an important horse centre. In 1897 he was appointed Senior Lecturer in what was then the Bengal Veterinary Institute where a two years' instructional course was given. This institute has long since risen to the dignity of a College. In 1900 he was made Veterinary Overseer in the Civil Veterinary Department, United Provinces, Horse breeding depot, and from there he was transferred to the Army Remount Depot in the same capacity. In 1903, he was appointed Assistant Principal in this College. At that time this handsome building was non-existent and the College classes were held in Dobbin Hall which now forms the central portion of the students' hostel.

Mr. D'Silva therefore brought with him a store of good practical experience which as you will have gathered already, has rendered much service to the students of this College as well as to the patients of this hospital. (Cheers.)

I am afraid that the unveiling of this portrait proclaims the approach of the separation of the subject of the portrait from the work of the College, at least, it heralds that the end of his association with it is near, for Mr. D'Silva will be going on long leave towards the end of this year preparatory to retirement. I am certain that "the parting

of the ways" from the College, he has served so long will not be without many regrets on the part of himself as well as of the whole staff, and I may say on the part of the whole of the Madras Veterinary Service and Department. If being able to see the fruit of one's work in this life, be a reward for one's labours, then, Mr. D'Silva's labours have brought him a full measure of reward. (Loud applause). I am sure I am expressing the hope of everyone here and of the whole of the department, that he will be spared to enjoy an extended and happy retirement, contented with a life's work well performed. (Loud and prolonged cheers.)

Mr. D'Silva who was apparently moved replied suitably.

EDITORIAL

THE DUTY OF VETERINARY ADVISERS.

From the title of this article it should not be presumed that we assume the role of High Gods of Officialdom and issue a fiat on the several duties of Veterinary Advisers to various provincial governments. It is our desire to merely invite the attention of Veterinary Advisers to the many problems that face the profession to-day and how far the profession expects them to help in solving those problems.

First and foremost comes the Veterinary Education. Any course of studies less than four years in duration is bound to be despised by all interested in the advancement of science. A higher standard of curriculum extending over full four years is an absolute necessity which should not be put off any longer. Further there is an intense desire on the part of the members of the profession so eloquently manifested at all conferences of the profession, for an advanced course of studies. Again, the conference of Principals of various Veterinary Colleges in India also favoured such a proposal. The

Punjab Veterinary College has already adopted such a course of studies. Why then is the delay in the introduction of similar course of studies in the other colleges as well? Here it is that Veterinary Advisers and the Principals of Veterinary Colleges can so manipulate matters as to force their respective local governments to adopt a four-year-course of studies. Otherwise they will be culpable of silent acquiescence in the attempt at labelling their colleges and their products as inferior to the Punjab graduates.

The curriculum must be the same, if not better, as that is obtaining at the Royal College of Veterinary Surgeons in England. Let no one start in amazement at our proposal as an audacious claim. If India is yet to go begging for experts to foreign lands, even in the matter of Veterinary Science, after nearly 200 years of British Raj, it is not much to the credit of both the countries. There are certain Ayurvedic and Unani physicians in India who fearing that their living will be lost if they publish their precious knowledge of medicine, make it known to the gullible public that the efficacy of the drugs will suffer if communicated to others, and thus manage to preserve the art within their family by passing it on from father to son. We hope such a pusillanimous spirit is foreign to those who have in their power to make the highest form of Veterinary education available in India. If necessary the general standard of education may be raised for admission into the Veterinary Colleges; but we are of opinion that the present system of admitting only matriculates or S.S. L.C men securing good percentage of marks in all the subjects should ordinarily suffice even for an advanced course of studies. Will the Veterinary Advisers move their Local Governments in the matter? We learn some have already done it. Our thanks are due to them. We appeal to others as well to bestow their thought on such an important subject.

Next is the item of expansion of the Civil Veterinary Department. When there is so much of need for veterinary aid is it not strange to find unemployment amongst Veterinary Graduates? We know the Provincial Governments are not treating the Veterinary Department fairly in the matter of allotment of funds. But Veterinary Advisers should give no rest to the Hon'ble Ministers concerned until every tahsil or taluk can boast of one or more Veterinary Hospitals. Look at the rapid march the Agricultural department has made. Specialists in every branch of Science have been produced in India and provincial gazetted ranks have been provided for to such officers. Almost every tahsil or taluk can boast of an Agricultural Demonstrator. True it is that that department is much favoured by the Government; but one does not fail to notice powerful advocates also in the heads of that department championing the cause of their subordinates.

Again in the matter of getting increased emoluments to the subordinates of the C. V. D., much rests with the Veterinary Advisers. Our impression is that in most cases our cause suffers for want of powerful advocacy. None can question the justice of our demands but yet it is hard to find a truer case of justice denied than the lot of the poor subordinates of the C. V. D. We have heard of a military Veterinary Officer in charge of the C. V. D., who at the very inception of the department in a particular province when questioned by the Government as to the pay to be provided for to the Veterinary Graduates proudly answered "I cannot ask my men to accept anything less than Rs. 100 to start with." It is such a spirit we wish to see in the Veterinary Advisers to-day the spirit of feeling the dignity of their subordinates as their own. If they cannot feel ashamed at the minimum of pay granted to their subordinates, the lowest paid to any professional man to-day, if they cannot realise how hard their subordinates struggle to compromise their low pay with the profes-

sional dignity and social status expected of them and even necessary for good work, if they cannot understand what honest attempts are made by the Veterinary Assistant Surgeons to make both ends meet month after month and yet fail, we begin to despair of the future of the poor ill-paid subordinates of the C. V. D. We do not want to prolong this sad tale of woe and we only hope that Veterinary Advisers will take up the question of improving the lot of their subordinates before anything else and thus earn the lasting gratitude of the entire profession.

There are other items to be dealt with under this heading and we shall return to these in our next issue.

NOTES.

We invite the attention of our readers to a pamphlet on "A plea for better Veterinary education in India" by Mr. C. J. Fernandes of Baroda Army Veterinary Service, presented to the Royal Commission on Agriculture and published in this issue.

* * *

It is an earnest attempt at presenting the case in as brief and effective a manner as possible with the help of facts and figures, in connection therewith. But will it have the desired effect? Let us wait and see.

* * *

With this number closes the third volume of our journal. The next issue of the journal will be sent per V.P.P to all of our subscribers unless otherwise informed in time. We request them to honour the V.P.P. and thus continue their patronage to us.

* * *

A correspondent writes in Hindu of 14th March, 1927.

A very strange phenomenon has been noticed in Tandoalahyar, a place 20 miles south-east of Hyderabad. A huge tree has been emitting a thick syrup juice in large quantities for the last three days. More than 500 lbs. have already been collected by the people of the neighbourhood and used as syrup. The whole soil under the tree is wet on which ants, flies and bees have collected. Hundreds of people are visiting the spot daily.

* * *

We regret to invite the attention of our readers to a letter published under communications conveying the sad news of the demise of Captain G. G. Howard, I. V. S., Dy. Director C. V. D., Orissa, under very tragic circumstances. We offer our condolences to the bereaved family.

* * *

We publish in this issue two articles extracted from two daily Newspapers of Madras, complaining against the absolutely inadequate state of Veterinary aid in that presidency. Will the Honourable Minister take note of it and remove the present ban of taking into service *only* a few of the graduates passing out of the Madras Veterinary College every year? Surely this is more important than opening more registration offices in the presidency. Is it not? Will some M. L. C. take up the question?

* * *

KURUVATHI CATTLE FAIR.

WHY NO VETERINARY SURGEON POSTED?

An "Observer" writes in "Swarajya" of March 15th 1927, a Madras daily, as follows:—

One of the largest annual cattle fairs in this Presidency takes place in a village in Harpanahally Taluk early in the month of March. Kuruvathi is the place where the annual cattle fair takes place. It is 20 miles from this place which is the head-quarters of the Taluk of the same name. Annually more than 20 thousand best cattle meet at the place, sometimes a pair of bulls costing even so much as Rs. 3,000. I was a visitor to this fair this year and to my surprise and regret found that there was no Veterinary Surgeon posted to attend upon these cattle

where the District Health Officer, Local Medical Officer and even the Assistant Director of Health and Sanitation are found to be camping there to make sanitary arrangements. There is a Veterinary Dispensary here in charge of a Veterinary Surgeon. This Officer in charge could have been easily deputed to the festival duty as has been done in the case of the local Medical Officer. Even this necessity of posting the resident Veterinary Medical Officer to festival duty could have been obviated if a touring man has been immediately posted for this Hadagalli Taluk after the transfer of the previous man in the month of December. This has not been done. It seems to me strange on the part of the Veterinary Department to neglect this huge cattle fair and to leave to fate so many as 20,000 cattle.

* * *

In "Justice" of 9th March, 1927, a correspondent writes as follows:—

CATTLE DISEASE.

Rinderpest in a rather virulent form is prevalent in parts of Gooty and Anantapur taluks, and calls for the immediate attention of the authorities concerned. It is felt that the present veterinary staff in the district is inadequate and deserves to be reinforced ere long to give relief to the dumb cattle. It is said that in some cases ryots had to lose all the live stock they possessed.

" Comment is needless on the above two articles. We are at a loss to find words to describe the attitude of the Government when thousands of animals are dying in the presidency."

Editor. I.V.J.

* * *

Since writing the above we have noticed yet another cry for Veterinary aid, in "Justice" of 15th March, 1927. 'Who says there is no public demand ?'.

Veterinary Department.

It is now 8 or 9 months since a touring Veterinary Assistant Surgeon has been posted for Palni Taluq with Palni as his Head-quarters. He stays in his Headquarters for 10 days and tours in the villages for the remaining days in the month. The present Veterinary Surgeon is a young and brisk man who is very popular in the town and every day while he is in the headquarters, several sick animals are being taken to the dispensary for treatment. The public of Palni town will be more benefitted if the Government sanctions the opening of a Veterinary Dispensary at Palni town in the coming official year, besides the touring Veterinary Assistant Surgeon who is now doing good work in villages.

* * *

We regret to record the demise of Mr. A. Doraswami Ayya, Veterinary Assistant Surgeon, Hospet, Madras Presidency, on the 5th March, 1927. He was admitted into the General Hospital on 25-2-27 for Influenza and died of Pneumonia on the ninth day. We offer our heart-felt condolences to the bereaved family.

* * *

We are informed that the Fifth All-India Veterinary Conference due to be held in Bombay is again postponed to December, 1927; we do not know the reason for such an action on the part of Bombay. Whatever it is, this was least expected of that presidency. The Central Board of management is just as much responsible as Bombay for this unseemly act of constant postponement. We only hope that we will see the end of such postponements, as early as possible.

GENERAL ARTICLES.

BLACK-LEG VACCINES: THEIR PRODUCTION AND USE.

BY G. A. AJWANI, M. Sc., D.V.M., G.B.V.C., D.V.H.
SHIKARPUR, SIND.

Recent advances in the manufacture of blackleg vaccines have prompted me to write on this subject. I have had the privilege to work at these vaccines in the Department of Vaccine Therapy at the Kansas State Agricultural College, Manhattan, Kansas, U.S.A. This college maintains one of the best Experiment Stations in America and it was here where some of the new vaccines were developed.

Introduction :—Blackleg, prior to 1782, was considered the same disease as Anthrax. In 1782, Chabert differentiated the two diseases clinically, and called blackleg as "Charbon Symptomatique," or *Symptomatic Anthrax*. The etiological organism was isolated in 1875 by Bollinger, and also by Feser in 1876.

In 1877, Airlong, Cornevin, and Thomas as a result of their study into the causative agent, *Bacterium Chauvæi*, developed an attenuated muscle vaccine. At present this vaccine is used extensively, with some modifications, in the form of double or Lyons Vaccine or the modified Single Vaccine.

In 1887, Nocard and Roux used pure attenuated cultures of *B. Chauvæi*, and in 1888 Roux used filtrates of broth cultures. In the same year, Kitt gave out a single powder vaccine and in 1900, used an immune horse serum.

In 1889, guinea pigs were immunized by Kitasato. Filtered muscle juices were used by Duenschmann for immunization of guinea pigs, in 1894. Threads containing cultures of this organism were used in place of Lyons vaccine by Thomas of Verdun. Blackleg toxins were used in the immunization of rabbits, cattle and sheep by Grassberger and Schattenfroh in 1908. In as much as their toxin

caused intoxication and death in cattle it was abandoned. For this reason these workers used a toxin-anti-toxin mixture and immune sera. A preparation of powder vaccine and a filtrate from pure cultures and precipitated with alcohol were used by Foth in 1911. Schobl in 1910 and 1912 devoted himself to the study of muscle-juice filtrates or aggressins from the affected tissues of guinea pigs and calves. Attenuation of pure cultures was done by Lechainchee and Vallie (1913) by growing them at high temperatures, 42° to 43° C. Much of the work on spore vaccines, antisera and filtrates for producing blackleg vaccines was conducted by Naoshi Nitta in Japan, in years 1915 to 1918. He produced a filtrate, basis of which is meat-piece culture media, and it is extensively used in that country.

In the United States the Lyons vaccine and later attenuated powder Vaccine in a Single Vaccine (introduced by Norgaard (1898), were used extensively since their introduction.

N. S. Mayo (1897) started experiments on both the double and single forms of vaccination, at the Kansas State Agricultural College Experiment Station. Mayo and Barness (1904) gave out an improved method of producing and testing both vaccines. O. M. Franklin and T. P. Haslam of the Kansas State Agricultural College undertook extensive field and experimental work on the use of powder vaccines, in 1911 to 1916. In 1914, a highly efficient anti-blackleg serum was produced, as it is reported in the college report of the successful treatment of 25,000 heads of cattle. Here in 1916, blackleg aggressin was made and distributed. Losses from the use of 150,000 doses have been reported to be 10 or 12. Drs. L.W. Goss and J.P. Scott produced filtrates from brain-liver cultures of *B. Chauvæi*. Losses reported from the use of 100,000 doses of this material have been the loss of eight calves or less than one in 10,000.

Improved Japanese method of producing blackleg

filtrate was introduced into United States of America by Eichorn in 1917 and during the same year quite a new method of preparing filtrate and aggressin was announced by Drs. Goss and Scott, and Franklin and Haslam respectively.

Vaccines:—High mortality, sometimes as high as 5 to 25 per cent of the young cattle affected, necessitated the use of best and reliable vaccines produced by special means. Curative measures have not been developed.

Powder Vaccine:—Prevention from blackleg by the use of virulent material in various forms was discovered by Airlong, Cornevin and Thomas in 1887. Attenuated muscle or the Lyons vaccine was developed by them in 1883. This material has been in use in Europe and other countries.

Production:—A calf is inoculated with pure culture of *Clostridium Chauvei* and as soon as death occurs, the blackest muscle is removed aseptically, cut into small pieces and dried at 40° to 60° C. The dried muscle is ground through a coffee mill. This forms a coarse powder. The powder is mixed into a thick paste with sterile water. This paste is placed into showel pans and put into attenuating oven. This is simply an oil oven, heated to 90° to 96° C. for 6 hours. It is then cut up into squares, ground through coffee grinder then placed in the ball mill and ground for 12 to 24 hours. This attenuated material or vaccine is distributed in the form of pills or powders. Some countries adopt the use of double-treatment vaccine. It consists of two vaccines, viz., a weak and a strong, they being attenuated at low and high temperatures and administered beginning with the weak and next strong at an interval of ten days. The single treatment vaccine which is above described, is a vaccine of intermediate strength between the weak and the strong.

POTENCY TESTS FOR POWDER VACCINE.

There are two tests used:—

1. Standardization Test:—Four guinea pigs weighing 250-400 gms. are obtained and one guinea-pig is given 40 mil. grams, and fourth 7½ mil. grams. The 40 mil. gram-pig should die and if he is the only pig to die the vaccine is considered a weak one and is used as a first injection of double dose method. If the 40, 25, and 15 mil. gram guinea pigs die, the vaccine is considered as a strong vaccine and is used as a second injection of the double dose method. If the 40 and 25 mil. gram pigs die the vaccine is of medium strength and is used as a single injection method. If none of the pigs die or show any lesions the vaccine is too weak for use. If the 7½ mil. gram pig dies the vaccine is too strong and requires to be reattenuated and retested several weeks later.

2. Safety Test:—This test consists of a series of 9 guinea pigs. 3 guinea pigs are given 3 mil. grams, 3 are given 5 mil. grams, and 3 are given 7½ mil. grams. All the nine guinea pigs must live and show no marked lesions. The vaccine is distributed in 10 and 25 dose packages and used as 10 mil. grams for a dose. For use the powder is mixed with small amount of cool boiled water, filtered through funnel and the straw coloured liquid divided into the specified number of doses and injected in front of the shoulder of cattle. This test is the official test required by the Bureau of Animal Industry in U.S.A. The results from the use of this powder vaccines have been sometimes successful and sometimes not. It has also been found that the degree of suceptibility of calves varies to a great extent.

BLACKLEG FILTRATE.

Filtrates prepared from artificial cultures have been given out by many workers, notably by Roux (1888). In Japan it was Nitta (1905) who produced a filtrate which

was used extensively. Eichhorn (1917) following Nitta's method, introduced it into U.S.A. Drs. L. W. Goss and J.P. Scott of the Veterinary Department of the Kansas State Agricultural College Experiment Station, produced a filtrate which gave higher immunising properties. It is very extensively used in America nowadays with great benefit.

Production of Blackleg Filtrate :—

In the production of this filtrate virulent cultures of *Clost. Chauvœi*, grown in brain-liver medium for nine days, at which time there is a great spore formation and medium being apparently saturated with the products of the growth, are used. Removal of the fluid part of the culture is effected, phenol added and then filtered in the same way as the black-leg aggressin. Filtrates thus prepared are tested for sterility and contamination on brain-liver media and glucose broth in the same way as described for aggressin and tests made on guinea pigs also. The filtrate is absolutely non-toxic. Dr. J. P. Scott gives us the following table demonstrating the non-toxity; although he injected 25 mil. in a guinea pig not even absorption lesion developed.

Guinea-pig			Product.	Results-First, second, third and fourth days,			
No.	Weight grams.	Dose mil.	Date.	first.	second.	third.	fourth.
285	300	5	13-1-20	O.K.	O.K.	O.K.	O.K.
286	400	7	13-1-20	O.K.	O.K.	O.K.	O.K.
305	500	15	14-1-20	O.K.	O.K.	O.K.	O.K.
306	500	25	14-1-20	O.K.	O.K.	O.K.	O.K.

Properties of Blackleg Filtrate :—Experiments of Dr. Scott on blackleg fitrate have shown that it possesses high degrees of immunity.

Dr. scott has given us the following table demonstrating through his experiment that blackleg filtrate has high degree of immunity.

Table showing immunity produced by the use of blackleg.

Product injected. Filtrate			Virus		Results-First, second, third and fourth days,			
Calf No.	Dose mil.	Date.	Dose Mil	Date	first.	second.	third.	fourth.
1260 (a)	5	22-2-18	5	3-2-18	death	...	...	...
1261	5	22-2-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.
1262	4	22-2-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.
1263	3	22-2-18	5	3-2-18	O.K.	O,K.	O.K.	O.K.
1264	Not vacc.	.....	5	3-2-18	death	...	...	...
1099	5	12-1-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.
1100	5	12-1-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.
1101	5	12-1-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.
1102	5	12-1-18	5	3-2-18	O.K.	O.K.	O.K.	O.K.

(a) The loss of calf No. 1260, following vaccination with the normal dose of filtrate may have been due to unusual susceptibility of the individual calf together with the large dose of virus in this case as in other cases included in the table.

Potency Tests :—There are three tests applicable to this substance and they are the same as dealt with in the blackleg aggressin.

Blackleg Aggressin.

O.M. Franklin and T.P. Haslam while working at the Kansas State Agricultural College Experiment Station (1913 to 1916) reported the production of aggressin which is now known as blackleg aggressin. They prepared it from a typical artificially produced lesion of blakleg in a healthy calf by injecting from 15 to 25 mil of pure culture of *Clost. Chauvœi*. All the juices are extracted, phenolised and filtered through Mandler filters. The aggressin was placed on the market since 1916.

Method of Production:—Calves used for the production are 400 lbs. good and healthy. These calves are inoculated with 20 to 30 c.c. of 48 hours pure cultures of *Clost. Chauvœi*. Inoculation is made in one or both of the hind quarters deep in the muscle. The dose is divided into two or three parts and injected in different

parts of the hind quarter. After inoculation the calves are placed in the pen containing two contact calves. Temperatures are taken daily and the animals carefully examined. As soon as death occurs, which usually occurs from 32 to 72 hours, the animal is taken to the cutting room, suspended by the legs, the hairs burnt up with the gasoline torch, after which the skin is removed from the lesion and all the affected muscles and subcutaneous tissue removed as aseptically as possible. All fluid exudates which drip from the carcass are taken in the pails placed under the carcass. As soon as muscles are removed, the affected skin and muscles are placed in the hydraulic press and all juices expressed under high pressure. As soon as all the juices have been obtained they are placed in jars and to 1/9th weight of it 5 per cent phenol is added. The juices are then placed in the cooler or ice box for 15 to 24 hours. Careful postmortem of the calves used should be made and any diseased condition other than blackleg would require that the juices be discarded.

The Filtration:—The cooled juices are then filtered through cotton and gauze to remove fibrin and precipitate. It is then filtered through porous filter candles (of 5 to 8 lbs. pressure). Kelegore or infusorial earth is used as a clarifier. About 4 to 6 table spoonfuls of this material be mixed with 500 c.c., of juice and then poured into candle case. From 10 to 40 lbs. air pressure is used to force the material. As soon as the juices have been filtered through porous set of candles, it is refiltered through a set of fine candles testing from 10 to 15 Ibs. The aggressin is received in receiving jars equipped with metal lids having four holes.

Hole No. 1 connects with the filter candle.
" " 2 " " " test funnel.
" " 3 " " " bottling funnel.
" " 4 " " " air filter.

The material is bottled by inverting the jars and removing the aggressin through the funnel.

Potency Tests:—

There are five tests applied to this product.—

1. Sterility test.
2. Safety test.
3. Potency test.
4. Neutralization test.
5. Washed culture test.

1. *Sterility Test*:—A preliminary test is made as soon as the material is filtered. Small amount of aggressin is removed by means of test funnel. 5 drops are placed in the dextrose infusion broth fermentation tube. These tubes are incubated at 37° c. and examined carefully daily for seven days. If the growth occurs the material is refiltered. If there is doubt about growth from a second sample, subcultures are made from the doubtful tubes. At the time of bottling, every 30 lb. bottle is used as a test bottle. About 5 c.c. of the aggressin is placed in these bottles and they are tested as outlined in the preliminary test.

2. *Safety Test*:—This test consists in inoculating each of the guinea pigs with 7 c. c. of aggressin. These guinea pigs are used for potency test.

3. *Potency Test*:—First test suggested was guinea pig test and this was more or less recognised by the United States Government. It consists of injecting 5 guinea pigs and two check guinea pigs with 1 to 2 *M. L. D.* * of blackleg virus. The majority of the guinea pigs should live and two guinea pigs should die. This test has been found unsatisfactory due to the variable susceptibility of the guinea pigs and the difficulty of producing measurable immunity. Is has been found that in number of cases there was no immunity.

Two toxicity pigs, which were given 7 c. c. were used and it was found that the guinea pigs given from 2 to

* Minimum lethal dose.

7 mil. of aggressin, 10 later, 50 per cent of them die. Same thing is true of the blackleg filtrate.

4. *Neutralization Test*:—This test was developed in 1918, by Drs. Goss and J. P. Scott. In this test 5 guinea pigs are given 15 antiblackleg units or antiblackleg serum. 15 hours later they are given a mixture of 1, 2, 3, 4 and 5 c. c. of blackleg aggressin mixed with 2 to 3 *M. L. D.* of blackleg virus. Guinea pigs given larger doses of aggressin will die within three days.

If the guinea pig was receiving 4 to 5 c. c. of aggressin it dies or shows marked lesions and the other guinea pigs show slight lesions or remain healthy; 4 c. c. seems to be the smallest dose which will activate the virus and 4 c. c. will then contain 13 aggressin units or one dose will contain 16½ aggressin units per dose.

This test is based on two facts (1) that blackleg aggressin is nontoxic even in doses of 25 c.c., (2) that the small amount of aggressin will activate non-lethal doses of blackleg virus.

5. *Washed Culture Test:*—This test is based on the fact that virulent culture of *Clost Chauvœi* when washed repeatedly in salt solution it produces a virulent mass of spores. 15 c.c. of washed culture produced no lesions in guinea pigs. If, however, small amounts of ½ c.c. or less of washed culture is mixed with small quantities of aggressin typical blackleg is produced. The washed culture test is performed by first determining the potential *M.L.D.* This is the smallest amount of washed culture which will produce blackleg when mixed with 7-10th or one aggressin unit. This test is made on 5 guinea pigs giving them 5 *M.L.D.* of washed culture mixed with variant doses of aggressin—doses that will give comparative reaching of neutralization test are 1 10 5/100, 5 1000, 3 10, and 4 10 and 1,2,3,4 and 5 c.c. with the other test. Very close results have been obtained with the usage of same lot of aggressin and filtrate.

Table showing the Neutralization test to determine the aggressive strength of blackleg aggressin filtrate:—

Guinea Pig. No.	Normal serum. Weight given.	Dose, mil.	Date,	Virus. Dose, mil	Product Date.	injected. Dose, mil	Date,	Results—1st, 2nd 3rd., and 4th days. 1st. 2nd. 3rd. 4th
18	400	...	...	0.1	11-13-19	...	...	1 x 1 x 1 x O.K.
19	300	...	...	.2	,,	...	...	O.K. 3 x(a)Death ...
20	300	...	...	.3	,,	...	...	2 x Death ... ...
				M.L.D.				
36	400	0.5	11-17-'19	4.0	11-18-'19	...	...	1 x 2 x O.K. O.K.
37	300	.5	,,	5.0	,,	...	...	1 x 1 x O.K. O.K.
38	500	.5	,,	6.0	,,	...	...	2 x 1 x O.K. O.K.
39	300	.5	,,	7.5	,,	...	...	2 x 3 x Death ..
195	200	1.0	12-17-'19	1.0	12-18-'19	5	12-18-'19	3 x (b) Death... ...
						Blackleg Aggressin.		
196	275	1.0	,,	1.0	,,	4	,,	3 x(c.)Death ... ...
197	300	1.0	,,	1.0	,,	3	,,	1 x 1 x 1xx 1 x
						Blackleg Filtrate		
205	300	1.0	12-19-'19	1.0	12-20-'19	5	12-20-'19	3 x(d.)Death ... ...
206	225	1.0	,,	1.0	,,	4	,,	2 x 2 x 2 x O.K.
207	200	1.0	,,	1.0	,,	3	,,	1 x O.K. O.K. O.K
208	400	1.0	,,	1.0	,,	2	,,	1 x 1 x 1 x O.K

In America month is put first & then the date.

(a) Two-tenths mil. of this virus is found to be the minimum amount necessary to kill or the minimum lethal dose—*M.L.D.*

(b) One mill. normal serum protects against twelve *M.L.D.* Virus.

(c) Pig No. 196 received 12 immunizing units of serum (b) and 1, *M.L.D.* of Virus plus 4 mil. of aggressin. Four mil. of aggressin, therefore neutralized eleven immunizing units of serum. One 5 mil. dose of blackleg aggressin has a strength of 13 aggressive units.

(d) Five mil. of blackleg filtrate neutralizes eleven immunizing units of serum; therefore this filtrate has an aggressive strength of eleven units per 5 mil dose.

x shows the degree of swelling produced by the virus, 1 x, slight swelling, 2 x moderate swelling; 3 x large swelling.

The above table shows that 0·5 mil. of normal serum has the power to protect a guinea pig against 6 *M.L.D.* of blackleg Virus, and that 7.5 *M.L.D.* of Virus just kills a guinea pig which has received 0·5 mil. of normal serum 15 hours previously. It will therefore be concluded that one mil. will protect a guinea pig against 12 M.L.D. of blackleg Virus. The amount of antiserum of normal serum required to protect a guinea pig against 1*M.L.D.* of blackleg Virus is one antiblackleg unit. It is deduced therefore, that 1 mil. of serum contains 12 antiblackleg units.

The researches of Dr. Scott, D.V.M., have proved that "the administration of 1 mil. normal serum and 15 hours later of 1 *M.L.D.* Virus plus 4 mil. of blackleg aggressin, caused death of the guinea pig from blackleg. The 4 mil. of aggressin increased the virulency of the single *M.L.D.* of blackleg Virus sufficiently to neutralize the action of the 12 antiblackleg units of serum. Counting one aggressive unit as that amount of blackleg aggressin that will neutralize one antiblackleg unit, it is seen that 4 mil. of aggressin have an aggressive action equal to 11 aggressive units, and that one 5 mil. dose of this aggresin has an aggressive strength of 13 units."

Dr. J.P. Scott, has given us a table in Kansas Technical Bulletin 10, 1923, on comparison of calf immunity, guinea pig immunity and neutralization produced by blackleg filtrate. From his experiment it has been found out that "a filtrate having an aggressive strength of 18 will give caves sufficient immunity to withstand large doses of Virus." Also that "Blackleg filtrate acts as an aggressin in the same way as blackleg aggressin, in that a few milli litres will activate small doses of inert washed blackleg culture. The purity of blackleg filtrate may be determined by means of the complement fixation test. (Gouchenour 1920)."

"Blackleg filtrate is given in doses of 5 mill. to all cattle, and has been shown to protect such animals till

hey are no longer susceptible to black-leg. Field reports show that losses are not greater that following the use of black-leg aggressin; that is, a loss less than one in 10,000."

Table showing the comparison of calf immunity, guinea pig immunity, and neutralization produced by black-leg filtrate.

Animal injected.		Normal Serum		Black-leg-filtrate.		Virus.		Results-1st., 2nd., 3rd., & 4th days			
No.	Weight given	Dose, mil.	Date.	Dose. mil.	Date.	Dose.	Date.	1st.	2nd.	3rd.	4th.
					Immunity Test.						
Calf 1	...	...	...	5	10-23-'17	10	11-7-'17	O.K.	O.K.	O.K.	O.K.
2	...	...	...	5	„	10	„	O.K.	Lameness	O.K.	O.K.
3	...	...	...	5	„	10	„	O.K.	O, K.	O.K.	O.K.
1020	...	...	...	...	...	10	„	O.K,	Lameness	Death	..
1021	...	...	...	...	...	10	„			„	...
					Guinea Pig Immunity Test						
Guinea Pig 988	275	...	...	2	1-30-'18	M.L.D 2	2-11-'18	Death	...	...	...
989	250	...	...	3	„	2	„	Death	...	...	...
990	275	...	...	3	„	2	„	3 x	Death	...	...
991	300	...	...	4	„	2	„	Death	...	...	...
992	375	...	...	4	„	2	„	Death	...	...	...
993	250	...	...	5	„	2	„	O. K.	O. K.	O.K.	...
994	300	...	..	5	„	2	„	O. K.	O. K.	O.K.	...
					Neutralization Test.						
514	330	1	5-7-'18	1	5-28-'18	1	5-28-'18	O.K.	O. K.	O.K.	O.K.
515	240	1	„	2	„	1	„	O.K.	O. K.	O.K.	O.K.
516	360	1	„	3	„	1	„	O.K.	O. K.	O.K.	O.K.
517	270	1	„	4	„	1	„	O.K.	Death.	...	...
518	270	1	„	5	„	1	„	O.K.	O. K.	O.K.	O.K.

(a) One mil. of the normal serum was found to have strength of 15 anti-black-leg units.

(b) This guinea pig, receiving 4 mil· of filtrate plus one *M. L. D.* of Virus, is killed; therefore 4 mil. of filtrate has an aggressive strength of 14 units and a 5 mil. dose an aggressive strength of 18 aggressive units.

"x" shows the degree of swelling produced by the virus. 1 x, slight swelling, 2 x moderate swelling, 3 x large swelling.

ANTI-BLACK-LEG SERUM,

Drs. O.M. Franklin and T. P. Haslam (1913 to 1015), of the Veterinary Division of Kansas State Agricultural College in America produced serum from horses which had been previously hyperimmunized through the administration of black-leg virus. This serum is used when the black-leg outbreak is on and very favourable results have been reported in that it stops further mortality. The following method of production is employed at K. S. A.C.

Method of Production :—Pure cultures of *Clost. Chauveii* which have been grown upon brain and liver medium for twenty-four hours and passed through gauze are injected intravenously into the jugular vein of a horse in increasing doses, beginning with 50 mil. followed at intervals of 7 to 10 days with 150, 250, 400 and 450, mil. doses (Vide the following table supplied by Dr. Scott).

Injection of cultures of *Clost. Chauveii* in the hyper-immunization of horse No. 23.

Date.	Dose Mil.	Strain No.
March 8, 1917.	50	5
„ 16, „	150	6
„ 24, „	250	3
„ 31, „	400	1
April 7, „	400	2

Nine days after the fifth injection about 20 mil. blood is drawn from the jugular vein. Allowing this to clot 0.55 mil. of the clear serum is injected subcutaneously to each of three guinea pigs. About 15 hours later these guinea pigs are injected subcutaneously with 125 mg. of dried finely ground muscle from the black-leg lesion of a calf. The horse treated with *Clost Chauveii* is

bled again upon the third day when none of the three guinea pigs dies within the following three days of their injection. The blood being drawn from the jugular into sterile 2.5" glass tubes, 20" high, weights after two to three hours keeping are placed. Clear serum is obtained on the following day, phenolized with 1% phenol, and is filtered through an infusorial earth filter.

"Each horse is bled 11,200 mil. to each 100 lbs. of weight. Ten days after bleeding the horse is again injected with 400 mil. of culture and tested 9 days later. Should the blood fail to be potent as is true in about 20% of the cases, the horse is again injected with 400 mil. of culture on the third day following the test. Some horses will produce a potent serum following one injection after bleeding, while others require two to three injections. The injections are sometimes followed by local or general disturbances, resulting in some cases in the death of the horse." (Scott, 1923).

Where serum is produced generally three to eight horses are bled simultaneously. The serum from all horses is mixed and filtered.

Potency Test

The following experiment was performed by. Dr. Scott to find out the potency of the anti-black-leg serum:—

Potency of serum obtained from horse No. 23.

Guinea pig.			Serum.	Virus.		Results-first, second & third day.		
No.	Wt. grms.	Dose mil.	Date.	Dose. mil.	Date.	First.	Second.	Third.
627	450	0·55	16-4-17	62	17-4-17	(a) 3X	3X	2X
628	250	·55	„	62	„	3X	2X	1X
629	375	·55	„	62	„	1X	1X	1X

"X" shows the degree of swelling produced by the virus. 1X slight swelling. 2X moderate swelling. 3X large swelling.

This experiment shows that 0·55 mil. serum of horse

No. 23 has a protection strength of 62 immunizing units; 1 mil., therefore has a strength of III immunizing units.

On April 16, 1917, 20 mil. of blood was drawn from the jugular vein. Into each of three 12-ounce guinea pigs 0·55 mil. of the serum was injected. Fifteen hours later they were injected with 125mg. of dry muscle virus. (Two mg. of this virus would kill a guinea pig not protected with serum). All three of the guinea pigs survived the test. On April 19, horse No. 23 was bled, II, 350 mil. being drawn from the jugular vein. On April 20th, the serum from four horses Nos. 23, 24, 25, and 26 was mixed and filtered after the addition of preservative. This filtered serum was put up as anti-black-leg serum, serial No. "Y".

The potency of anti-black-leg serum, serial Nos. 45 to 54, has been found to have a protective strength of 70 to 100 units at the present time (September 1921) as compared to strength III units when produced in 1917 and 1918. (Scott 1922).

Use of Anti-black-leg Serum:—

It has been conclusively shown that this serum produces only a passive or short immunity. To produce a lasting immunity the serum administration is followed by a dose of black-leg filtrate or aggressin at an interval of 10 to 12 days. The antiserum produces immunity in calves within 5 days and protection afforded even against large doses of virus. Field reports of the outbreaks of black-leg when antiserum has been used are very encouraging. It has been known that the anti-black-leg serum has curative properties if used in large quantities on black-leg subjects. It has been reported that an injection of 150 to 300 mil. of serum will cure black-leg provided the administration has been done in the early stages of the disease. As much as 50 % of the cases have been reported to be cured.

Dosage:—The following dosage is adopted by K. S. A. C.

Minimum dose.			Weight of calf.
15 mil.	...	...	300 pounds or under
20 „	...	...	300 to 500 pounds
25 „	...	...	500 to 600 „
30 „	...	...	600 to 700 „
35 „	...	...	700 to 900 „

Black-leg aggressin or filtrate may be administered in a dose of 5 mil. after 10 days of the antiserum administration.

Comparison of Aggressin and Filtrate.

Both these products are non toxic. 25 c.c. produced no lesion in guinea pigs when injected subcutaneously. Intravenous or intracardial injections of 1 c.c. of these products produced no symptoms in guinea pigs. No toxins have been detected in filtrates with or without the addition of phenol. This demonstrates the non-toxicity of the products. Aggressiveness is demonstrated by the fact that 1/10 of *M. L. D.* will be activated by the small amount of these products and also by neutralization of potency test. The action of heat on both these products increases their potency as demonstrated in the washed culture test. Heating these products for one hour for 60° C. increases their potency from 19 before heating to 28 at heating.

The keeping qualities of these two products have been shown to be high and no decrease occurs in the potency until 2 to 3 years. The aggressive substance is not absolutely specific. Small amount of black-leg filtrate will activate non-lethal doses of *Vibrion septique*. However, the dosage is fairly larger than required by black-leg virus.

Black-leg filtrate and aggressin are given in 5 mil. doses to all animals.

Other Filtrates.

There are various other filtrates prepared in different methods, for example, in Japan black-leg filtrate is made from meat piece—it has been in use since 1914. (N. Nitta, J. Amer. Vet. Med. Ass., 1906, Volume VI, No. 4, pp. 446-481.) Then Eichhorn introduced this method into the United States in 1917. (J. Amer. Vet. Med. Ass. 1917, Volume II, No. 4, p. 406, and also in 1918 Volume VI., 6, pp. 653-659.)

In Switzerland some other kind of filtrate has been prepared since 1920. (Veterinary Rev. 1922. Volume IV. p. 365). The method of preparation of black-leg filtrate as prepared at K. S. A. C. is based on none of the above mentioned methods but was independently discovered and experimented upen, the full details of which have been described above.

COMPARATIVE EFFICIENCY OF BLACK-LEG FILTRATE AND AGGRESSIN.

DISCUSSION UNDER THIS HEADING HAS BEEN GIVEN BY DR. J. P. SCOTT IN THE FOLLOWING PAPER.

Age and Time for the Administration of Black-leg Vaccines.

It has been recommended that calves should be treated for immunization purposes in the early part of fall before the fall rains start because it has been noted that blackleg outbreaks occur after the rains when fresh grass comes up. " If calves are in badly infected pastures or lots it is advisable to treat them as young as three or four weeks of age. Animals treated at this age should be treated again when five to eight months old; otherwise one treatment has proved to be sufficient. All calves should be vaccinated before six months of age in districts where the presence of blackleg infection is suspected."

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COMPARATIVE EFFICIENCY OF BLACK-LEG FILTRATE AND AGGRESSIN.*

By Dr. Joseph P. Scott, D. V. M.

Professor of Vaccine Therapy, Kansas State Agricultural College.

Black-leg filtrate and aggressin are the soluble products of growth of *Clostridium Chauveii*, the causative agent of blackleg, blackleg aggressin being the product formed when the organism is grown in the animal body, blackleg filtrate when grown on artificial culture media.

Since 1888, when Roux studied the soluble substances produced by *Clostridium Chauveii* these products have been studied to a considerable extent. This study has resulted in the establishment of two immunizing agents. Black-leg aggressin was developed to practical use in 1916, by Drs. O. M. Franklin and T. P. Haslam of the Agricultural Experiment Station of the Kansas State Agricultural College. In 1917, Dr. Eichorn introduced the Japanese method of producing black-leg filtrate and during the same year Dr. Goss and the speaker introduced black-leg filtrate.

* Read at the fifth annual conference, National Research workers in animal diseases Chicago December, 3rd 1923.

The comparative efficiency of these two products from data obtained,

1st. In the methods of production of these agents.

2nd. From researches concerning the nature of the antigenic substance involved.

3rd. From the potency tests applied to the two products.

4th. Action of heat.

5th. From field reports following the use of these products.

6th. Ease of manufacturing.

7th. Keeping qualities.

1. The production of both these products depends primarily on the isolation of the causative organism *Clostridium Chauveii* from a typical case of black-leg.

Black-leg aggressin is produced from the lesions of a calf inoculated with pure cultures of *Clost Chauveii* or with uncontaminated black-leg muscle virus. All the juices are expressed, phenolised and filtered and thus form the well known dark coloured fluid black-leg aggressin.

Black-leg filtrate is produced by growing *Clost. Chauveii* in a liquid medium containing solid particles; the usual media are either liver or meat broth containing either brain or meat pieces. When the medium is considered to contain all the products of growth the fluid portion is removed, phenolised and filtered, forming a light straw colored fluid.

2. The nature of the antigenic substance in both these products is toxic, even when used in the doses of 25 mil. or 5 times a calf dose, and as non-lethal doses of black-leg virus are activated by small doses of filtrate or aggressin.

3. The potency tests may be divided into two groups,

the animal immunity tests and the aggressive action tests.

The most satisfactory test is a calf immunity test in which calves are given one 5 c. c. dose of the product and in from 10 days to several weeks are given doses of black-leg virus sufficient to kill susceptible calves.

Comparing the two products on this basis, we find that out of 22 calves given filtrate and 10 to 49 days later 5 to 10 mil. virulent culture virus, 21 or 95.5 lived, one of them showing slight lameness and one died. Of all 11 calves given aggressin and in 10 to 49 days black-leg culture-virus none died, 4 showed marked lameness and recovered. In calf immunity tests on filtrate and aggessin that had been refiltered, of three calves given filtrate and in 49 days 10 mil. black-leg culture virus none died and none showed lameness, of 6 calves given aggressin and in 49 days given 5 and 10 mil. of black-leg culture virus 5 or 83.3% died and the 6th showed lameness. The virus used in these cases had a killing strength of 0.1 mil. when tested on guinea pigs.

This test shows that black-leg filtrate and aggressin protect calves against large doses of black-leg virus. The calves given aggressin showed more lameness than the filtrate calves and in the case of refiltered aggressin the potency was shown to have been reduced to such a degree that 83.3% of the animals were not immunized.

Immunity tests on guinea pigs are unsatisfactory as the degree of immunity that it is possible to produce is less than their normal variation in resistence to black-leg virus.

Out of 138 guinea pigs given 2 to 7 mil. aggressin and 10 days to 2 weeks later 1 or 2 *M. L. D.* black-leg virus 70 or 50.72% died. Of 270 guinea pigs given 2 to 7 mil. filtrate and 10 days to two weeks 1 or 2 *M. L. D.* black-leg virus 128 or 47.4% died.

These guinea pig tests show the same lack of immunization powers for both products.

The aggressive action tests are the neutralization test and the washed culture test. In these tests the strength of the products is determined by measuring the aggressive units in a dose of the products. An aggressive unit is the amount of aggressive substance that will neutralize the action of one unit of antiserum, or the amount of aggressive substance that will activate an amount of washed virus equivalent to one *M. L. D.* of black-leg virus.

The neutralization test is performed by giving a series of guinea pigs a known amount of anti-black-leg serum, the usual dose being 15 units of serum, and 15 hours later these pigs are given a dose of black-leg virus mixed with graduated amounts of filtrate or aggressin, the dosage of virus used being from one to three *M. L. D.* that of the filtrate or aggressin 1, 2, 3, 4 and 5 mil. Some of the pigs will die in 24 to 72 hours, the one receiving the smallest dose of the filtrate or aggressin determines the strength of the product, that amount contains 15 minus 2 (dose of serum minus dose of virus) or 13 aggressive units.

Comparing the two products by means of this test we find that of the 50 serial of filtrate the average aggressive strength was 17.18 A.U. of 14 serial aggressin the average aggressive strength was 18.57 A.U.

The washed culture test depends on the fact that vegetative cells and spores of *Clost. Chauveii* when freed from all their products of growth are avirulent, and that when small amounts of the cells are mixed with small amounts of the products of growth the mixture is virulent in practically the same dosage as before the separation of the two.

To quantitatively determine the aggressive strength of filtrate or aggressin by this method the smallest dose of washed culture that would become activated by small amount of filtrate is taken to be a potential *M.L.D.* and is an aggressive unit. Comparing the two products by a

series of combined tests we found:—Two serials of aggressin tested by neutralization test gave an average strength of 18.6 units, when tested by the washed culture test a strength of 16.65.

25 filtrates tested 45 times by the neutralization test gave 16.2 A. U.

25 filtrates tesed 36 times by the washed culture test gave 15.44 A.U.

The same filtrate or aggressin when tested 2 or 3 times by either of these tests gives readings within 2 A.U.

4. The action of heat on the two products is practically identical as far as it has been possible to determine by means of the aggressive action tests.

Four filtrates tested by these tests before and after heating at 60° C. for one hour showed:

Using the neutralization test 16.71 A. U. before and 28.45 after heating.

Using the washed culture test 18.3 A.U. before and 28.91 after heating.

Three aggressins tested at the same time.

Using neutralization test 20.79 before and 32.5 after heating.

Using washed culture test 20 before and 33.3 after heating.

The degree of heat was sufficient to coagulate the proteins of the aggressin which became quite thick. The filtrate remained unchanged physically.

5. Field reports are practically indentical for both these products, reports of losses aggregating less than one in 10,000 having been received, some losses may not have been reported and others may have been improperly diagnosed as black-leg. Practically all losses reported specially during the last three years have been in cases where herds were vaccinated following losses from black-leg, the animals dying within 3 or 10 days following vaccination, and in cases where very young calves were

vaccinated and died 10 months or a year later. In one case *Vibrion septique* was also isolated.

6. A comparison of the two products from the stand point of ease of manufacture shows that black-leg filtrate is considerably easier to filter. 20 %, of the serials of black-leg produced at K.S.A.C. have had to be refiltered while 38 of the serials of aggressin produced during the same time had to be refiltered as previously stated. Refiltration is shown to decrease the potency of black-leg aggressin to a marked degree.

7. The keeping qualities of the two products are high. Samples of aggressin and filtrate kept for several years show no marked decrease in aggressive strength. Three aggressins produced in 1919 and having an average strength of 16.91 A.U. had in 1923 an aggressive strength of 16.91 A.U. Four filtrates produced in 1917-18 with a strengh of 15.1 had on testing in 1923 a strength of 13.4.

To sum up. No essential difference has been found between these two products on calf immunity tests, guinea pig immunity tests or aggressive action tests or from field reports. There appears to be no difference in the character of the antigenic substances in either of the products as shown by the aggressive action tests, the action of heat, or by the action of time.

A considerable difference was found when refiltered aggressin and filtrate were compared in a calf immunity test, this is probably explainable in that the antigenic substances in the aggressin are to a considerable extent fixed by the colloidal substances of the tissue juices which are readily held back by the filter candle whereas the antigenic substance in the filtrate are in solution in a watery fluid that is easily filtrable.

The advantages of black-leg filtrate are that the processes of the growth of the organism are under control at all times, the product is easier to make, is cheaper and just as efficient and the needless destruction of cattle avoided.

One advantage of black-leg aggressin is that the calf will greatly assist in the differentiation between *Clost. Chauveii* and allied anærobes in that a typical lesion will only be produced where the virus used is an essentially uncontaminated black-leg virus.

In the discussion of this paper by Dr. L.W. Goss and in answer to questions the following information was added.

There are five important points that greatly assist in the differentiation of *Clost. Chauveii* from *Clost. œdematis maligni* (Vibrion septique).

1. *Clost. Chauveii* does not grow readily on ordinary beef infusion agar, it grows readily in liver agar and specially in media to which fresh serum has been added.

2. It will not grow in beef agar containing 2 dextrose.

3. Small pin point solid colonies are formed in liver agar shake, they may be spherical or lenticular in shape but are never fuzzy or woolly.

4. In smears, or impressions from the diaphragmatic surface of the liver of guinea pigs killed by inoculation of pure cultures of *Clost. Chauveii* single gram positive rods are found, occassional pairs may be found but no chains.

5. Guinea pigs protected by 7 units anti-black-leg serum resist the action of 5 *M. L. D. Clost. Chauveii* culture administered 15 hours later. These tests have been checked on 35 strains of *Clost. Chauveii* and 12 strains of *Vibrion septique.*

The black-leg filtrate described in this paper is not based on the Japanese method as introduced by Eichorn, the preliminary work on this filtrate was done prior to the publication of the report of the Japanese method in the J. of A. V. M. A. in 1917.

The length of immunity produced by aggressin and filtrate has not been determined experimentally. The usual test period used by various workers has been 10 to 21 days and very similar results have been obtained from both products. A period of 5½ months was reported by Kelser using two calves in an aggressin test both were immunized, his test with filtrate showed that two out of 6 had died following injection of black-leg muscle virus in 14 days. Field reports following the use of 250,000 doses filtrate and 150,000 doses aggressin in most of the States of the U. S., in Maxico and Central America show that when an animal is immunized by either of these products it is protected for at least the natural period of susceptibiiity and probably for life.

VARIOLA IN ANIMALS AND MEN

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Variola is known by various names, such as Small-pox in men, cow-pox (variola vaccina) in cattle, horse-pox (variola equinae or stomatitis pustulosa contagiosa) in horses, sheep-pox (variola ovina) in sheep, goat-pox (variola caprina) in goats, swine pox (variola suilla) in pigs, and chicken-pox (Epithelioma contagiosa or Fowl Diphtheria) in fowls.

Variola is an infective disease, caused by an ultra-microscopic organism, and is characterised by a rise in temperature followed by eruption on the skin consisting first of papulae or pimples then of vesicles, pustules which dry up finally into scabs. These changes pass through a regular course as will be described later in connection with the signs of this disease.

History:—Small-pox in man is one of the oldest known diseases. Mention has been made of this disease in the Chinese records as far back as 1122 B.C.

Rhazesin, an Arab physician, taught us about this disease in 925 A.D. Sheep-pox was reported by Joubert in

1567 A.D. Cow-pox existed unrecognised for centuries, but it received attention of the British physician and Philosopher Dr. Jenner in 1796, who for the first time transmitted cow-pox to man and proved that it conferred immunity against smal-pox. Since that time vaccination has become established in every country. Jenner and Lafosse were of opinion that horse-pox was identical with cow-pox.

Etiology :—The disease is caused by an ultra-microscopic organism which is infectious. It is contained in the contents and crusts of the pustules, blood, secretions excretions and Chauveii has proved that the infective matter is contained in the solid and not in the fluid constituents of the lymph. The poison of-small-pox and sheep-pox remains virulent and active in an infected locality for a month or six weeks, but when it is protected from decomposition it may remain virulent for a considerable time.

General Symptoms :—The course of the disease is divided into 5 stages, viz., Incubation, Initial period, Eruption, Suppuration and Exciccation.

The incubation period of Small-pox disease is about a week.

The initial period lasts a day or two and is marked by fever, cold in the head and eyes.

"The stage of eruption which continues from 6 to 8 days is marked by the sudden appearance of red spots like flea-bites or pimples, which are converted into hard red nodules, pin head sized and are surrounded by red (areolæ). After a few days the tops of the nodules become pale and turn into bluish white vesicles, are depressed in the centre and are filled with limpid serous fluid. (At this period the *pocks* are at their highest state of maturity and are then most suitable for inoculation purposes)".

The suppurative stage lasts for about 2 or 3 days the contents of the vesicles become turbid and purulent,

owing to the growth of streptococci and staphylococci and the umbilicated appearance disappears. The body temperature which had decreased during the stage of eruption again rises. Then follows the final stage the exciccation or scab stage, in this stage the pustules gradually dry up into at first yellowish and later on dark-brown scales, which become detached and leave behind white shining cicatrices or brownish-red spots. The completion of scabbing takes about 3 to 5 days.

Differing from the foregoing normal course several of the pocks may run together and form large pustules (viriola confluens), or the eruption may be complicated with hæmorrhagic diathesis (variola hæmorrhagica) with gangrene of the skin (variola diptheritica) in many cases.

Anatomy of Variola:—If we follow the development of variola under microscope, we shall see above, the papillary body swell and form here and there pale flakes with cells which contain no nuclei. Afterwards, the papillary body is converted into a serous fluid and all the epithelial cells of the stratum mucosum dissolve with the exception of a few. which become drawn out into trabeculæ and threads by the accumulated exudate. The vesicles thus form, between the papillary body and the horny layer, a cavity which is filled with fluid, and has trabecules and threads intersecting it. At the same time the papillary body and the cutis lying under it become inflamed, swollen and infiltrated with round cells. The pustule develops from the vesicle by an abundant immigration of leucocytes from the papillary body into the fluid of the vesicles and by the exciccation of the pustule and by the absorption of the cellular infiltration under the crust. The epidermis is replaced from the remaining tissue and from the edges of the sore. The trabeculæ in the interior of the vesicle prevent the centre of the pock from rising up and hence the depressed appearence of the centre of the pock".

The Symptoms in lower animals:

(a) *Horse-pox* (Stomatitis pustulosa contagiosa):-

It is a mild disease in equines. The introductory stage mostly passes off unnoticed, the eruption appears on lips, nasal mucosa, genitals and on the hairless portions of the skin, particularly the hollows of the feet. The eruptions may appear on the entire body or be localized. The changes go through exactly the same course described previously, or in some cases and in some situations such as the heels of the feet the vesicles burst discharging limpid fluid without going through the suppurative stage.

(b) *Cow-pox*:—This is a mild disease. The pocks accompanied by slight rise in temperature appear on the skin covering the teats and udder. The skin becomes tender followed by appearance of small reddish spots. These coalesce, become vesicles, then turn into pustules with depressed or umbilicated centres surrounded by an areola. Many of these vesicles are ruptured by the hands of milkmen and the virus transmitted to superficially injured udders of other cows.

(c) *Sheep pox:*—This appears in two different forms. The benign, simple or uncomplicated form and malignant or complicated form. It is called "Clavelee" in France and 'Scabrat' in Germany: it occurs epizootically and enzootically. It is usually not fatal but in bad cases the mortality may be as high as 20 %. It is characterised by high temperature followed by eruptions going through the usual stages. The eruptions appear inside the thighs, arms, under surfaces of the belly and chest and sometimes all over the body. In malignant form of the disease there may be hæmorrhages from the eruptions giving the so called "black" sheep-pox. The infection of sheep-pox appears to be through the respiratory tract.

(d) *Goat pox* (Variola caprina):—This disease closely resembles sheep-pox. At the beginning there are

moderate febrile and catarrhal symptoms and different sized vesicles appear inside thighs, udder, face, lips and round the eyes. In some cases, even the milk becomes tainted with blood which is due to small abscesses that develop inside the tissue of the udder.

Therapeutics:—Beyond keeping the affected parts clean and dressed with camphorated vaseline or hot Boric compresse, I believe nothing more is necessary.

The affected animals should be segregated and fed with mashes and nutritious gruels. The milkmen and attendants should be told about the contagious nature of the disease and necessary precautions to be taken to avoid them spreading the disease to healthy stock.

Vaccination:—Dr. Jenner in 1789, in a virulent outbreak of small-pox in men, observed that milkers were free from this disease. He found eruptions on the udder and teats of cows secured the contents of the vesicles of cow-pox, inoculated several presons including children with this material and found that the inoculated persons were immune to small-pox. Since then vaccination against small-pox was established. Dr. Jenner's wonderful discovery was quite different from what his previous observers had done. Jenner's method consisted of transplanting cow-pox in men and thus immunising them, more or less, against small-pox.

At first, soon after his discovery, the original lymph of cow-pox or vaccinia was used for the vaccination of man. The difficulty in obtaining requisite amount of cow-pox lymph was soon felt owing to comparative rarity of cow-pox in cows. Then came vaccination from man to man. Owing to the transmission of human diseases such as syphilis it had to be abandoned and vaccination with lymph obtained from calves has been introduced.

The technique of making lymph.

Calves (about 5 to 12 weeks old) which have been found to be healthy are placed on an aseptic table and

secured in latricumbent position with the right hind-leg drawn upwards. The skin from the symphysis pubis up to the umbilicus, and laterally to the fold of skin at the stifle, is shaved and carefully disinfected. Then either "incision" inoculation or "surface" inoculation is performed, either with long parallel incisions or discrete punctures on the entire surface. These are rubbed over with mature lymph from a previously inoculated calf.

The vesicles generally mature in 4 or 5 days, and the lymph contained in them is used for the vaccination of human beings and for further inoculation of calves. The inoculation material is obtained by means of a pair of clamp forceps, with which the lymph can be easily squeezed out of the vesicle. One calf gives from 1000 to 3000 doses.

Concluding Remarks:—Of late, many workers have found a very close relationship in the pox found in man, lower animals and birds. Van Heelsbergan-(1920) has done experiments to show the close relation between some of them. He describes a series of experiments on the transmissibility of fowl pox to mammals. He passed the fowl-pox virus through rabbits and the thus exhalted virus was planted on calves and a cow. The reaction produced appeared to be identical to vaccinia. Cow-pox virus was inoculated on combs of fowls and a reaction was similar to natural fowl-pox He also proved that Pigeon-pox was transmissible to the combs of fowls. Immunity tests were also done by him and it was observed that infection with cow-pox gave the fowl immunity against fowl-pox virus., i.e. Bassi (1896) and De Jong (1914-15) have shown that the virus of contagious pustular stomatitis of the horse is identical with vaccinia. In 1879, Freidberger succeeded in transmitting a variola infection to the fowl by means of stomatitis material from the horse.

Van Heelsbergan succeeded in transplanting the fowl-pox material on to the mucous membrane of the upper lip of horse. He says that after 3 to 5 days the follicles of

the mucous membrane commenced to swell. Vesicles appeared which became pustules. Small ulcers coalesced to form large denuded areas thus resembling contagious pustular stomatitis.

In 1899, while working under late Col. Raymond at Belgachia transplanting experiments with vaccinia on pigs were successful. Though I have not seen a case of swine-pox, it does not exclude the possibility of swine-pox in Bengal. The transplanting experiment is interesting in this way that when vaccinia can be transplanted on a pig, the converse may also be possible bearing in mind that other variolæ are so closely related to one another or are identical if I may venture to suggest it.

Observers such as Turner Leroi and others believed about a common origin of Variola and Vaccinia. Bollinger maintained that small-pox and sheep-pox were the only two essential forms of Variola and that the other forms met with in other animals evolved from Variola. Roloff and Bollinger held the opinion that cow-pox originated from small-pox.

To sum up, the relation between the different forms of this disease met with in different class of animals makes one believe that the causative agent is the same but gets modified in the various kinds of environments in which it grows and passes.

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MUDSORES, INCLUDING SUMMARY OF NOTES ON PERIODICAL INSPECTION OF ELEPHANTS ATTACKED WITH MUDSORES.

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Subscribed by his son, Mr. S. Gupta.

Nomenclature:—The term "Mud-sores" is fairly known in Burma amongst the men who work during the rainy season in the forests. As the symptoms on both men and elephants are more or less identical, this name has been appropriately chosen for the sores of elephants which occurred last year.

Geographical distribution:—The disease was fortunately limited to one area in the North Division Forests, i. e. at Zadipo Chaung. A few mild cases also happened in the areas not far from the infected area, the history of which, if properly traced may be found that the animals might have been grazed in or near this particular stream. This season there are a few cases of a very mild form at Myohla chaung, and one case at West Seva in Sinok Kyaw Hmu's herd (Pe Bu).

Etiology:—The main cause of the disease originated from the soil. The soil of the particular stream after the flood favours the growth of fungus and as both men and beast have to stand in water for hours together daily for consecutive days during the rain, small parasites get accross into the feet of both animals and men (men also suffer from mudsores at the same time with elephants). I was not in a position to ascertain the chemical composition of the soil which particularly favours to germinate the parasites of the itch. From several scrapings taken from the patients suffering from this troublesome disease, in a few I found on microscopical examination parasites analogous to itch insects on human beings, *Sarcoptus Scabiei.*

These parasites I only found on Mola and Damyagyi.

The disease is essentially endemic and not epidemic. The season when the elephants are more severely affected is July to September. Cases are much less common in the cold and dry weather. The new elephants are mch more susceptible to attack than the seasoned beasts. It may be possible that prolonged residence in the working forests confers immunity and that newcomers are especially liable to get the sores.

Ill health and debility do not seem to predispose to the complaint. The robust are attacked as often as the weak.

Symptoms:—

(1) *Mode of commencement:*—The sore generally begins as a papule probably through scratches from thorns or splinters when the parts are very soft and tender on account of continuous standing in the slush and mud. That abrasions of this kind of the starting point is indicated by the fact that the sores rarely occur elsewhere than in the extremities at dorsum of the feet and toe-nails.

(2) *Mode of Growth:*—Extension commonly takes place in two ways, viz:—(a) by simple growth of the primary nodule. It generally maintains a roughly circular shape or (b) secondary papules may form in the areola of the primary nodule, sometimes all round it, sometims on one or other side, and often at a distance of an inch or an inch and a half. The sores grow and proceed to coalesce, forming an extensive raised warty patch which may be two, three or even more inches in its long diameter. Its common shape is irregularly oval and seldom circular. In its natural untreated state it is found to be covered by a rough scab found by the drying of the light discharge which oozes from its surface.

(3) Stage of ulceration:—Sooner or later in a large proportion of the sores a stage of definite ulceration sets in. It generally begins soon after the first attack. In some

cases the sores gradually dry up and shrink without breaking down into ulcers.

When ulcertaion does set in, the centre of the sore breaks down and definite loss of substance takes place. This proceeds solely at the expense of the neo-plasm and does not extend beyond the infiltrated area of the skin. Deep tissues are never invaded. The depth of the ulcer depends on the thickness of the neo-plasm. In the prominent fungating sores an excavation of some depth may form. In the flat dry sores there may appear to be nothing but a loss of surface epithelium. The edges of the ulcer are ill-defined, irregular and sometimes jagged. They are, however, not undermined. They merge gradually into the thickened nodular margin of the growth. On probing or scraping the sore, it is found to consist of a thick layer of friable granulation tissue which they have infiltrated and destroyed the whole thickness of the skin, but never seems to penetrate further. The ulcer, if it does not proceed to heal loses in time its characteristic appearence; the nodular over-growth disappears and the edges of the ulcer become hard and horny. The sore in fact becomes an ordinary indolent ulcer.

In size the sores vary from an inch to three or four inchs in diameter. In prominence they vary greatly. Some are moist projecting growths, raised half-an-inch above the level of the skin and resembling at first sight fungating epithelioma. Such growths are sometimes very fœtid. They are frequently multiple and generally oval at the dorsum of the lower extremities.

(4) *Stage of Healing and Treatment*,—Healing usually sets in very satisfactorily under the treatment of Hypochloras acid. The drug itself is a valuable germicide and by far the best antiseptic. It is cheap at the same time. The chobing with wax, catechu etc. is generally used as a coating. The treatment so far has proved very successfull and even stubborn cases did not take long to heal up.

Summary of Notes on
Periodical Inspection of Elephants attacked with Mud-sores

No.	Elephants.	Sinok.	Location of camp.	Date of inspection.	Summary of report.	Results.
1.	Pu Tauong Nyaing.	Aung Thein.	Camp 5. Zadipo. chaung,	26-8-16.	The parts around and under the nails of right hind feet have been affected. The slipper of the affected limb is also partly eaten away; condition fairly good; trifle thin.	
			Camp Sagwe	6-9-16.	Mud-sores are healing up slowly; has beep treated for worms on 6-9-16.	
			Shweka-Tongyi.	22-10-16.	Mud-sores fully recovered.	
		Clerk Tun Win.	Do.	8-3-17.	*Second attack*; cracked nails and a tissue between the 2nd and 3rd toe-nail.	Recovered.
2.	Mg wa.	Aung Thein.	Camp 5 Zadipo Chaung.	26-8-16.	Condition fair; put off work before my inspection. Left front toe-nils are affected with mud-sores. Skin scaly. Prescribed a course of Liqr. Arsenicalis.	
			Camp Sagwe.	6-9-19.	Mud-sores are healing up slowly.	
			Camp Shweka Tongyi.	22-10-16.	A small mud-sore on the toe-nail of the left front foot.	Recovered.
3.	Mebauk.	Aung Thein.	Zadipo chg. camp No. 5.	26-8-16.	Mud-sores on both hind feet.	
			Camp below Sagwe.	5,6-9-16	Mild attack of sores; healing up slowly.	

No.	Elephants.	Sinok.	Location of camp.	Date of inspection.	Summary of report.	Results.
			Shweka Tongyi	17 to 22 Oct. 16.	Cracked toe-nails on both front feet.	
		Clerk Tun Win.	Do.	8-3-17.	*Second attack.* Two patches of unhealthy looking sores on the front toe-nails.	
				17-3-17.	Sores still bad.	Cured.
4.	Motovo.	Aung Thein.	Camp 5. Zadipo chg.	26-8-16	Toe-nails of the hind feet affected, the front feet tender.	
			Camp below Sagwe.	5.6-9-16	Condition of the sores about the same as before.	
			Shweka Tongyi.	17 to 22 Oct. 16.	Mud-sores healed up completely.	
		Clerk Tun Win.	Do.	8-3-17.	*Second attack.* Sores between 3rd and 4th right toe-nail.	Cured.
5.	Kayinma.	Aung Thein.	Camp 5. Zadipo ch.	26-8-17.	A few sores have broken out on the toe-nails of right hind foot. The slipper of the affected limb is slightly eaten away.	
			Camp below Sagwe.	5 6-9-16.	Sores healing up gradually.	
			Shweka-Tongyi.	17 to 22 Oct. 16.	Mud-sores completely healed up.	Cured.
6.	Papo.	Aung Thein.	Shewka-Tongyi grazing.	17-3-17.	Mud-sores on the front toe-nails.	Cured.
1.	Damyagyi.	Po Thein.	Camp 4. Zadipo chg	27-8-16.	Toe-nails of the left hind quarters affected. The slipper of the left hind foot is worn and attenuated; trifle thin.	

No.	Elephants.	Sinok.	Location of camp.	Date of inspection.	Summary of report.	Results.
			Shweka-Tongyi.	4-9-16.	Sores are all healing up gradually; a fresh small sore has developed on the upper part of the wrist joint.	
			Do.	17-to 22-Octr. 16.	Sores healing up rapidly. An injury to the right eye. Pupil and cornea opalescent. Defective eye-sight,	
		Clerk Tun Win.	Do.	8-3-17.	Sent to Shweka-Tongyi as a second attack of mud-sore has developed since the later part of January. Condition also has run down to a certain extent.	
				17-3-17.	A fresh sore has developed with right front foot.	
				16-4-17.	Mud-sores almost healed up.	Died of malignant lpmphangitis.
2.	Swega.	Po Thein.	Zadipo chg.	27-8-16.	Bad with mud-sores affecting nearly all the toe-nails.	
		Do.	Shweka-Tongyi.	4-9-16.	Sores are all healing up satisfactorily.	
			Do.	17 to 22-Octr. 16.	Mud-sores have nearly healed up.	Good recovery.
3.	Pakyikaw.	Po Thein.	Zadipo chg.	24-8-17.	Toe-nails have been slightly affected.	
			Shweka-Tongyi.	4-9-17.	Mud-sores practically healed up. A big swelling has developed on the dorsal region of the spine.	

No.	Elephants.	Sinok.	Location of camp.	Date of inspection.	Summary of report.	Results.
			Shweka-Tongyi.	22-10-16.	Mud-sores healing up. The swelling of the spine was opened by Sinok.	
		Clerk Tun Win.	Do.	8-3-17.	*Second attack.* Chronic mud-sore on the right fore foot. Condition fair.	Cured.
4.	Moki.	Po Thein.	Zadipo chg:	27-8-16.	Mud-sores on her toe-nails. Condition fair, trifle thin.	
			Shweka-Tongyi.	4-9-16.	Sores are all improving; condition 'fair to good'.	
			Do.	17 to 22 Oct. 16.	Sores completely healed up.	Good recovery.
5.	Menin.	Po Thein.	Compartment No. 4 belowZadipo chg:	27-8-16.	A few sores on the toe-nails of her right front foot; condition very fair.	
			Shweka-Tongyi.	4-9-16.	Sores are not healing up satisfactorily on account of difficulty in handling the beast. Condition from "Very Fair" to "Good".	
			Do.	22-10-16.	A small sore at the right front foot. Condition fairly good.	Cured.
6.	Mekwa.	Po Thein.	Compartment 4. Zadipo chg:		Transferred to the sick camp (Mg. Tike) on 18-8-16- for a bad attack of mud-sores before I inspected the herd.	

No.	Elephants.	Sinok.	Location of camp.	Date of inspce-tion.	Summary of report.	Results.
		Mg. Tike.	Camp Ougmget-Sho-myaung.	27-8-16.	Both hind feet have been badly affected; moisture round the toe-nails with sores which are communicable to the slippers. Dimension of the sore 3" x 2" x 2". Other small sores viz. one on the left shoulder, one on the back, and one on the left cheek were not mud-sores, but the sores caused by injury inflicted by the rider, unavoidably of course, when the animal was at large and evading capture.	
		Po Thein.	Shweka-Tongyi.	22-10-16.	Sent back to this camp from Sinok Mg. Tike. The animal has many dab cut wounds inflicted by her rider when at the sick camp. Mud-sores are looking unhealthy. Condition poor.	Died of debility and worms.
7.	Namukaw.	Po Thein.	Shweka-Tongyi.	4-9-16.	Developed a very mild attack of mud-sore on her toe-nails. Condition fairly good.	
			Do.	22-10-16.	Mud-sores healed up now.	Completely recovered.
1.	Mekyein-san.	Po Lu	Do.	22-10-16.	Mild attack of mud-sores. Condition good.	Fully recovered.
2.	Mukaw.	Do.	Do.	2a-10-16.	Mild attack of mud-sores. Condition good.	Fully recovered.

No.	Elephants.	Sinok.	Location of camp.	Date of inspection.	Summary of report.	Results.
1.	Mola.	Mr. Noyee's Baggage.	Do.	8-3-17.	Sores on the left toe-nails and back of the right side of the front foot. Condition fair.	Still in the Rest camp, not fully recovered yet.
1.	Sinbankgyi.	Po Thet.	Myohla chaung.	27-7-17.	Mild attack of mud-sores on both front and hind limbs. Condition good.	Under treatment at Shweka-Tongyi rest camp.
2.	Papome.	Po Myaing.	Do.	14-8-17.	Slight attack of Mud-sores.	At Kayin-legyin for treatment.

Remarks.

From the foregoing summary it may be observed that the outbreak of Mud-sores happened in the middle of August 1916 at Zadipo chaung amongst the working elephants of sinoks Aung Thein & Po Thein. Out of elephants of Aung Thein only one (Minthagyi) escaped from the attack. Sinok Po Thein's only one elephant (Balagyi) was free from it. In the later part of the rainy season "Mopado" an elephant of the sick camp and Mekyeinsan & Mukaw of Sinok Po Lu had a very mild attack which recovered no sooner the treatment was taken in hand. Mr. Noyee's baggage elephant Mola had a bad attack in the middle of the dry season. She is still in the hospital and the condition of sore is much improved.

The elephants were at once removed from the infected area and segregated to Shweka Tongyi where they were kept under strict observation. The sores all improved very satisfactorily. " Pukyikaw ", " Damyagyi," " Putaung Nyaing" "Mebauk" and " Motoro " had second attack and they were sent back to hospital camp for treatment in the middle of the dry season. I think the disease was in a quiescent state when they were discharged from the grazing camp at the beginning of the dry season.

THE SPREAD OF BACTERIAL INFECTION.

BY R. V. PILLAI G.B.V.C., OFFG. SECOND SUPERINTENDENT (C.V.D.) CP.

It is recognised by one school of bacteriologists that, if a mouse population be selected which is in a state of equilibrium in respect of casualities due to a bacterial infection, the addition of large numbers of susceptible individuals of the same species is followed invariably by a *larger* or *smaller* outbreak of the disease in question. In other words the outbreak presents a wave form and the survivors react in the same general manner to the addition of fresh susceptibles. It has thus been made clear that the conditions which determine infection or its absence, death or recovery, vary in some orderly manner.

What is a probable explanation to the phenomena thus observed ?

The one feature in the subsidence of an outbreak is a loss of infectivity by the bacterial virus and perhaps the resistance of the host.

Topley (1919) attempted to make a sharp distinction between the property of virulence as measured by the rapidity of multiplication of bacteria in tissues and the power of producing infection by transference from *one animal to another* under natural conditions.

The term " Virulence " is very generally used to denote the power of growth within the tissues.

Similarly, " Infectivity " denotes an attribute not of the parasite but of the diseased subject and depends to a great extent on environments.

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We may therefore say that virulence of an organism and infectivity of the host are essential processes in the natural spread of infection from host to host.

Again while variations in the biological characteristics of bacteria also play an important role in an epidemic wave, yet the relative mass of infection is also one of the determining factors at any given moment.

Amoss (1922) pays considerable attention to the elucidation of this problem. He first thought that exaltation of virulence is a factor which cannot be overlooked in an outbreak but later suggested that the dosage, favourable, or unfavourable condition of growth and multiplication of bacilli in the system have to be accounted for.

There was some doubt regarding the correct meaning of dosage. Whether it meant the number of living bacteria injected by the host or the speed with which the bacteria were capable of multiplication in the tissues. The conclusion arrived at was that the epidemic spread of infection is a result of the saprophytic spread of the micro-organism concerned associated with an increased ability to multiply rapidly under conditions locally existing.

A certain concentration of susceptible hosts is an essential preliminary to the epidemic spread of infection.

With regard to the immunity possessed by those individuals which have passed through one or more waves of disease the evidence available is entirely concordant. Such surviving members of a host popula-tion have a relative but by no means absolute immunity. As a proof thereof Amoss records the presence of agglutination in the blood serum of 60% of the survivors of an outbreak. It was founded by Topely that the bacillus of enteritidis group could be recovered from tissues of a good proportion of the mice that survived an epidemic

of enteric infection. This proves that the survivors resisted infection rathar than escaped it, that the relative immunity possessed by them has been either acquired or increased from a lower level.

For the successful conduct of experiments to test these known facts it was found that prevention of cage to cage infection was an impossibility unless an experimental cage is treated approximately to processes employed with a bacterial culture. With such methods it was possible to conduct experiments with an almost entire absence of accidental infection.

Cages made of zinc were used. For each experiment a double set of cages was provided. Early in the morning the necessary amount of food and saw-dust being distributed, mice were distributed with sterile forceps or were driven into. Rubber gloves were used by attendants and the dirty cages were cleaned and sterilised at 100° c. and kept ready for the reception of a fresh lot the next day. With such precautions it was possible to ensure strict isolation as one would wish in natural conditions if made practicable.

The results obtained in previous experiments by author and others show clearly that the addition of susceptible mice to others that have survived an epidemic wave is almost invariably followed by new outbursts of disease whether this addition is carried out at one step or by daily addition of small numbers of susceptibles or by addition carried out irregularly and at varying intervals. Infection might pass from individual to individual or group to group. Infective animals might transmit the parasite concerned to susceptible members of their species which on coming into contact with other susceptibles might pass on the infection to them. In such a case there would be no accumulation of a considerable population composed of mice of varying grades of infectivity or susceptibility on the one hand and resistance on the other. Each group would be exposed to the risk of

infection for a limited time and would subsequently have an opportunity of passing on any infection which it might have acquired.

Experiments were planned to test the possibility of transmitting infection from groups to group in this way on the following general plan.

Five mice were taken from a cage in which an epidemic of infection with *B Entcritidis* was slowly subsiding. To them 5 normal mice were added and the ten animals were allowed to remain together for three days. They were then separated into two original groups and kept segregated for three days longer. To the second group five more normal mice were added which were separated after three days' contact and the process continued, each group being in-contact for three days with the group preceding it, three days in isolation, three days in contact with the group succeeding it and then in isolation until the mice of which it is composed died or were killed and examined. Each group was observed for six weeks from the date on which it was first exposed, and the results noted.

The general trend of the evidence was that the exposure of susceptible mice to the risk of infection in 4 out of 6 experiments gave evidence of spread of infection from group 1 to group 2. The spread however in all cases soon ceased and in only one experiment does it reach beyond the third group exposed to risk.

To summarise, susceptible mice have been placed in contact with infective individuals of the same species separated from them after a definite period and placed in contact with a further group of normal mice. This process was then repeated again and again, the number of groups exposed varying in different experiments from 3 to 12. In this way, the spread of infection has been limited to that occurring between any one group and the group immediately following it.

Under these circumstances infection has spread far

less readily than was the case in other experiments, in which the mice were retained as a single population and in which infection could spread in any directon among all the individuals at risk. This, therefore is the ideal condition to be aimed at in dealing with an outbreak, if practicable. The next attempt had been the study of resistance of the host in an outbreak. The experiments were particularly directed towards elucidation of the problem of differences, if any, which might occur in the mode of spread of any enteric infection in mice. Then the immunity of the population at risk was varied by including amongst normal and susceptible mice a varying proportion of artificially immunised animals.

This stand point was taken up to study herd immunity as a separate problem from immunity of an individual host. A vaccine of *B. Enteritidis* killed by heat and standardised to contain 4000 million p c. c. and preserved by addition of 5 % phenol was used.

A lot of 127 mice were given an intraperitonial injection of 500 million bacteria. The 119 survivors after 8 days were each injected with 1000 million bacteria. The agglutination titre was found to be 1/10,000.

Immunised and normal mice were mixed up and distrubuted into different cages in varying proportions and all were fed for 2 successive days with bread soaked in 24 hours broth culture of B. *Enteritidis* and events were observed for 60 days.

The results showed a decreasing mortality with an increasing proportion of immune mice, also that intraperitonial inoculation of a killed vaccine confers a definite but by no means an absolute protection against infection by feeding with massive doses of *B. Enteritidis* as a small proportion of immunised mice also succumbed amongst others.

The following tentative conclusions were drawn as a result of the all but few experiments.

Active immunisation of mice in the manner indicated

confers a degree of immunity against subsequent natural infection. It also confers some protection against mouse to mouse infection. There is evidence that spread of infection occurs with difficulty among a population, each individual of which has been actively immunised. There is definite evidence that among a population of mixed susceptible and immunised individuals, the relative immunity of the latter does not save them from infection and death. It appears that a degree of immunity that may save individual host when living among resistant companions is rendered of no avail when surrounded by highly susceptible individuals of their own species.

This conclusion is extremely important. It shows that even actively immunised individuals cannot resist infection when mixed with very susceptible individuals. This explains why we hear of attacks and deaths even amongst inoculated animals within the period of immnnity known to have existed.

EXTRACTS

RESEARCH ON FOOT-AND-MOUTH DISEASE.

(Reprinted from 'The Agricultural Journal of India, January 1927').

Since Lœffler and Frosch in 1897 reported the striking fact that fluid from the vesicles which form the main outward lesion of foot-and-mouth disease in bovines, could, after dilution with water, be passed through kieselguhr filters without suffering loss of potency, it has been customary to regard the virus of this, perhaps the most contagious of all animal diseases, as belonging to the group of ultra-visible or filter-passing viruses. This demonstration by Lœffler and Frosch was, indeed, the first indication that an animal disease might be associated with a virus, the minute size of which permitted it to pass

with ease through filters which retained the ordinary microscopic bacterial forms.

On the Continent, especially in France, Germany, and Holland, where foot-and-mouth disease has long maintained a strong foothold, experimental research has been very intensely and continously prosecuted, largely with a view towards the elaboration of specific methods of prevention and cure. Though much information with regard to the properties of the virus emerged from these investigations, it cannot be said that any decisive solution of the problem of prophylaxis was reached which would be applicable, at any rate, to a country such as Great Britain, which is liable only to occasional outbreaks readily controlled, as a rule, by wholesale slaughter of affected animals and contacts. Further, the accumulated research data have been to some extent of uncertain quality, probably because of the expense involved in carrying out experiments on bovines on a sufficiently grand scale. It came, therefore, as something of a surprsie when Waldmann and Pape in 1920 showed that guinea-pigs could be infected with the virus of foot-and-mouth disease. Lœffler's earlier results in this connexion had been negative and the non-susceptibility of small animals had long been regarded as a *chose jugee*.

The new knowledge, as might have been expected, immediately opened up a new and readily exploitable field for further experimental investigations of the foot-and-mouth virus. In April 1924, Frosch and Dahmen, working in Berlin, announced that they had succeeded in cultivating the virus through many generations on an artificial medium and that by a photographic process they had been able to render the virus visible.

It was at this juncture that the Ministry of Agriculture in Great Britain, faced with the severe and continuing prevalence of foot-and-mouth disease in the country, took the enlightened step of appointing a research committee of ten medical and veterinary experts

with Sir William Leishman as Chairman, "to initiate, direct and conduct investigations into foot-and-mouth disease either in this country or elsewhere, with a view to discovering means whereby the invasions of the disease may be rendered less harmful to agriculture." The first progress report of this research committee has just appeared. It contains no dramatic discoveries, but there is abundant evidence of carefully conducted work leading to decisive conclusions in regard to many hitherto obscure points connected with the properties of the foot-and-mouth virus. So far, the research has been conducted in two establishments, at the Lister Institute, where several workers specially engaged by the committee are being directed by Dr. J. A. Arkwright, a member of the committee, and at the Ministry's laboratories at New Haw, Weybridge, where the work is under the immediate supervision of Sir Stewart Stockman.

Both groups have been working on very similar lines, and both have been employing the guinea-pig as the test animal with great success. The method of choice for inoculating this animal with the foot-and-mouth virus is the intracutaneous, in the hairless pads of the hind feet. In twenty to twenty-four hours redness and swelling at the site of inoculation give place to extensive formation of vesicles locally, and this is followed by generalization of the virus throughout the body, as evidenced by the presence of minute vesicles in the fore feet and tongue and by the infectivity of the blood. The energies of the workers were devoted in the first instance to traversing the claims of Frosch and Dahmen, but with the exception of one or two results of dubious interpretation, no confirmation whatever of the claims of the German workers was obtained. In Germany also, Frosch and Dahmen's claims do not appear to have received any acceptation. It has been apparent, in fact, that the virus tends to die out rapidly in a matter of hours, when kept at 37° C. on a variety of artificial media. Low

temperatures, on the other hand, have favoured its survival.

Always, therefore, with the view of ultimate successful culture, efforts have been concentrated on testing the most suitable conditions for survival of the virus at a temperature of 37° C., and it has been found, for example, that in phosphate solution of P H 7.6 the virus can remain active for four or five days at 37° C. The virus shows a surprisingly high resistance to chloroform and alcohol. In 60 per cent. alcohol, for example, it preserves its potency for eighteen hours at room temperature, while organisms like *B. coli* and *S. pyogenes aureus* are killed in one minute under the same condttions.

Many attempts have been made to infect with the virus other small animals such as rats and mice. Accurate knowledge on this point was desirable, in view of the obscurity that not infrequently surrounds the paths of dissemination of foot-and-mouth disease. White rats, wild rats, white mice, and house mice only very occasionally give evidence of susceptibility to experimental inoculation. On the other hand, the long-tailed field mouse *(Apodemus sylvaticus,)* twelve of which were tested, could be infected with ease. No evidence has emerged, however, to show that, either under laboratory or field conditions, foot-and-mouth disease can spread among these small animals.

Recently the Cattle Testing Station at Pirbright has been adapted for experimental work with cattle, sheep and pigs, every precaution being taken to prevent the entrance or escape of infection. At this station, only, will such experiments be permitted. While research on foot-and-mouth virus with the guinea-pig as test animal is proceeding at approved institutes, the new experimental station will prove a most valuable adjunct for the final testing of varied material on bovines.

SELECTING SIRES FOR THE DAIRY HERD.

(Reprinted from 'The Agricultural Journal of India, January 1927').

There is no more difficult problem in farm livestock breeding than the dairy sire, and when one of the principal aims is dual-purpose character the difficulty is increased rathar than diminished. The choice of the sire is, of course, a matter of cardinal importance and of very great difficulty in all stock breeding enterprises. There are many characteristics to be looked for in all sires according to the requirements of the breed, but in most instances all the qualities that meet the eye are as easily discernible in one sex as in the other. In the case of dairy cattle, however, milking character difficult to detect with certainty in the female is much more obscure in the male.

Beef is as easily discerned in the bull as in the cow, mutton and wool in the ram as in the ewe, bone action and symmetry in the stallion as in the mare, fleshing and form in boar as in the sow, and it is an axiom of stock-breeding that like tends to produce like. In building up the accumulation of merits that makes for prepotency and consistency we can examine, as far as our knowledge goes, the merits of all ancestors, but in the case of dairy cattle we have gaps all along the male side, including the bull whose value we are trying to assess. For pedigree knowledge of the bull's worth for milk we must rely almost entirely upon the merits of the cows from which he is descended.

Milk Records

Milk records have, of course, helped to simplify the task of choosing a bull for a dairy herd, but it has also introduced dangers that are very real. It is common knowledge, indeed general experience, that a heavy milking cow does not always produce heavy milking daughters. We may have a fifteen-hundred gallon cow,

some of whose daughters become her equal or even superior in milk production, while others, perhaps full sisters, cannot be prevailed upon to give half of this amount. We may even have cows, all of whose daughters fall short of them as milkers without any adequate explanation being discoverable in the breeding on the sire's side.

As daughters of a heavy milker may fail to inherit their dam's milking character, or may inherit it in varying degrees, so we may assume that her sons will vary. Indeed no guessing is required, for it is everyday experience that they do. In the female the lapse is detected, but we have to wait for another generation to discover it in the male. Milk records are a great assitance, but they do not provide data from which infalliable deductions can be drawn.

Blind Reliance on Records.

It has been mentioned that a real danger attaches to milk records, and this is to be found partly in a blind faith that a bull well bred for milk must produce heavy milkers, but chiefly in making the scales the supreme test, or worshipping at the shrine of exceptional records. In the breeding of pedigree cattle breed character must remain one of the primary considerations, and in the breeding of all dairy cattle farm, stamina, and constitution cannot be ignored. It happens with all breeds that some of the heaviest milkers are in themselves moderate animals, judged by every standard except milk production, and it may be claimed that in the dairy herd milk production is almost the only thing that matters. Prolonged and persistent milk production is, however, largely a matter of stamina, stamina again of conformation, and conformation of consistent breeding to one standard. A blind trust in milk records must lead quickly into degeneracy, and prove a handicap rathar than assistance. Because it is the object to breed heavy yielders it does not follow that the best results will always be

obtained from breeding from those with the greatest yields to their credit.

The Breeder's Problem.

The breeder's problem is how best to combine breed character, conformation, stamina, and yielding power. What particular characteristic should he build upon? Should he start with heavy yielding capacity, and try to graft the others on to it, or should he begin with character and conformation, and work towards the yield? I do not think that there can be any question about the latter being the safer course. Character and conformation are much more difficult to regain if they are lost, and when they are lost it is only a matter of time, and generally a short time before milking capacity goes with them. We do not require to go to poor milkers to obtain the necessary character and constitution and heavy production does not necessarily mean that they must be absent. If we can get all the required qualifications in one animal it is likely to prove the one we are looking for, and if it transmits all its merits it certainly is. This combination, however, is so rare that it is negligible, and it is the safer plan to look first for primary merits, and take as much as we can of the others.

Success in dairy cattle breeding is founded upon constitution. Heavy milk production is a severe tax on a cow's system. No cow with a weak constitution can continue giving very heavy yields, heavy according to her size, but in the absence of cast-iron stamina she may ruin such constitution as she has. It is quite possible and very common for a cow to have milking character beyond her constitution, with the result that she and her race fade away. The use of a bull from such a dam can only end in disaster.

In the early days of milk recording one frequently heard the objection that it would destory the capacity for good judgment, which would decay owing to disuse,

but so far from this being the case milk records increase the field for the exercise of sound judgment. They supply more precise information along one particular line, so that the breeder instead of guessing at certain things has trustworthy data to go upon. He does not find matters settled for him, but only obtains facts to help him to arrive at a decision.

Analogy with Laying Poultry.

There is a fairly close analogy between laying poultry and the dairy herd. In each case the return comes through an essentially female function. In both cases a sire's value can be gauged only by the performance of his daughters, but in poultry breeding the returns come much more quickly, so that breeding experience accumulates more rapidly. It has been found in poultry breeding that the big layers are seldom bred from stock with extreme egg records. The tax upon the constitution of the heavy layer is similar to that upon the constitution of the heavy milker.

Now all this might be taken to point to heavy yields in dairy cattle as a mistake. Far from it, for heavy yields must be the aim, and the only ultimate aim, in the breeding of dairy stock where dual-purpose character is not a plank of the breeders' platform. What I desire to emphasize is that the desired yields cannot be attained and retained without due regard to the constitution and stamina of which vigour is but a sign.

Importance of the Udder.

There is another fault often seen in heavy milkers-a badly shaped udder. Indeed, many of our heaviest yielders have rather atrocious vessels. What, then, is the sense of striving after symmetry and shape of bag when the shapely vessel is out-stripped in milk production by the ugly, pendulous, badly balanced, split-up and windy-teated vessel? Here again, however, we have to look to

the future rathar than the present. A good level vessel is much more likely to wear well, and is less liable to the ills that udders are heir to. The sloppy, pendulous bag is more liable to injury, and the coarse teats cost much more to milk. Incidentally easy milking does not perhaps get all the attention it deserves in these days of high wages; a hard milker that keeps a man a few minutes longer at every milking brings a considerable bill against herself in the course of a year. The shape of the udder is not a fancy point set up against utility qualities. The stock-breeder has to wage a constant war against degeneracy and to the correction of faults-faults that in moderation are not a serious blot on the commercial value of an animal but that if allowed to develop unchecked would ruin any race of cattle. There can be no question that the sire is a very important factor in determining the shape of the udder, and a son of a cow with a bad udder is not likely to give satisfactory results even if the dam's record is exceptional.

Breed Character.

The maintenance of breed type and character sometimes involve points that it is somewhat difficult to separate from the fancy, but one must always be careful before treating lightly any well-established breed characteristics. One of the faults we have to guard against in all breeds is degeneracy into mongrelism, with the loss of the prepotency built up by generations of careful breeding. Breed type is an important foundation in breeding for the future, and in maintaining a standard, and is an elementary factor that no breeder can afford to neglect. Indeed, in pedigree breeding it must be the foundation upon which all is built.

In the selection of the stock bull the breeder of dairy cattle has to study breed type, character, form, constitution, and pedigree. He must get not only a good bull, but one bred from good stock, as far as he can discover.

He must get the best milk records in the immediate dams he can obtain, combined with these other qualities, and even so bulls will be found that fall much short of expectations. This failure of pedigree may sometimes be apparent in the beef male when it is hidden in the dairy-bred bull. The supreme difficulty is that the breeder has to discover it in the failure of his stock. He may have suspicions when heifers have reached in a year or so of age, but he has to wait until they have calved before he feels even fairly certain, and until the sire's daughters have reached second-calf stage, before he can be dogmatic. In other words, no one can speak with certainty about the dairy sire until he has reached five or six years of age.

LICE, MANGE AND TICKS OF HORSES, AND METHODS OF CONTROL AND ERADICATION.

BY MARION IMES.

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HORSE LICE.

Each species of domesticated animal has its own peculiar kinds of lice, and horse lice will not live on animals other than horses, mules and asses. Three kinds of lice are commonly found on horses in the United States. The first and most important of these is the blood sucking species known technically as *Hæmatopinus asini*. The two other species, *Trichodectes pilosus* and *Trichodectes parumphilosus*, are biting lice.

The sucking louse of the horse is easily distinguished from the biting species. It is much larger, and has a long, pointed head, whereas the biting lice have short, blunt, rounded heads. The sucking louse apparently

causes more damage than the biting lice, and it is more difficult to eradicate.

NATURE AND HABITS.

The eggs or "nits" of the sucking louse are attached firmly to the hairs, usually close to the skin, and they hatch on the animal in from 11 to 20 days, the majority hatching in from 12 to 14 days. The young lice reach maturity and the females begin laying eggs when they are 11 or 12 days old. The lice pass their life on horses, and can live only about 2 or 3 days when off a host animal.

The biting lice of horses deposit their eggs in the same general manner as the sucking louse. The period of incubation is probably from 8 to 10 days. These lice may live as long as 10 days when separated from the host animal if kept on tufts of hair, but most of them die in 5 or 6 days.

During cold weather, when the hair on horses is long, lice increase very repidly; but when the animals shed their hair in the spring these parasites seem to disappear. Some of the lice usually remain on the animals throughout the summer, but not in sufficient numbers to cause annoyance or to be easily detected. The animals, therefore, usually go into the winter infested. Since the most efficacious remedies are liquid dips, which cannot safely be used on horses during cold weather, fall dipping should be practised whenever horses have been lousy at shedding time.

SYMPTOMS.

The sucking louse obtains its food by puncturing the skin of the horse and sucking blood and lymph. When not feeding it moves about on the hair and skin. The biting lice do not suck blood from the host, but apparently feed on particles of hair, scales, and exudations from the skin. The irritation and itching which result from either or both methods of feeding are shown by the

efforts of infested animals to obtain relief. Infested horses rub and bite themselves and often kick and stamp and manifest extreme uneasiness and irritation.

The coat becomes rough; the frequent rubbing destroys the hair in patches and often causes bruises or wounds in the skin. If lice are present in sufficient numbers to cause considerable itching and irritation they can usually be found; especially if the infested animal is placed in the sunshine. All species of horse lice are easily seen with the naked eye, and often congregate in groups or colonies on parts of the animal. The favourite locations are the sides of the neck, around the flanks, and under the jaws. In cases of gross infestation, however, lice may be found all over the body and legs.

When horses are lousy, close examination should be made to learn what kind or species of lice is present. It is not especially important, from a practical standpoint, to distinguish between the two species of biting lice, but it is important to know whether the animals are infested with biting or sucking lice or with both kinds.

METHOD OF SPREADING.

More cases of infestation originate from direct contact with lousy animals than in any other way. Under reasonably good sanitary conditions stables, yards and other premises which have contained lousy horses are not a source of great danger to horses free from lice. It seems probable, however, that occasionally lice may become dislodged from their host and drop on mangers, floors, etc., and from these locations find their way to a new host.

When separated from their host sucking lice live about 3 days, the biting lice not to exceed 10 days. Ordinarily eggs are not deposited except on the host, but when the hair to which they are attached is removed and kept under favourable conditions they may continue to hatch for as long as 20 days. The newly hatched lice live only 2 or 3

days unless they find a host. It is therefore possible for premises to remain infested for 25 or 30 days from the time they were occupied by infested horses. When lousy horses are clipped the hair should be burned and the ground or floor where the clippings dropped should be thoroughly treated with an insecticide.

Lice may be carried from one animal to another on currycombs, brushes, and blankets, or by harness, saddles, and other equipment moved directly from a lousy horse to one free from lice. Currycombs and brushes should be treated each time a horse is groomed. Harness, saddles, blankets, and other equipment used on lousy animals should not be put on horses that are free from lice unless the equipment has been thoroughly cleansed.

When cleaning stables and yards remove all litter and manure down to a smooth surface, then spray well with a good insecticide. The coal-tar creosote dips, diluted in accordance with the instructions printed on the label of the container, are suitable for ridding premises of the lice.

TREATMENT.

None of the dips recommended for use in treating horses can be depended on to eradicate lice at one dipping. The first dipping, if properly done, will probably kill all the lice, but it may not destroy all the eggs. The "nits" or eggs which survive dipping often hatch, forming a new generation of lice. This new generation should be destroyed by a second dipping after hatching is completed and before the young lice become mature and begin depositing eggs. Since these two periods overlap somewhat and vary greatly, and because the periods from hatching to egg laying are different for the sucking and biting lice, it is impossible on this basis to calculate the exact period that should elapse between dippings. Young lice appear on dipped animals as early as the third day after the first dipping, and since the average period of maturation is about 12 days it seems evident that the second dipping

should be given in about two weeks. Experience has shown that two dippings with an interval of from 14 to 16 days can usually be depended on to eradicate both sucking and biting lice.

The dips commonly used for eradicating lice on horses, mules, and asses, named in the order of their effectiveness, are arsenical solution, coal-tar creosote, and nicotine. The arsenical solution is poisonous, and unless handled with due precaution injury to man and animal may result. When properly used, however, it is the most dependable known dip for eradicating lice. The coal-tar creosote dip is effective when used in reasonably good water. Two dippings, from 14 to 16 days apart, in either of these dips can usually be depended on to eradicate horse lice. Two dippings in nicotine solution will ordinarily free horses from lice. On account of the difficulties in dipping in cold weather, and the unsatisfactory nature of hand treatments, most of them only palliative, it is advisable to dip for lice, when they are present, in the fall of the year before the onset of cold weather.

Hand applications of dusting powders and oils and greases are often resorted to in treating horses for lice. Some of the dusting powders are of value in holding the parasites in check, but as a rule they are not effective in eradicating sucking lice. Biting lice can be eradicated with sodium fluoride applied in the form of a powder or mixed with water in the proportion of about 1 ounce to 1 gallen ; but it is not effective against sucking lice. Care should be taken not to apply sodium fluoride too freely around the natural body openings or where the skin is very thin and hairless, and not to rub it into the skin. It may be applied with a dust gun, or a shaker, or by hand.

Oils and greases, such as crude petroleum, crank-case oils, or equal parts of cottonseed oil and kerosene, are effective remedies for lice ; but ordinarily they are not

suitable for use on horses, as they cause the hair to come out, and they often blister the skin.

Fumigating horses with the fumes from burning sulphur (sulphur dioxide) will kill horse lice, but many of the eggs survive, and two treatments two weeks apart are necessary to effect eradication. The advantage of this method of treatment is that it can be used when the weather is too cold for dipping. The disadvantages are that it is necessary to have a gastight enclosure and the animal's eyes and nostrils must be kept away from the gas. A concentration of about 1 per cent sulphur dioxide is necessary to kill the parasites, and serious injury or death may result if the gas comes in contact with the eyes or nostrils. After fumigation it is necessary to hand treat that part of the head that was not fumigated.

HORSE MANGE.

Scabies in horses, commonly known as mange, itch, or scab, is a name given to a group of contagious skin diseases caused by minute parasites known as mites, which live on or in the skin. Four species of these parasites are found on domesticated animals, but horses are commonly affected by only three of them. These parasites are classified zoologically in three different genera--*Sarcoptes, Psoroptes,* and *Chorioptes.*

In obtaining their food from the host and preparing a resting place in or on the tissues, the mites cause wounds, or lesions in the skin. As each kind of mite possesses distinctive habits, the location and nature of the lesions in the early stages are more or less characteristic. Each kind of mite, therefore, causes a specific kind of mange which is named after the generic name of the mite. Thus we have in horses sarcoptic, psoroptic and chorioptic mange. The sarcoptic variety is the one most common on horses in the United States.

SARCOPTIC MANGE.

SARCOPTIC MANGE MITE.

The mites which cause sarcoptic or common mange of horses are small, white, or yellowish parasites known technically as *Sarcoptes scabiei equi.* The female when full grown measures about one-fiftieth and the male about one-sixtieth of an inch in length. When placed on a dark blackground they are visible to the naked eye. The general form of the body is more nearly round than oval, and the bluntly rounded head is as broad as it is long. When mature these mites have four pairs of short, thick legs, the fourth pair and usually the third pair also not extending beyond the margin of the body. Under a higher power microscope a number of short, backward-projecting spines may be seen on the upper surface of the body.

The sarcoptic mites penetrate the upper layer of the skin and excavate burrows or galleries in which the mating of the sexes occurs and the eggs are laid. Each female may lay from 10 to 25 eggs during the egg-laying period, which probably lasts from 12 to 15 days. When that period is completed the female dies in her burrow. The entire life cycle is passed on the body of the host animal. The eggs hatch in from 3 to 10 days, and the young mites after passing through several molts reach maturity and begin laying eggs in 10 or 12 days.

As the average period of incubation on the animal is about 4 days, and the average period after hatching until egg laying begins is about 11 days, a new generation of mites may be produced in about 15 days. If the first treatment or dipping could be depended on to kill all the mites on the animal the time for the second treatment could be calculated accurately. Unfortunately, the first treatment usually does not kill all the sarcoptic mites on the animal because of the difficulty of getting the dip or other insecticidal substance into the burrows and in contact with the mites. Practical experience has shown

that the interval between treatments or dippings should be from five to seven days.

SYMPTOMS.

In the early stages of sarcoptic mange in horses the first visible lesions usually occur on the neck or shoulders or around the head, but the disease may start on the breast, flanks, sides, or other parts of the trunk. From these parts the disease spreads until the entire surface of the body may become involved.

The mites penetrate the upper layer of the skin, each female making a separate burrow or gallery, which usually extends to the sensitive tissues or "quick." The presence and activities of the mites on the sensitive tissues cause great irritation and itching, and the skin becomes inflamed and swollen, so that small nodules are formed over and around the burrows. As the disease developes vesicles are formed which break and discharge serum. As the serum dries, small scabs are formed and the hair over the affected parts stands erect and some of it drops out. In some cases the affected areas of skin become dry and scurfy, and may have a leatherlike appearance.

The mechanical injury to the skin resulting from rubbing and biting causes large scabs to form, which adhere firmly to the underlying tissues. The large scabs often are broken by the movements of the animal, and blood or serum may stain the scabs a reddish yellow.

As the disease advances the skin becomes more or less bare in irregular-shaped, bald patches, and is greatly thickened and thrown into wrinkles or folds. In severe cases the horse loses flesh rapidly, becomes greatly weakened and unless properly treated may die.

CONTAGIOUSNESS.

Sarcoptic mange is transmissible from one species of animal to another, and also from animals to man. Ordi-

narily when one species of animal contracts the contagion from another species the mites live only a limited time on the new host. Sarcoptic mites of the sheep, hog, camel, dog, cat and rabbit may live on horses and those of the horse, dog and hog are known to be readily transmissible to man.

Sarcoptic mange of horses is contagious to all classes of horses, and is usually transmitted by direct contact with infested animals. It may, however, be transmitted by other objects, such as currycombs, blankets, or harness, or in stables or other premises. It is important that mangy horses be isolated and all equipment kept separate until the disease is eradicated.

Apparently the disease spreads slowly during warm weather, especially among horses on pasture, but it makes rapid headway in horses closely confined or crowded together in small inclosures. Exposure to cold, inclement weather, insufficient feed or poor quality, or any other circumstance tending to lessen the vitality or functional activities of horses hastens the spread and development of mange. When the mites are active under favourable conditions the lesions extend rapidly, and the entire body surface may become involved in about six weeks.

Although they do not propagate themselves except on the bodies of animals, the mites as well as their eggs may retain their vitality for a considerable time off the host animal. When exposed to sunlight in dry places the sarcoptic mites live only a few days, but in moist protected places they may live three weeks or even longer. Although it is difficult to infect horses experimentally from infested premises, the possibility that the disease may be contracted from such sources should not be overlooked. It is good sanitary practice to clean and disinfect all stables and small enclosures which have been occupied by mangy horses, also all currycombs, brushes, blankets and other objects used on such horses, before using them

for clean animals. Cleaning and disinfecting for sarcoptic mange may be done in the same manner as for lice.

TREATMENT.

On account of their burrowing habits, sarcoptic mites are difficult to eradicate. The common dips, such as lime-sulphur, nicotine, and coal-tar creosote, will kill sarcoptic mites if the dip can be brought into direct contact with the parasites. This method, however, requires thorough, frequent, and persistent applications. From four to six dippings five to seven days apart, in lime-sulphur or nicotine solution will usually effect a cure in ordinary cases, especially if all affected areas are soaked well with warm dip and scrubbed with a brush just prior to the first dipping. Affected animals should be held in the bath from two to three minutes.

Two or more applications, a week apart, of unprocessed crude petroleum will usually eradicate sarcoptic mange, if treatment is applied before the disease becomes chronic. Crude oils, however, often cause the hair to come out and may blister the skin. Crude oil is not a suitable dip for common use on horses, but it is of value in hand treatment for holding mange in check during the winter months when the temperature is too low for dipping. Crank-case drainings may be substituted for crude petroleum, but such oils also cause loss of hair and often blister the skin.

Fumigation of mangy horses with sulphur dioxide has been recommended by some European investigators. The Bureau of Animal Industry has conducted some field tests with this method of treatment, but the equipment and methods of application so far devised are too complicated and expensive for general use except where large numbers of horses are assembled for treatment under the supervision of a veterinarian. Apparently this method of treatment has no distinct advantage over dipping except that it can be used when the temperature

is too low for dipping. In applying home treatment or fumigating for mange the medicament has a better chance of reaching the parasites if the hair over and around the lesions is first clipped and singed.

Cases of sarcoptic mange of long standing, which have been neglected and allowed to develop until the affected skin has become greatly thickened and leather-like, are usually incurable by any ordinary method of treatment. In cases of suspected mange prompt and vigorous action should be taken as the disease can be eradicated in the early stages at comparatively low cost.

PSOROPTIC MANGE.

PSOROPTIC MANGE MITE.

The mite (*Psoroptes communis equi*) which causes psoroptic mange lives on the surface of the skin and does not form burrows. Psoroptic mites are slightly larger than sarcoptic mites, the mature female measuring about one-fortieth and the male about one-fiftieth of an inch in length. The entire life cycle is passed on the host animal. Each female may deposit from 15 to 24 eggs, which hatch in 3 to 4 days. The young mites reach maturity, mate, and the female deposits eggs in from 10 to 12 days.

Dipping, if properly done, kills all psoroptic mites, but cannot be depended on to destroy the eggs. Some of the eggs may hatch after dipping, thus forming a new generation of mites. To effect eradication it is neessary to give a second dipping after hatching is completed and before the young mites reach maturity and begin laying eggs. It is evident that the interval between the first and second dippings should be from 10 to 12 days.

SYMPTOMS.

Psoroptic mange may start on any part of the body covered thickly with hair, but the first lesions usually appear on the head under the foretop, on the top of the

neck around the mane, or on the rump. From the starting point the disease spreads slowly over the body.

The mites prick the skin and probably introduce a poisonous secretion into the wound. A slight inflammation is caused, accompanied by an intense itching. In the early stages of the disease the lesions are not sufficiently prominent to attract attention, but the animals rub and bite themselves to relieve the intense itching, and these symptoms should always be investigated to learn the cause.

As the mites multiply, large numbers of small wounds are made in the skin, followed by the formation of papules, increased inflammation and itching, and the exudation of serum. The serum which oozes to the surface becomes mixed with foreign matter and micro-orgaisms, and this mass soon hardens into yellowish or gray-coloured scabs. The scabs are frequently stained with blood. In the early stages the hairs around the lesion may be glued together in a small clump and the nodule or scab may be about the size of a pea. As the mites constantly seek the healthy skin around the edges of the wound the scab or lesion gradually increases in size.

Some of the mites migrate to other locations and start new lesions, which extend until they cover large areas. As the disease advances the skin becomes thickened, tumefied, and thrown into wrinkles or folds. Large areas become denuded of hair and covered with thick, adherent scabs. When the disease reaches this stage it is difficult to differentiate it from sarcoptic mange.

Itching is intense and irritation continues throughout the course of the disease. The skin becomes bruised and raw from the reckless rubbing against any available surface. The uniform thickening and hardening of the skin is characteristic of mange, but the most certain diagnosis consists in finding and identifying the mite which causes the disease. In the early stages of psoroptic

mange the mites may usually be found in scrapings taken with a blunt-edged knife from around the edges of fresh lesions. In the advanced stages scrapings taken from the edges of scabs or from the bottoms of the folds of skin may contain mites.

In the early stages psoroptic mange may be distinguished from sarcoptic mange by the character of the lesions and the manner of spreading, but the most dependable diagnosis consists in finding the mite. For practical purposes where facilities for examination are limited the principal differences in form and structure of the two species of mites may be summarized thus. The sarcoptic mite is slightly smaller than the psoroptic mite, and the body of the former is more nearly round than oval. Adults of both species have four pairs of legs, those of the psoroptic mites being long, and all four pairs extend beyond the margin of the body. The sarcoptic mites have shorter legs, and the fourth or hind pair and usually the third pair do not extend beyond the margin of the body. The head of the common scab mite is tapering or cone-shaped and is longer than it is broad, whereas that of the psoroptic variety is bluntly rounded in front and is as broad as it is long.

It is advisable to examine several specimens in all cases, because under low-power magnifying glasses the females of the two species are more easily distinguished from one another than the males. On account of the burrowing habits of the sarcoptic mites they are difficult to find, especially in the early stages of the disease. They are situated in burrows under conical papillae, and by scraping the infested area until the blood oozes from the tissue, the mites sometimes may be found in the scrapings.

CONTAGIOUSNESS.

Each species of domesticated animal has its own peculiar variety of psoroptic mange, and the variety

which lives on the horse, ass, or mule is not transmissible to other animals, with the possible exception of the camel. The disease is more highly contagious to all classes of horses than sarcoptic mange. The predisposing causes, manner of spreading, carriers of the mites and precautions to be observed in isolating infected animals and cleaning and disinfecting premises are practically the same as for sarcoptic mange.

TREATMENT.

As the psoroptic mites live on the surface of the skin, they are more easily eradicated than the sarcoptic variety. The remedies recommended for sarcoptic mange are effective in eradicating this disease. Two dippings from 10 to 12 days apart may usually be depended on to cure oridinary cases. Four or more dippings may be necessary in chronic cases.

CHORIOPTIC MANGE.

Chorioptic or symbiotic scabies, commonly known as foot mange, is caused by a mite (*Chorioptes equi*) which closely resembles the psoroptic mite. Chorioptic mites live on the surface of the skin and produce lesions similar to those of psoroptic mange.

The lesions of chorioptic mange are usually confined to the lower part of the limbs around the foot and fetlock. Occasionally the mites spread over the legs above the hocks, and may reach even the thighs and abdomen, but usually the dissease remains localized around the feet.

Infested animals paw and kick, and rub the pastern with the opposite foot, and often try to bite the affected parts. Some of the hair comes out and the skin has the thickened aud hardened condition characteristic of scabies.

The remedies recommended for sarcoptic mange are effective in eradicating foot mange. The affected areas should be well soaked in warm lime and sulphur dip, and the treatment repeated every 10 days until a cure is

effected. To drive the horses through a shallow wading tank filled with dip is a quick and effective method of treatment for foot mange.

TICKS.

There are many different kinds of ticks which may attack horses, but since the habits and life cycles of the different species vary greatly, discussion in this bulletin is necessarily limited to general information except for the ear tick, which is discussed more fully.

When only a few ticks are found on horses they may be removed by hand or covered with crude petroleum, cylinder oil, kerosene, or other oil, which usually causes them to detach and drop to the ground. In removing ticks by hand the writer has observed that they may sometimes be detached without leaving the head embedded in the skin by twisting them around as they are pulled loose.

In the southern and western parts of the United States it is not uncommon for horses to become grossly infested with ticks. In some sections of the country the infestation may occur only infrequently; in others it may occur more or less regularly each year. In the region infested with cattle-fever ticks where eradication work is in progress, tick-infested horses are dipped in arsenical solution to kill the parasites.

In any region where the horses become infested with ticks and the infestation is extensive the State livestock sanitary authorities should be notified in order that the ticks may be identified and proper measures taken for control. Control or eradication methods, to be successful, must be based on a knowledge of the life history and habits of the tick involved.

SPINOSE EAR TICK.

NATUR AND HABITS.

The spinose ear tick *(Ornithodoros megnini)* is prevalent on horses in the Southwest and causes serious

damage to the livestock industry. Spinose ear ticks enter the ears of animals as small, six-legged seed ticks and attach themselves in the external canal well below the hair line, where in a week or two they become engorged larvæ. The engorged larvae molt to form nymphs or young ticks having eight legs. The young ticks remain in the ears from one to seven months, or until fully grown and engorged, when they drop to the ground, crawl up into dry, protected places above the ground, and again molt. The skin of the nymph is covered with spines, but that of the mature tick is smooth. So far as known the adult tick does not attach itself to animals nor does it take food. Mating and egg laying take place off the animal, and when egg laying is completed the female dies. The eggs may hatch as early as 10 days after they are laid. Shortly after hatching the seed ticks are ready to attach themselves to any suitable host. They may live as long as three months if no host is found.

SYMPTOMS.

When animals are grossly infested and the ear canals packed full of ticks the parasites are visible on superficial examination, but when the degree of infestation is light or moderate the ticks may be over-looked. They usually attach themselves in the deep folds of the ear or crawl into the ear canal and follow it inward, sometimes as far as the eardrum. As the ticks increase in size and others enter, they and the excretions, with the wax from the ear, accumulate in masses or plugs sufficient in some cases to close up the ear passages completely. These conditions give rise to various symptoms. The infested animal usually shakes its head and repeatedly turns it from side to side, meanwhile inverting, or turning down, first one ear and then the other. When irritation and itching are more intense on one side the animal often turns its head so that the more seriously affected ear is held downward. There is a tendency to rub and scratch the

ears, and young animals often run as though endeavouring to relieve the nervous tension.

In all cases where ear-tick infestation is suspected the animals should be examined, and if no ticks are visible the ears should be probed. A convenient and effective instrument for probing the ears, removing ticks from the ear canals, and breaking down masses of ear wax and ticks may be made from a piece of ordinary baling wire.

TREATMENT.

Complete eradication of spinose ear ticks is a difficult matter, on account of the habits and great vitality of the ticks and the wide range of animals which they may infest. Results of investigations conducted by the Bureau of Animal Industry have shown that dipping in any of the known dips or the injection into the ear passages of bland oils, crude petroleum, or various dips, etc., is not effective in killing the ticks or causing them to leave the ears. Gasoline and kerosene when applied undiluted kill the ticks, but cause blistering of the skin and are not suitable for use on horses. Chloroform, undiluted or mixed with a bland oil, is commonly used on horses and dogs and is effective. Such substances as chloroform evaporate rapidly, and therefore afford no protection against reinfestation.

The remedy for ear ticks formulated and thoroughly tested by the Bureau of Animal Industry consists of a mixture of 2 parts by volume of ordinary pine tar and 1 part by volume of cottonseed oil. In mixing the ingredients add the cottonseed oil to the pine tar and stir until a uniformly smooth mixture is obtained. When necessary the ingredients should be warmed before mixing so that they will mix readily and flow freely. The mixture remains uniform without separation or deterioration, and may safely be used on any species of

domesticated animal. Being of a sticky consistence, it remains in the ears and affords protection against reinfestation from 30 to 60 days. The only known effective method of applying treatment is to inject the remedy into the ear passages by hand.

Most horses oppose the insertion of anything into their ears, and some form of restraint is necessary. Gentle farm horses can usually be controlled with the twitch or other well-known methods of restraint, but in treating wild range horses special equipment is necessary. An ordinary crowding chute not more than 3 feet wide is suitable for treating horses for ear ticks.

An ordinary metal or hard-rubber syringe holding from 1 to 2 ounces is the best instrument to use for injecting the pine-tar-cottonseed-oil mixture. Have the mixture warm enough to flow freely, fill the syringe, grasp the ear with the left hand, then insert the nozzle into the opening of the ear canal and inject about one-half ounce of the fluid. Hold the ear in an upright position for a few seconds and manipulate to force the mixture into the deeper parts. If too much fluid is injected it will overflow and run down over the head and face, where it may cause blistering. The mixture causes very little irritation except on parts exposed to the direct rays of the sun.

When the ear passages contain masses of hard wax and ticks, such masses should be broken down and scraped out with a wire loop before treatment is applied. Treatment should be applied as often as necessary to keep the ears free from ticks. One treatment properly applied can be depended on to kill all ticks in the ears and to prevent reinfestation for about 30 days. It should be remembered, however, that the eggs of the tick are not deposited or hatched in the ears of animals, and a new crop of seed ticks may find lodgment at any time on animals kept in infested places.

TREATING HORSES FOR EXTERNAL PARASITES.

The three commonly used methods of treating horses, mules, and asses for external parasites are (1) hand applications, (2) spraying, and (3) dipping. A fourth method, not in common use but recommended by some European investigators, is fumigation with sulphur dioxide.

HAND APPLICATIONS.

Infested animals may have parasites on any or all parts of the body surface, and to effect complete eradication usually it is necessary to cover the entire surface of the skin with the medicament. On account of the difficulty of applying treatment by hand over the entire body surface, hand applications are recommended only as a temporary measure for holding parasites in check until the animals can be dipped or sprayed.

SPRAYING.

Common parasites on or in the skin can be eradicated by proper spraying, but the method commonly practised is not economical. It is difficult to wet the hair coat of an animal with a spray, and much of the liquid runs off and is wasted. Spraying is not effective unless all parts of the skin and hair are well soaked.

An ordinary orchard-spraying outfit or a common hand pump equipped with hose and spray nozzle may be utilized for spraying animals.

DIPPING.

Dipping is the most effective known method of applying treatment for common external parasites. Dipping plants are so arranged that the animals are immersed in liquid deep enough to swim in, and the entire body surface is well soaked. For dipping horses the dip in the vat should be kept at a depth of 70 to 80 inches, or sufficient to immerse completely the tallest animal to be dipped. Horses will carry out and retain from 2 to 4 quarts of dip each, and the depth of the liquid in the vat will be lowered accordingly. The total estimated

quantity of dip which the animals carry out plus that required to charge the vat should equal the total quantity required, provided none is lost by leakage or otherwise wasted.

The capacity of the vat is usually obtained by multiplying, in terms of inches, the average length by the average width, then the product by the depth. This gives approximately the number of cubic inches of space to be filled with dip. Divide this by 231 (the number of cubic inches in a gallon), and the result will be the number of gallons of dip needed to charge the vat.

To obtain the average length, add the length at the bottom to the length at the dip line and divide by two. The average width is obtained in the same manner. The depth should be taken at the centre of the vat and from the bottom to the dip line only, and not to the top. All measurements should be made only of the space to be filled with dip, and not above the dip line. The capacities of the various tanks are obtained by a like process.

Before dipping, the contents of the vat snould be well stirred in order that dip may be of uniform strength and temperature throughout. The pens, chutes, vat, etc., should be examined for projecting nails or any object that might puncture or wound the horses, as the dip may injure those having fresh wounds.

In dipping wild range horses it is necessary to have a gate or bar in the chute to prevent the animals from piling up in the vat. Horses should be watered and fed from two to four hours before dipping, and if heated by driving they should be allowed to cool off before entering the vat.

The head of each animal should be completely submerged for an instant at least once while in the vat. The head should not be held under, but quickly ducked with a dipping fork and released. Two duckings of the head are advisable, espcially if the animals are affected with

scabies. Care should be taken to see that the inner surface of the ear is well soaked.

In dipping for lice, it is not necessary to hold horses in the vat, but if they have scabies they should be held in the vat two or three minutes. After leaving the vat the animals should be held in the draining pens until all surplus dip has drained off their bodies. Dipping should be finished for the day early enough to dry the animals before sunset.

FUMIGATING.

Fumigation consisits in exposing animals to the fumes of burning sulphur (sulphur dioxide) or some other gas. The animals to be fumigated are placed in a gas-tight chamber with the head projecting through an opening and the nose and eyes protected from the gas. This method is often recommended for treating animals for external parasites.

Investigations conducted by the Bureau of Animal Industry have shown that the present known methods of fumigating animals are not suitable for general use. The minimum effective concentration of sulphur dioxide for mange apparently is about 4 per cent and for lice about 1 per cent. Under ordinary conditions the concentration or per cent of gas in the air cannot be raised to more than about 1.5 or 2 per cent by burning sulphur in the gas chamber unless special apparatus is installed. Sulphur dioxide compressed to a liquid and stored in steel cylinders is available on the market. By using the compressed gas any desired concentration in the chamber within certain limits may be obtained. In winter, when the temperature is too low for dipping, fumigation is feasible if a large number of horses are to be treated and competent men are available to supervise the work. This method apparently has no other distinct advantage over dipping.

DIPS FOR HORSES.

Before approving a dip for use in official dipping one of the requirements of the Bureau of Animal Industry is that there shall be a practical field test for such dip. Of the various classes of dips used on horses, three only are on the approved list—arsenicals, lime-sulphur, and nicotine. Of these the two most commonly used are the lime-sulphur dip for mange and the arsenical dip for lice and ticks.

ARSENICAL DIP.

Arsenical dip, when properly used, eradicates biting and sucking lice, but it is not an effective remedy for mange. Prepared arsenical dips have been placed on the market, and those which are permitted by the Government for use in dipping cattle for southern fever ticks are suitable for use in dipping horses, mules, and asses for lice. The instructions on the label of the container should be followed in diluting and using ready-prepared dips. The arsenical dip is not usually warmed or heated in the vat.

It should be remembered that arsenical dip is a poison, and precaution should be taken to prevent injury to man or animal. When it is handled and used with proper care it is a safe and effective remedy. Care should be taken not to get the clothing wet with the dip, and the hands should be washed frequently to prevent possible absorption of arsenic.

Freshly treated animals should be held in the draining pens or other suitable place until all surplus dip has drained off. If allowed to drain where pools of dip collect from which the animals may drink, or if the pasture or feed becomes soiled with arsenical dip, losses are liable to occur.

If homemade arsenical dip is preferred to the proprietary brands, see United States Department of Agriculture Farmers' Bulletin 603 for full instructions for making it.

LIME-SULPHUR DIP.

Proprietary brands of liquid lime-sulphur may be purchased, and many of them are equal to or even better than the homemade product. Manufacturers have also placed on the market a product commonly known as dry lime-sulhur, made by evaporating, *in vacuo* or in the presence of an inert gas, concentrated lime-sulphur solution to which a small amount of cane sugar has been added to act as a stabilizing agent. Dry lime-sulphur is readily soluble in hot water, and it is being extensively used as a dip for animals and as an insecticide for plants. Prepared dips should be diluted and used in accordance with instructions printed on the label of the container. Lime-sulphur dips are efficacious and dependable remedies for mange, but they are not effective against lice and ticks

Homemade lime-sulphur dip is made in the proportion 12 pounds of unslaked lime (or 16 pounds of commercial hydrated lime) and 24 pounds of flowers of sulphur to 100 gallons of water. The lime and sulphur should be weighed and the water measured; do not trust to guesswork. Slake the lime in a shallow, water-tight box or tank and add water enough to form a thin paste. Sift the sulphur into the paste and mix well with a broad hoe until a mixture of about the consistence of mortar is formed, adding water as required. Put the mixture into 30 gallons of boiling water, adding it slowly so as not to interrupt the boiling, and boil until the sulphur disappears from the surface. The boiling should be continued for from one and a half to two hours without cessation, and the mixture stirred to prevent settling and caking on the bottom. When the sulphur has disappeared from the surface and the mixture is of a chocolate or dark-amber color, the boiling should be discontinued.

The contents of the boiling tank should be drawn off or dipped out and placed in the setting tank and allowed to stand until all solids have settled to the bottom and

the liquid is clear. An ordinary water-tight barrel will serve very well for a settling tank at a small vat. A settling tank of any kind should have an outlet at least 4 inches from the bottom, in order that the clear liquid may be drawn off without becoming mixed with any of the sediment.

When the sediment has fully settled draw off the liquid into the dipping vat and add warm water to make a total of 100 gallons of dip. When mixed and cooked as specified above, the concentrate is three and one-third times the strength required for the dip in the vat, so that to every 30 gallons of such concentrate 70 gallons of warm water should be added to make a dip of the required strength.

In preparing lime-sulphur dip in large quantities, several hundred gallons of concentrate are often made at one time in a single large cooking tank. The quantity made at one boiling is limited only by the facilities at hand. If the boiling tank is of sufficient capacity, a large enough quantity of dip should be cooked at one time to dip the herd. The quantity of mixture in the cooking tank may be varied at will, but the proportions of the various ingredients should not be altered.

NICOTINE DIPS.

The nicotine dips sold under various trade names are commonly used for dipping animals and spraying plants for insect pests. They are efficacious remedies for horse lice and mange when diluted with water so that the solution contains not less than five one-hundredths of 1 per cent nicotine. If used much stronger they are liable to injure horses, especially if the animals are dipped while they are warm from exercise or hot weather.

Nicotine dips are generally used warm, but should not be heated above 110° F. The temperature of the bath should be maintained at 90° to 95° F. Sulphur is sometimes added to nicotine dips in the proportion of 16 pounds of flowers of sulphur to 100 gallons of diluted dip.

The addition of sulphur increases the effectiveness of the dip for mange and extends the period of protection against reinfestation. These dips should be diluted and used in accordance with instructions printed on the label of the container. Do not use a nicotine dip the strength of which is not given on the label.

COAL-TAR CREOSOTE DIPS.

The coal-tar creosote dips, commonly known as coal-tar dips, are sold under many trade names. They are made from coal-tar derivatives, and the principal ingredient is creosote oil, which is made miscible with water by means of soap. When diluted with soft water they are efficacious in eradicating lice, but they are not dependable remedies for sarcoptic mange.

Before using a coal-tar creosote dip in hard or alkaline water, dilute a small, measured quantity of the dip with the water in the proportion to be used in dipping and place in a clean, glass container. If, after standing for one hour, an oily layer or mass of globules appears either at the top or at the bottom of the liquid, the dip should not be used with that kind of water, as it is liable to injure the animals. Injury may occur even when there is no apparent separation in the dip so tested.

The coal-tar creosote dips may be used cold or warm, but the temperature of the bath should not exceed 95° F. They should be diluted and used in accordance with the instructions printed on the label of the container.

OIL DIPS.

Kerosene, crude petroleum, crank-case drainings from gasoline motors, and other oils and greases are commonly used in treating horses for external parasites. When properly used they will eradicate mange and lice, but they often injure horses by blistering the skin and causing the hair to fall out. Oil dips are not recommended for common use in dipping horses.

Cottonseed oil and kerosene, equal parts, or kerosene one-half pint to 1 pound of lard or crude petroleum is often

applied by hand to hold mange and lice in check when the weather is too cold for dipping.

DIPPING VATS.

In those sections of the United States where there are a large number of horses to be dipped, cattle-dipping vats usually are available, and they can be utilized for dipping horses. Plans of cattle-dipping vats suitable for dipping horses are given in Farmers' Bulletins 1017 and 1057.

The so-called cage vats are sometimes used for dipping horses. In these vats the animal is placed in a movable cage and lowered into the bath by means of a windlass or other mechanical apparatus. The operations are much slower than in the longitudinal vat.

Portable, galvanized-metal vats may be purchased, and they are suitable for dipping a small number of animals. After digging a trench and setting the vat so that the top is flush with the surface of the ground, a chute and slide board should be provided as a means of getting the horses into the vat.

COMMUNICATIONS

TO

The Editor,

The Indian Veterinary Journal, Madras.

Sir.

I shall be highly obliged if you wil kindly publish the accompanying letter, in your valuable journal.

Nagar.
December 25th, 1926.

Yours sincerely,
P. DEV.
Veterinary Surgeon.

The all India Veterinary Association and its Need.

There is a Provincial Veterinary Association in each Province or Presidency, and there is also one for the whole of India called the "ALL-INDIA VETERINARY ASSOCIATION".

The Provincial Associations hold their Annual Conference in different centres in their Provinces, and

the All-India Veterinary Association holds it in each Presidency by turn every year, according to the invitations received from the Provincial Associations. All of them are doing useful work in their own way, the line and direction of work being almost the same in each case, with one main difference, viz., the Provincial Associations being concerned only with the local questions, while the All India Association with the general questions affecting any or all of them. Those in Government service form a majority of their members.

After the report of Lee Commission on the Public Services was published in 1924, it has been decided by the Government of India that the Civil Veterinary Department in each Province will remain under the full control of the Provincial Governments, that recruitment for the Indian Veterinary Service in Engiand will be discontinued, that the I. V. Service will be Indianised as vacancies occur, and that those vacancies will be filled up by suitable men to be selected on merits by the Local Governments. Thus the full control over the Imperial and Provincial Officers and their appointments are now left entirely to the Provincial Governments in each Province.

As far as the interests of the men in the subordinate service (Viz:—Inspectors & Veterinary Assistant Surgeons) are concerned, there is need of a Service Association for them, separate from the Provincial Veterinary Association in each Province, to sefeguard their own interests. Some Provinces have got a separate Service Association, while others have none, though it is absolutely necessary to form such an Association in each Province, and get it registered according to the rules framed by the Imperial Government for the purpose. It may be noted here that the Government of India as well as the Provincial Governments have refused on several occasions to consider the representations made by the All-India, as well as Provincial Associations, as

long as they were not registed under the existing rules. It is, therefore, most desirable that each Presidency should have a Service Association, in addition to the Provincial Association, whose main duty is to further the interests and advancement of the Veterinary Profession, while that of the former (i. e., of the Service Association) is to safe-guard the interests of those in Government service in the C.V.D. Under the circumstances a question naturally arises how far a need for the All-India Association exists, expecially as it meets in an annual Conference once a year in each Presidency by turn, which involves a great expense of time, energy and money on the part of the provincial Associations inviting it, while the results obtained hitherto by the repressentations made by it to the Imperial or the Local Governments concerned are not encouraging. It cannot be denied that there is one advantage by such an annual conference held by the All-India Association, Viz., it is an excellent opportunity of meeting different men of the profession coming from the different Provinces, and exchanging their views on various subjects, but it is a question whether this advantage is worth the time, energy and money spent on holding such a conference. As to the reading of and discussions on professional papers at its sittings, the same kind of work is also done at the Annual Conference of the Provincial Associations in each Presidency.

Under the circumstances, it is a question for all concerned for consideration, whether there is any need for the All-India Veterinary Association. In this connection it may be suggested for their consideration, whether a Veterinary Council consisting of Members elected by the Provincial Veterinary Associations will serve the purpose, which is at present served by the All India Association, to safe-guard and promote interests of the Veterinary profession. It may also be noted here that a perusal of their proceedings as well as resolutions passed by them at the last Annual Conference held at

Late Captain, G. G. Howard, I. V. S.
Director C. V. D. of Bihar and Orissa, Orissa Range.

Calcutta in 1925 and their Annual Report for 1925, read at the conference by the Honorary Secretary, as published in the quarterly Issue No. 4 of Volume II of the Indian Veterinary Journal for April 1926, shows that most of the questions dealt with and the resolutions passed at the Conference are purely local questions, which can be dealt with in a better way, if handled with tact, by the Provincial Associations than by the All-India Association, as the former can secure support of the Provincial Superintendents in many cases of public or professional interests.

5. The above article is written, not with a view to break the All-India Association, but simply with the object of inviting the views and free discussion by the members on the main points raised above in the interests of all concerned.

Nagar,
December 25th, 1926. } P. Dev, G. B. V. C.

To

The Editor,
The Indian Veterinary Journal, Madras.

Dear Sir,

May I request you to kindly publish the following in your esteemed Journal of the next issue

LATE CAPTAIN G. G. HOWARD, I. V. S.

Captain G. G. Howard, I.V.S., Deputy Director of Civil Veterinary Department, Orissa Range with his headquarters at Cuttack, had gone to the Angul Khedda ; while out on alligator shooting in the Mahanadi river (near Tikerpara) on the morning of the 21st. January, 1927, with his family and some other colleagues, he, most unfortunately, met with an accident which resulted in his sad death.

Captain Howard was serving under the Government of Burma, where he enrolled himself as a volunteer in the

B. Ry. Vety. corps in the year 1914. He came into this province (Bihar & Orissa) in the year 1921. He was an able officer, and was very much liked by his subordinates as well as by the public. He had been conducting experiments on surra cases with Naganol etc., and this will often remind us about him. He was a keen sportsman and as such was well known here in this town and elsewhere also. He was very kind and sympathetic to the poor. One who has come in contact with him even for a short time, can never forget him.

We are all very sorry at his untimely loss. May his departed soul rest in peace. We all invoke the blessings of the Almighty to the bereaved family.

Yours truly,
B. B. Chowdhuri.
Veterinary Asst. Surgeon.

To.

The Editor,
The Indian Veterinary Journal, Madras.

Sir.

Please publish the following article in your valuable journal and oblige

Yours,
C. J. FERNANDES.

A PLEA FOR BETTER VETERINARY EDUCATION IN INDIA.

By C. J. Fernandes, G. B. V. C.,
Veterinary Surgeon, Baroda State Army Service.

Submitted,

To the Royal Commission on Agriculture under the Chairmanship of the Marquess of Linlithgow.

Plea For Better Veterinary Education In India.

Veterinary education has been the Cinderella of Government educational departments in India. After

forty years' of existence, it is still in its infancy and its growth and progress has been retarded by a parsimonious policy. It originated as a half-hearted attempt at imitating the veterinary arrangements of civilized European countries but has remained in its original conception through lack of encouragement and neglect of the persons responsible for the progress of agricultural welfare in India. (1) It is gratifying, however, to find that sentiment is undergoing a rapid and radical change and that people as well as the Government are fast coming to a realization and an appreciation of the value and importance of veterinary profession.

Value Of Veterinary Science.

Indeed much elaboration is not needed to prove the immense benefits that accrue to a country through veterinary science. The veterinarian does not merely relieve the sufferings and prolong the existence of our dumb servitors but he helps materially to conserve the vast wealth of the nation, invested in its flocks and herds. Moreover, the benefit to the general public by the State control through its veterinarians, of the chief infectious diseases of animals, some of them communicable to man, cannot be overestimated. Incalculable also is the value of animal life saved by prevention of the spread of contagious diseases by segregation etc. Reports from towns and cities, where meat and milk inspection are carried out, show what service is rendered by the veterinarian in safeguarding the health of the population. Veterinary research has also proved of great benefit to its sister science medicine and the help rendered to medicine by experiments conducted on animals by both medical men and veterinarians is too well known to need more than passing mention. It is interesting, however, to point out that Ehrlich discovered his famous "606" remedy for human syphilis whilst studying the action of arsenical preparations on the pathogenic spirachætes of

fowls. Again it was by the study of fowl cholera that Pasteur demonstrated that the virus could be so attenuated by artificial culture as to act as a vaccine against a virulent or fatal form of the natural disease.

Its Importance In India

India is an enormous country, chiefly agricultural. Agriculture in the main may be said to mean the art of raising plants and animals that are best suited for the supply of food for man. If this is so, then the importance to India of maintaining the health of the live-stock in the country, which is chiefly in the hands of veterinarians, may be appreciated when we consider that the total livestock in 1924-25 in India was 213 millions. (2)

It is interesting to recall here the reasons which led the Government of Bombay to establish the Bombay Veterinary College. In their resolution, the Bombay Government then stated: "It is difficult to overrate the importance of agriculture and agricultural stock in India; and seeing that the value of agricultural cattle, which perish from Plague and other epidemic diseases in India is calculated at £ 6,000,000 sterling per annum (1883), it is obvious that any measure which would tend to check this great mortality and heavy loss by increasing the knowledge of the nature and remedies for the various diseases, which attack cattle, and provide a class of persons competent to treat scientifically the different maladies, to which cattle are subject, would prove of immense advantage to the State and to the innumerable owners of livestock, comprising the mass of the cultivators". (3) These reasons as set forth by the Bombay Government have increased yearly in importance and weight.

In his presidential address to the third All-India Veterinary Conference, Principal Mac Gregor of the Bengal Veterinary College, stated: "Without looking even into approximate figures, a casual glance at existing

facts, such as that of the number of veterinarians in India, relative to area and cattle they tend, may suffice to prove the collosal task we have in front of us. It works out at one veterinarian to 1-1/2 lakhs of cattle in every 700 square miles, whereas in the United Kingdom, the figures appproximate one veterinary surgeon to 5, 241 cattle in every 51-1/2 square miles." This gives a faint idea of the enormous field for expansion and development of veterinary science and education in India. The present staff of the Veterinary Service is therefore totally inadequate to cope successfully with the problems presented in any one branch of the work, either in research, teaching or executive.

Veterinary Colleges.

With the exception of a few men, who come out from England the present staff is chiefly recruited from the four veterinary Colleges in Bombay, Bengal, Madras and Lahore. The course in each of these Colleges except the Punjab College covers a period of three years.

The oldest of all is the Bombay College, which was opened just 40 years back under the direction of Mr. Steel. Prinicpal Steel undertook his new duties with enthusiasm but his career was cut short by his untimely death, which was a serious blow to the promotion of Veterinary Science in India. In his annual reports during the four years he conducted the College, Principal Steel outlined his ideas for the future development of the College. He reported that "the average amount of knowlege conveyed to our students before they become practitioners will equal that given in the British School". ....."Our best men will not equal the best European graduates but they will not fall far short and the discrepancy will disappear with time and the still further development of the College". (4) The College, therefore, opened under very happy auspices and it was confidently expected that in a few years it would be affiliated to the Bombay University.

Indeed Principal Steel in his comprehensive reports dealt with this aspect of the question. Referring to minimum limit of general education fixed for applicants for admission, he said:—"If in future, as I consider *very desirable*, our College be affiliated with the University of Bombay, the time will have arrived when admission may be refused to non-matriculates." (5)

Failure of Principal Steel's Hopes.

All these high hopes, however, of Principal Steel, have not been at all realized. "The curriculum of studies has been from time to time so reduced that it has now been brought to an extremely elementary degree, incompatible with the name and aims of the College and seriously telling upon the efficiency of its present alumni who in proficiency cannot be compared with those of the past." (6) These remarks, made by Professor Narsingrao in 1904, need to be qualified in the light of later developments. It may be generally stated, however, that the course of instruction at presnt given in the three Veterinary Colleges in Bombay, Calcutta and Madras, is entirely inadepuate to produce a properly qualified graduate. It will be apposite here to quote the criticism of the training imparted in the Bengal College by the Veterinary Journal (April, 1926). "This method", says the Journal, "of production of veterinary staff may have been necessary in the early days of the profession's existence in India; but at the present day, to turn a man out of College, illequipped in the struggle for existence is a crime of which the veterinary profession should not be guilty. That this is going on in the Bengal College is evidenced by the unemployed graduates and the shortage of applicants to vacancies for students at the College.....Unless the Bengal Government moves with the times by employing a full expert teaching staff and extending the course to give the students a fair opportunity of gaining a thorough knowledge of their profession the College may close its

doors, as no sane person would send his son to spend three years at College, gaining a smattering of learning, which is useless as a means of livelihood afterwards."

Need Of Revision Of Curriculla.

That the curriculla in the Colleges needed a thorough revision, was, however, recognized by the Government of India themselves and early in 1922, under instructions from the Agricultural Adviser to the Government of India, a meeting of the Principals of Veterinary Colleges met at Bombay. The meeting recommended that the course be extended in all Veterinary Colleges to four years in English, and that a higher standard of preliminary education be demanded of recruits. It was further of the opinion that the standard of the Matriculation exmination of the local university concerned be insisted upon prior to entrance to the Veterinary Colleges. The meeting consisdered that the scheme of study and method of examination outlined by them was of a sufficiently comprehensive and advanced character to justify recognition by the local Universities as an approved degree course in science and the conference by these bodies of a special degree in science entitled B. Sc. (Vet) on students who graduate in this course. (7)

This system of study was discussed and approved by the Second Meeting of Veterinary Officers in India held at Calcutta in 1923. In the course of the discussion that took place at the meeting some very pertinent remarks were made by the Veterinary officers. A few extracts from the proceedings published under the authority of the Government of India will not be out of place:—

Approval of New Scheme

The president, Colonel G.K. Walker, C.I.E., O.B.E., F.R.C.V.S., Principal of the Punjab Veterinary College, Lahore stated:—

"The discussion on this knotty point has revealed the fact that we are practically unanimous in approving

whole-heartedly the course of instruction prepared by the Principals at Bombay. I shall ask a formal resolution to that effect. There is no doubt that it represents a genuine attempt to educate Indians up to the highest standard in veterinary science. Personally, my only fear is that four years may prove to be rather too short a time for students admitted to colleges after passing the matriculation standard of examination to grasp the work. My experience in the Punjab is that the matriculation standard is not very satisfactory. We should aim at obtaining students with the intermediate qualifications in science and the Punjab prospectus provides for them."

Again: "The scope of veterinary study has developed so much that three years' study for men of inferior preliminary education is quite insufficient. Why then pretend to give a qualification that cannot be substantiated in its practical outcome?", and more to the same effect. He favoured the admission of students who had passed the University Intermediate examination in Chemistry and Biology as soon as possible. The matriculation standard in science was not sufficient.

Mr. J.T. Edwards, B.Sc., M.R.C.V.S., Director, Imperial Bacteriological Laboratory, Muktesar.—"He strongly maintained that the Bombay programme represented the minimum required for the inculcation of an intelligent conception of veterinary science as the science stood at the present day. He pointed to the advances made in our knowledge during recent years, since the time when shorter courses of study were adequate."

LEGAL STATUS.

It is not necessary to dwell further on the necessity of revising and improving the present courses of study in the colleges in India. The present training has produced, it is true, some men, who have filled with distinction the highest posts in the India Veterinary Service, but the general type is not of that quality, that can be compared

with veterinarians in England or other countries. As Colonel Walker said at the meeting of Veterinary officers, referred to above, "We owe it to our profession to insist that a man, who describes himself as a veterinarian should be well educated and capable of meeting members of other scientific professions on equal terms. The time will come in India, as in other countries, when a legal status will be given to qualified veterinarians. If we look ahead, therefore, we should, in order to avoid complication create a well educated class entitled to the use of the term "Veterinarian". These words of Colonel Walker indicate the way in which the solution lies. The low status of the Veterinarian, passed out from Indian Colleges, has lowered the reputation of the profession itself in India. This bad impression has been strengthened by the inferior quality of the men turned out with the result that both the Government and the public have attached little importance to the benefits to the country to be derived from veterinary work. Having clearly before one's mind the innumerable benefits that will accrue to the country from that work, it will be apparent how urgent is the necessity of reorganizing veterinary education and service in India. College education in veterinary science needs to be improved at least to the extent proposed by the meeting of principals. It will produce a higher type of graduate, and it will attract better men to the profession, which has wrongly and to the great harm of the country, been relegated to a low and insignificant position. The better man will naturally demand higher pay and better prospects in Government service. But this need not deter Government, as it has done in the past, since in the long run it will be more economical considering the better service of the new men. If necessary, Government can certainly side by side institute a lower grade of service for men with inferior training to perform certain duties mechanically.

EDUCATION IN FOREIGN COUNTRIES

The Government of India will do well to take a leaf from the example set by the most progressive countries in the world. In America, on the Continent and in England, the importance of veterinary science is being increasingly recognized. Foreign Universities have instituted special chairs and courses of studies and confer degrees in the science, which occupies a place of equal status and importance to medicine. Government posts, carrying good pay, have been created all over the country and legislation dealing with cattle etc., and giving certain powers to the veterinarian in cases of infectious diseases have been passed. Such encouragement has reacted for the good of the science itself, attracting better men and developing research work, to the great benefit of the country.

Thus in Germany since 1902, veterinary surgeons have had to go through an equal preliminary education for university study to that of medical men and the period of technical study has now been extended to four years. The examination in natural science as well as in the special branch of veterinary science has to be passed and the former has to be surmounted before the student can enter for the veterinary examination, the veterinary schools having thus attained the organization and extensiveness of universities. The Dresden Veterinary School was incorporated in the University of Leipzig and the Munich School with theUniversity of Munich in 1914, the degree of Dr. Med. Vet. being conferred by them. (8)

The number of Veterinary Colleges in the United States is legion. A strong organization, the American Veterinary Medical Association with a large membership, looks after the interests of Veterinary science. Almost all the great Universities, such as Pennsylvania, Cornell, etc., have their Veterinary departments or schools and a great many State Universities are similarly equipped.

Besides these, there are several institutions of a more private character that stand high as teaching colleges.

Even in a small country like Switzerland, there are two University faculties, one in Zurich, the other in Burne. Students in these faculties are required to matriculate according to the revised regulations of the year 1910. By thus raising the standard of elementary education, the two veterinary colleges were enabled to keep pace in their development with the other natural sciences and the faculty of Medicine. The fear expressed in former years that the requirements of matriculation and the creation of medical veterinary faculty would limit the number of veterinary surgeons has not been realized. On the contrary, there are now a much greater number of veterinary students than before. (9) In other continental countries also veterinary education is highly developed. In Hungary, veterinarians are entitled to the degree of "Dr." In Belgium the course of studies lasts for seven years. In Italy, there are seven State veterinary schools,which are centres of research and also of teaching, the instruction given being of the very best. (10)

HIGHLY DEVELOPED IN FRANCE

But perhaps in no other country in Europe, Veterinary education is so highly developed and systematised as in France. "Veterinary education in France is national. There are three national Veterinary Colleges-Alfort, founded in 1765; Lyons founded in 1761; and Toulouse founded in 1825. Aspirants for admission apply to the Minister of Agriculture and submit with the application their legal, moral and educational credentials. Applicant must hold the "Baccalaureat" of the French educational system. The competitive examination is both written and oral and is a test of the applicant's knowledge of composition, physics, chemistry and biology, including Zoology, botany and palcontology. The college course is four years of ten months each, exclusive of examina-

tions. Each professor is a master of the subject he teaches, an authority of world wide reputation. He is so well-known to readers of books and current literature that one feels acquainted with him before the introduction. The school is divided into ten departments called chairs, each one directed by a professor, who is supplied with an assistant professor and tutors as required. Each chair has its own buildings and equipment, including laboratories and such laboratory paraphernalia as the group of branches it covers requires. (11)

LESSONS FOR INDIA.

From a cursory glance at the educational systems of foreign conntries, two facts are apparent. One is the high standard of education demanded of the candidate on entrance and the other is the advanced technical teaching. The high standard of entrance examination is essential so that the candidate might profit from the teaching in the veterinary college and it is thus complementary to the advanced course of technical training provided for the student. Sufficient importance is not given to this entrance qualification in India with the result that the Indian graduate lacking in general educations fails to make efficient use of the facilities actually provided for him even at present. He has little enthusiasm for his profession and fails to realize the noble opportunities for service before him. His work is characterized with listlessness and he easily falls, especially when in Government service, into a mechanical routine. "A process of settling down into grooves takes place. It gives license to a stagnant serenity of mind and hopeless placidity, which no other form of employment can, and in the tropics, where a driving and dominating desire to progress, to improve is more essential to the individual than in more temperate climes, we find this form of employment in greater prominence" (Principal Mac

Gregor). This "hopeless placidity" to which Principal Mac Gregor refers is to a very great extent due to the want of general education in the Indian Veterinarian.

VETERINARY SCIENCE AND MEDICINE.

The need of a high standard of preliminary education is confirmed by the findings of Lord Haldane's Royal Commission on University Education, which states that "that the modern veterinary surgeon should proceed through an exacting progamme of education, a course of training as specialised and as thorough as that of the student of human medicine."

The need of immediate revision of the present courses of instruction in Indian Colleges has been acknowledged by the highest authorities in India. The four years' course proposed by the Principals' meeting may certainly be adopted with advantage. It embodies the experience gained in India by years of actual teaching practice. It also recognises the necessity of better study of bacteriology and pathology and cognate subjects than at present, thus endorsing another finding of Lord Haldane's Royal Commission, which found that the "future development of veterinary medicine depended upon its adoption of the methods of dealing with disease that have been worked out for human pathology.', thus prescribing a training for the veterinary student equal to that for the medical student.

The Commission considered that research in animal disease must of necessity, be associated with research in human disease and that a department dealing with animal disease has become almost as necessary to a school of investigation in human medicine as the association with human pathology is to investigation in animal disease. This pronouncement by no less an authoritative body than a Royal Commission should be carefully considered both by Government as well as Indian Universities. It shows the importance and value of

veterinary science in research work. In fairness to Indian Universities, it must be mentioned, however, that some of them are prepared to hold examinations and award degrees in veterinary science, if the standard of admission and training in colleges is raised.

In conclusion, it may be mentioned that Government has always relegated veterinary science and education to the background. The argument of economy and want of finance has been every time propped out, when any complaint has been made or any agitation started for improvement in the scale of pay of veterinary officers or for better-staffed colleges. It is time that the Government should re-consider its suicidal policy in the case of such a nation-building department. The appointment of the Royal Commission on Agriculture is, however, a landmark in the history of veterinary science in India and has aroused bright expectations. Let us hope that they will be realized.

THE CONCLUSIONS.

From all these considerations, the following conclusions may be drawn:—

1 The curriculum adopted by the meeting of Principals in Bombay in 1922, should be introduced in the four Colleges without delay.

2 As College education is raised, efforts snould be made to affiliate them to the respective Provincial Universities.

3 Post-graduate courses should be instituted in all the Colleges and better facilities for research made available.

4. The prospects of the veterinarians in the lower Government service should be raised, in sympathy with his better education and higher status as a University graduate to the same standard as that of the medical and agricultural graduate.

APPENDIX.

1 Veterinary Journal, London, February, 1926.
2 Indian Livestock Census, 1925-26.
3 Res. No. 4002 of 1883, Rev. Dept., Govt. of Bombay.
4 Annual Report for 1887 of the Bombay Veterinary College.
5 Annual Report for 1887 of the Bombay Veterinary College for 1886.
6 Mr. N. Narsingrao, G.B.V.C., Asst. Professor, Bombay Veterinary College, in a memorial to the Governor of Bombay in 1904.
7 Report of the Meeting of Principals of the Indian Veterinary Colleges.
8 Veterinary Journal, London.
9 Do. do. do.
10 Do. do. do.
11 L. A. Merillat (Jnl. Am. Vet. Med. Assn.)

REVIEWS OF THE ANNUAL REPORTS.

C. V. D. Bihar and Orissa for 1925-26.

This is a pleasing record of substantial progress. "The establishment of an up-to-date and well-equipped Veterinary College for the province received final form during the year" and "the scheme which involves a capital expenditure of over six lakhs and an annual recurring cost of over one lakh will be placed before the Legislative Council". "We are also told that sanction has been given to the establishment of a breeding and dairy farm on the old university site alongside the proposed veterinary college and a start has been made on the work of the farm." These are real achievements and we heartily congratulate Mr. Quinlan on the success of his untiring efforts.

It is a pity that in this province there are only 30 hospitals and 90 touring billets. Although these figures show an increase over those of the previous year,

"the progress is not very encouraging". "Government trust that the Boards will give this matter their very careful consideration" and we shall therefore expect good progress under these heads in the next annual report.

We are told that investigations on "Filariasis in dogs" and "Dry coat" in horses are going on; we keenly await the result.

C. V. D. Central Provinces and Berar for 1925-26.

"The feature of the year was the severe mortality from contagious diseases"; Rinderpest alone has accounted for 84 % of the total mortality and this, in spite of the fact that "the prejudice of the ryots against inoculation has all but disappeared." Yet we are told that "the strength of the staff of the Veterinary Assistant Surgeons has remained virtually constant for the past 17 years". This is a real case of the apathy of the Government towards the Civil Veterinary Department and, to use their own words, "Apathy is inexcusable in regard to measures directed to prevent avoidable loss in perhaps the most important asset of this pre-eminently agricultural country". We appeal to the Government to shake off their apathy and give the Civil Veterinary Department the attention that it richly deserves.

Dealing with Serum Simultaneous inoculation against Rinderpest, the Veterinary Adviser says that "it should be adopted slowly and with greatest caution". We do not think there is any need for such an overcatious opinion. We have seen this method adopted on a fairly large scale both amongst Government and private owned animals in the Madras Presidency with absolute safety and without any mortality. We therefore unhesitatingly suggest the adoption of this method in other provinces also without any fear whatsoever.

Lastly, we would have liked to know whether any curative treatment for Rinderpest was tried at all during

the severe outbreaks. In the previous issues of this journal we published, with statistics, the extreme efficacy of treatment with Tr. Iodine. We commend it to all professional brothren in this province, if they had not already tried it.

Bengal Veterinary College and Civil Veterinary Department Bengal for 1925-26

The report has just been received. The College has continued to do its useful work of training Veterinary graduates but "during the year there has been a marked falling off in the number of students on the rolls", the chief reason being "the failure of the District Boards to employ Veterinary graduates up to the prescribed standard". This is rather a pity, because, for one thing, the department continues to be understaffed and "there is no emergency staff at Headquartars to send to help them (District Boards) in time of need; for another, the contagious diseases, especially Rinderpest, continue to levy a heavy toll in the province and "numerous calls for help from the districts could not be complied with". It is false economy to stint money to save the poor suffering animals of the poverty-stricken ryots and we earnestly look up to the Government of Bengal to remedy this state of affairs.

The department in this province, as in some other provinces also, is under the dual management of the Government and the local bodies; and that, in our opinion, is one of the reasons for the slow progress made. All local bodies are not like Rangpur with its eight Veterinary Institutions. Majority plead penury and Government is always chary of contributions to them. The consequence is stagnation and, in some cases, even retrogression. The only obvious remedy for this is for the Government itself to take up the whole department, as has been done in Madras. Will the Bengal Government do it?

It is gratifying to learn that the pay and prospects of the Veterinary Inspectors have been improved but those of the Veterinary Assistant Surgeons still appear to be under the consideration of the Government. Contented subordination of the departmental staff is essential to interested and satisfactory discharge of duties and we, therefore, hope that the Government would not be long in considering this subject.

C. V. D. Burma for 1925-26

The report is tragic reading. In the words of Mr. W. Q. Taggart M. C., I. C. S., "the year has been a particularly disastrous one from the point of view of the prevalence of contagious disease. The total number of deaths from this source recorded is 50942 as against 18360 in the year 24-25. *Rinderpest accounted for almost 90 % of the total deaths from contagious diseases*". (Italics ours). This state of affairs becomes highly pathetic when we read of "the unsatisfactory nature of the arrangements for the supply of serum from Muktesar". We are told that "supplies can be held up at Calcutta owing to Puja or any other holidays or sent by mistake to Singapore instead of Rangoon, while the cattle of this province are perishing by hundreds for lack of it". The climax is reached "when the department suffered considerably during the year under review from a shortage of superior staff which finally necessitated its being placed temporarily under the control of the Director of Agriculture". We would never have imagined that such a state of things could have existed in the twentieth century A.D., and that under the aegis of the British Government but for the fact that we have taken the above statements from the Govern-ment report before us. There is really something rotten in the state of Denmark and the sooner that sore part is scarified and touched, the better for all concerned. We shall, therefore, say a solemn Amen to the following wisl

of the temporary officer in charge of the Civil Veterinary Department. "It is to be hoped that the reorganisation of the department will not be unduly delayed, as until the extra teaching, research and field staff are recruited, very little progress can be made towards putting Veterinary science in the province on a sound basis.

In the midst of the above circumstances, there is an important incident to which we would like to draw pointed attention.

The report says:—

"Owing to the shortage of the district staff it also became necssary to send four final-year pupils to assist in dealing with an outbreak in Arakan. Volunteers were called for, and they were inoculating there during August, September and October when owing to their approaching examination they were recalled and were replaced by four Class B pupils. The latter were engaged on inoculation duty for three weeks in November, after which they returned to their studies.

It is desirable that pupils should get as much practical knowledge as possible while they are at the school, and local outbreaks afford them an excellent opportunity of doing so, but it is to be deplored that it should be necessary to call upon them to assist in dealing with protracted outbreaks at a distance, necessitating a serious interruption in their studies as did the one in Arakan."

Verily, out of evil cometh good. We would like to see the pupils of the different Veterinary colleges in India given a course of the practical side of their profession in the field during the college recess and holidays. It should be an easy thing for their Principals to send them, without, of course, intermission to their studies, to different centres of outbreaks of contagious diseases. That would certainly give a finishing touch to their studies in the college.

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EDITED BY

P. SRINIVASA RAO, G. M. V. C.,

Veterinary Surgeon, Madras.

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