INTER-AFRICAN BUREAU FOR ANIMAL HEALTH
BUREAU INTERAFRICAIN DE LA SANTE ANIMALE

IBAH

BULLETIN OF EPIZOOTIC DISEASES OF AFRICA

BULLETIN DES EPIZOOTIES EN AFRIQUE

O.A.U./S.T.R.C.

March 1967
Mars

Vol. XV
No. 1

959

DIRECTIONS TO CONTRIBUTORS

Contributions to the *Bulletin* are invited on subjects relevant to the control of animal disease with particular reference to Africa and papers should conform to the following conditions.

A paper accepted for publication in the *Bulletin of Epizootic Diseases of Africa* is done so on the understanding that it has not previously been published nor will be submitted for publication elsewhere without prior agreement with the Editor.

Papers should be typewritten on one side of the paper only in English or French. Double line spacing and adequate margins are desirable. The original and one carbon copy are required.

Papers are accepted on the understanding that they are subject to minor editorial revision to conform with the general principles of format adopted by the Bureau.

The title should be concise. The initials and name of author(s) without professional qualifications should be followed by the title of his post and the organisation and country in which the work described was carried out.

Papers should contain a summary, which should be factual, should convey the contents of the paper and should draw attention to new information and to the main conclusions.

Headings and sub-heads should not be underlined. Binomial specific names and other words to be printed in italics should have a dotted underline.

Tables should be limited and be typed on separate sheets of paper numbered consecutively, Table I, Table II, etc. Figures, including photographic prints, graphs, maps, etc., should be numbered consecutively, Fig. 1, Fig. 2, etc., and attached at the end of the text. References to tables and figures in the text should be by number and not to "table below" or "figure below". Coloured illustrations are reproduced only at the author's expense.

Bibliographical references should be listed in alphabetical order of first author or country (if annual report) at the end of the paper, and not numbered. Only those cited in the text should be included. References cited in the text should be inserted, as e.g. (Richards, 1950) or "Richards (1950) showed".

If the same author is cited more than once, his publications should be arranged in chronological order in the list of references, and if more than one publication of the same author in the same year of publication is included, the letters "a, b, c" should be added after the date in both the list of references and in the text.

References should include, in the following order, surname, initial of author(s), year of publication (in parentheses), World List abbreviation of title of periodical (dotted underline), volume number (arabic numerals underlined), first page number. The title of the article should not be included.

References to books should include name and initials of author(s), year of publication (in parentheses), the exact title (underlined), town of publication, page number (if page number specifically cited).

References to annual reports should state the country, year of reference, followed by the name of the department or organisation, e.g. Kenya (1955) An. Rep. Dept. Vet. Services, p. 50 (if specific page cited).

Twenty-five reprints of each article published will be supplied free of charge. Orders for reprints required in addition to the author's 25 free copies must be submitted together with the manuscript.

DIRECTIVES POUR LES AUTEURS

Les auteurs qui désirent publier des articles sur la lutte contre les maladies animales avec des références particulières à l'Afrique devront se conformer aux conditions suivantes.

Le Bureau n'accepte de publier un article dans le *Bulletin des Epizooties en Afrique* que sous la réserve qu'il n'a pas été précédemment publié ou qu'il ne sera pas proposé ailleurs sans le consentement de la Rédaction.

Les articles devront être dactylographiés sur un seul côté du papier et rédigés uniquement en anglais ou en français. Des interlignes doubles et des marges suffisantes sont recommandés. L'original et une copie au carbone sont nécessaires.

Il est entendu que les articles acceptés pourront être soumis à quelques modifications de formes et de présentation pour être conformes à notre présentation habituelle.

Les titres devront être concis. Les initiales et le(s) nom(s) de(s) auteur(s), sans titres professionnels, devront être suivis par le nom de son poste et de l'organisation, ainsi que celui du pays où le travail indiqué a été entrepris.

Les articles devront être suivis d'un résumé, portant uniquement sur les faits, qui devra contenir l'essentiel de l'article et en faire ressortir tous les renseignements nouveaux et les principales conclusions.

Les titres et sous-titres ne devront pas être soulignés. Les noms d'espèces et de genre en latin et tout autre mot devant être imprimés en italiques seront soulignés en pointillés.

Le nombre des tableaux devra être autant que possible limité et ils seront présentés sur des feuilles séparées, numérotés respectivement Tableau I, Tableau II, etc. Les photographies, cartes, graphiques devront être numérotés respectivement, Fig. 1, Fig. 2, etc. et attachés à la fin du texte. Les références aux tableaux et aux figures devront être numérotées et non pas indiquées " tableau ci-dessous " ou " figure ci-dessous ". Les illustrations en couleur ne sont reproduites qu'aux frais de l'auteur.

Les références bibliographiques feront l'objet d'une liste par ordre alphabétique des principaux auteurs (ou de pays lorsqu'il s'agit de rapports annuels) à la fin de l'article. Elles ne seront pas numérotées. Seuls les auteurs cités dans le texte seront indiqués. Les références, dans le texte, seront mentionnées de la façon suivante (Richards 1950) ou " Richards (1950) ".

Si le même auteur est cité plus d'une fois, ses publications seront indiquées dans l'ordre chronologique dans la liste bibliographique et s'il y a plus d'une publication pour une même année, les lettres " a, b, c " seront ajoutées après la date, aussi bien dans la liste bibliographique que dans le texte.

Les références devront comprendre dans l'ordre suivant : le nom, les initiales de l'auteur(s), l'année de la publication (entre parenthèses), le titre en abrégé du périodique (suivant la Liste mondiale) souligné en pointillés, le numéro du volume (chiffre arabe souligné) et le numéro de la première page de l'article. Le titre de l'article ne devra pas être indiqué.

Les références à des ouvrages devront comprendre le nom et les initiales de l'auteur(s), l'année de la publication (entre parenthèses), le titre exact (souligné), la ville où il a été publié, le numéro de la page (lorsque les pages sont expressément citées).

Les références aux rapports annuels devront indiquer le pays, l'année faisant l'objet du rapport, puis le nom du service ou de l'organisation, par exemple : Kenya (1958), Rapp. Ann. Serv. Vét., p. 50.

---

25 tirés à part de chaque article sont fournis gratuitement. Lorsque l'auteur désire un nombre plus important de tirés à part, une commande doit être envoyée en même temps que l'article.

IBAH PUBLICATIONS
LES PUBLICATIONS DE L'IBAH

BULLETIN OF EPIZOOTIC DISEASES OF AFRICA
BULLETIN DES EPIZOOTIES EN AFRIQUE

A Quarterly Journal of Original Articles and Abstracts in English and French

---

Subscription per annual volume : Shs. 50/-

Revue trimestrielle contenant des articles originaux et des analyses en anglais et en français

---

Abonnement pour un an : Shs. 50/-

INFORMATION LEAFLETS

PAGES D'INFORMATION

A weekly information sheet on individual subjects of general veterinary interest (posted monthly)

Annual subscription : Shs. 30/-

Feuilles d'informations hebdomadaires portant sur différents sujets d'intérêt vétérinaire
(expédiées mensuellement)

Abonnement pour un an : Shs. 30/-

INTER-AFRICAN BUREAU FOR ANIMAL HEALTH
BUREAU INTERAFRICAIN DE LA SANTE ANIMALE

MUGUGA — KIKUYU, KENYA

BULLETIN

VOLUME 15

1967

March 1967
Mars

No. 1

ORGANISATION OF AFRICAN UNITY
ORGANISATION DE L'UNITE AFRICAINE

COMMISSION SCIENTIFIQUE, TECHNIQUE ET DE LA RECHERCHE

SCIENTIFIC, TECHNICAL AND RESEARCH COMMISSION

Bureau des Publications/Publications Bureau
Watergate House, York Buildings
London, W.C. 2.

BULLETIN OF EPIZOOTIC DISEASES OF AFRICA

BULLETIN DES EPIZOOTIES EN AFRIQUE

Vol. 15 No. 1, pp. 1-84 March/mars 1967

CONTENTS/SOMMAIRE

BULLETIN OF EPIZOOTIC DISEASES OF AFRICA

BULLETIN DES EPIZOOTIES EN AFRIQUE

Vol. 15 No. 1, pp. 1–84 March/mars 1967

Continuation/Suite

EDITORIAL

With this number of the *Bulletin*, we start the fifteenth year since it was first published. It is edited by the Inter-African Bureau for Animal Health, which is an organ of the Scientific, Technical and Research Commission of the Organisation of African Unity.

The main objective of our IBAH is to combat animal diseases, and thereby make our own contribution in the fight against famine that threatens vast areas of our planet, in addition to safeguarding humanity from animal diseases transmissible to man.

Although the *Bulletin* specialises in publications of works either carried out in Africa, or with a bearing on African animal health problems, yet it has subscribers throughout the whole world. Its original articles have always been received from authors in every continent, and its abstracts are carefully selected from the world veterinary literature.

A well-known fact is that disease has no boundaries, and so science should never be monopolised by any one nation, but should be for the benefit of the whole humanity. Nowadays, in the decade of jets, rockets and satellites, any disease can easily threaten any country or even planet which had never seen it before. Therefore, I would like to thank all scientists who have contributed in the success of this *Bulletin*, and wish to make it clear that former authors are heartily welcomed, as well as new authors are invited to contribute.

In conclusion I would like to send my appreciation and best wishes to the former editors who had in the past years, undertaken this task efficiently; to international organisations which have always co-operated with IBAH in its scope; and to our colleagues in veterinary services of Africa who supply us with their useful informations and practice regularly. In this editorial which is being written at the beginning of the New Year, I would also like to send my greetings to all veterinarians all over the world. I wish them all the happiness and self-satisfaction a veterinarian usually attains, when he feels he has sincerely contributed to the welfare and happiness of mankind.

EDITORIAL

Avec ce fascicule du *Bulletin*, nous commençons notre quinzième année d'existence. Il est publié par le Bureau Interafricain de la Santé Animale, qui est un organe de la Commission Scientifique, Technique et de la Recherche de l'Organisation de l'Unité Africaine.

Le but principal de l'IBAH est de combattre les maladies animales et d'apporter ainsi sa contribution à la lutte contre la famine qui menace de vastes régions de notre planète, tout en sauvegardant l'humanité des maladies animales transmissibles à l'homme.

Bien que le *Bulletin* se spécialise dans la publication de travaux entrepris en Afrique ou qui ont une incidence sur les problèmes de la santé animale dans ce continent, il compte des abonnés dans le monde entier. Ses articles originaux ont toujours été reçus d'auteurs travaillant dans divers continents et ses analyses sont soigneusement choisies dans la littérature vétérinaire mondiale.

C'est un fait établi que les maladies ne connaissent pas de frontières ; et c'est pourquoi la science ne devrait jamais être le monopole d'une seule nation, mais devrait profiter à l'humanité entière. De nos jours, en une décade d'avions à réaction, de fusées spatiales et de satellites, n'importe quelle maladie peut menacer n'importe quel pays ou même n'importe quelle planète qui en avaient été exempts jusqu'à ce jour. C'est pourquoi je désire remercier tous les scientifiques qui ont contribué au succès de ce *Bulletin* et tiens à leur dire que le auteurs qui y ont déjà collaboré sont toujours les très bienvenus et que de nouveaux auteurs sont invités à y apporter leur contribution.

En conclusion je désire présenter mes remerciements et mes meilleurs vœux aux précédents éditeurs qui ont au cours des années rempli efficacement leur tâche ; aux Organisations Internationales qui ont toujours coopéré avec l'IBAH dans son domaine ; et à nos collègues des Services Vétérinaires en Afrique qui nous fournissent régulièrement des rensignements utiles et nous font bénéficier de leur expérience. Dans cet éditorial, écrit au début de la nouvelle année, je désire également présenter mes meilleurs vœux aux vétérinaires du monde entier. Je leur souhaite la joie et la satisfaction personelle que connait un vétérinaire lorsqu'il sent qu'il a rééllement contribué au bien-être et au bonheur de l'humanité.

Bull. epizoot. Dis. Afr. (1967), 15, pp. 7–10.

EVALUATION OF DIAGNOSTIC TESTS FOR CONTAGIOUS BOVINE PLEUROPNEUMONIA

M. SHIFRINE * and R. N. GOURLAY
East African Veterinary Research Organisation,
P.O. Box 32, Kikuyu, Kenya

INTRODUCTION

Gourlay (1965a) compared the efficiency of several diagnostic tests for detecting contagious bovine pleuropneumonia (C.B.P.P.). The study included two herds of cattle naturally infected with C.B.P.P., and serological test results were correlated with necropsy findings. Both the agar gel test for antigen and antibody, and the complement fixation test (C.F.T.) detected 100% of the acutely infected cattle. In chronic C.B.P.P., no tests were entirely satisfactory. The allergic reaction and the C.F.T. were the most efficient in chronic C.B.P.P. and detected 74% and 72%, respectively, of the cattle.

During C.B.P.P. outbreaks in Uganda in 1964, and in Kenya in 1966, we reevaluated the different tests to find the most efficient one for field use. The results of these studies are presented in this paper.

MATERIALS AND METHODS

Cattle

Cattle involved in this study were East African Zebu from herds naturally infected with C.B.P.P. One herd located in Iriri, Karamoja District, Uganda, was tested in October 1964; the other herd, located at Archer's Post, Isiolo District, Kenya, was tested in May 1966. Both herds included cattle in the acute stages of the disease with many deaths occurring daily.

Experimental Procedures

Skin tests were done for immediate and delayed allergic reactions as described by Shifrine and Gourlay (1965) and Gourlay and Shifrine (1965). After these tests were read, the cattle were killed, and blood was collected from the jugular vein. At necropsy, C.B.P.P. infections were classified on macroscopic examination as being acute, chronic, doubtful, or negative. Specimens of the lungs and mediastinal lymph nodes were collected for attempted isolation of *Mycoplasma mycoides*, the causative agent of C.B.P.P. The only cattle classified as positive were those with unmistakable C.B.P.P. lesions or with *M. mycoides* in the lungs or bronchial and mediastinal lymph nodes. Cattle with no lung lesions but with *M. mycoides* in the lymph nodes were termed peracute. Cattle with evident encapsulation or sequestered lesions were termed chronic, and all others with C.B.P.P. lung lesions were termed acute. Cattle with no lung lesions and no evidence of *M. mycoides* but with positive reactions to any of the serological tests were termed doubtful. These cattle could

* Employed by the United States Department of Agriculture, Agricultural Research Service, Animal Disease and Parasite Research Division, Plum Island Animal Disease Laboratory, P.O. Box 848, Greenport, Long Island, New York.

have either false positive reactions (Gourlay and Shifrine, 1966) or undetected microscopic lesions. Only cattle with no lesions and negative test reactions were classified as negative.

The sera and tissues were refrigerated and brought to the laboratory at Muguga within two days where all serological tests were performed.

The agar gel double diffusion precipitin test (A.G.T.) and the slide agglutination serum test (S.A.S.T.) were done following the procedures used by Gourlay (1964). For detection of circulating antigen in infected cattle, bovine hyperimmune anti-*M. mycoides* serum was used. For detection of antibodies, we used 10 mg./ml. water of *M. mycoides* cells, frozen and thawed three times. Although Huddard (1963) published a field modification of the C.F.T. for diagnosing C.B.P.P., no published data are yet available on its value in the field; therefore, we used the method of Campbell and Turner (1953) with the modification of Gourlay (1965b). For isolation of *M. mycoides*, the tissue was cut into small pieces with sterile scissors, and the pieces were then put into Newings tryptose broth (Gourlay, 1964) containing 100 i.u. penicillin and 1 : 2,000 thallium acetate/ml.

RESULTS

Results of the tests on cattle from Uganda are presented (Table I). The skin tests were not repeated as all had been positive for both immediate and delayed allergic reactions.

Table I.—Results of positive serological tests on 54 cattle with C.B.P.P. (Uganda, 1964)

Cattle		C.F.T.	S.A.S.T.	A.G.T. for	
Number	C.B.P.P. status			Ag	Ab
6	Negative	0	0	0	0
6	Doubtful	0	0	5	1
3	Peracute	0	1	2	1
13	Acute	13	13	10	8
26	Chronic	25	23	19	21

C.B.P.P. = contagious bovine pleuropneumonia.
C.F.T. = complement fixation test.
S.A.S.T. = slide agglutination serum test.
A.G.T. = agar gel diffusion test, for antigen (Ag) or antibody (Ab). For detecting circulating Ag, bovine hyperimmune anti-*M. mycoides* serum was used. For detecting antibody, 10 mg./ml. water of *M. mycoides* cells, frozen and thawed three times, was used.

M. mycoides was isolated from the enlarged lymph nodes of three cattle with no macroscopic lesions in the lungs. Sera from these cattle were positive for antigen or antibody in the A.G.T.; one was also positive in the S.A.S.T. (Table I). These were classified as peracute infections.

Among the acute infections, only one serum was negative in the A.G.T. for both antigen and antibody.

In the chronic infections, only one serum was negative in the A.G.T. for both antigen and antibody, but it was positive in the S.A.S.T. All three sera that were negative in S.A.S.T. were positive in A.G.T.

Of the six doubtful C.B.P.P. cattle, all were positive in A.G.T. but negative

in the C.F.T. and S.A.S.T. (Table I). The mediastinal lymph nodes of these cattle were enlarged.

Results of the tests done on the cattle from Kenya are presented (Table II). All the sera from the chronic and acute infections were positive in either A.G.T. or S.A.S.T.

Table II.—Results of serological tests on 57 cattle with C.B.P.P. (Kenya, 1966)

Cattle		C.F.T.	S.A.S.T.	A.G.T. for	
Number	C.B.P.P. status			Ag	Ab
5	Negative	0	0	0	0
28	Acute	27	27	24	4
24	Chronic	23	18	23	7

C.B.P.P. = contagious bovine pleuropneumonia.
C.F.T. = complement fixation test.
S.A.S.T. = slide agglutination serum test.
A.G.T. = agar gel diffusion test, for antigen (Ag) or antibody (Ab). For detecting circulating Ag, bovine hyperimmune anti-*M. mycoides* serum was used. For detecting antibody, 10 mg./ml. water of *M. mycoides* cells, frozen and thawed three times, was used.

DISCUSSION

All cattle from Uganda gave positive skin test although six of these were negative to all other tests and normal on necropsy. As this skin test was later shown to be non-specific (Shifrine and Gourlay, 1965), it was not used in the outbreak in Kenya. We are currently trying to purify extracts of *M. mycoides* in an effort to render this test specific.

The C.F. test was negative when sera from two chronic, one acute and three peracute infections were tested. From the latter three, *M. mycoides* was isolated and the sera were positive in the A.G.T. Thus, out of 94 C.B.P.P. cattle tested (this figure excludes the negative and doubtful cattle), there were six C.F.T. negative sera. Turner and Etheridge (1963), evaluated the S.A.S.T., slide agglutination blood test (S.A.B.T.) and C.F.T. in the diagnosis of C.B.P.P. They found that both S.A.S.T. and S.A.B.T. had the disadvantage of giving negative results with sera from animals with sequestered lesions and non-specific reactions with the S.A.S.T. In our limited studies, we did not find many non-specific reactions using the S.A.S.T. When non-specific reactions were encountered in C.B.P.P.-free cattle, the sera were positive also in the C.F.T. (Gourlay and Shifrine, 1966). The study of Turner and Etheridge (1963), also included cattle involved in a field outbreak of C.B.P.P. Among these there were 57 with pathogenic lesions; 52 of these reacted to C.F.T. and 55 reacted to the S.A.S.T. Out of five recovered animals with only fibrous adhesions, none reacted to C.F.T. and all reacted to the S.A.S.T. Thus, the S.A.S.T. may be more sensitive in both recovered cases and peracute cases.

Turner and Etheridge (1963), reported the S.A.S.T. to be least sensitive with chronic cases of C.B.P.P., probably because of circulating antigen. However, at this stage of the disease, the A.G.T. for antigen is quite sensitive.

In our studies, neither the S.A.S.T. nor the A.G.T., for both antibody and

antigen, detected all positive infections. However, by using the results of both of these tests, all positive cattle were detected.

Our results confirm those of Gourlay (1965a and b) that no single test can detect all C.B.P.P. cattle and the C.F. test is the most sensitive single test for detecting C.B.P.P. However, all C.B.P.P. cattle from the two outbreaks studied, could be detected by using both the S.A.S.T. and the A.G.T.

The results presented here indicate that the use of S.A.S.T. in conjunction with A.G.T. for detecting antigen is the method of choice for detecting C.B.P.P. in the field. It also has the advantage of being easier to perform than the C.F.T.

SUMMARY

The slide agglutination serum test in conjunction with agar gel diffusion test for antigen and antibody detected 100% of cattle naturally infected with contagious bovine pleuropneumonia. The complement fixation test, however, failed to detect 6% of these cattle.

ACKNOWLEDGMENTS

We wish to thank Mr. John Njumba for expert technical assistance and Dr. J. Moulton for performing necropsies of the cattle in Kenya.

The research described in this paper was partly financed by United States/Aid for International Development under the terms of the Commission for Technical Co-operation in Africa/Joint Project 16 for research on contagious bovine pleuropneumonia.

REFERENCES

Campbell, A. D., and Turner, A. W. (1953). *Aust. Vet. J.*, **29**, 154.
Gourlay, R. N. (1964). *J. Comp. Path.*, **74**, 286.
Gourlay, R. N. (1965a). *J. Comp. Path.*, **75**, 97.
Gourlay, R. N. (1965b). *J. Comp. Path.*, **75**, 89.
Gourlay, R. N., and Shifrine, M. (1965). *J. Comp. Path.*, **75**, 375.
Gourlay, R. N., and Shifrine, M. (1966). *J. Comp. Path.*, **76**, 417.
Huddart, J. E. (1963). Animal Health Branch, Monograph No. 6, FAO, Rome.
Shifrine, M., and Gourlay, R. N. (1965). *J. Comp. Path.*, **75**, 381.
Turner, A. W., and Etheridge, J. R. (1963). *Aust. Vet. J.*, **39**, 445.

(Received for publication 22 December 1966)

Résumé

En utilisant les deux tests diagnostiques: sérologique d'agglutination et épreuve de diffusion sur gélose pour l'antigène et les anti-corps, on peut déceler la péripneumonie contagieuse chez 100% des bovins infectés, tandis qu'avec la réaction de fixation de complément seule, 6% d'entre eux échappent à la détection.

Bull. epizoot. Dis. Afr. (1967), 15, pp. 11–17.

AN ATTEMPT TO TRANSFER IMMUNITY TO *MYCOPLASMA MYCOIDES* INFECTION WITH SERUM

L. C. LLOYD
Division of Animal Health, CSIRO, Animal Health Research Laboratory, Parkville, N.2, Victoria, Australia

INTRODUCTION

The immunity to contagious bovine pleuropneumonia (C.B.P.P.) of cattle vaccinated with live vaccine persists for at least 3½ years (Hyslop, 1956), but complement fixing (C.F.) or agglutinating antibodies are not usually detectable for more than a few months after vaccination (Campbell and Turner, 1953). It therefore seems possible that these antibodies do not play a role in the long-term resistance of immune animals to C.B.P.P. However, before humoral antibodies can be dismissed, the possibilities must be considered that they are not being measured or that they remain at a low resting level until the animal is challenged and then rise to effective measurable levels. In either case immunity should be transferable with serum from recently challenged immune animals. An alternative explanation is that cellular immunity is involved in the acquired resistance to this disease.

Experiments have been carried out to examine the significance of some of these factors. Serum, from immune animals that had resisted the local infection produced by the subcutaneous injection of *M. mycoides*, was injected into susceptible animals which were then challenged by subcutaneous inoculation with organisms to determine whether immunity had been transferred passively.

MATERIALS AND METHODS

Serum was taken from eight immune animals that had been recently challenged and administered to eight susceptible cattle over several days at a high dose rate. These cattle, together with the immune cattle that provided the serum, and eight additional susceptible control animals, were challenged and the results were compared.

Cattle

The susceptible or unexposed cattle were Jersey or Jersey-Angus crossbreds, reared from birth at the laboratory field station. They showed no reaction to the C.F. test and slide agglutination whole blood (S.A.B.) test (Turner and Etheridge, 1963). They were 9½–20 months old and 360–684 lb. in weight.

The immune cattle of the same breed were also reared at the laboratory field station, but they had later all been inoculated subcutaneously at the laboratory with *M. mycoides* and had developed severe local lesions, bacteraemia and titres of C.F. antibodies between 1 in 320–1 in 5,120. At the time of the immunity transfer experiment to be described, their C.F. titres had fallen to 1 in 10 or less. The animals were 13–25 months old and 400–740 lb. in weight.

Preparation of Serum

Three weeks before the serum was collected from the immune cattle they were given a subcutaneous injection of 2 ml. of a filamentous culture of the virulent Gladysdale strain of *M. mycoides*. The aim of this was two-fold: to verify that the animals were in fact immune and to reinforce such immunity by further challenge so that serum might later be collected when a maximum concentration of factors responsible for resistance to infection could be expected. The dose of organisms used to challenge the immunity of these cattle was $3 \cdot 18 \times 10^9$ for half the group and $1 \cdot 6 \times 10^9$ for the other half.

The effect of the subcutaneous injection of virulent *M. mycoides* was negligible; no swelling occurred at the site of injection and the C.F. titre remained below 1 in 10 in three animals, rose from 1 in 10 to 1 in 20 in three, and from 1 in 10 to 1 in 40 in two. Hence a high degree of immunity to subcutaneous infection was present in the donor animals. Serum for injection was collected three weeks after this injection of virulent *M. mycoides* when all sera had the low C.F. titres typical of those that exist in immune animals when the reaction to vaccination may be considered to have ceased. It is in contrast to the situation soon after vaccination when the CF titre can be as high as 1 in 2,560 (Hudson and Turner, 1963).

After the appropriate time the cattle were bled into sterile containers, the serum removed aseptically and deep frozen until used. One serum showed a 4 + reaction to the S.A.B. test; one was 1 in 20 and two were 1 in 10 in the complement fixation test and the rest were negative to both tests.

Preparation of Serum-treated Cattle

For each animal, the serum for the first injection was chosen by random selection at the beginning of the experiment. Subsequent doses of serum for any one animal were from the same donor. The first dose of 200 ml. was injected intravenously on day 1, 24 hours before the challenge; further doses at days 3, 6 and 9 were of 100 ml. each. The aim of this schedule was to build up a level of serum which might at least delay development of the lesion for an appreciable time if it did not completely prevent it.

Challenge

The three groups of animals, the immune, the serum-treated and the controls, were challenged on day 2 by the subcutaneous injection of 2 ml. of a filamentous culture of the virulent Gladysdale strain of *M. mycoides* at a site behind the left shoulder. The dose of organisms used in half the group was $1 \cdot 8 \times 10^9$ and in the second half $6 \cdot 28 \times 10^9$.

Observations on Test Cattle

Lesions were measured twice a week for the first 45 days, and then once a week. Usually horizontal and vertical measurements were made, the limit of the lesion being taken as that point where the firm swelling ceased; soft oedematous tissue outside this limit was not included in the measurement. The area of the lesion was computed. Extension over the lower abdominal wall was noted separately. The cattle were bled three times a week for the C.F. test (Campbell and Turner, 1953), for the S.A.B. test (Turner and Etheridge, 1963), and for blood culture by the method of Turner and Trethewie (1961).

Necropsy

Animals that died or were killed *in extremis* were examined *post mortem.* Specimens for bacteriological examination were taken from the subcutaneous lesions, the prescapular, precrural, posterior and anterior mediastinal, and the left bronchial lymph nodes, and the heart blood, and were sown to B.V.F.-O.S. broth to which penicillin and thallium acetate had been added (Turner and Trethewie, 1961). Material for section was taken from the subcutaneous lesions, and from any lung lesions whether they appeared to the naked eye to be due to *M. mycoides* or not.

Scoring System

The severity of the response to challenge was assessed by a system which was compounded of a score for the serological and clinical responses (Hudson and Turner, 1963) and a score for the size of the lesion (Turner, 1960).

RESULTS

Results of the Test for the Transfer of Immunity

(*a*) Immune cattle—None of the immune cattle showed a swelling at the site of the challenge injection nor pyrexia, and although the C.F. titre increased in four cattle the maximum did not exceed 1 in 20 in any of the four. Blood cultures were taken twice a week for a period of 28 days and all were negative.

In three cattle the skin at the site of injection was firmly attached to the underlying tissues over an area about 10–12 cm. diameter. Since none of the usual signs of infection such as swelling, pain or heat were associated with it and there was only a small rise in the C.F. titre, these lesions were not taken into account when the scores for these cattle were computed.

(*b*) Susceptible cattle treated with immune serum—All individuals reacted. At seven days, seven of the eight developed at the site of injection swellings about 8 to 12 cm. in diameter; the eighth developed at 10 days. These later increased in size to 1,000 cm^2 or more, and frequently extended on to the ventral abdominal wall and down the fore-limbs. Five of the eight showed pyrexia with a temperature exceeding 103° F. for at least seven days, whilst in the other three it was of shorter duration. Five of the eight either died or were killed *in extremis.* The C.F. titres of all the animals in this group exceeded 1 in 80 and in most cattle rose as high as 1 in 1,280.

Blood cultures were made twice a week until two or three consecutive bleedings were negative. Some samples were positive for *M. mycoides* as early as the third day and all were positive at about the fourteenth day. In general, the bacteraemia continued for 10 to 20 days but in one exceptional animal it continued for 46 days.

The necropsy findings were typical of those associated with severe Willem's reactions, being characterised by local inflammatory oedema and necrosis; *M. mycoides* was found in specimens from various sites including the local lymph nodes and the heart blood.

(*c*) Untreated susceptible cattle—All individuals reacted and, as a group, the reactions of these were similar to those of the serum-injected group. Swellings about 12 cm. in diameter developed at the site of injection in six out of the eight at seven days and at nine and 12 days in the other two; these progressed until they covered areas greater than 1,000 cm^2, often extending over the ventral abdominal wall and down the fore-limbs. In only two of the eight did temperature higher than

103° F. persist for seven days or more, but in most of the others there were sporadic rises above 103° F. Three animals were killed *in extremis*. The results of regular blood culturing for the presence of *M. mycoides* were similar to those of the serum-injected group. Five of the samples taken on the third day were positive and seven out of the eight were positive by about the fourteenth day; all were positive for periods that varied from seven to 14 days at some stage of the experiment, except for one which had positive cultures on only two occasions 14 days apart.

The necropsy findings were similar to those of the serum-injected group.

The scores allotted to each animal are given in Table I.

Table I.—Results of the subcutaneous injection of 2 ml. of a virulent strain of *M. mycoides*

Animal	Serology score	Clinical score	Lesion score	Total score
Immune cattle				
G35	0	0	0	0
F32	0	0	0	0
J79	1	0	0	1
J81	1	0	0	1
L42	1	0	0	1
L43	0	0	0	0
L44	1	0	0	1
L48	0	0	0	0
				Mean = 0·5 ± 0·5
Serum-injected cattle				
G51	3	3	6	12
G52	3	3	5	11
L37	3	3	6	12
L38	3	3	6	12
L43	3	0	3	6
L45	3	2	6	11
L46	3	3	6	12
L48	3	0	5	8
				Mean = 10·5 ± 2·1
Untreated cattle				
F70	3	0	6	9
L31	3	3	4	10
L40	3	3	6	12
L42	3	0	6	9
L44	3	0	3	6
L49	3	0	4	7
L51	3	3	6	12
L53	3	0	3	6
				Mean = 8·9 ± 2·3

DISCUSSION

The animals injected with serum from immune cattle were not resistant to infection with *M. mycoides*: they were highly susceptible and were, in fact, no different from untreated control cattle. The immune cattle, on the other hand, were solidly resistant to infection. If humoral factors play an important part in the acquired resistance of cattle to C.B.P.P., then serum from animals that had recently resisted a severe challenge should have modified the development of an infection in the treated susceptible cattle.

An important point to be considered is whether the dose of serum was adequate. Comparisons can be made between the dose used in this experiment, namely 200 ml.

initially and a total dose of 500 ml. given over nine days, with the recommended doses of prophylactic sera for other cattle diseases. Thus the British Veterinary Codex (Anon., 1953) recommends 100–150 ml. of antiserum for protection against anthrax (*Bacillus anthracis* infection), 10 ml. for black disease (*Clostridium oedematiens* infection), 10–40 ml. for blackleg (*Clostridium feseri* infection), and 80–180 ml. for rinderpest protection. However, this comparison is only partly valid since these are hyperimmune sera produced by repeated injections of antigens, whereas repeated injections of *M. mycoides* do not lead to an increased level of detectable antibody but do produce a highly resistant animal.

These considerations led to the selection of a dose rate that was well above that of known prophylactic sera and, as well, the treatment was continued over a period of 9 days so as to increase the chances that a prophylactic effect would be demonstrated. Further, the animals from which the serum was harvested had had at least two injections of *M. mycoides*, the last being only three weeks before the serum was harvested, and they were solidly immune to the effects of the organism.

The successful transfer of immunity to *M. mycoides* infection by serum was claimed by Nocard (cited by Hutyra *et al.*, 1949). He obtained his serum from animals that had recovered from the disease produced by subcutaneous injection and had then been " hyperimmunised " by inoculation with 6 litres of culture over a period of several months. This method is not substantially different from the one used in the present work. Our cattle had recovered from a subcutaneous challenge and though Nocard's dose of culture appears very large the actual number of organisms, because of the inadequate method of culture at the time, may not have been any greater than the challenge dose of about 10^9 organisms administered to our cattle to confirm their immunity before the serum was harvested. He found, however, that 40 ml. of serum protected cattle for 8–10 days, whereas 500 ml. failed to protect our cattle.

Evidence for the transfer of immunity by means of serum in other *Mycoplasma* infections is both meagre and apparently inconsistent. According to Shirlaw (1949), serum from goats that had been vaccinated against contagious caprine pleuropneumonia, caused by *M. capri*, was not effective in preventing the disease, but Lukashenko (1961) claimed that it was effective. However, Shirlaw prepared his donor animals by inoculating them with *M. capri* culture at infrequent intervals over a long period whereas Lukashenko prepared his by injecting progressively larger doses of infected animal material at short intervals over a comparatively short period. Carré (1912), and Bridré and Donatien (1925), found that hyperimmune serum protected goats against infection by *M. agalactiae*, the causative agent of contagious agalactia of sheep and goats. The serum donors used by Carré, which had recovered either from the experimental or the natural disease, were given a course of injections of infected material from animals with agalactia; the sheep, goats and horses used by Bridré and Donatien, on the other hand, were given very large doses of living organisms before the serum was harvested. Howell and Jones (1963), using mice, passively transferred immunity to *M. arthriditis* with serum from mice that had recovered from arthritis.

Thus, even though protective serum can be produced, the circumstances of its production are so artificial that they would seldom if ever arise in normal vaccination.

The evidence presented here is not sufficient to attribute immunity to C.B.P.P. entirely to non-humoral factors, and work is in progress to determine whether

resistance is due to cellular immunity. Preliminary observations on diffusion chamber experiments support this cellular hypothesis. It is worth noting that Gourlay (1964) has demonstrated a specific delayed hypersensitivity-type reaction to *M. mycoides* antigen in cattle; this reaction is commonly associated with cellular immunity (Mackaness, 1962).

Even though the type of immunity operating in C.B.P.P. has not yet been clearly defined, the experiment described here indicates that studies of serum factors only, are unlikely to elucidate the mechanisms that are involved in the production and the maintenance of immunity.

SUMMARY

Cattle which possessed an acquired active immunity to *M. mycoides* infection were subjected to a confirmatory challenge and then bled three weeks later to obtain serum for injection into young susceptible cattle. Immunity of the latter was then tested by the subcutaneous injection of the virulent Gladysdale strain of *M. mycoides*, while serum injections were continued for a further eight days; equal numbers of immune and fully susceptible cattle were challenged at the same time. The serum-injected cattle proved to be as susceptible as the controls, while the immune cattle were completely resistant to the challenge. It is therefore suggested that the resistance of immune cattle to contagious bovine pleuropneumonia may depend little, if at all, on humoral antibodies.

ACKNOWLEDGMENTS

I wish to thank Mr. J. R. Hudson, B.Sc., M.R.C.V.S., for his helpful advice and criticism, and Miss Marija Aras for her skilful technical assistance.

REFERENCES

Anonymous (1953). British Veterinary Codex, Pharmaceutical Press, London.
Bridré, J., and Donatien, A. (1925). *Annls. Inst. Pasteur, Paris*, **39**, 925.
Campbell, A. D., and Turner, A. W. (1953). *Aust. vet. J.*, **29**, 154.
Carré, H. (1912). *Annls. Inst. Pasteur, Paris*, **26**, 937.
Gourlay, R. N. (1964). *J. comp. Path. Ther.*, **74**, 286.
Howell, E. V., and Jones, R. S. (1963). *Proc. Soc. exp. Biol. Med.*, **112**, 69.
Hudson, J. R., and Turner, A. W. (1963). *Aust. vet. J.*, **39**, 373.
Hutyra, F., Marek, J., and Manninger, R. (1949). *Special pathology and therapeutics of the diseases of domestic animals*, 5th ed., London. Vol. 1, p. 455.
Hyslop, N. St. G. (1956). *Bri. vet. J.*, **112**, 519.
Lukashenko, F. D. (1961). *Trudy Uzbek nauchno-issled. Inst. Vet.*, **14**, 27. Abstracted in *Vet. Bull.*, Weybridge (1963), **33**, Abstract No. 3459.
Mackaness, G. B. (1962). *J. exp. Med.*, **116**, 381.
Shirlaw, J. F. (1949). *Indian J. vet. Sci.* **19**, 181.
Turner, A. W. (1960). Working paper for first meeting of Joint FAO/OIE/CCTA Expert Panel on Contagious Bovine Pleuropneumonia, Melbourne.
Turner, A. W., and Etheridge, J. R. (1963). *Aust. vet. J.*, **39**, 445.
Turner, A. W., and Trethewie, E. R. (1961). *Aust. vet. J.*, **37**, 1.

(Received for publication 21 October 1966)

Résumé

Des bovins qui ont acquis une immunité active envers l'infection à *M. mycoides* ont été soumis à l'épreuve confirmatoire. Ils ont été saignés après trois semaines

pour fournir du sérum à injecter à de jeunes animaux réceptifs. L'immunité de ces jeunes a été éprouvée par l'injection par voie sous-cutanée d'une souche virulente (Gladysdale) de *M. mycoides*, et l'on a continué à faire des injections quotidiennes du sérum pendant encore 8 jours. Un nombre égal d'animaux immuns et réceptifs a été éprouvé en même temps que le groupe sérumisé. On a montré que ce dernier groupe est aussi sensible à l'épreuve que les témoins réceptifs non-sérumisés, tandis que le groupe immun reste indemne à l'épreuve. Les résultats suggèrent que la résistance des bovins immuns à la péripneumonie contagieuse dépend peu ou pas du tout des anti-corps humoraux.

Bull. epizoot. Dis. Afr. (1967), 15, pp. 19–23.

EXPERIMENTAL RINDERPEST IN CAMELS. A PRELIMINARY REPORT*

K. V. SINGH and F. ATA
Rinderpest Research Laboratories, Near East Animal Health Institute, P.O. Box 2223, Cairo

INTRODUCTION

Camels are important draft and meat animals in Arab countries, Afghanistan, Ethiopia, India, Iran, Pakistan, Somalia, Turkey, West and Equatorial Africa and Asian Republic of the U.S.S.R. They also are popular zoo animals throughout the world. Little is known concerning the susceptibility of these animals to rinderpest which is economically one of the most important diseases of the cattle industry in most of these countries.

Dhillon (1959) noticed clinically recorded outbreaks of rinderpest in the district veterinary records among Indian camels, which were not confirmed by laboratory tests. Recently Scott and MacDonald (1962) failed to detect antibodies in serum samples collected from 30 camels which originated from the Northern Frontier Province of Kenya where an outbreak of rinderpest had caused high mortality among game animals. Specific published information on the clinical and serological response of camels to infection with rinderpest virus is not available. These experiments were therefore conducted to provide such information.

MATERIALS AND METHODS

Viruses

Two virulent and one laboratory attenuated strains of rinderpest virus were used. One of the virulent strains, designated as " Libyan strain " was isolated in 1966 from the blood and lymph glands of Benghazi calf with a natural case of rinderpest. This field strain was passed only once in susceptible cattle and produced a thermal response, distinct mouth lesions, bloody diarrhea and killed inoculated cattle on the tenth day. The other virulent strain was a local Egyptian strain maintained in cattle since 1903. It has a three-day incubation period and produces severe clinical disease with almost 100% mortality in inoculated cattle. It does not produce mouth lesions however.

The attenuated virus used is the laboratory attenuated strain tissue culture modified Kabete " O " virus (Plowright and Ferris, 1959). This strain is now employed for mass immunisation of Egyptian cattle and buffaloes as a live virus vaccine. In most inoculated animals this strain does not evoke pyrexia and is not spread by contact (Singh, *et al.*, 1966).

Camels

One- to two-year-old locally bred camels were used for experimental infection. Serum samples were collected from camels which were imported from Sudan and

* These investigations were jointly supported by the Ministry of Agriculture, U.A.R. and the United Nations Development Program/Special Fund.

killed in Cairo abattoir. Serum samples were also collected from some locally bred camels.

Bovine Kidney Cell Cultures

Cell cultures were prepared and maintained as previously described (Singh, *et al.*, 1966). As a growth medium Hanks balanced salt solution (H.B.S.S.) was used with 0·5% lactalbumin hydrolysate containing 5% fresh calf serum and usual concentration of antibiotics. Immediately prior to inoculation the growth medium was replaced by a maintenance medium which contained 3% instead of 5% calf serum.

Serum Neutralisation Tests

This was performed in bovine kidney cell cultures using 100–200 $T.C.D._{50}$ of tissue culture adopted rinderpest virus as inoculum according to the method described by Plowright and Ferris (1961). All sera were inactivated at 56° C. for 30 minutes.

EXPERIMENTAL PROCEDURES AND RESULTS

Response to Inoculation with Virulent Virus

Camel A was infected subcutaneously (S.C.) with 1,000 cattle LD_{100} of laboratory maintained strain of virulent virus. A thermal reaction, which occurred on day 5 post infection, was the only clinical sign of disease recognised during the period of observations (Fig. 1). Serum samples, obtained at periodic intervals post

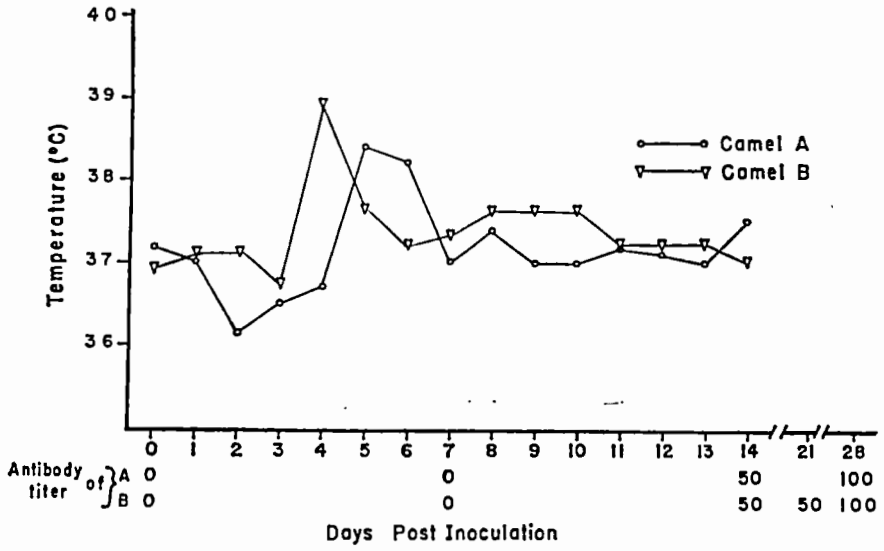


FIG. 1.—Clinical chart of camels infected with virulent rinderpest virus.

inoculation, demonstrated the development of high titres of virus neutralising antibodies, indicating that the camel was infected and produced a serological response following infection with virulent rinderpest virus.

To determine if a camel showing no recognisable clinical signs of the disease is

capable of transmitting infection to susceptible contact cattle, the following experiment was designed.

Camel B which was susceptible to infection as determined by the " screening test " (Plowright and Ferris, 1961) was inoculated S.C. with 5 ml. of 20% spleen and lymph gland suspension of " Libyan strain " virulent virus (Field Strain). The following day it was housed in an isolated box stall (9 ft. × 10 ft. × 12 ft.) with a susceptible Benghazi three-year-old steer. The stall was not cleaned regularly and both animals drank water from the same water tank. Morning rectal temperature, first of cattle and then of camel, were taken by separate thermometers which were disinfected after use with ether. The animals were observed daily for any other abnormality. As shown in Fig. 1 this camel developed a thermal response of 38·9° C. for one day. On the fourteenth day post inoculation it developed a high level of neutralising antibodies, which reached to 10^2 on twenty-eighth day indicating that the camel became infected with the field strain of rinderpest virus. The contact calf did not show any clinical signs of rinderpest and serum sample collected from the calf on the twenty-fifth day of contact was negative to detectable levels of neutralising antibodies and when challenged with virulent rinderpest virus reacted typically and died. All indications were that the contact calf did not become infected.

Response to Inoculation with Attenuated Virus.

Four camels whose susceptibility was checked by the " screening tissue culture neutralisation test " and found to be negative were inoculated S. C. with 10^4 T.C.I.D.$_{50}$ of one-hundred-and-second passage level of Kabete " O " virus. These animals were bled at regular intervals to determine their serological response. Two of the four camels developed low level of neutralising antibodies (Table I). The

Table I.—Antibody response of sero-negative camels to rinderpest virus infection

Camel No.	Type of virus	Antibody titre * on days after inoculation					
		0	7	14	21	28	67
11	T.C.R.V.	0	N.T.	0	N.T.	0	0
282	,, ...	0	N.T.	0	0	0	0
339	,, ...	0	N.T.	2	N.T.	2	T
402	,, ...	0	N.T.	T	N.T.	2	T
A	Virulent	0	0	50	N.T.	100	N.T.
B	Virulent	0	0	50	50	100	N.T.

* Reciprocal of serum dilution.

T.C.R.V. = Tissue culture rinderpest virus.
N.T. = Not tested.
T = When one tube out of the two tubes was protected by the undiluted serum.

veterinarian in charge of these camels noted no adverse signs following inoculation with the tissue culture rinderpest virus (T.C.R.V.).

Frequency of Infection in Camels

To determine the extent of infection among these animals serum samples from 97 camels (25 local and 72 Sudanese) slaughtered at Cairo abattoir were collected,

Results summarised in Table II indicate that 8% of local and 9·7% of Sudanese camels had heat stable serum neutralising antibodies.

Table II.—Incidence of neutralising antibodies in camels slaughtered at Cairo abattoir

Study group	No. tested	Positive	Per cent positive
Sudan	72	7	9·7
Local	25	2	8·0
Total	97	9	9·2

When 4/4 tubes were protected by undiluted serum ; 5/9 positive sera had 1 : 10 antibody titre.

DISCUSSION

The experimental results yield four interesting observations regarding the infection of camels with rinderpest virus. (*a*) Camels are susceptible to rinderpest virus, but develop inapparent infection ; (*b*) they developed high level of neutralising antibodies following infection with virulent virus but developed low level of antibodies following inoculation with attenuated tissue culture rinderpest virus. (*c*) Approximately 8–10% of camels coming from enzootic areas had rinderpest neutralising antibodies. (*d*) An infected camel failed to transmit infection to a susceptible calf. The only clinical sign of experimental infection was a transient fever and could easily have been missed thereby concluding that camels are not susceptible to rinderpest infection. Our very limited observations do not support the transmission of rinderpest from infected camels to contact susceptible cattle, although there are great individual variations in the rate and frequency of shedding of virus, and this phenomenon has been demonstrated amply with other viral and bacterial agents.

There was serological response in two camels experimentally infected with virulent virus and thermostable neutralising antibodies were demonstrated in nine of 97 camels, from enzootic areas.

The course of the disease under various stress conditions as these animals are occasionally subjected to, especially during long desert journeys without water, may prove to be different than our observations following experimental infection under laboratory conditions. The importance of these animals in the epizootiology of rinderpest is still open to speculations.

SUMMARY

When virulent strains of rinderpest virus were administered subcutaneously (S.C.) to camels, they revealed no signs of rinderpest, except slight thermal reaction, and developed a high level of neutralising antibody titres following infection. Camels infected S.C. with attenuated tissue culture virus remained normal and developed poor serological response. A camel infected with virulent rinderpest virus failed to transmit infection to a susceptible contact steer.

ACKNOWLEDGMENTS

We are highly indebted to Dr. H. Ayoub and Dr. M. A. E. Ezzat for providing excellent working facilities. Also we are grateful to Dr. W. M. Moulton and

Dr. Kai Jensen for their advice and encouragement during the course of these investigations.

REFERENCES

Dhillon, S. S. (1959). *Ind. Vet. J.*, **36**, 603.
Plowright, W., and Ferris, R. D. (1959). *J. Comp. Path. and Therap.*, **69**, 152.
Plowright, W., and Ferris, R. D. (1961). *Archiv. Ges. Virusforsch*, **11**, 516.
Scott, G. R., and MacDonald, J. (1962). *Bull. epizoot. Dis. Afr.*, **10**, 495.
Singh, K. V., *et al.* (1966). *Cornell Vet.* In press.

(Received for publication 10 November 1966)

Résumé

Des chameaux inoculés par voie sous-cutanée avec des souches virulentes du virus de la peste bovine ne montrent aucun signe de la maladie, sauf une hyperexie faible, mais il se développe un titre élevé d'anti-corps neutralisants. Des chameaux inoculés avec un virus atténué de culture cellulaire restent normaux et développent une faible réaction sérologique. L'infection d'un bovin réceptif en contact avec un chameau inoculé avec un virus virulent n'a pu être réalisée.

Bull epizoot. Dis. Afr. (1967), 15, pp. 25–29.

SEROLOGICAL SURVEY OF DISEASES OF CATTLE, SHEEP AND GOATS IN THE EASTERN PROVINCES OF NIGERIA

J. W. KRAMER,* *Adviser in Veterinary Pathology*, O. NDUAKA, *Lecturer*, and M. UZOUKWU,* *Lecturer*
Veterinary Science Department, University of Nigeria, Nsukka

INTRODUCTION

Traditionally the Eastern Provinces of Nigeria have relied heavily on the importation of trade cattle from the Northern Provinces for their primary source of animal protein. During the year 1964–65 over 89,000 cattle were imported both by rail and by trekking. Plans are being made to expand animal production within the Eastern Provinces, which consists primarily of tropical rain forest. Because of this expansion programme a disease survey was considered necessary in order to ascertain the incidence of existing diseases. The survey was limited to ruminants, as this is the direction in which further expansion appears to be indicated. A large poultry production programme has already been implemented with considerable success. The diseases surveyed were limited to those which could be detected by serological examination and for which tested control methods appear to be readily applicable. Because of the lack of reliable specific data concerning disease losses on individual livestock farms, no real attempt could be made to evaluate other disease problems on a basis of written records.

Serological tests for brucellosis, anaplasmosis, leptospirosis, and contagious bovine pleuropneumonia (C.B.P.P.) were carried out. Of these, only leptospirosis has not been reported as a clinical entity in Nigeria, although it had been detected serologically on at least one occasion in the Northern Provinces (personal correspondence, Director of Veterinary Research, Vom, Nigeria).

Brucellosis and anaplasmosis are both considered endemic, although the actual incidence was not previously known in these provinces.

As has been pointed out by Ezebuiro (1964), outbreaks of C.B.P.P. occur in some Northern Provinces of Nigeria, but no outbreaks have been reported in the other regions of Nigeria since 1952. However, because of the free movement of cattle in Nigeria, this disease remains a constant threat to the whole livestock industry.

MATERIALS AND METHODS

Serum specimens were collected from animals on six of the eight improved farms with ruminants and six slaughter slabs in the Eastern Provinces of Nigeria. These specimens were then returned to our laboratories for testing.

Eighty-three sera from sheep and goats (Kramer, 1965) are included in the total figures for purposes of analysis of the over-all disease position.

Breeds of animals sampled were the Muturu, Ndama, and Fulani cattle, Dwarf West African goat and sheep (*Ovis jubata*, Hill, 1960).

* Present address: Department of Pathology, College of Veterinary Medicine, Michigan State University, East Lansing, Michigan, U.S.A.

Leptospirosis—The rapid macroscopic-slide agglutination screening test (Galton, Powers, Hall, Cornell, 1958) was used with the mechanical rotator for the detection of positive sera. Bacto-L Antigen Pools 1, 2, 3 and 4 * were used, as was Bacto-L Antisera L. icterohemorrhagiae, L. pyogenes, L. pomona, and L. hyos * for control antisera. Each of the above-mentioned pools contains antigens for the leptospira listed in Table I.

Table I.

Pool 1	Pool 2	Pool 3	Pool 4
L. ballum	*L. batavial*	*L. autumnalis*	*L. australis*
L. canicola	*L. grypotyphosa*	*L. pomona*	*L. hyos*
L. icterohemorrhagiae	*L. pyogenes*	*L. sejrol*	*L. min. georgia*

Brucellosis—The rapid slide agglutination technique was used with a dyed Brucella antigen * prepared similarly to the method of Huddleson and Abell (1928).

Animals which were not vaccinated were considered positive when complete agglutination occurred in a serum dilution of 1 : 100 and suspect when agglutination was complete at 1 : 50 or incomplete at 1 : 100. Vaccinated animals were considered positive when complete agglutination occurred in the serum dilution of 1 : 200 and suspect when agglutination was complete at 1 : 100 and incomplete at 1 : 200. This interpretation is the one used by the United States Department of Agriculture.†

Anaplasmosis—The capillary tube agglutination test‡ (C.A.), (Ristic, 1962) was used to check each of the bovine sera. This test has been shown to be highly specific for detecting the carrier state of anaplasmosis for up to four years after the initial infection (Ristic, 1962; Welter and Zuscheck, 1962).

Contagious Bovine Pleuropneumonia (C.B.P.P.)—All bovine sera were screened by the slide agglutination serum test (S.A.S.T.).§ It was our intention to use the S.A.S.T. for herd screening. Any herds with one or more positive sera were then retested with the plate complement fixation test of Fulton and Dumbell (1949). This is the procedure followed by the Federal Department of Veterinary Research, Vom, Nigeria (Ezebuiro, 1964). Sera were not considered positive unless also positive by the plate complement fixation test.

Gourlay (1965) has compared the diagnostic tests for C.B.P.P. and found the S.A.S.T. to be 75% effective and the complement fixation test (tube test) 100% effective in detecting the acute stage. However, he did not find any test entirely satisfactory in detecting the chronic stage.

RESULTS

The serological examinations were carried out on 366 bovine sera. Of these, 63 were from trade cattle from the Northern Provinces of Nigeria and 303 from cattle on improved farms in the Eastern Provinces. In five of the six improved farms sampled, the entire herd was sampled. All of the 63 trade cattle from the

* Difco Laboratories, Detroit, Michigan, U.S.A.

† Bovine Brucellosis Eradication (recommended) Uniform Methods and Rules, ARS-91-10-1, United States Department of Agriculture, 1960.

‡ Diamond Laboratories, Des Moines, Iowa, U.S.A.

§ Antigens and negative and positive control sera for both tests were obtained from the Federal Department of Veterinary Research, Vom, Nigeria.

north were of the Humped Horned Zebu breed. The sera from the Eastern Provinces were from three primary breeds: Fulani, Muturu, and Ndama. There did not appear to be any statistical relationship between the bovine breeds and diseases for which they were examined, although there is some statistically insignificant indication of a lower incidence of anaplasmosis in the Muturu and Ndama breeds.

Samples from 102 sheep were examined. Of these, 53 were from improved farms of the Eastern Provinces and 49 from the small unimproved farms. All of these specimens were from the West African dwarf sheep, *Ovis jubata.*

One hundred fifty-three goat sera were examined. Of these, 57 were from the Northern Provinces, where the West African dwarf goat is not generally found but where there is a larger type. The actual breed is not known, but the animals were of the long-legged large breed(s) commonly found in the Northern Provinces of Nigeria. Eighty-six were of the West African dwarf goat breed, and 10 were a first cross between the Nubian and the West African dwarf goat.

LEPTOSPIROSIS. None of the bovine, sheep, or goat sera examined showed agglutination.

ANAPLASMOSIS. Of the 366 bovine sera examined, 14 were positive, an incidence of 3·8% of the animals examined. Seven areas had between one and five positive cattle, and four of these were improved farms.

BRUCELLOSIS.

Ovine. One of the 115 sera examined was positive, and this was from an animal in Veterinary Science Project 10 (Kramer, 1965), which drew its samples from the unimproved farms around the University of Nigeria's Nsukka campus.

Caprine. One of the 163 sera examined was positive, and this was one of the 40 goats from the Northern Provinces of Nigeria.

Bovine. Cattle from three areas of nine had either suspicious or positive reactions. These areas contained (1) 14 sampled, one suspicious, two positive; (2) 61 sampled, three suspicious, no positives; and (3) 79 sampled, one suspicious, three positive.

C.B.P.P. In conducting the S.A.S.T. it was noted that the first batch of antigen (batch A) appeared coarse and some difficulty was encountered in interpreting the test. Three hundred and fifty-seven sera were examined with batch A antigen, and 48 were noted as doubtful. However, because of the coarseness and the known reliable history of the herds concerned, it was decided to obtain new antigen (batch B) and repeat the test on all 357 sera. The second S.A.S.T. with batch B antigen gave no positive reactions.

To safeguard against the possibilities of error, all sera from the herds which had suspicious reactions to S.A.S.T. batch A antigen were retested with the plate complement fixation test. These were all negative.

DISCUSSION

The animals sampled are a fair cross section of the domestic ruminant population of the Eastern Provinces' improved livestock farms and northern trade cattle, goats, and sheep. Collection of serum specimens from unimproved farms is difficult, although it is felt that the samples obtained on these farms for the purpose of the survey give some indication of their position.

It may well be indicated by these figures just how small the present ruminant

population is on the improved farms in the Eastern Provinces. However, the estimated sheep and goat population was 3,200,000 in 1964 (personal correspondence with the Chief Veterinarian's Office, M.O.A., Enugu). Of this, not more than 150 sheep and goats were on improved farms.

The capillary tube agglutination test for anaplasmosis is capable of detecting the carrier state but is not efficient at detecting the acute and recovering state (Ristic, 1962). This may be cause to suggest a higher incidence than is directly shown by the test results alone. However, in an area in which arthropod vectors abound it is of interest that the anaplasmosis carrier rate was 3·8%. Seven of the nine localities sampled had one or more positive sera. This seems to suggest that the disease has a low incidence but is enzootic. It may therefore lend itself to active control or eradication on an individual herd basis.

Brucellosis is another disease which appears to have a relatively low incidence (2·7%) in cattle and less than 1% in sheep and goats. One herd of cattle which had been tested approximately one year earlier had a reactor rate of about 9%. All reactors in this herd were slaughtered and, at the time of this survey, only three out of 124 sera showed titres of one-twenty-fifth.

In 1965 nearly half of the 89,000 cattle imported into the Eastern Provinces from the Northern Provinces were trekked in. In view of the fact that sporadic outbreaks of C.B.P.P. still occur in certain areas of the Northern Provinces, one can only wonder how long it will be before an outbreak occurs in the Eastern Provinces. The present control of the movement of trade cattle into the Eastern Provinces may be inadequate for effective control of this insidious disease.

SUMMARY

In view of the findings of this survey, it would appear that eradication programmes for brucellosis and anaplasmosis are feasible on the improved farms if warranted.

Control or eradication of these diseases at the unimproved farm level appears to be difficult, if at all warranted, for several reasons. However, as the planned rural agricultural communities are established, care should be taken so that the individuals who are to inhabit these communities are supplied with at least tested stock as well as being taught good husbandry methods.

Strict control measures should be undertaken to see that all new stock, whether imported from outside the Eastern Provinces or purchased locally from unimproved farms be tested for leptospirosis, anaplasmosis, brucellosis, and C.B.P.P. before importation is permitted and before introduction to the improved herds and flocks.

ACKNOWLEDGMENTS

The authors wish to acknowledge the aid and encouragement given to them by the Economic Development Institute, University of Nigeria, the Chief Veterinary Officer and Chief Agriculture Officer, and their respective offices in the Ministry of Agriculture, Eastern Provinces of Nigeria. Credit also goes to Dr. G. R. Moore, Visiting Professor and Head of the Department of Veterinary Science, University of Nigeria, Nsukka, for his encouragement and permission to carry out this work.

REFERENCES

Ezebuiro, E. O., Griffin, R. M., and Peers, F. G. *Bull. epizoot. Dis. Afr.*, **12**, 171.
Fulton, F., Dumbell, K. R., Griffin, R. M., and Peers, F. G. (1949). *J. Gen. Micro.*, **3**, 97.

Galton, M. A., Powers, D. K., Hall, A. D., and Cornell, R. G. (1958). *Am. J. Vet. Res.*, **19**, no. **71**, 55.
Gourlay, R. N. (1965). *J. Comp. Path.*, **75**, 97.
Hill, D. H. (1960). Third Annual Conference of Science Association of Nigeria, held at University College, Ibadan.
Huddleson, I. F., and Abell, E. (1928). *J. Inf. Dis.*, **42**, 242.
Kramer, J. W. (1965). Vet. Sci. Proj. 10/5 : Survey of Diseases of Goats and Sheep in the Immediate Campus Area, University of Nigeria, Nsukka. On file with the Research Committee, University of Nigeria, Nsukka.
Ristic Miodrag (1962). *J.A.V.M.A.*, **141**, 588.
Welter, C. J., and Zuscheck, F. (1962). *J.A.V.M.A.*, **141**, no. **5**, 595.

Received for publication 3 November 1966)

Résumé

Sur la base des résultats de cette enquête, les auteurs concluent que les projets d'éradication de la brucellose et de l'anaplasmose sont possibles dans les exploitations améliorées, si ils sont justifiables. Pour diverses raisons, le contrôle et l'éradication de ces infections chez les animaux de fermes d'un niveau non-amélioré parait être difficile, si même indiqué. Quand la planification des communautés agricoles sera réalisée, il faudra prendre soin de fournir des animaux indemnes aux habitants de ces communautés et veiller à ce que ces derniers soient bien formés en zootechnie moderne.

Il faudra prendre des mesures strictes de contrôle pour que tous ces animaux, qu'ils soient importés de régions autres que le Nigéria Oriental, ou qu'ils soient achetés localement dans des fermes non-améliorées, soient éprouvés envers la leptospirose, l'anaplasmose, la brucellose et la péripneumonie contagieuse avant de permettre leur importation et leur introduction dans des élevages améliorés.

Bull. epizoot. Dis. Afr. (1967), 15, pp. 31–41.

PRELIMINARY OBSERVATIONS ON A STOMATITIS AND ENTERITIS OF GOATS IN SOUTHERN NIGERIA

J. C. WHITNEY,* G. R. SCOTT * and D. H. HILL
Department of Veterinary Medicine, University of Ibadan, Nigeria

With the goal of eradication of rinderpest from Nigeria within sight, the incidence of pseudorinderpests assumes greater significance. In 1965, we encountered at Ibadan in Western Nigeria, a stomatitis and enteritis of dwarf goats that closely simulated rinderpest and which was known locally as " Kata ". Most affected goats died. Surviving goats developed prominent labial scabs reminiscent of orf (Fig. 1).

Our observations were, of necessity, perfunctory. Nevertheless they are reported here to draw attention to what appears to be a major affliction of goats in Southern Nigeria.

AETIOLOGY

Kata was an infection that was transmitted readily by contact between sick and healthy goats. The disease was transmitted also parenterally by the subcutaneous route using blood or suspensions of spleen from febrile goats.

The examination of blood smears from affected goats failed to reveal bacteraemia but, on occasion, trypanosomes were observed. Other forms of parasitaemia were not encountered.

The agent was injected subcutaneously into two rinderpest-immune steers and intracerebrally into two rabbits. Neither the steers nor the rabbits exhibited signs of ill-health after inoculation.

SYMPTOMATOLOGY

Incubation period: the median incubation period following natural contact exposure was five days. This period was significantly longer than the median of three days associated with experimental parenteral exposure ($t = 3 \cdot 114$; $P < 0 \cdot 01$).

Clinical signs: illness was first manifested by a prodromal nasal catarrh, serous in character (Fig. 2). Within hours the nasal discharge was profuse and mucopurulent. Sneezing was frequent. The discharge persisted until death in acute cases and for up to 14 days in goats that survived (Fig. 3). In the later stages, there was considerable encrusting around the external nares.

The onset of fever was sharp and sudden occurring one day after the start of the nasal catarrh (Fig. 2). Two febrile patterns were apparent (Fig. 4). In goats that died in the acute phase of the disease, the mean duration of fever was $5 \cdot 2 \pm 1 \cdot 0$ days but in goats that survived, the duration of fever was significantly shorter, the mean being $3 \cdot 3 \pm 0 \cdot 8$ days ($t = 3 \cdot 833$; $P < 0 \cdot 01$). Fever peaks ranged from $103 \cdot 4°$ F. to $107 \cdot 0°$ F., the mean being $105 \cdot 6 \pm 1 \cdot 0°$ F.

* On secondment from the Faculty of Veterinary Medicine, University of Edinburgh, Scotland.

FIG. 1.—Young male goat 12 days after the onset of fever showing extensive labial scabs around the commissures. There is dried ocular and nasal discharge on the face.

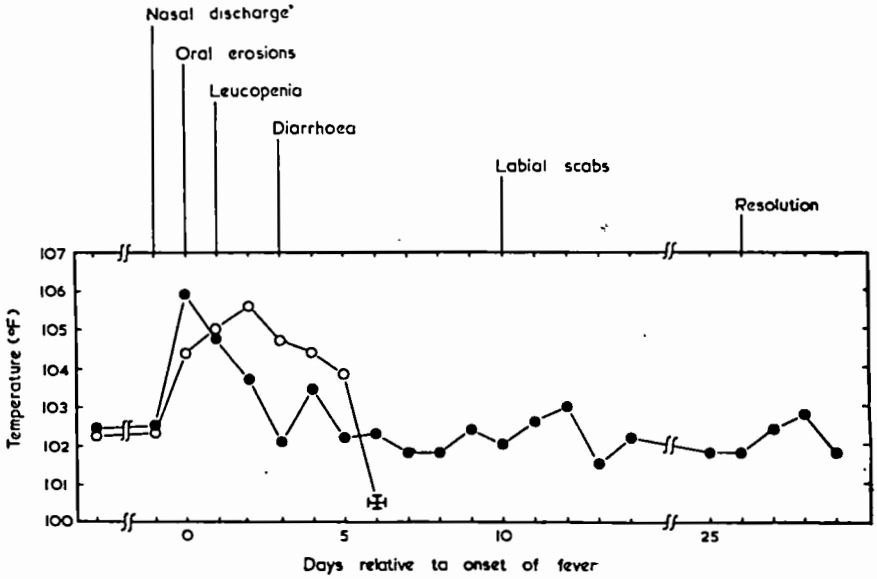


FIG. 2.—The clinical reactions of goats infected with Kata.

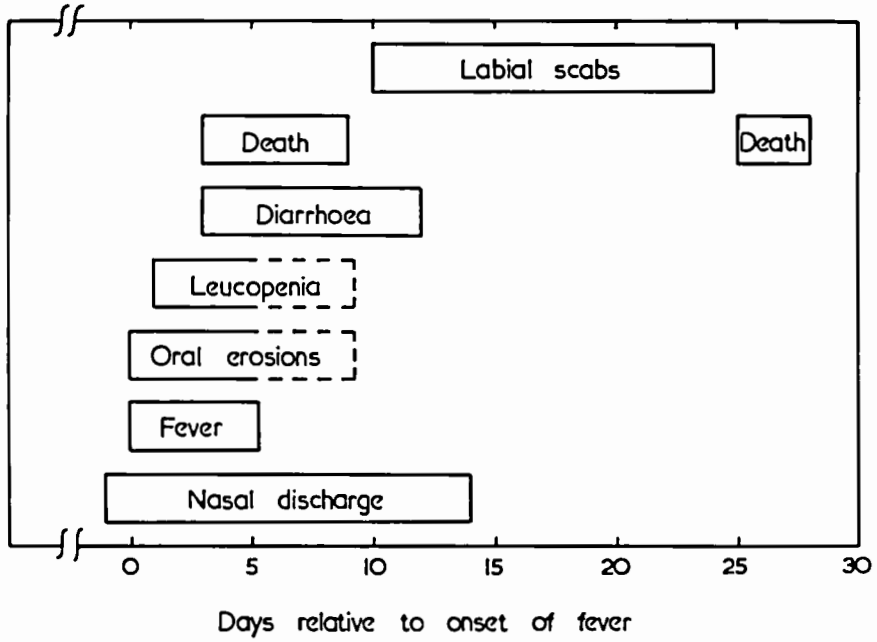


FIG. 3.—The persistence of clinical signs in Kata.

The median day of appearance of oral erosions was the first day of fever (Fig. 2). The erosions were often extensive and involved the gums, buccal mucosae and the hard palate. Salivation was profuse and there was a continuous protrusion and retraction of the tongue.

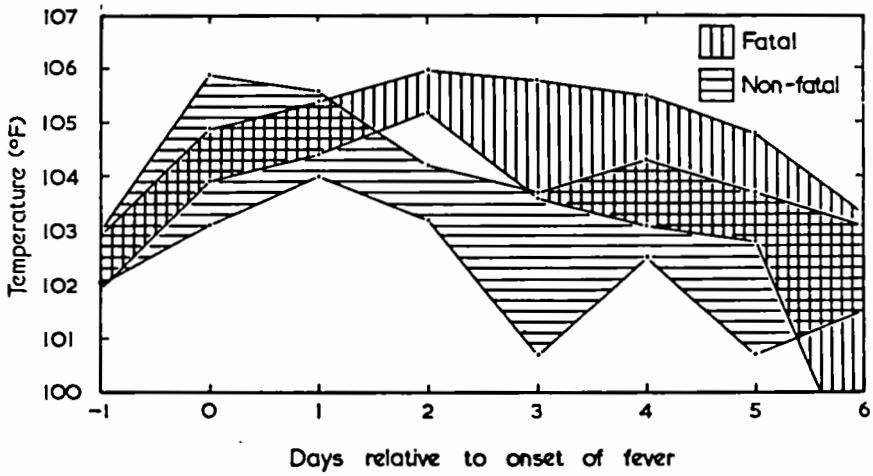


FIG. 4.—The 95% fiducial limits of the fevers in fatal and non-fatal Kata.

Leucopenia was evident on the day after the onset of fever and it persisted until death in acute cases (Figs. 2 and 3).

Diarrhoea began three days after the onset of fever and persisted until death in acute cases and for up to 12 days in goats that survived (Figs. 2 and 3).

Labial scabs developed in goats that survived the acute phase of the disease. They were prominent 10 days after the onset of fever and persisted for two weeks (Figs. 1, 2 and 3). Resolution occurred 26–30 days after the onset of fever and it was associated with loss of pigmentation of the lips.

Mortality: the course of the disease was followed in 17 goats, 12 of which died, giving a case mortality rate of 71 per cent. The mortality curve, however, had two peaks (Fig. 5).

59% of the goats died during the acute phase of the disease, the mean death time

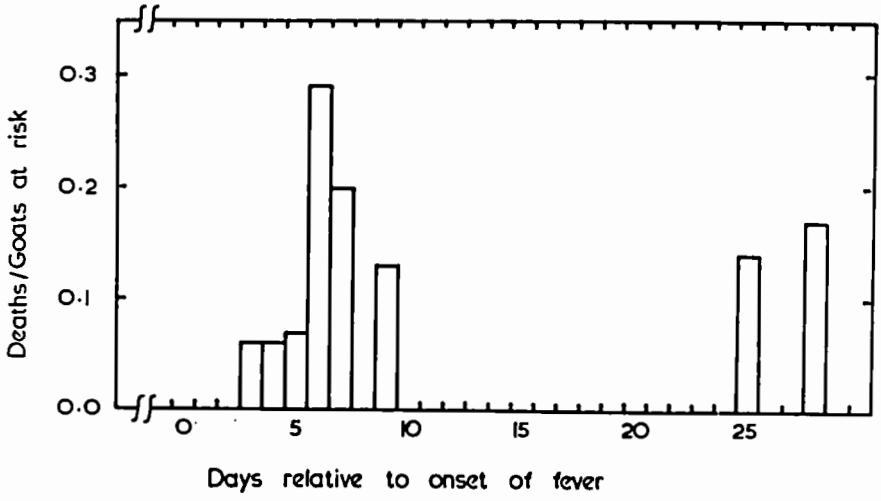


FIG. 5.—The mortality pattern in Kata.

being $5 \cdot 9 \pm 1 \cdot 7$ days after the onset of fever. The remaining deaths occurred 2–3 weeks later when labial scabbing was prominent.

PATHOLOGY

A post-mortem examination was undertaken on 12 goats, 10 of which died four to eight days after the onset of fever (Group I) and two which died 25 and 28 days respectively after the onset of fever (Group II).

Group I

The carcases were dehydrated and dried ocular and nasal discharge was observed around the external nares and eyes. The lips were oedematous and golden-brown scab material was seen around the margins of the lips, particularly at the commissures. The perineum and posterior aspects of the hind limbs were soiled with watery, sometimes blood-tinged, faeces.

Head and neck. The gross lesions were confined to the eyes, buccal and nasal cavities and the lips.

Lips. The lips were oedematous and their margins showed a progressive accumulation of golden-brown scab material which, if removed in the early stages of the disease, revealed an erythema with patchy erosion and ulceration of the underlying epithelium. From three to five days after the onset of fever the scab material tended to shed spontaneously without any visible underlying changes. In those goats which survived for a week or more the scab material became more pronounced around the commisures while resolution occurred elsewhere.

Histologically the lesions were characterised by focal necrosis of the stratified squamous epithelium which appeared to originate in the prickle cell layer. An occasional cell at the periphery of this lesion showed hydropic degeneration. The focal lesion tended to become confluent with neighbouring lesions to give rise to erosions following the sloughing of the necrotic cells (Fig. 6). Subsequently resolution followed or the lesion persisted, became infiltrated with neutrophils and the basal layer was penetrated with the formation of an ulcer. The dermis was oedematous and the capillaries in the papillae were engorged.,

The heavy crusts of scab material which formed at the commissures were composed of heaped up necrotic epithelium and inflammatory exudate which had not been shed, associated with a hyperkeratosis of the underlying epidermis.

Buccal cavity. Lesions were found throughout involving the inner aspect of the upper and lower lip, the cheeks, the dental pad, hard and soft palate and severe lesions occurred in the pharynx with great regularity. In two severe cases the lesions extended from the pharynx to the upper third of the oesophagus.

Histologically the lesions were similar to those on the lips.

Nasal cavity. There was an intense congestion and occasional petechiae and ulcers on the mucosa often with extension to the sinuses, larynx and the upper third of the trachea. An abundant seromucinous exudate was evident.

Histological examination of the mucosa revealed patches of confluent necrosis of the epithelium with secondary infection in some cases. There was evidence of local proliferation of lymphoid tissue.

Thoracic Cavity

Heart. There were no gross lesions in the heart but in three cases a diffuse interstitial myocarditis was evident upon histological examination.

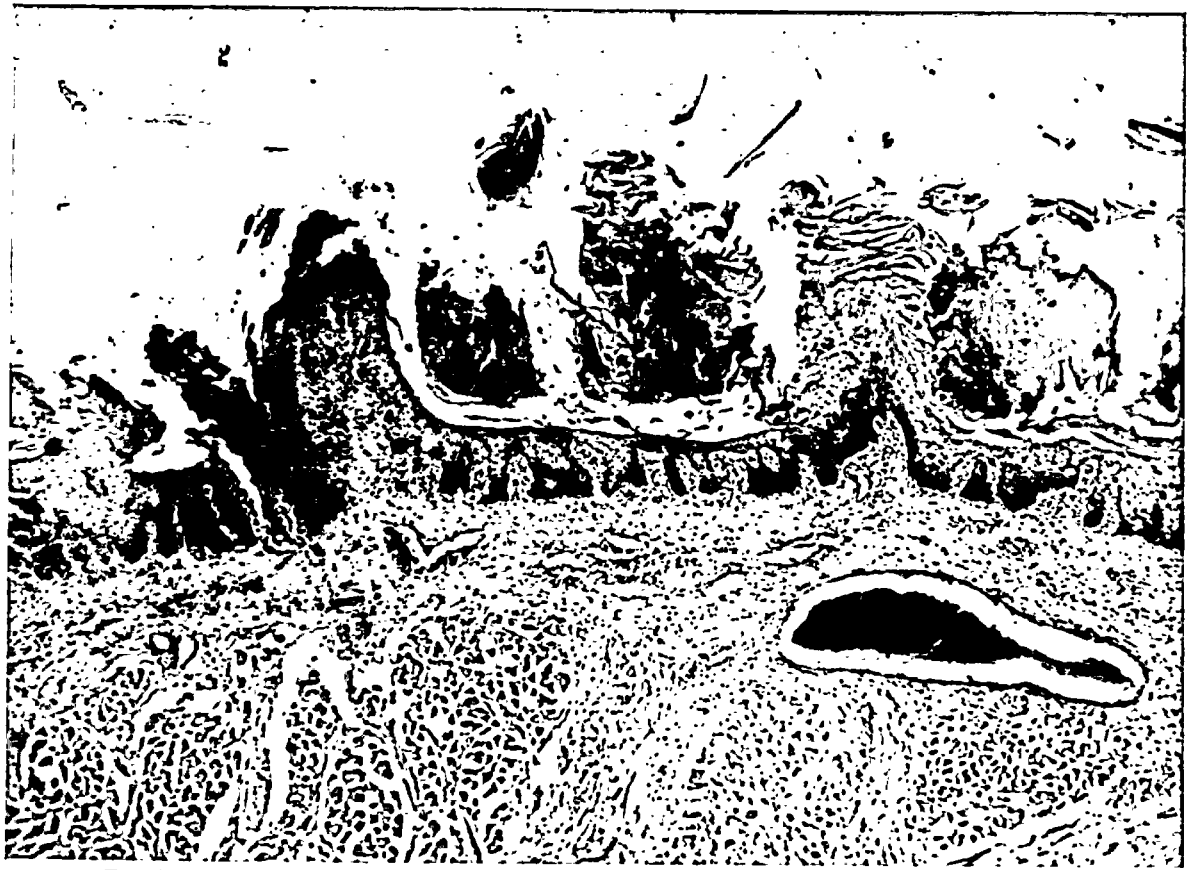


FIG. 6.—Confluent erosions in the tongue of a goat four days after the onset of fever. H and E ×30.

Lungs. The lungs were congested and emphysematous. No other changes were seen upon histological examination.

The Abdominal Cavity

Liver. The liver was pale. Histological examination showed a widespread fatty change, associated with focal necrosis of parenchymal cells.

Spleen. The spleen was contracted and histological examination revealed lymphocytolysis and necrosis of the malpighian corpuscles.

Urogenital System

No gross or microscopic abnormalities were observed in the urogenital system other than petechiation or diffuse erythema of the mucosa of the bladder.

Adrenals

No abnormality was detected.

Alimentary Tract

Rumen, Reticulum and Omasum. With the exception of a single rumenal ulcer in one case no abnormalities were detected.

Abomasum. The abomasum contained little or no food. The plicae were oedematous to a variable degree and intensely congested. Occasional haemorrhages and ulcers were observed in the pylorus. Histological examination confirmed these observations.

Small Intestine. The contents of the small intestine were limited, consisting of a bile-tinged fluid. Pathological changes were minimal and confined to the terminal ileum where they were characterised by diffuse erythema of the mucosa. In one case Peyer's patches were enlarged and prominent.

Histologically Peyer's patches were oedematous and necrotic with lymphocytolysis in all the cases examined.

Large Intestine. The changes were dramatic with " zebra-striping " of the caecum, colon and rectum (Fig. 7). The changes were variable in their severity and distribution. They were seen constantly at the caeco-colic junction which was enlarged and intensely haemorrhagic.

Histologically focal areas of congestion and haemorrhage were observed in the submucosa associated with occasional ulcers. Lymphoid follicles showed evidence of necrosis and lymphocytolysis.

Remainder of the Carcase

The carcase lymph nodes were swollen and oedematous with haemorrhages into the cortex, the changes being most pronounced in the superficial glands.

Histological examination of a wide range of superficial and deep lymph nodes revealed a lymphocytolysis and necrosis of the lymphoid follicles.

Group II

The two goats which survived the acute stage of the disease and died two to three weeks later showed prominent labial scabs and dried exudate around the commissures but no lesions were detected elsewhere on the skin or in the alimentary tract or buccal cavity. Both carcases were emaciated and death in both cases was attributed to secondary broncho-pneumonia.

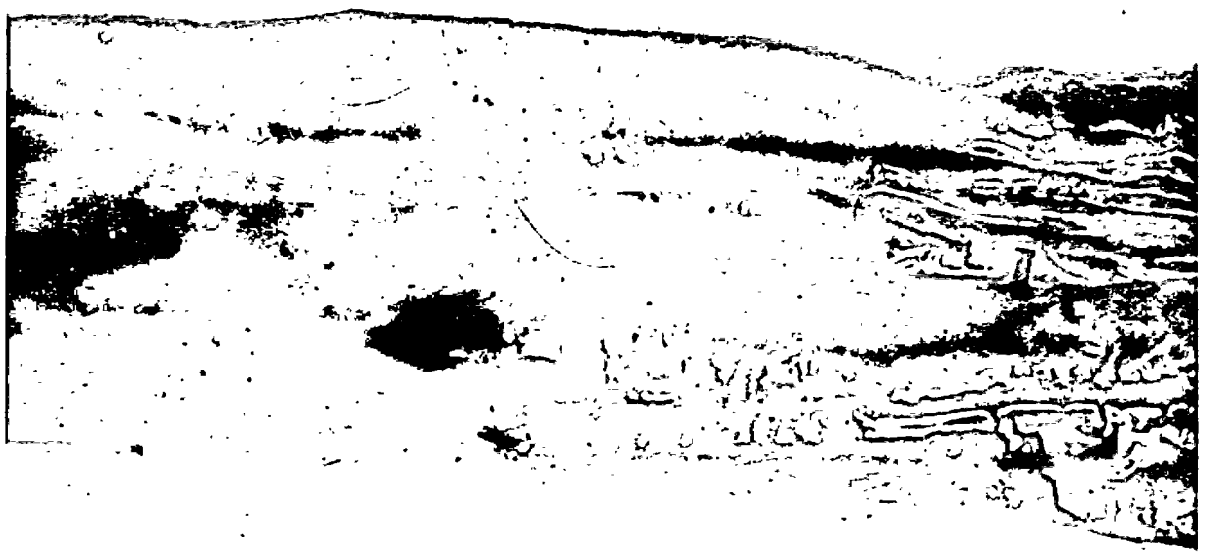


FIG. 7.—Zebra stripes and haemorrhages in the colon of a goat which died six days after the onset of fever.

Histological examination of the labial lesions revealed pronounced acanthosis and hyperkeratosis covered by a thick layer of necrotic epithelium infiltrated with degenerating polymorphs. There was no papilliform proliferation and no evidence of hydropic change in the prickle cell layer. The dermis showed some oedema and congestion with a mild mononuclear infiltration and some fibrosis.

IMMUNOLOGY

Active Resistance. Recovered animals developed an active resistance and withstood a parenteral challenge that killed susceptible control goats inoculated simultaneously. The duration of the active resistance is unknown but two adult goats of unknown history also withstood challenge with the Kata agent. Again, the susceptible control goats reacted.

Apparent Differentiation from Rinderpest. Five goats infected with caprinised rinderpest virus, reacted typically and recovered. When challenged with the Kata agent either parenterally or by contact with sick goats, the rinderpest-immune goats developed the disease and two of them died. Two goats that had recovered from Kata were challenged with caprinised rinderpest virus and developed rinderpest.

EPIZOOTIOLOGY

Geographic Distribution. Kata was widespread in Western Nigeria. Personal contact with veterinarians from other regions of Nigeria revealed that the labial scab phase was well known and that it was attributed to orf.

Seasonal Occurrence. In 1965 Kata assumed prominence during the wet season in Western Nigeria and this seasonal occurrence was allegedly consistent.

Age Incidence. Only adolescent goats, 5–7 months old, sickened. Adult goats deliberately exposed to infection remained healthy.

DISCUSSION

Kata proved to be a contagious disease. It exhibited two distinct syndromes; an acute febrile phase which was indistinguishable clinically and pathologically from rinderpest, and a convalescent phase characterised by the development of prominent labial scabs similar grossly to lesions associated with orf. Although every goat, in our series, that survived the acute phase, developed labial scabs, the numbers were small and it is possible that the double syndrome was the result of dual infection, superinfection or activation of a latent orf-like disease by the rinderpest-like disease. The infectiousness of goats in the labial scab phase has yet to be determined.

The aetiological agent was not identified. We attributed the appearance of the occasional trypanosome to activation of latent trypanosomiasis by Kata. Bacteria were conspicuous by their absence and we favour, therefore, the hypothesis that the aetiological agent is a virus. The clinical picture, particularly the leucopenia, supports the hypothesis. Likewise, the pathology suggests that it is viral in origin, characterised as it is by focal necrosis in the prickle cell layer of the epithelium and lymphocytolysis and necrosis of lymphoid tissue, throughout the body.

The macroscopic and microscopic changes in the acute stage of the disease resembled closely the changes observed in rinderpest. Our biological tests, albeit few in number, failed however, to support a diagnosis of rinderpest. On the other hand, the biological test results were similar to those reported for " peste des petits ruminants " by Mornet, Orue, Gilbert, Thiery and Sow Mamadou (1956). They

challenged seven goats, previosuly injected with lapinised rinderpest virus, with the virus of " peste des petits ruminants ". The majority of the goats developed fevers and two died. Similarly six goats injected with a formolinised rinderpest vaccine reacted when challenged with " peste des petits ruminants " and one died. Nevertheless these authors concluded, on the basis of biological tests in cattle and *in vitro* neutralisation tests that the virus of " peste des petits ruminants " was a variant of rinderpest virus.

Our inability to infect rinderpest-immune cattle or rabbits despite intracerebral inoculation suggests that the agent was not the virus of malignant catarrhal fever. The short experimental incubation period ruled out heartwater which has been known in Nigeria since 1930 (Henderson, 1933). It could be blue tongue which was first identified positively in Nigeria in 1943 (Henderson, 1945). On the other hand, the oral lesions in the acute phase were shallow erosions not ulcers and neither foot lesions nor lameness were observed.

In the two goats which died after the subsidence of acute signs the labial scabs resembled those observed in orf but the diagnosis was not confirmed by histological examination (Nisbet, 1966). The site of origin within the malpighian layer is different, there is little or no hydropic change and no inclusion bodies were evident. The restriction of lesions to the lips, the high mortality and the absence of inclusion bodies differentiates Kata from goat pox.

Only adolescent goats were affected. This age incidence was very striking and suggests that the disease was enzootic in Western Nigeria. Presumably, younger animals were protected passively while adults were resistant because they had survived an earlier attack of the disease when adolescent.

We do not have enough data to assess the importance of the apparent seasonal incidence. Perhaps the aetiological agent is an arbo-virus; our contact experiments did not eliminate this possibility which would account for the seasonal incidence because increased anthropod activity is associated with the onset of the rains. On the other hand, the rains cause managemental and behavioural changes; goats huddle together under shelter and so facilitate the spread of contagions. Beaton (1939) reported a similar managemental practice in Northern Nigeria where goats remained tethered in their shelters during the rainy season. He cited two reasons: one, goats dislike rain and, secondly, growing crops had to be protected. A sequel noted by Beaton was the frequent occurrence of orf during the rainy season which he attributed to close contact.

The rinderpest-like syndrome of Kata is not reported in Beaton's extensive survey of the causes of mortality in goats in Northern Nigeria (Beaton, 1939). Major losses were attributed to anthrax, contagious caprine pleuropneumonia and goat pox. Orf was well known but deaths were rare and confined to sucking kids. Rinderpest-like infections in goats have been observed on several occasions in Nigeria (Henderson, 1930) and when studies on caprinised rinderpest virus were first undertaken in Nigeria many indigenous goats were found to be unsuitable as vaccine donors because they were " immune " (Henderson, 1933). Nevertheless, natural rinderpest in goats in Nigeria has never been recorded (Beaton, 1939; Johnson, 1958).

More recently, a disease labelled " goat catarrhal fever " has caused widespread losses in Eastern Nigeria (McCulloch, 1951; Gates, 1952). One of its main symptoms was diarrhoea. It is not clear whether or not " goat catarrhal fever " is similar to the goat pneumonia described as occurring annually at the beginning of

the wet season in Eastern Nigeria. Campbell (1958) emphasised that the latter was not a pleuropneumonia. The onset of illness was heralded by a sharp rise in temperature up to 105·6° F. followed by a mucopurulent nasal discharge, inappetance and general symptoms of malaise. Broncho-pneumonia was a constant feature at autopsy but no specific organisms were found. Mortality ranged from 80 to 90%. Treatment with chloramphenicol or sulphamezathene saved lives if started early enough (Campbell, 1958; Anon., 1961).

Our observations and enquiries suggest that many adolescent goats die annually in Western Nigeria. This annual toll is, perhaps, of greater importance than the fact that Kata is a pseudorinderpest because the local people rely on goat meat as one of their major sources of animal protein. Plans to expand the goat population in the region (Anon, 1965) may be frustrated unless prophylactic measures against Kata are developed.

SUMMARY

Kata, a common transmissible infection of goats in Western Nigeria, was characterised by a prodromal nasal catarrh, transient fever, stomatitis, diarrhoea and death. Goats that survived developed prominent labial scabs. Thus, the early stages of the infection simulated rinderpest and the later stages orf.

ACKNOWLEDGEMENTS

We wish to thank Mr. I. S. Beattie for his advice and criticisms of the Pathology section of this paper. We are grateful to Mr. D. E. Currie and Mr. T. K. Biuwovwi for their able technical assistance and to Mr. R. C. James and Mr. R. Hood for their assistance in the preparation of the charts and photographs.

This study was supported in part by a grant from the Overseas Development Ministry, London.

REFERENCES

Anon. (1961). Eastern Nigeria, Ann. Rep. Vet. Div., 1959–60, p. 5.
Anon. (1965). Agricultural Development in Nigeria, 1964–1980, FAO, Rome.
Beaton, W. G. (1939). Nigeria, Ann. Rep. Vet. Dept., 1937, p. 31.
Campbell, A. D. (1958). Eastern Region Nigeria, Ann. Rep. Vet. Dept., 1957–58, p. 9.
Gates, G. M. (1952). Eastern Region Nigeria, Ann. Rep. Vet. Dept., 1950–51, p. 29.
Henderson, W. W. (1930). Nigeria, Northern Provinces, Ann. Rep. Vet. Dept., 1929, p. 63.
Henderson, W. W. (1963). Nigeria, Ann. Rep. Vet. Dept., 1932, p. 2.
Henderson, W. W. (1945). Nigeria, Ann. Rep. Vet. Dept., p. 5.
Johnson, R. H. (1958). *Vet. Rec.*, 70, 457.
McCulloch, J. (1951). Eastern Region Nigeria, Ann. Rep. Vet. Dept., 1949–50, p. 27.
Mornet, P., Orue, J., Gilbert, Y., Thiery, G., and Sow Mamadou (1956). *Rev. Elev. Med. vet. Pays trop.*, 9, 313.
Nisbet, D. I. (1966). Personal communication.

(Received for publication 23 November 1966)

Résumé

Une maladie transmissible, commune chez les chèvres du Nigéria Occidental et appelée " Kata " en Yoruba, est caractérisée par le coryza nasal prodromal, la pyrexie transiente, la stomatite, la diarrhée puis la mort. Les animaux survivants montrent des croûtes labiales prononcées. De sorte qu'au stade primaire la maladie ressemble à la peste bovine, mais dans les stades ultérieurs à la dermatite pustulaire.

Bull. epizoot. Dis. Afr. (1967), 15, pp. 43–48.

A COMPARATIVE STUDY OF VACCINE IMMUNOGENICITY AND NEWCASTLE DISEASE VIRUS STRAIN PATHOGENICITY IN EASTERN NIGERIA *

M. UZOUKWU
Lecturer, Veterinary Science Department, University of Nigeria, Nsukka, Nigeria

Newcastle Disease (N.D.) was first reported in Eastern Nigeria in 1951 by Kirkby (Hill, *et al.*, 1953) but it has spread widely and now constitutes the single most dreaded poultry disease in Nigeria. The National Veterinary Services since then have adopted several prophylactic measures, the most significant of which is vaccination. Currently, two live vaccines, viz. a mild " intraocular (i/oc) vaccine " and one prepared from the Komarov strain of a possibly velogenic virus (Komarov and Goldsmit, 1947) and designated " intramuscular (i/m) vaccine ", are manufactured in the National Veterinary Research Laboratories, Vom, and used throughout the country (Crowther, 1964). There have been occasions, however, when post-vaccinal reactions following the use of the i/m vaccine have assumed alarming proportions and there is a rising demand for an effective but safer vaccine.

There could be many explanations for the unsatisfactory results of the vaccination, such as inadequate attenuation of the virus, faulty preservation of vaccines, variation in vaccination techniques, poor management, and debilitation through latent intercurrent disease. But there is also the possibility that there may be immunologic differences among the vaccine strains in use and indigenous wild but unknown strains of the N.D. virus.

In this study an immunological comparison is made between the two vaccine strains and an imported naturally lentogenic strain, BI; the pathogenicities of wild strains isolated from field cases are compared and, at a later investigation, they will be used to challenge birds vaccinated with the various vaccines.

MATERIALS AND METHODS

Four 10 ft. × 10 ft. isolated rearing houses 7 feet and 6 feet high front and rear respectively were constructed 600 feet apart. The floors were of concrete and the walls of galvanised iron to a height of 1 ft. 6 in. completed to roof with 1-inch wire mesh. Each house was surrounded with a barbed-wire fence, 50 ft. × 50 ft. at a distance of 20 feet from each wall. Padlocked gate and door guaranteed against unauthorised entry. Each house had a separate attendant, feeding and watering facilities. Wood shavings were used as litter, and the feed was a commercial mash.

Four 10 ft. × 10 ft. isolation rooms with plywood walls and ceiling, concrete floors and individual exhaust fans with fibre-glass filters were constructed. Two of these rooms had in each, six 20 in. × 30 in. wire battery-type cages with feeders and waterers. In each of the other two four modified Horsfall-Bauer units with a feeder, waterer, light source, expanded metal floor and individual ventilation with fibre-glass filter were installed. A foot-bath was provided for each of the rooms.

* This study was supported by grants from the University of Nigeria, Nsukka Research Grants Committee, the Economic Development Institute, and the Veterinary Division of the Ministry of Agriculture, Enugu.

The birds were White Leghorn chicks supplied by a Rhodesian firm. Two vaccines, the intraocular (i/oc) and intramuscular (i/m, Komarov strain) prepared by the Federal Department of Veterinary Research, Vom, were supplied by the Veterinary Division, Ministry of Agriculture, Enugu. The LaSota, GB Texas, and B_1, strains were supplied by Prof. R. P. Hanson of the Newcastle Disease Virus Repository, University of Wisconsin, United States of America. The " Vom Wild " strain was obtained from Vom where it is used for checking out the N.D. vaccines produced in the establishment.

The 340 unsexed chicks were distributed randomly into the four rearing houses such that there were 85 chicks to each house. These were then vaccinated as shown in Table I.

Table I.—Vaccination regimen

Age at vaccination	House No. and vaccine *			
	I	II	III	IV
(weeks)				
2	i/oc	i/oc	B1	—
8	i/m(K)	i/oc	B1	—
18	—	—	B1	—

* i/oc = Intraocular vaccine.
i/m = Intramuscular vaccine (Komarov strain).
B1 = B1 strain vaccine.

Vaccination procedures were as follows:

I/oc. ($E.I.D._{50} = 10^{-7.8}/0{\cdot}1$ ml.) was used as a 1 : 5 dilution in saline, each bird received a drop of the suspension in each eye (Crowther, 1964). I/M (K) ($E.L.D._{50} = 10^{-8.7}/0{\cdot}1$ ml.)—0·2 ml. of the reconstituted vaccine was injected deep into the breast muscle of each bird.

B_1 ($E.I.D._{50} = 10^{-9.2}/0{\cdot}2$ ml.). The vaccine was made up with sufficient distilled water to give a vaccine concentration of approximately $10^6 E.I.D._{50}$ in 20 ml. (Toth and Markovits, 1964). Enough of this was dispensed to provide the birds starved of water for at least 12 hours with approximately 20 ml. of the vaccine mixture at two weeks of age. At 6, 16 and 18 weeks of age the birds were estimated to consume between 40 and 80 ml. of the above mixture.

Spleen and long bones from suspected cases of Newcastle Disease were received from different parts of the Provinces and were used in isolation procedures in eight-day embryonated hen's eggs (Goodpasture, *et al.*, 1931; Burnet and Ferry, 1934; Hanson, *et al.*, 1947), Positive isolates, as determined by embryo mortality and haemagglutination of fowl red cells, were designated " Henry ", " Umuahia," and " 24 " according to the source or the diagnostic number where the source was not indicated. The $E.I.D._{50}$ and/or $E.L.D._{50}$ of the following strains were estimated: I/oc, LaSota, Vom Wild, and GB Texas using the method of Reed and Muench (1938) for the calculations shown in Table II. The pathogenicity to chickens of the following strains, Henry, Umuahia, 24, Vom Wild and GB Texas was estimated by injecting 0·2 ml. of undiluted positive allantoic fluid into the breast muscle of each of four susceptible 10 week-old chickens. Four susceptible birds served as controls for all the groups. Each group of four birds was housed separately in a

Horsfall unit. The Vom Wild strain was then selected for subsequent challenge experiments.

For the challenge experiments six birds from each of the rearing houses were labelled accordingly and put into a cage in one of the isolation rooms two weeks after each of the first and second vaccinations, i.e. at four and 10 weeks of age respectively. Each bird was then injected deep in the breast muscle with 0·2 ml. of 100 $E.L.D._{50}$ dose of the Vom Wild virus. Observations were made for a period of 30 and 21 days respectively when the experiments were terminated. At 16 weeks of age another batch of six birds from each group was similarly challenged and observed for 14 days. Half of the birds in House III were identified and revaccinated via the drinking water with B_1 vaccine at 18 weeks. Finally at 28 weeks of age six birds from each of the houses, except House II, in addition to six from the group in House III that did not receive the third vaccination, were again challenged and observed for 14 days. The observations are summarised in Table IV.

All dead or sacrificed birds were examined post-mortem for gross lesions of N.D. with special reference to the alimentary and respiratory systems. The spleen in each case, was triturated and 0·1 ml. of 10^{-1} suspension in phosphate buffered saline (pH 7·4) inoculated into 10, eight-day embryonated hen's eggs to attempt virus isolation. All embryos that died between the twenty-fourth and seventy-second hours of incubation were subjected to haemagglutination and haemagglutination-inhibition tests.

RESULTS

The pathogenicity of the strains to chick embryo as determined by either the infectivity or mortality of the embryos gave the results shown in Table II as $E.I.D._{50}$ or $E.L.D._{50}$ respectively.

The pathogenicity in 10-week-old chickens yielded the results shown in Table III. Observations on strain pathogenicity in 10-week-old chickens are recorded in Table III. The results of the challenge experiments are shown in Table IV.

Table II.—Pathogenicity in embryonated eggs

Strain	$E.L.D._{50}$	$E.I.D._{50}$ (HA)
Intraocular	10^{-4}/0·2 ml.	$10^{-7\cdot8}$/0·2 ml.
LaSota	10^{-4}/0·2 ml.	$10^{-7\cdot00}$/0·2 ml.
Vom Wild	$10^{-7\cdot8}$/0·1 ml.	—
GB Texas	$10^{-8\cdot3}$/0·1 ml.	—
Umuahia	$10^{-6\cdot8}$/0·2 ml.	—
Henry	$10^{-4\cdot8}$/0·2 ml.	—
B1	—	$10^{-9\cdot2}$/0·2 ml.

Table III.—Pathogenicity in 10-week-old chickens

Strain	Titre	Dose	Route	No. of birds	Remarks
Vom Wild	$10^{-7\cdot8}$/0·1 ml.	0·2 ml.	i/m	4	All dead by day 5
GB Texas	$10^{-8\cdot3}$/0·1 ml.	0·2 ml.	i/m	4	,, ,, 3
Umuahia	$10^{-6\cdot8}$/0·2 ml.	0·2 ml.	i/m	4	,, ,, 5
Henry	$10^{-4\cdot8}$/0·2 ml.	0·2 ml.	i/m	4	,, ,, 5
Control	—	—	—	4	All alive by day 7 Expt. terminated at day 7

Table IV.—Resistance to challenge following single or multiple vaccination

Vaccination status	Challenge virus (dose 0·2 ml. iEm.)	No. of birds	Age at challenge (weeks)	Remarks *
I				
I/OC × I . .	Vom Wild	12	4	Two birds paralysed by day 4, died fifth day. Four, mild nervous and respiratory signs day 15. Three recovered by twenty-first day, one got worse and was sacrificed by thirtieth day.
B1 × I . .	,,	6	4	Three mild nervous sign died in three days.
Control . .	,,	6	4	Six died by ninth day.
II				
I/OC × 2 . .	Vom Wild	6	10	Two, mild nervous sign third day—one died fourth day, other sacrificed twenty-first day.
I/OC × K . .	,,	6	10	No signs.
B1 × 2 . .	,,	6	10	No signs.
Control . .	,,	6	10	Six died by ninth day.
III				
I/OC × 2 . .	Vom Wild	6	16	Three died by seventh day.
I/OC × K . .	,,	6	16	No signs.
B1 × 2 . .	,,	6	16	No signs.
Control . .	,,	6	16	Six died by fourteenth day.
IV				
I/OC × K . .	Vom Wild	6	28	No signs.
B1 × 2 . .	,,	6	28	One died by fourteenth day.
B1 × 3 . .	,,	6	28	No signs.
Control . .	,,	6	28	Six died by fourteenth day.

* Virus was isolated from all dead or sacrificed birds and confirmed N.D.V. by the H.A. test.

DISCUSSION

Results of the challenge experiments support the findings of Crowther (1964) with regard to the i/oc and i/m (Komarov) vaccines. While the single i/oc vaccination appears to protect 80% of the birds, fully for two weeks the increase in immunity given by the second vaccination with the same strain seems to wane quite rapidly as indicated by the 50% mortality 10 weeks after the boosting dose. On the other hand, the protection given by the combination of i/oc and i/m (Komarov) remains solid 22 weeks after and possibly longer. The drinking water B_1 at two vaccinations only appears to be protective for at least 80% of the recipients even after 22 weeks and the protection rises to 100% if a third vaccination is given before a critical fall in immunity has occurred. It therefore confirms the rationale for the recommended multiple use of this vaccine in some countries (Luginbuhl, *et al.*, 1955; Winterfield and Seadale, 1957).

There are obvious limitations to the use of the B_1 vaccine. These include the need for calculating the adequate dose for different age (Winterfield and Seadale, 1957); adherence to recommendations for preservation away from direct sunlight, reconstitution in disinfectant-free water and vessels and the need to starve the birds of water so that they become sufficiently thirsty. There is also the chance that some

birds may not drink enough of the vaccine water while the virus is alive, and will therefore remain susceptible in an otherwise supposedly immune flock. The advantages are several. Drinking water method of administration of B_1 is labour-saving and free from the risks of individual handling. It appears to give as much protection as the combined i/oc–i/m (Komarov) regime without the undesirable post-vaccinal reactions, and this may well be one of its greatest assets. There are indications also that it can be used in an outbreak of N.D. to arrest the course of the outbreak (Siccardi, 1965). Ocran (1965) had used the i/m (Komarov) vaccine in Ghana in the same circumstances, but it is clear that in large commercial poultry establishments use of the drinking water vaccine is more economically feasible and is to be preferred.

The protection afforded by the various vaccines against indigenous strains of the N.D. virus will be compared in a later publication. Meanwhile isolated strains have been shown to vary widely in their virulence in embryos and chickens and there is a preliminary indication that they also vary widely in their haemagglutinating titres (Uzoukwu, 1965).

SUMMARY

1. The protective effect of various vaccines against experimental N.D. is compared. Multiple application of the drinking water B_1 vaccine is shown to be as protective but not as deleterious as the combined i/oc–i/m (Komarov) method currently in use in Nigeria.

2. It is advocated that the B_1 drinking-water vaccine is labour-saving and could be used to advantage in an outbreak.

3. Isolated indigenous strains of N.D. virus have been shown to vary in their virulence and haemagglutinating titres and this will be related in a later study to the protective effect of the vaccines evaluated.

ACKNOWLEDGMENTS

The author is grateful to Dr. George R. Moore for encouragement and guidance in the course of the studies; to Dr. Frank J. Siccardi for technical assistance, and to Mr. Clement Ezimoha for laboratory help.

REFERENCES

Burnet, F. M., and Ferry, J. D. (1934). *Brit. J. Exptl. Path.*, **15**, 56.
Crowther, R. W. (1964). *J. Comp. Path. Therap.*, **74**, 2.
Goodpasture, E. W., Woodruff, A. M., and Buddingh, G. J. (1931). *Science*, **74**, 371.
Hanson, R. P., Winslow, N. S., and Brandly, C. A. (1947). *Am. J. Vet. Res.*, **8**, 416.
Hill, D. H., Davis, O., and Wilde, J. K. H. (1953). *Brit. Vet. J.*, **109**, 2, 3.
Komarov, A., and Goldsmit, L. (1947). *Cornell Vet.*, **36**, 368.
Luginbuhl, R. E., Jungherr, E. L., Chomiak, T. W. (1955). *Poult. Sci.*, **34**, 1399.
Ocran, J. A. (1965). Proceeding of FAC Meeting on Poultry Production South of the Sahara—Lagos, Nigeria.
Reed, L., and Muench, H. (1938). *Am. J. Hyg.*, **27**, 495.
Siccardi, F. J. (1965). Personal communication.
Toth, B., and Markovits, P. (1964). *Acta Vet.*, **14**, 4, 339.
Uzoukwu, M. (1965). Unpublished data.
Winterfield, R. W., Goldman, C. L., and Seadale, E. H. (1957). *Poult. Sci.*, **36**, 1076.

(Received for publication 29 August 1966)

Résumé

1. La valeur protectrice de divers vaccins contre l'infection expérimentale de la maladie de Newcastle est comparée. L'application multiple de vaccin B1, administré dans l'eau potable, est également efficace mais moins nuisible que la méthode de Komarov utilisée courament au Nigéria ; c'est à dire l'administration par voie intraoculaire et intra-musculaire à la fois.

2. L'auteur soutient que le vaccin B1 dans l'eau potable épargnerait du travail et pourrait être d'une utilisation avantageuse en cas d'épidémie.

3. On a pu montrer que les souches indigènes isolées varient dans leur virulence et en titre H.A. Dans une prochaine étude, ces faits seront mis en rapport avec l'effet protectif des vaccins évalués.

UGANDA

Department of Veterinary Services and Animal Industry—1964

General—Although the staff of the Veterinary Department was stretched to the limit in controlling the major diseases during the year, especially contagious bovine pleuro-pneumonia, the report states that steady and spectacular progress has been made in the field of animal husbandry and modern management of livestock especially the high yielding dairy breeds of cattle.

Dairying—During the previous three years, milk production had risen to 7,000 gallons daily, and the rest of requirement is imported from Kenya. It is contemplated to set up a 2,500 gallons capacity plant at Mbale. UNICEF has provided $62,000 to expand the present Uganda Creameries Dairy Plant and Uganda Development Council (UDC) is to come into partnership to run it on behalf of the Uganda Government.

Disease Situation—The major source of concern during the year was the constant threat of the introduction of epizootic disease by livestock and dogs brought in by refugees from the countries to the north and west of Uganda. 16,000 head of cattle and the same number of small stock had crossed the border between March and May. The cattle were infected with contagious bovine pleuro-pneumonia, rinderpest and trypanosomiasis.

C.B.P.P.—Widespread outbreaks occurred from July onwards throughout Dodoth County, and later in Bokora and Pian Counties.

Rinderpest was also introduced by refugee cattle but did not spread into the immune cattle population of the north. It remained endemic in Karamoja but only eight outbreaks in calves were diagnosed during the year. The annual vaccinations in the barrier zones along the Karamoja and Sudanese borders were carried out successfully and a good cover obtained. All cattle were immunised in the barrier zones. Elsewhere calves and yearlings were vaccinated.

Rabies remained a serious problem in the Western and North-Western Regions.

Foot-and-Mouth Disease was relatively widespread in the north and east, and at times all the main exporting quarantines became infected. Efforts were made to increase the number of samples collected for typing and a total of 50 samples was submitted to Pirbright of which 20 proved positive for either " A " or " O " strains. Owners of exotic cattle are now practising regular vaccination and a total of 3,890 cattle were vaccinated during the year.

Trypanosomiasis continued to increase in incidence in Buganda and parts of the Northern Region. In certain areas it became necessary to block-treat with Berenil as infection became widespread. Elsewhere individual treatment with antrycide methyl sulphate was continued.

Tick-borne Diseases continued to take their heavy toll of young animals. Progressive farmer's co-operation still leaves much to be desired to combat these diseases by dipping and spraying.

Anthrax, Blackquarter and Haemorrhagic Septicaemia were reported from all regions but most outbreaks were sporadic in nature.

Poultry Diseases were not a serious problem on commercial poultry farms where all birds are protected by routine vaccination. Localised outbreaks of **Fowl Typhoid** and **Fowl Pox** were reported from most districts in indigenous birds, and **Newcastle Disease** was confirmed in one outbreak.

Tsetse Control—625 square miles in Ankole have been cleared of *G. morsitans*.

Entomological Investigations—The forest tsetse in Bunyoro and North Buganda which had always previously been regarded as *G. fuscipleuris* and as such were shown on the tsetse species map in the Uganda atlas, was discovered to be actually *G. fusca*, a West African species which was previously thought to occur only in the Semliki Valley.

Veterinary Education—Veterinary Training Institute in Entebbe provides an intake of 40 candidates annually for a three-year diploma course.

A rural training and leathercraft school was nearing completion in the vicinity of Entebbe Veterinary School, and the establishment of a Dairy Training School in the same premises is under consideration.

Livestock Census, 1964—

Cattle	3,496,797
Sheep	754,833
Goats	2,013,597
Pigs	31,712
Donkeys	16,734
Camels	440

(Report received 8 August 1966)

MAURITIUS

Department of Agriculture, 1964

Reserves of undeveloped land are small, and policy is aimed at intensification of production of crops and livestock particularly milk, meat and poultry. Self-sufficiency in pork and poultry products is considered to be an attainable goal. An artificial insemination service for cattle is available, using Creole semen, but breeding policy has been changed, and from 1965 Friesland semen will be made available. The Department carried out extensive poultry breeding. Various pure breeds and commercial hybrids were used with success, but Broad Breasted Bronze turkeys proved unsuitable. The Department also breeds pigs, Anglo-Nubian goats and rabbits.

Since the island is free of most epizootic diseases, but imports slaughter stock and meat, much attention is paid to quarantine measures and inspection of imported animal produce.

During the year, the Veterinary Division of the Department celebrated its fiftieth anniversay.

Disease Situation—There were no major outbreaks of disease. **Babesiosis** (*B. bovis*) was discovered in imported slaughter cattle, and a subsequent survey of local cattle revealed the presence of the parasites. **Anaplasmosis** was also shown to be present. **Bovine Tuberculosis** occurs, but the incidence is low, and tuberculin testing is done annually.

In poultry, the main troubles were **Leucosis** and nutritional deficiencies. **Chronic Respiratory Disease** was shown to be present, but a search for **Infectious Bronchitis** was negative. The laboratory produced 180,000 doses of **Newcastle Disease** vaccine and 108,000 doses of **Fowl Pox** vaccine.

Livestock Population—A full livestock census was carried out, which gave the following figures:

Cattle (Creole) . .	32,150
Cattle (Crossbred). .	9,660
Sheep	370
Goats	68,662
Pigs	3,698
Poultry . . .	385,107

(Report received 29 July 1966)

ISLAMIC REPUBLIC OF MAURITANIA

Service de l'Elevage, des Pêches maritimes et des Industries Animales — 1965

General—The Director is to be congratulated on preparing and circulating his report with so little delay. The staff of five veterinarians was due to be augmented by the return from specialist training of three Mauritanian veterinarians. Livestock Officers were in charge of some districts.

Development from traditional subsistence production, and the rise and fall of the itinerant cattle trader are described. Mauritania is now engaged in the construction of abattoirs to meet export requirements and in the quest for external markets for its meat. The important livestock are Zebu and North African cattle, sheep, goats and camels. The milk of all these animals is an important part of the diet of the people.

Disease Situation—The incidence of **Rinderpest** decreased. There were only two important outbreaks in adult cattle. It is hoped that participation in J.P. 15 will result in its total eradication.

Rabies was not common, but six human deaths were recorded. Vaccination of dogs is confined to the capital and other urban areas; elsewhere control is effected by destruction of stray dogs.

Contagious Bovine Pleuropneumonia was spread throughout the country by trade stock movements, resulting in a serious epizootic. The number of outbreaks and of animals involved precluded a slaughter policy, and chemotherapy with Novarsenobenzol was used on a large scale. **Blackquarter** is well known to stock owners, and the incidence is low, because of systematic vaccination of young stock. **Anthrax** did not occur. **Pasteurellosis** is not common, but takes the form of small local outbreaks in cattle, which may be confused with Pleuropneumonia in the early stages. It was the cause of a pulmonary disease in camels (at the end of the year), which responded to tetracycline.

Surra (*T. evansi*) is a serious economic problem in camels; it is controlled by "Moranyl".

Internal parasites are particularly important in sheep and goats. Phenothiazine is issued to stock owners, with instructions for use.

Mange is important in goats and camels and acaricides are supplied by the Service for the stock owners' use. There are no dipping tanks.

Livestock Populations—

Cattle	1,191,172
Sheep and goats . .	128,026
Camels . . .	51,511
Donkeys . . .	2,048
Horses . . .	479

(Report received 25 July 1966)

OUGANDA

Department of Veterinary Services and Animal Industry—1964

Généralités — Quoique le personnel du Département Vétérinaire ait du faire tous ses efforts pour contrôler les principales maladies au cours de l'année, et en particulier la péripneumonie contagieuse bovine, le rapport mentionne que des progrès réguliers et spectaculaires ont été atteints dans les domaines de l'élevage et de l'amélioration du bétail, en particulier chez les races laitières à haut rendement.

Industrie laitière — Au cours des trois années précédentes, la production de lait a atteint 40.000 litres par jour, le complément nécessaire ayant été importé du Kénya. Il est envisagé de créér une installation d'une capacité de 14.000 litres à Mbale. L'UNICEF a fourni 62.000 dollars pour agrandir les actuelles Laiteries de l'Ouganda et le Conseil de Développement de l'Ouganda (UDC) s'associera à sa gestion pour le compte du Gouvernement de l'Ouganda.

Situation sanitaire — La préoccupation principale au cours de l'année a été la menace constante d'introduction de maladies épizootiques par le bétail et les chiens apportés par les réfugiés en provenance des pays situés au Nord et à l'Ouest de l'Ouganda. 16.000 têtes de bétail et le même nombre de petits animaux ont franchi la frontière entre les mois de Mars et de Mai. Le bétail était infecté de péripneumonie contagieuse bovine, de peste bovine et de trypanosomiase.

Péripneumonie contagieuse bovine — Des foyers étendus ont éclaté à partir de Juillet dans le District de Dodoth, et ensuite dans les districts de Bokora et de Pian.

La Peste bovine a été introduite également par le bétail des réfugiés mais ne s'est pas répandue dans le bétail immun du Nord. Elle est demeurée endémique dans le Karamoja mais on n'a noté que huit cas chez les veaux au cours de l'année. Les vaccinations annuelles dans les zones barrières, le long des frontières du Karamoja et du Soudan, ont été menées à bien et une bonne couverture a été réalisée. Tout le bétail des zones barrières a été immunisé. Ailleurs, les veaux et les jeunes animaux ont été vaccinés.

La Rage a continué à être un problème sérieux dans les régions Ouest et Nord-Ouest.

La Fièvre aphteuse a été relativement répandue dans le Nord et l'Est et, par moments, toutes les quarantaines principales d'exportation ont été infectées. Des efforts ont été faits pour accroitre le nombre de prélèvements recueillis pour identification du type de virus et un total de 50 échantillons a été soumis à Pirbright, dont 20 ont été positifs pour les souches A ou O. Les propriétaires des animaux des races exotiques vaccinent leur bétail régulièrement d'habitude — et les vaccinations ont monté à un total de 3.890 têtes.

Trypanosomiase — Son incidence a continué à grandir au Buganda et dans certaines parties de la Région Nord. Dans certaines zones, il est devenu nécessaire de faire un traitement de blocage avec le Berenil car l'infection devenait générale. Ailleurs, le traitement individuel au methyl-sulphate d'antrycide a continué.

Maladies apportées par les tiques — Ces infections ont continué à affecter lourdement les jeunes animaux. La coopération apportée par les agriculteurs épris

de progrès laisse encore beaucoup à désirer dans la lutte par bains ou pulvérisation des acaricides.

Les maladies charbonneuses et la pasteurellose bovine — Toutes les régions en ont été affectées, mais la plupart des foyers étaient sporadiques.

Maladies des volailles — Dans les élevages de volailles commercialisés où les oiseaux sont protégés par des vaccinations régulières, il n'y a pas de problèmes. Des foyers localisés de typhose aviaire et de variole aviaire ont été signalés dans la plupart des districts chez les races indigènes, et la maladie de Newcastle a été confirmée dans un foyer.

Controle des tsé-tsé — 625 miles carrés, à Ankole, ont été éradiqués de *G. morsitans.*

Recherches entomologiques — La mouche tsé-tsé des forêts à Bunyoro et au Nord Buganda, que l'on avait toujours considérée jusqu'ici comme *G. fuscipleuris* et qui avait été portée comme telle sur la carte de l'espèce tsé-tsé dans l'Atlas de l'Ouganda, a été établie comme étant réellement *G. fusca*, variété ouest-africaine que l'on ne croyait précédemment exister en Ouganda que dans la vallée de Semliki.

Enseignement vétérinaire — L'Institut de Formation des auxiliaires vétérinaires d'Entebbe prend annuellement 40 candidats pour un Cours de Diplôme de trois ans.

Une école de formation rurale et de maroquinerie est presque achevée aux environs de l'Institut Vétérinaire d'Entebbe et la création d'une Ecole de Formation en produits laitiers est envisagée au même endroit.

Recensement du cheptel, 1964 —

Bovins . . .	3.496.797
Moutons . . .	754.833
Chèvres . . .	2.013.597
Porcins . . .	31.712
Anes	16.734
Chameaux . . .	440

(Rapport reçu le 8 août 1966)

ILE MAURICE

Department of Agriculture, 1964

Les réserves de terres non-utilisées sont faibles et la politique actuelle vise à intensifier la production de récoltes et de bétail, et en particulier le lait, la viande et les volailles. La couverture des besoins en viande de porc et en produits des volailles est un but considéré comme réalisable. Un service d'insémination artificielle, utilisant du sperme de race Créole, existe, mais la politique de reproduction a été modifiée et à partir de 1965 du sperme Frisien sera mis à la disposition. Le Service Vétérinaire a mené à bien une vaste extension d'élevage de volailles. Diverses variétés pures et des hybrides commerciaux ont été utilisés avec succès mais la race de dindons bronzés à poitrine large s'est avéré inadéquat. Le Service élève également des porcs, des chèvres anglo-nubiennes et des lapins.

Comme l'Ile Maurice est exempte de la plupart des maladies épizootiques, mais qu'elle importe du bétail de boucherie et de la viande, on porte grande attention aux mesures de quarantaine et à l'inspection des produits animaux importés.

Au cours de l'année, le Service Vétérinaire du Départment d'Agriculture a célébré son cinquantième anniversaire.

Situation sanitaire — Il n'y a pas eu de foyers majeurs. La **Babésiose** à *B. bovis* a été découverte dans du bétail de boucherie importé et une enquête subséquente sur le bétail local a révélé la présence des parasites. **L'Anaplasmose** a également été démontrée. La **tuberculose bovine** existe, mais son incidence est faible et l'épreuve à la tuberculine est pratiquée annuellement.

Chez les volailles, les maladies principales ont été dûes à la **Leucose** et aux carences alimentaires. La **mycoplasmose respiratoire chronique** a été démontrée mais la recherche de la **bronchite infectieuse aviaire** a été négative. Le laboratoire a produit 180.000 doses de vaccin contre la **maladie de Newcastle** et 108.000 doses de vaccin contre la **variole aviaire.**

Recensement du cheptel — Un recensement complet du cheptel a été mené à bien; il a donné les totaux suivantes:

Bétail (Créole) . .	32.150
Bétail (Croisé) . .	9.660
Moutons . . .	370
Chèvres . . .	68.662
Porcins . . .	3.698
Volailles . . .	385.107

(Rapport reçu le 29 juillet 1966)

REPUBLIQUE ISLAMIQUE DE MAURITANIE

Service de l'Elevage, des Pêches maritimes et des Industries Animales, 1965

Généralités — Le Directeur mérite toutes félicitations pour avoir préparé et distribué ce Rapport en un délai aussi bref. Le personnel de cinq vétérinaires doit s'accroitre lors du retour de trois vétérinaires mauritaniens qui suivent actuellement un cours de spécialisation. Les districts étaient sous la direction de fonctionnaires chargés des problèmes du bétail.

Le développement à partir de la production traditionelle de subsistance et la croissance puis le déclin des marchands itinérants de bétail sont décrits. La Mauritanie construit maintenant des abattoirs pour l'exportation et recherche des marchés extérieurs pour sa viande. Le bétail important comprend le zébu et la race bovidée nord-africaine, le mouton, la chèvre et le chameau. Le lait de tous ces animaux fournit une part importante de l'alimentation.

Situation sanitaire — L'incidence de la **peste bovine** a décru. Il ne s'est produit que deux foyers importants dans les animaux adultes. On espère que la participation au Projet Conjoint No. 15 aura pour résultat son éradication complète. La **rage** n'est pas fréquente, mais six décès humains ont été enregistrés. La vaccination se limite à la capitale et aux stations; ailleurs le contrôle s'effectue pas abattage des chiens errants.

La **péripneumonie contagieuse bovine** est répandue dans tout le pays à cause des mouvements commerciaux du bétail, de sorte qu'il existe une épizootie sérieuse. Le nombre de foyers et d'animaux affectés a empêché la politique de

" stamping out ", de sorte que la chimiothérapie avec le Novarsenobenzol a du être employée sur une grande échelle. Le **charbon symptomatique** est bien connu des propriétaires, mais l'incidence est basse, grâce à la vaccination systématique des jeunes animaux. Le **charbon bactéridien** n'est pas apparu. La **pasteurellose** n'est pas commune, mais elle prend la forme de petits foyers locaux. On peut la confondre avec la péripneumonie dans ses premiers stades. Elle a été la cause d'une maladie pulmonaire chez les chameaux, à la fin de l'année ; elle a bien répondu au traitement à la tetracycline.

La **Trypanosomiase à** *T. evansi* est un problème économique sérieux chez le chameau. On le contrôle par le " Moranyl ".

Parasites internes — Ils sont particulièrement importants chez les moutons et les chèvres. On distribue de la Phenothiazine aux propriétaires de troupeaux, avec le mode d'emploi.

Les **Gales** — Importantes chez les chèvres et les chameaux. Des acaricides sont fournis par le Service pour être employés par les propriétaires. Il n'y a pas de bains d'immersion.

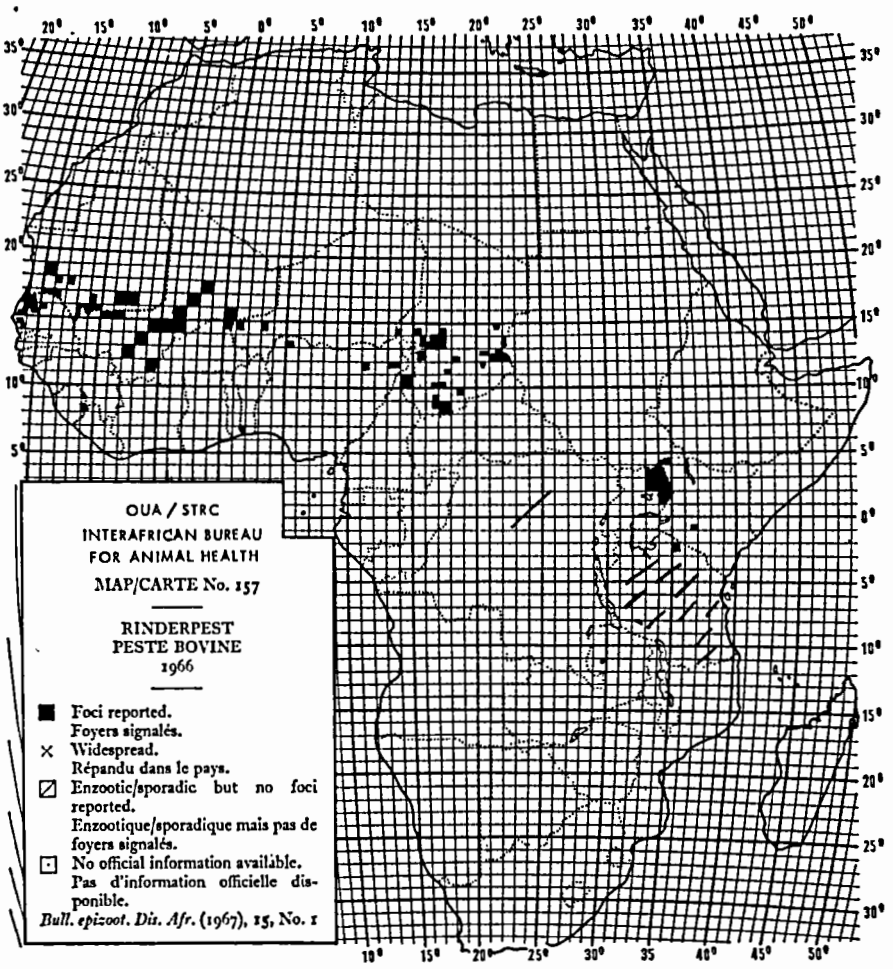
Recensement du cheptel —

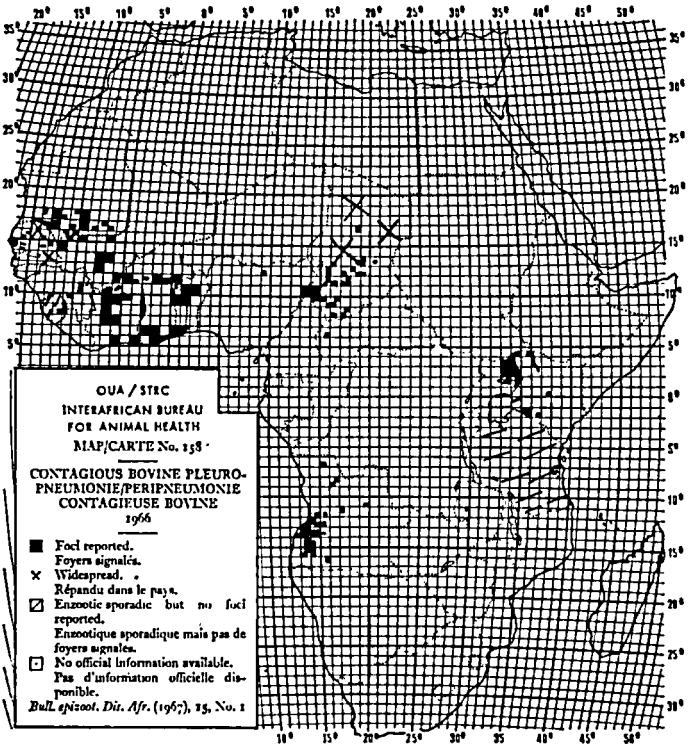
Bétail	1.191.172
Moutons et chèvres .	128.026
Chameaux . . .	51.511
Anes	2.048
Chevaux . . .	479

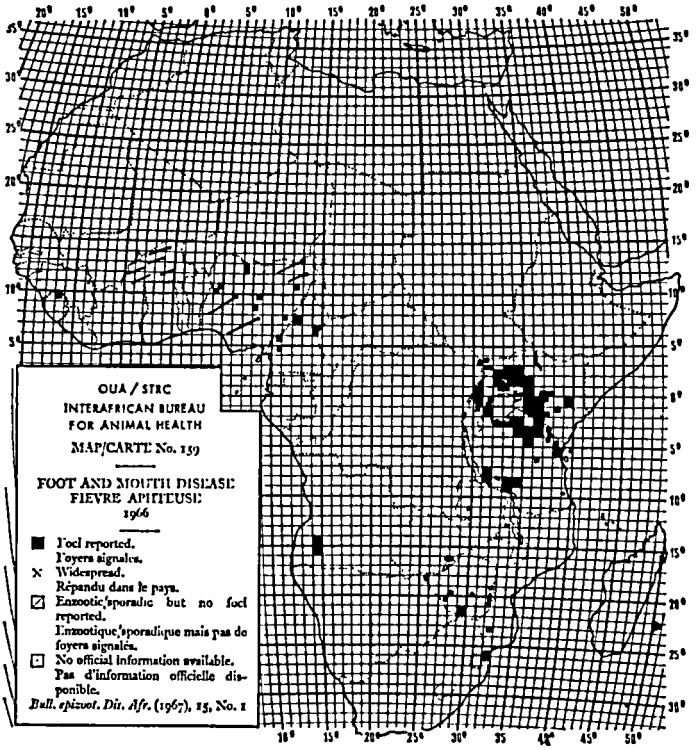
(Rapport reçu le 25 juillet 1966)

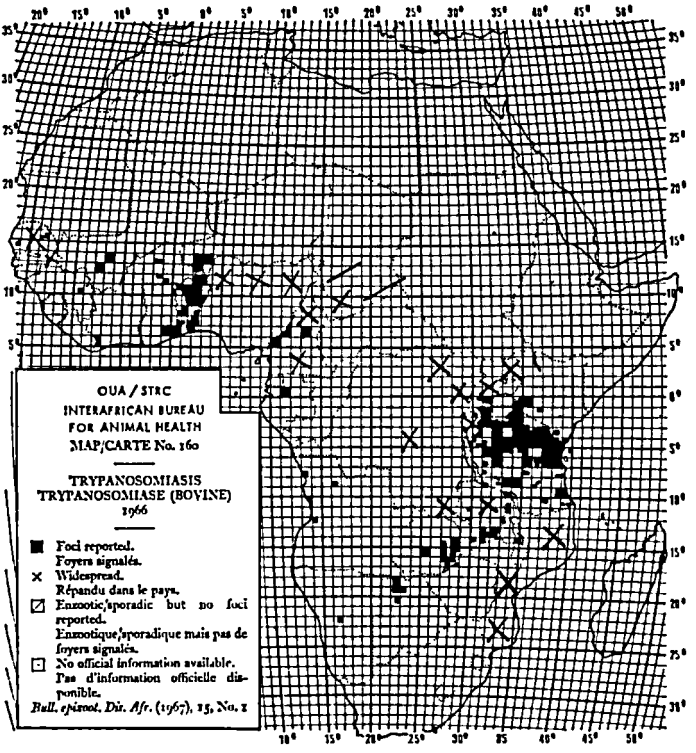
MAPS/CARTES

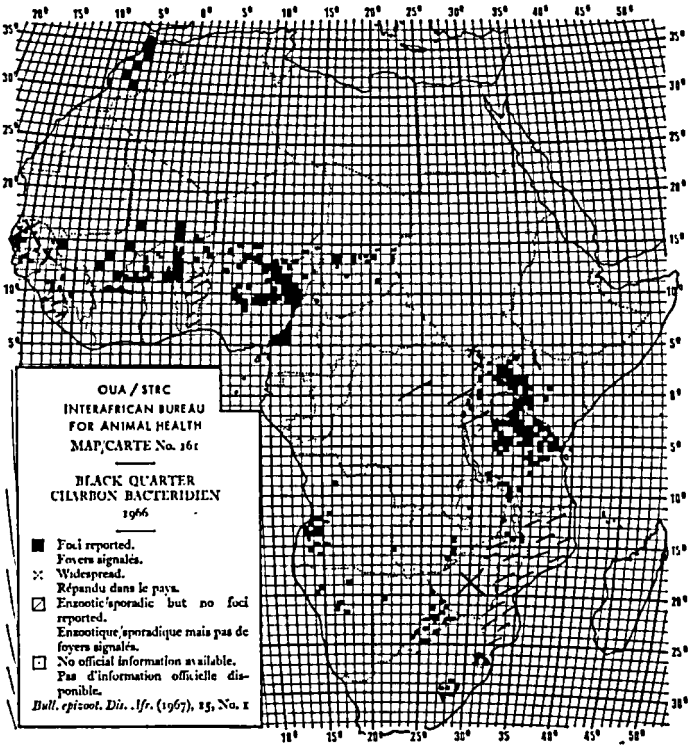
GEOGRAPHICAL DISTRIBUTION OF ANIMAL DISEASES
DISTRIBUTION GEOGRAPHIQUE DES MALADIES ANIMALES

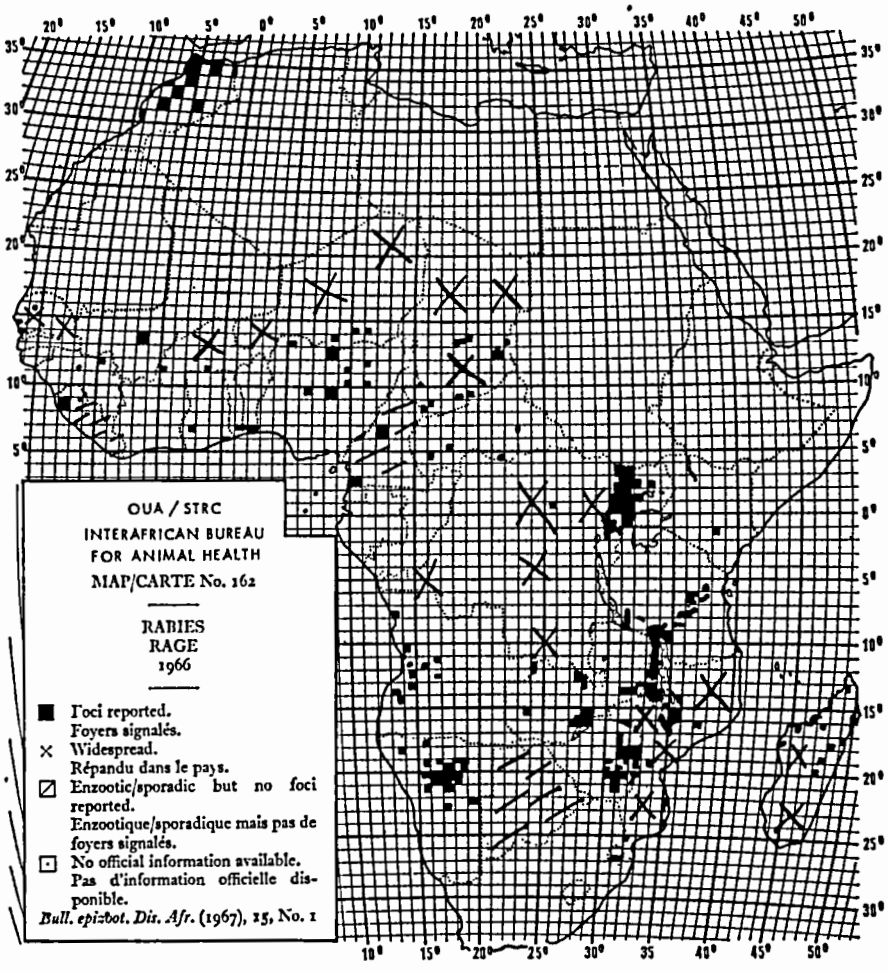



OUA / STRC
INTERAFRICAN BUREAU
FOR ANIMAL HEALTH
MAP/CARTE No. 158
CONTAGIOUS BOVINE PLEURO-PNEUMONIE/PERIPNEUMONIE CONTAGIEUSE BOVINE
1966
Foci reported.
Foyers signalés.
Widespread.
Répandu dans le pays.
Enzootic sporadic but no foci reported.
Enzootique sporadique mais pas de foyers signalés.
No official information available.
Pas d'information officielle disponible.
Bull. epizoot. Dis. Afr. (1967), 15, No. 1


OUA / STRC
INTERAFRICAN BUREAU
FOR ANIMAL HEALTH
MAP/CARTE No. 159
FOOT AND MOUTH DISEASE
FIEVRE APHTEUSE
1966
Foci reported.
Foyers signalés.
Widespread.
Répandu dans le pays.
Enzootic sporadic but no foci reported.
Enzootique sporadique mais pas de foyers signalés.
No official information available.
Pas d'information officielle disponible.
Bull. epizoot. Dis. Afr. (1967), 15, No. 1


OUA / STRC
INTERAFRICAN BUREAU
FOR ANIMAL HEALTH
MAP/CARTE No. 160
TRYPANOSOMIASIS
TRYPANOSOMIASE (BOVINE)
1966
Foci reported.
Foyers signalés.
Widespread.
Répandu dans le pays.
Enzootic/sporadic but no foci reported.
Enzootique/sporadique mais pas de foyers signalés.
No official information available.
Pas d'information officielle disponible.
Bull. epizoot. Dis. Afr. (1967), 15, No. 2


OUA / STRC
INTERAFRICAN BUREAU
FOR ANIMAL HEALTH
MAP/CARTE No. 161
BLACK QUARTER
CHARBON BACTERIDIEN
1966
Foci reported.
Foyers signalés.
Widespread.
Répandu dans le pays.
Enzootic/sporadic but no foci reported.
Enzootique/sporadique mais pas de foyers signalés.
No official information available.
Pas d'information officielle disponible.
Bull. epizoot. Dis. Afr. (1967), 15, No. 2


OUA / STRC
INTERAFRICAN BUREAU
FOR ANIMAL HEALTH
MAP/CARTE No. 162
RABIES
RAGE
1966
Foci reported.
Foyers signalés.
Widespread.
Répandu dans le pays.
Enzootic/sporadic but no foci reported.
Enzootique/sporadique mais pas de foyers signalés.
No official information available.
Pas d'information officielle disponible.
Bull. epizbot. Dis. Afr. (1967), 15, No. 1

BOOK REVIEW

Newcastle Disease (A Review 1926–64). By J. E. Lancaster. Canada Department of Agriculture Monograph No. 3 (1966). 188 pp. Price: $2·00. Catalogue No. A63–1254.

This book is a review collecting all the articles published by the author over several years. Some additions, expansions and inclusion of diagnostic measures were made.

It goes into a lot of details, particularly on the research lines of Newcastle Disease, and is therefore useful for immediate use by research workers or other workers interested in the virus of Newcastle Disease.

The author gives a good definition of N.C.D. with illustrations of the structure of the virus.

Part I of the book deals with the spread of the disease. Here the author gives the geographical distribution and with the aid of a map * he shows how the disease entered and spread in Africa, giving dates when this occurred. In the maps of Europe, he shows the infection density of N.C.D. and fowl plague during the period 1940–55. The author then describes the modes of spread and the important part wild birds, markets, transport of birds and bird products, etc., play in it. Part II of the review is on the diagnosis and differential diagnosis. Lesions are very well described and illustrated by clear photographs. Part III gives the control measures adopted in most countries. Part IV deals with " Virus propagation " illustrated by graphs and photographs.

On the whole this review gives the progress made from 1926 up to date. The books ends by a long list of 53 pages of references which shows that the author must have gone into a lot of research to produce this book.

* Reproduced from *Bulletin of Epizootic Diseases of Africa*.

La maladie de Newcastle (Enquête, 1926–64). Par J. E. Lancaster. Canada Department of Agriculture Monograph No. 3 (1966). 188 pp. Prix: $2·00. Catalogue No. A63–1254.

Ce livre est une compilation de tous les articles publiés par l'auteur au cours de plusieurs années. Des additions, des textes supplémentaires et l'inclusion des tests diagnostics y ont été apportés.

L'auteur entre dans quantité de détails, en particulier sur les lignes de recherche sur la maladie (de Newcastle); ce livre est donc d'un usage immédiat pour les chercheurs et autres vétérinaires intéressés par le virus de cette maladie.

L'auteur donne une bonne définition du N.C.D., avec des illustrations sur la structure du virus.

La Partie I du livre traite de l'epizootologie de la maladie. L'auteur y donne la distribution géographique et, à l'aide d'une carte,* montre comment la maladie a pénétré et s'est étendue en Afrique, en fournissant les dates. Dans les cartes d'Europe, il montre la densité de l'infection du N.C.D. et de la peste aviaire au cours de la période 1940–55. Il décrit ensuite les moyens de dissémination et montre la part importante jouée par les oiseaux sauvages, les marchés, le transport d'oiseaux et les produits d'oiseaux.

La second partie traite du diagnostic et du diagnostic différentiel. Les lésions sont très bien décrites et les illustrations photographiques sont très claires.

La troisième partie fournit les mesures de contrôle adoptées dans la plupart des pays.

La quatrième partie traite de la propagation du virus, illustrée par des graphiques et des photographies.

Dans l'ensemble, cette étude décrit le processus survenu de 1926 à ce jour. Le livre se termine par une longue liste de 53 pages de références qui prouvent que l'auteur a du faire des recherches trés poussées pour écrire ce volume.

* Reproduite du *Bulletin des Epizooties en Afrique.*

Bull. epizoot. Dis. Afr. (1967), 15, pp. 63-65.

INSTALLATION D'UN LABORATOIRE VETERINAIRE POUR LE BURUNDI A BUJUMBURA

W. BEINHAUER
Laboratoire vétérinaire, Département des Affaires vétérinaires et de l'Elevage, Bujumbura, Burundi

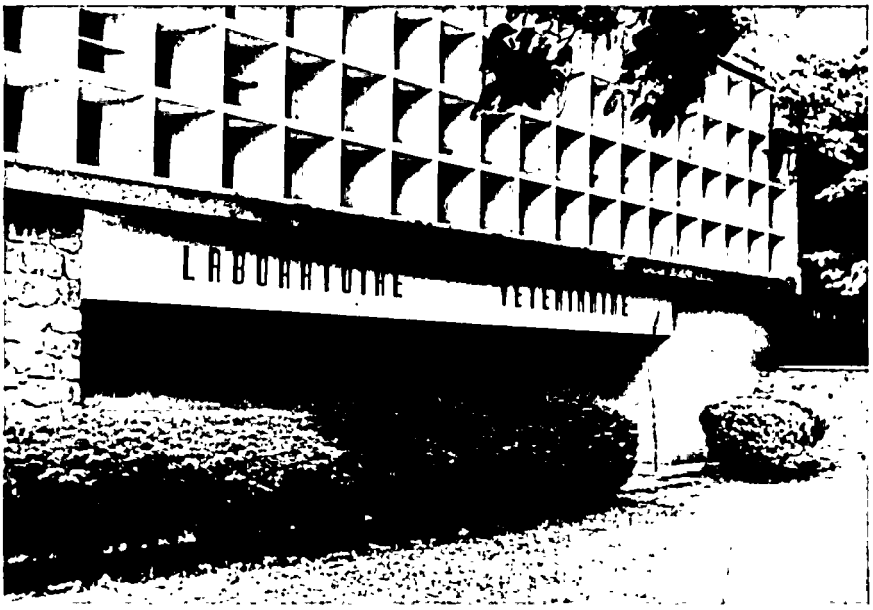
Le Burundi, jumelé au Rwanda jusqu'à l'accession à l'indépendance des deux pays en 1962, se trouvait, après les évenements politiques entre les deux pays voisins, démuni des services du Laboratoire vétérinaire de Butare (ex-Astrida) situé en territoire rwandais. Dans le temps cet Institut a joué le rôle de fournisseur de vaccins à usage vétérinaire du Burundi, et également de laboratoire de diagnostic. Faute d'autres institutions dans les pays voisins qui pourraient dépanner le Burundi en matière laboratoire, la République Fédérale d'Allemagne, sur proposition du Gouvernement du pays et de la FAO, a donné son accord pour fonder un Institut vétérinaire à Bujumbura, capitale du Burundi.

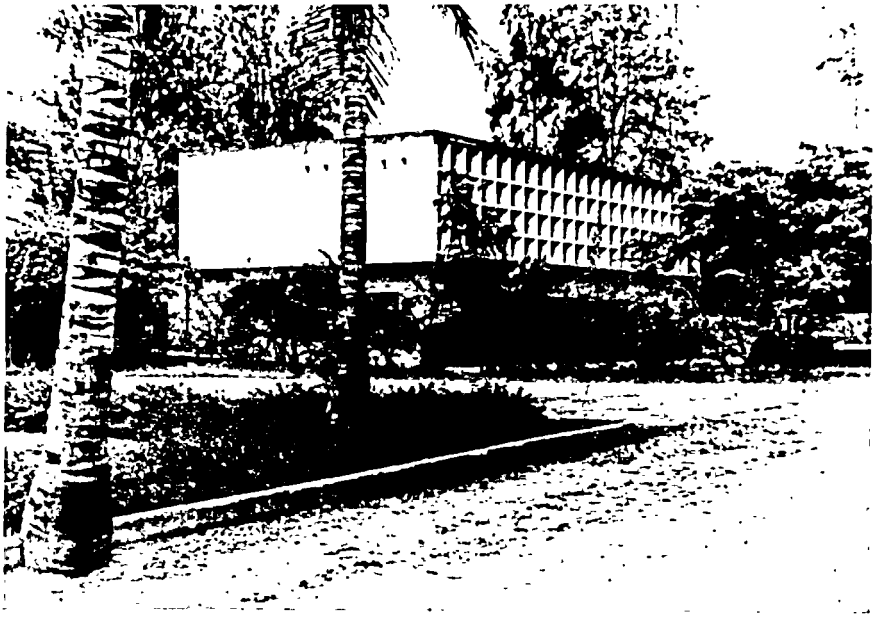
Un bâtiment laboratoire se trouvant sur place, il ne fallait donc que transformer cet ex-institut gouvernemental (Département d'Agriculture) en un laboratoire pour des affaires purement vétérinaires. Deux médecins vétérinaires et deux agents de laboratoire allemands y sont attachés aux fins d'installation et de mise en marche de ce laboratoire, ainsi que pour l'instruction des nationaux en vue, plus tard, de la remise des installations aux Barundis eux-mêmes. Le but de l'Institut sera de remplacer et d'intensifier les services rendus jadis par le Laboratoire de Butare.

Premièrement: il faut produire et fournir les vaccins contre le charbon bactéridien et symptomatique, maladies du gros bétail très répandues dans le pays. Plus tard, l'élargissement de cette gamme de vaccins à bactéries sera envisagé, selon les besoins.

Deuxièmement: en même temps, l'équipement définitif du Laboratoire aura aussi comme but important, les travaux de diagnostic. Il est incontestable qu'un diagnostic rapide est à la base d'une lutte efficace, biologique ou médicamenteuse, contre les maladies des animaux domestiques; donc: animaux sains = meilleur rendement. Au fur et à mesure que la production animale sera intensifiée, selon les besoins de l'économie nationale pour remplacer les importations de produits d'origine animale ou même pour l'exportation, il faudra inévitablement avoir recours à un institut scientifique ayant des moyens courants de recherches afin de pousser les examens des maladies courantes et de celles peu connues jusqu'à présent. Il faut se rendre compte aussi, que le Burundi, pays montagneux d'une superficie de 28.000 km², a avec le Rwanda, la population la plus dense en Afrique (95 habitants/km²) et une relation bétail: homme = 1 : 5. La croissance continuelle de la population (3,5%) est parmi celles des pays les plus prolifiques, alors que le bétail entre en concurrence avec l'homme en regard de la superficie en terre, nécessaire pour le nourrir.

En attendant le début de la fabrication propre de vaccins, la République Fédérale d'Allemagne a accordé une aide de vaccins contre les maladies charbonneuses pour une campagne de vaccination de tout le cheptel du Burundi. En





Vues du Laboratoire Vétérinaire à Bujumbura (Burundi)

outre, vu le grand problème qu'est la rage dans le pays, elle a donné également du vaccin antirabique du type Flury L.E.P. pour une série de vaccinations contre la rage des chiens. Etant donné l'impossibilité de mettre la main sur tous les chiens du pays pour les vacciner, on a envisagé la vaccination obligatoire des chiens dans les plus grands centres et leurs alentours.

Voici le cadre de l'activité du nouveau Laboratoire vétérinaire à Bujumbura, Burundi. Pour l'intensification du travail vétérinaire et pour l'independance de l'économie nationale, le Laboratoire représentera une contribution importante.

Résumé

Le Burundi, jumelé au Rwanda jusqu'à l'indépendance des deux pays en 1962, est démuni depuis lors des services du Laboratoire vétérinaire de Butare (ex-Astrida) situé sur territoire rwandais. Vu la nécessité d'avoir sur place les moyens propres aux examens diagnostics et à la fabrication de vaccins à bactéries, la République Fédérale d'Allemagne a donné son accord pour l'installation d'un Laboratoire vétérinaire à Bujumbura, capitale du Burundi. L'ex-Laboratoire du Gouvernement (Service d'agriculture) sera transformé à cet effet. Deux médecins vétérinaires et deux agents de laboratoire, ainsi que l'équipement approprié, sont envoyés par l'Assistance technique allemande.

Addresse de l'auteur : Dr. Werner Beinhauer, B.P. 195, Bujumbura, Burundi.

FOUNDATION OF A VETERINARY LABORATORY FOR BURUNDI AT BUJUMBURA

SUMMARY

A short description is given of the newly established Veterinary Laboratory at Bujumbura, Burundi. The ex-governmental Laboratory (Agricultural Department) is being modified for veterinary use. The activity will consist in vaccine production, firstly against blackleg and anthrax, to be used for the annual vaccination campaign in Burundi and in diagnostical work, which is regarded as very helpful for the improvement of animal production. The Burundi was cut off from the services of the Veterinary Laboratory at Butare (ex-Astrida) on Rwanda Territory by political events in 1963 after Independence. The project is realised by the Technical Assistance Aid of the Federal Republic of Germany who furnishes the equipment and sends two veterinarians and two laboratory agents to run the laboratory and to instruct the local personnel.

(Reçu pour publication le 21 novembre 1966)

ABSTRACTS

Vol. 15, No. 1—Nos. 1-30

SUBJECT INDEX

ANALYSES

Vol. 15, No. 1—Nos. 1–30

TABLE DES MATIERES

IBAH/67 1. BOTROS, B. A. M. **Propagation of Foot-and-Mouth Disease virus on Explanted Buffalo's Tongue Epithelium.** (Multiplication du virus aphteux sur l'épithélium explanté de la langue des buffles.) *J. Vet. Sci. U.A.R.* (1965), 2, 63.

Author's summary : 1. Foot and Mouth Disease virus could be successfully propagated on buffalo's tongue epithelium just as well as on cattle tongue epithelium.

2. The virus multiplied well on buffalo's tongue epithelium and an infectious titre of 10^{-6} $I.D._{50}$ in the eighth passage.

Résumé de l'auteur : 1. Le virus aphteux peut proliférer tant à partir de l'épithélium de la langue bubaline que de celle des bovidés.

2. La croissance du virus est bonne, avec un titre infectieux atteignant 10^{-6} $I.D._{50}$ au huitième passage.

IBAH/67 2. VAN BEKKUM, J. G. **The influence of Foot-and-Mouth Disease Vaccination of the Mother on the Level of Neutralising Antibody in her Young.** (L'influence de la vaccination anti-aphteuse de la mère sur le taux d'anticorps neutralisants chez les petits.) *Bull. Off. int. Epiz.* (1966), 65, 439.

Author's summary : In young pigs and calves from mothers that have been vaccinated under field conditions, i.e. repeatedly, traces of antibody may persist for as long as 150 to 160 days.

In young from dams that have been vaccinated only once we would expect these periods to be shorter by 30 days or so.

However, it should be pointed out that this is only an estimate for an upper limit and that any values between this maximum and zero may occur.

Résumé de l'auteur : Chez les porcelets et les veaux issus de mères vaccinées sous les conditions au terrain, c'est à dire répétées, on peut démontrer la présence d'anticorps à l'état de traces jusqu'à 150 ou 160 jours.

Chez les petits des mères vaccinées une seule fois, on peut envisager des périodes plus courtes d'à peu près 30 jours.

Mais il faut souligner que ces constatations ne sont qu'une estimation de limite supérieure et qu'on peut avoir n'importe quelle valeur entre ce maximum et zéro.

IBAH/67 3. CARDASSIS, J., PAPPOUS, C., BROVAS, D., STOURAITIS, P., SEIMENIS, A. **Test of Infectivity and Dosage of Foot-and-Mouth Vaccine in Sheep.** (Test d'infectivité et dosage du vaccin anti-aphteux chez le mouton.) *Bull. Off. int. Epiz.* (1966), 65, 427.

Authors' summary : Experimental infection of sheep by different routes (principally sublabial, intralingual and foot), despite the use of high doses of Foot-and-Mouth Disease virus (up to 10^7 $L.D._{50}$/ml.), was not always followed by generalisation of the disease in the inoculated animals, some of the animals having shown asymptomatic infection and others, primary lesions at the site of inoculation.

Titration of serum-neutralising antibodies, for the purpose of comparison with vaccinated animals on the twenty-first day after vaccination, showed titres up to 1·94–2·80 (mostly above 2·80). Thus, this titration seems to be the best index of the infection of animals, especially in cases where the disease is not apparent.

It seems to us that this titration can also be of value concerning the dosage of Foot-and-Mouth Disease vaccine for sheep as well as for the development of the state of immunity following vaccination.

Seeing that resistance is found in sheep to generalisation of lesions after natural or experimental infection, it is difficult to fix the $P.D._{50}$ of Foot-and-Mouth Disease vaccine for sheep in the same way as the level of antibody titre corresponding to the different degrees of immunity.

Résumé des auteurs : L'infection expérimentale du mouton par différentes voies (surtout par voies sous-labiale, intra-linguale et podale) n'a pas toujours été suivie chez les animaux inoculés de généralisation, malgré l'emploi de doses élevées de virus aphteux (atteignant 10^7 $L.D._{50}$/ml.). Quelques animaux ont fait une infection asymptomatique et d'autres des lésions primaires au point d'inoculation.

Le titrage des anticorps neutralisants du sérum réalisé en vue d'établir des comparaisons

entre les animaux 21 jours après leur vaccination, donna des titres atteignant 1,94–2,80, la plupart étant au-dessus de 2,80. Ainsi ce titrage semble constituer le meilleur index d'infection des animaux, surtout lorsque la maladie est inapparente.

Il nous semble également que ce titrage peut être valable pour le contrôle de dosage des vaccins anti-aphteux chez le mouton, ainsi que pour l'appréciation de l'état de l'immunité post-vaccinale.

Trouvant que chez le mouton il y a une résistance manifeste des lésions après l'infection soit naturelle, soit expérimentale, il est difficile de fixer pour le mouton le $D.P._{50}$ du vaccin anti-aphteux, de la même façon qu'on le fait pour le niveau de titre d'anticorps correspondant à différents degrés d'immunité.

IBAH/67 4. GOLDSMIT, L., BARZILAI, E. **Isolation and Propagation of a Bluetongue Virus Strain in Embryonating Chicken Eggs by The Intravenous Route of Inoculation. Preliminary Report.** (Isolement et multiplication d'une souche de virus de la maladie de la " langue bleue " du mouton sur l'œuf embryonné par emploi de la technique d'inoculation par voie intra-veineuse. Note préliminaire). *Refuah Vet.* (1965), **22**, 285.

Authors' summary : Attempts were made to isolate Bluetongue (B.T.) virus in embryonating chicken eggs from six blood samples of suspected B.T. cases in sheep. Groups of embryonating chicken eggs were inoculated simultaneously by the yolk sac (y.s.) and by intravenous (i.v.) routes of inoculation.

The results obtained when the y.s. route of inoculation was employed were as follows: Type 4 B.T. virus was isolated from four out of the six blood samples tested. The embryo mortality was low in the early egg passages and reached 100% in the seventh consecutive egg passage. The virus titre of embryos that died following inoculation in the seventh egg passage was $10^{3\cdot6}$ C.E. $L.D._{50}$/0·1 ml. The time required for identification of the virus isolates by serum neutralisation tests was eight weeks.

The results obtained when the i.v. route of inoculation was employed were as follows: Type 4 B.T. virus was isolated from all six blood samples tested. The rate of embryo mortality reached a 100% in the second egg passage in four out of the six samples tested and in the third egg passage in two out of six blood samples tested. The virus titre in chicken embryos that died following inoculation in the first egg passage was $10^{6\cdot2}$ C.E. $L.D._{50}$/0·1 ml. The time required for identification of the virus isolates by serum neutralisation tests was about 10–20 days.

The titre of a chicken embryo virus suspension (first i.v. egg passage) was found to be $10^{6\cdot2}$ C.E. $L.D._{50}$/0·1 ml., when the titration was carried out by the i.v. route, and $10^{3\cdot0}$ C.E. $L.D._{50}$/0·1 ml. when the titration was carried out by the y.s. route.

Résumé des auteurs (abrégé) : Des essais d'isolement du virus de la maladie de la " langue bleue " sur l'œuf embryonné ont été effectués avec succès, sur les prélèvements du sang de six moutons suspects de la maladie.

Les résultats sont décrits dans une étude comparative des deux voies d'inoculation : par le sac du jaune d'œuf et par la route intra-veineuse. Il semble que la dernière méthode soit la plus efficace.

IBAH/67 5. KAPLAN, MM., WIKTOR, T., KOPROWSKI, H. **An Intracerebral Assay Procedure in Mice for Chemical Inactivation of Rabies Virus.** (Un procédé intra-cérébral pour essayer chez la souris l'action virilicide des produits chimiques sur le virus rabique.) *Bull. Wld. Hlth. Org.* (1966), **34**, 293.

Authors' summary : An intracerebral assay technique in mice is described for testing chemical disinfectants acting on the rabies virus. The assay determines whether more than 99% of 10·000 mouse intracerebral LD_{50} of virus are inactivated within 1–2½ minutes. By this test, several substances usually available for the treatment of animal bite wounds were found to be effective. They are: 1%–20% soap solutions, 43%–70% alcohol; 1 : 1,000 (0·1%) or lower dilutions of two quaternary ammonium compounds, benzalkonium chloride and cetrimonium bromide; 1 : 10,000 or lower dilutions of iodine; acetone; and ether.

Several other substances tested for possible use in environmental disinfection were also found to be virucidal. They were: 3% caustic soda and commercial preparations of organic

phenols, iodine, and a mixture of trisodium phosphate and sodium hypochlorite. No virucidal effect was exerted by a 2% aqueous solution of mercurochrome, a 1 : 1,000 aqueous solution of thiomersal, or 3% formalin (1% formaldehyde).

A number of substances that inactivate rabies virus have thus become available for local treatment of bite wounds and for environmental disinfection. The assay procedure described may be useful in testing other disinfectants and chemical substances.

Résumé des auteurs : Exposé d'une méthode pour essayer, au moyen d'une inoculation des souris par voie cérébrale de produits chimiques désinfectants, de déterminer s'ils inactivent le virus rabique. Le procédé permet de montrer si l'activité virilicide atteint 99% sur 10.000 $D.L._{50}$ intracérébraux pour la souris dans une période d'une à deux minutes et demi. A partir de cette méthode, on a pu montrer l'activité virilicide satisfaisante de quelques substances vulgaires pour le traitement des morsures. Ce sont des solutions savonneuses à 1–20%, l'alcool éthylique à 43–70%, des concentrations à 0,1% ou moins de deux dérivés de l'ammoniaque quaternaire : le chlorure de benzalkonium et le bromure de cetrimonium, une solution aqueuse d'iode à 1/10.000, l'acétone et l'éther.

Plusieurs autres substances disponibles pour la désinfection locale, et sans danger pour les tissus traités, ont été décelées au cours des essais. Ce sont : la soude caustique à 3%, des préparations commerciales de phénols organiques et un mélange de phosphate trisodique et d'hypochlorite de sodium. La solution aqueuse de mercurochrome à 2%, la solution aqueuse de thiomersal à 0,1% et la formaldéhyde à 1% n'ont eu aucune action virilicide.

On dispose donc, pour le traitement local et la désinfection des morsures, de nombreux produits inactivant le virus de la rage. Le procédé décrit semble utile pour essayer d'autres produits chimiques désinfectants.

IBAH/67 6. SCHNEIDER, D., YUTAKA FURUSHO. **Immunofluorescence Study of Wild Rabies Virus and Antibody.** (Etude par la technique d'immunofluorescence du virus rabique des rues et des anticorps.) *Con. J. Comp. Med. Vet. Sci.* (1966), **30**, 129.

Authors' summary : A concentrate of wild rabies antibody was prepared from hyperimmune serums of three dogs refractory to wild rabies. The animals resisted repeated intramuscular injections of large doses of wild rabies virus in emulsions of whole brain, in emulsions of submaxillary salivary glands, and in emulsified mixtures of brain and submaxillary glands from naturally rabid dogs.

The antibody was conjugated with fluorochrome and then absorbed by a procedure that gave " cell-free " working solutions of fluorescent antibody. The procedure entailed parallel absorption steps with minced pathological canine submaxillary glands from (1) naturally rabid dogs (these glands contained specific, undergraded, natural antigens of live wild rabies plus non-specific substances and antigens) and (2) non-rabid dogs from a rabies endemic region (these glands contained non-specific substances and antigens).

Extracts from submaxillary glands of the three naturally rabid dogs and one non-rabid dog were stained with a cell-free solution of the fluorescent antibody. The glands of the rabid dogs contained fluorescent aggregates of intense green spherical and filamentous particles. When non-fluorescent canine hyperimmune serum was incubated with rabies-containing submaxillary extract, the rabies antigens were quenched. When non-fluorescent equine fixed virus antiserum was incubated with such extracts, the aggregates still retained bright fluorescence.

Résumé des auteurs : On a préparé une concentration de virus rabique des rues à partir du sérum hyperimmun de trois chiens réfractaires à ce virus. Les animaux ont résisté à des injections répétées par voie intramusculaire de doses élevées de virus des rues en émulsion à partir soit du cerveau total, soit des ganglions sous-maxillaires, soit d'un mélange de cerveau et de ganglions provenant de chiens infectés naturellement.

L'anticorps a été conjugué avec du fluorochrome, puis absorbé par une technique donnant des solutions " cellules libres " d'anticorps fluorescent. Le procédé requiert une préparation parallèle par absorption à partir de ganglions hachés 1) de chiens infectés naturellement, et 2) de chiens non-infectés provenant d'une région endémique.

Les extraits de ganglions sous-maxillaires des trois chiens rabiques naturellement et d'un chien non-rabique ont été colorés avec une solution " cellules libres " d'anticorps fluorescents. Les ganglions des chiens rabiques contenaient des agrégats fluorescents de particules filamenteuses ou rondes d'une coloration verte brillante. L'incubation du sérum canin hyperimmun mais non-fluorescent avec de l'extrait sous-maxillaire rabique étanche les antigènes tandis que lorsque le sérum équin non-fluorescent de virus rabique fixe est étuvé avec des extraits, les agrégats retiennent leur fluorescence brillante.

IBAH/67 7. CHURCHILL, A. E., BLAXLAND, J. D. **Experiments with a Live Newcastle Disease Vaccine Administered in the Drinking Water of Chickens.** (Expériences de vaccination pseudo-pestique aviaire par l'eau potable chez les poussins.)
Vet. Rec. (1966), **79**, 30.

Authors' summary : Experiments are described using a live vaccine prepared from the lentogenic F strain of Newcastle disease virus (N.D.V.) grown in the embryonated fowls of eggs which were produced by a specific pathogen-free breeding flock.

One dose of vaccine contained 10^6 tissue culture infective $doses_{50}$ of virus per chick which was administered in the drinking water, at 10 days of age.

The level of resistance following vaccination was measured serologically and by challenge 18 days, and 7½, 12½ and 18½ weeks after primary vaccination, and again following re-vaccination.

After re-vaccination at 20 weeks of age, the fowls were challenged five and 29 weeks later and the effect upon egg production was recorded.

Immunity, as judged by survival following an intramuscular injection of 200,000 embryo infective $doses_{50}$ of virulent Herts strain N.D.V., was 87, 100, 90 and 80% respectively after primary vaccination, and 100% on each occasion after re-vaccination. Egg production was quite unaffected by challenge of laying fowls five weeks and 29 weeks after re-vaccination.

The effect of antibody in the eggs laid by immune parents on the response of young chickens to vaccination was studied in two experiments:

(1) Chickens, hatched from eggs of F strain immunised hens and vaccinated from seven days of age, were resistant to challenge four weeks later, but 7% of those vaccinated at four days of age were susceptible.

(2) Four out of 19 chickens hatched from eggs of hyperimmune hens and vaccinated at 14 days of age were susceptible to challenge, as compared with all 20 unvaccinated control chickens of the same age hatched from eggs laid by the same parents.

The results of these experiments are discussed. It is considered that a live F strain N.D.V. vaccine, prepared and used as described is an effective immunising agent with certain advantages over inactivated vaccines.

Résumé des auteurs : Le vaccin vivant utilisé a été préparé à partir d'une souche lentogène F de virus de la Maladie de Newcastle, cultivée sur les œufs embryonnés provenant d'un volailler pathogène-libre.

Une dose unique pour chaque poussin, contenant du virus à titre 10^6 $D.I._{50}$ culture cellulaire, a été administré dans l'eau potable, à l'âge de dix jours.

Le niveau de résistance post-vaccinale a été titré sérologiquement et par virus d'épreuve le dix-huitième jour et sept semaines et demi, douze semaines et demi, dix-huit semaines et demi après la vaccination primaire et aussi après la re-vaccination à l'âge de vingt semaines. Plus tard, la cinquième et la vingt-neuvième semaine post-revaccination à l'âge de vingt semaines, les poulets ont été éprouvés par virus et l'on a noté l'effet sur le niveau de la ponte.

L'immunité, jugée par la survivance à l'injection intra-musculaire de virus d'épreuve était respectivement de 87, 100, 90 et 80% après la vaccination primaire et de 100% dans chaque groupe après la re-vaccination. L'effet sur la ponte était nul.

L'effet des anticorps dans les œufs pondus par les poules-immunes sur la réponse vaccinale de leurs poussins a été étudié en deux expériences avec les résultats suivants:

1) Les poussins, couvés des œufs de poules vaccinées et eux-même vaccinés à sept jours d'âge, ont résisté au virus d'épreuve quatre semaines plus tard, mais parmi ceux vaccinés à quatre jours d'âge, 7% sont réceptifs.

2) Sur 19 poussins provenant d'œufs de poules immunisées, vaccinés à 14 jours d'âge, quatre sont réceptifs à l'épreuve tandis que tous les 20 poussins non-vaccinés des mêmes parents sont réceptifs.

L'on discute ces résultats et les auteurs concluent qu'un vaccin vivant de souche F de virus pseudo-pestique aviaire, préparé et employé comme ils décrivent, constitue un agent immunisant effectif présentant certains avantages sur les vaccins inactivés.

IBAH/67 8. RODWELL, A. W. **The Stability of *Mycoplasma mycoides*.** (Stabilité de *Mycoplasma mycoides*.)
J. gen. Microbiol. (1965), **40**, 227.

Author's summary : The morphology of *Mycoplasma mycoides* was well preserved after washing and suspension in buffered 0·4 M-sucrose solutions, but the survival of viable particles was no better, and the loss of ultraviolet (u.v.)-absorbing substances and the decrease of turbidity was no less than in hypotonic solution (0·01 M-tris HCL or 0·01 M-Na_2HPO + KH_4PO_4). The addition of Mg^{2+}, Ca^{2+}, spermidine or spermine (increasing order of activity)

decreased the decrease of turbidity and loss of u.v.-absorbing substances. Ca^{2+} and Mg^{2+}, but not spermine, increased the degree of survival of viable particles. Ethylenediaminetetra-acetate (E.D.T.A.; 0·01 M) increased the loss of u.v.-absorbing substances, and decreased the turbidity and degree of survival. Ca^{2+}, Mg^{2+} and spermine annulled the effects of E.D.T.A. on loss of u.v.-absorbing material and on the turbidity, but only Ca^{2+} prevented the lethal effect of E.D.T.A. Filaments disappeared and cell volume increased when the organisms were transferred from hypertonic to hypotonic solutions; the shape changes were reversible:

Résumé de l'auteur : Suivant le lavage et la suspension en solution sucrosée, la morphologie de *Mycoplasma mycoides* demeure bien conservée. En comparaison, en employant les solutions hypotoniques, la survivance des particules viables n'est pas meilleure et la perte des substances absorbantes des rayons ultraviolets ainsi que la diminution de l'état bourbeux ne le sont pas moins. L'addition de Mg^{2+}, et de Ca^{2+}, de spermidine ou de spermine (en ordre d'accroissance d'activité) retarde la diminution de l'état bourbeux et la perte des substances absorbantes de rayons ultra-violets. Le Ca^{2+} et le Mg^{2+}, mais pas la spermine, augmentent le degré de survivance des particules vivants. L'Ethylenediaminetetra-acetate (E.D.T.A.; 0,01 M) augmente la perte des substances absorbantes de rayons ultra-violets et diminue l'état bourbeux ainsi que le degré de survivance. Le Ca^{2+}, le Mg^{2+} et la spermine annullent les effets de l'E.D.T.A. sur la perte des substances absorbantes de rayons u.v. et l'état bourbeux, mais seul le Ca^{2+} empêche l'effet léthal de l'E.D.T.A. En transférant des mycoplasmes d'une solution hypertonique à une solution hypotonique les filaments ont disparu et la masse cellulaire s'est augmentée; les changements morphologiques sont réversibles.

IBAH/67 9. O'BERRY, P. A., BRYNER, J. H., FRANK, A. H. **Isolation of Mycoplasma from an Aborted Bovine Fetus and Vaginal Mucus.** (Isolements mycoplasmiques d'un fœtus bovin avorté et du mucus vaginal.)
Am. J. Vet. res. (1966), **27**, 677.

Authors' summary : Mycoplasma organisms were isolated from an aborted fetus and from bovine vaginal mucus. Methods of examination of fetal and vaginal material for mycoplasma are described.

Biochemical and morphologic comparisons of one strain isolated from an aborted fetus, two strains from bovine vaginal mucus, and four strains from other sources are presented. The isolant from the fetus differed from the isolants from the vagina in colonial morphology, methylene blue reduction, and carbohydrate fermentation. Isolants from the vagina were similar in colonial morphology and biochemical properties with the exception of serum requirement. Similarities were also noticed between the bovine and non-bovine strains. The significance and possible implications of these isolations are discussed.

Résumé des auteurs : Les auteurs signalent l'isolement de mycoplasmas d'un fœtus bovin avorté et du mucus vaginal. Ils décrivent les méthodes d'examen pour déceler la présence du mycoplasma chez ces matériaux.

Les comparaisons biochimiques et morphologiques de sept souches de mycoplasma, l'une d'origine du fœtus avorté, deux du mucus vaginal et quatre souches d'autres sources sont présentées. L'isolant du fœtus diffère de ceux du mucus dans les caractères de morphologie des colonies, de réduction de bleu de méthylène et de fermentation des carbohydrates. Les isolants vaginaux sont semblables pour ce qui est de la morphologie des colonies et des propriétés biochimiques, à l'exception du besoin en sérum. Les ressemblances entre les souches bovines et les souches non-bovines ont été notées. On discute l'importance et les implications possibles de ces isolements.

IBAH/67 10. COTTEW, G. S., LLOYD, L. C. **An outbreak of Pleurisy and Pneumonia in goats in Australia attributed to a Mycoplasma Species.** (Sur un foyer de pneumonie et de pleurite chez la chèvre en Australie.)
J. Comp. Path. (1965), **75**, 363.

Authors' summary : A non-fatal respiratory disease of goats in Victoria is described which was characterised clinically by coughing, loss of condition, drop in milk yield, moist râles on ausculation and, in some cases, a high temperature.

Extensive pleurisy and pneumonia were present at necropsy. The pneumonia was characterised by distended interlobular septa, necrotic brochioles and focal necrosis of lung parenchyma; the alveoli were filled with alveolar macrophages and serous exudate. Chronic lesions were characterised by extensive fibrosis of the pleura and interlobular septa, extensive cuffing of bronchioles with mononuclear cells and collapse of lung tissue.

The Mycoplasma species isolated from lungs of two affected goats differed biochemically and serologically from *M. caprae*, from a Californian goat mycoplasm and from the only other reported caprine mycoplasm isolated in Australia. It was similar biochemically and related antigenically to *M. agalactiae*.

Experimentally, the organism produced small lung lesions in a sheep and a goat after intratracheal inoculation, subcutaneous lesions in sheep and goats after injection by that route, and joint lesions in young goats after intravenous administration.

Résumé des auteurs : Les auteurs signalent un foyer d'une maladie respiratoire non-mortelle chez la chèvre dans l'état de Victoria, caractérisée par les symptômes cliniques de la toux, de la perte de poids, de la réduction du rendement en lait, de râles à l'auscultation et, parfois, de pyrexie élevée.

A l'autopsie, des lésions graves de pneumonie et de pleurite sont décelées. Les caractéristiques de ces lésions sont décrites *in extenso*.

La souche de mycoplasme isolée des poumons dans deux cas montre des caractères biochimiques et sérologiques qui la font classer comme une espèce différente de *M. caprae*, du mycoplasme de la chèvre de Californie et de la seule autre souche signalée en Australie. La souche ressemble à *M. agalactiae* dans ses caractères biochimiques et antigéniques.

Lors des essais expérimentaux effectués chez la chèvre et le mouton par l'inoculation de cette souche de mycoplasma, on produit par la voie intra-trachéale de petites lésions du poumon, par la voie sous-cutanée des lésions sous-cutanées ; et chez le chevreau, l'inoculation par la voie intraveineuse a produit des lésions arthritiques.

IBAH/67 11. PLASTRIDGE, W. N., KERSTING, E. J., WILLIAMS, M. S. **Resistance of Vaccinated Heifers to Vibriosis.** (Résistance chez les génisses vaccinées contre la vibriose.)
Am. J. Vet. Res. **27** (1966), 186.

Authors' summary : Heifers that were inoculated intracervically with *Vibrio fetus* 20 weeks after vaccination were culturally positive for an average of two weeks and conceived after an average of 1·6 services with an average interval of 36 days between the first service and the service that resulted in a normal gestation. Unvaccinated heifers were culturally positive for an average of 21 weeks and conceived after an average of 2·7 services with an average interval of 128 days between the first service and the service that resulted in a normal gestation.

In field trials, the incidence of abnormal breeding cycles for heifers that were vaccinated once was 25·2%, and for unvaccinated heifers, 35·3% ; for heifers that were vaccinated three times, 26·1%, and for unvaccinated heifers, 42·7%. The difference between vaccinated and unvaccinated heifers was significant (P = 0·003).

Résumé des auteurs : Vingt semaines après l'inoculation par voie intra-cervicale de *Vibrio fœtus*, des génisses sont devenues positives par culture. La positivité dure en moyenne deux semaines. La conception réussit dans une moyenne de 1,6 saillies avec un intervalle moyen de 36 jours entre la première saillie et la saillie de la gestation normale. Les génisses non-vaccinées restent positives par culture 21 semaines en moyenne ; la conception réussit dans une moyenne de 2,7 saillies avec un intervalle moyen de 128 jours entre la première saillie et la saillie précédant la gestation normale.

Les essais au terrain ont montré que l'incidence de cycles anormaux de reproduction était de 25,2% chez les génisses vaccinées une seule fois, de 35,3% chez les génisses non-vaccinées ; de 26,1% chez les génisses vaccinées trois fois et de 42,7% chez les génisses non-vaccinées. La différence entre les animaux non-vaccinés et les animaux vaccinés était significative (P = 0,003).

IBAH/67 12. ALTON, G. G. **Duration of the Immunity Produced in Goats by the Rev. 1 *Brucella melitensis* Vaccine.** (Durée d'immunité chez la chèvre après la vaccination brucellique à partir de *Br. melitensis* Souche Rev. 1.)
J. Comp. Path. (1966), **76**, 241.

Author's summary : *Brucella melitensis*, Rev. 1 vaccine administered to goats between three and seven months of age induces a high degree of immunity at least two and a half years after vaccination.

The vaccine does not produce undesirable side-effects, such as prolonged interference with serological tests of excretion of the organism when administered at this age.

Résumé de l'auteur : La vaccination des chèvres âgées de trois à sept mois au moyen de la souche Rev. 1 de *Br. melitensis* provoque une immunité d'un haut degré d'une durée d'au moins deux ans et demi. Inoculé à cet âge, le vaccin ne produit pas d'effets nuisibles tels que l'interférence aux tests sérologiques, par l'excrétion prolongée des organismes.

IBAH/67 13. DENNIS, S. M., BAMFORD, V. W. **The Role of *Corynebacteria* in Perinatal Lamb Mortality.** (Le rôle des Corynebactéries dans la mortalité périnatale des agneaux.)
Vet. Rec. (1966), **79**, 105.

Authors' summary : The isolation of five species of *Corynebacteria* from 44 perinatal lamb deaths is recorded. Four species were identified as *Corynebacterium pyogenes*, *Corynebacterium pseudotuberculosis*, *Corynebacterium renale*, and *Corynebacterium equi*; 13 strains, however, were unidentified diphtheroids and were regarded as being " intermediate " species. The importance of these unidentified diphtheroids is not known. The *Corynebacteria* were responsible for abortion, navel-ill, pyaemia, pneumonia, pericarditis, meningitis, cerebral abscess, hepatitis and were suspected as a cause of early post-parturient lamb loss.

Résumé des auteurs : Dans les 44 cas de mortalité des agneaux étudiés, on a isolé cinq espèces de Corynebactéries dont on a identifié quatre espèces : *C. pyogenes*, *C. pseudotuberculosis*, *C. renale* et *C. equi*. 13 isolements sont des bactéries diphtéroides non-identifiées, mais considérées comme des espèces intermédiaires d'importance inconnue. Les *Corynebacteria* sont responsables de l'avortement, de la pyaemie, de la pneumonie, de la péricardite, de la méningite, des abcès cérébraux, de l'hépatite et sont vraisemblablement la cause de la mortalité post-parturiente précoce.

IBAH/67 14. AHMED, A. A. S., BAHGAT MOSTAFA, A. M., SOLIMAN, M. K. **Studies of Spirochaetosis in Fayoumi Chickens. The Pathology of experimental Spirochaete Infection.** (La Spirochaetose chez les volailles Fayoumi. Etude sur la pathologie d'infection expérimentale.)
J. Vet. Sci. U.A.R. (1965), **2**, 25.

Authors' summary : The pathological picture of experimental spirochaetosis in the native Fayoumi chickens was studied.

The outstanding changes involved primarily the spleen, liver, kidneys and intestine. The frequency of involvement of the different organs in the pathological process was as follows : spleen, 100% ; liver, 87·5% ; intestine, 83·3% ; kidneys, 79·1% ; lungs, 75% ; heart, 66·6% ; and pancreas, 12·5%. The characteristic features of the microscopic picture were hyperaemic, degenerative and inflammatory processes.

The significance of the pathological changes as an aid for the diagnosis of the disease in dead birds was concluded.

Résumé des auteurs (abrégé) : Les changements salients concernent surtout la rate, le foie, les reins et les intestins. L'incidence des lésions dans les tissus est : la rate, 100%, le foie 87,5%, les intestins 83,3%, les reins 79,1%, les poumons 75%, le cœur 66,6% et le pancréas 12,5%. Les caractéristiques microscopiques des changements sont : des processus dégénératifs, inflammatoires et de l'hyperaemie.

On souligne l'importance de la pathologie dans le diagnostic de la spirochaetose chez les volailles mortes.

IBAH/67 15. NASH, T. A. M., JORDAN, A. M., BOYLE, J. A. **A Promising Method for Rearing *Glossina austeni* (Newst.) on a Small Scale, Based on the use of Rabbits' Ears for Feeding.** (Une méthode prometteuse d'élevage de *Glossina austeni* (Newst.) par l'emploi des oreilles de lapin pour leur nourriture.)
Trans. Roy. Soc. Trop. Med. Hyg. (1966), **60**, 183.

Authors' summary : By manually applying cages to the ears of ordinary rabbits and coaxing the tsetse flies to feed, we have for the first time approached the full reproductive potential of *G. austeni* and reared an insect which does not seem to be physically inferior to that found in nature.

The tedious coaxing process has been overcome by strapping cages to the ear of lop-eared rabbits, but at a small loss in pupal weight.

Our preliminary findings suggest that a method has been found which should enable a research worker to keep his own small colony of tsetse and achieve an excellent survival rate for trypanosome transmission experiments.

Résumé des auteurs : En appliquant manuellement des cages contenant des mouches tsé-tsé aux oreilles du lapin ordinaire et en incitant les mouches à piquer, on a réussi pour la

première fois à atteindre le potentiel reproductif maximum de *G. austeni* et à reproduire un insecte qui ne semble pas être inférieur à celui que l'on trouve dans la nature.

L'incitation, qui est un processus long et lassant, a pu être évitée en attachant la cage avec une courroie à l'oreille des lapins de races à oreilles longues. Néammoins, il y a une petite perte de poids des pupae.

Nos constatations préliminaires nous permettent de croire qu'il s'agit donc d'une technique grâce à laquelle un chercheur peut établir sa propre colonie de mouches tsé-tsé et obtenir un bon degré de survie chez les insectes destinés aux expériences de transmission de trypanosomes.

IBAH/67 16. FRANCIS, J. **Resistance of Zebu and other cattle to Tick Infestation and Babesiosis with special reference to Australia : an Historical Review.** (Résistance du zébu et d'autres races bovines à l'infestation par les tiques et à la babésiose, en ce qui concerne spécialement l'Australie. Un examen historique.)
Br. Vet. J. (1966), **122**, 301.

Author's summary : The gradually accumulated knowledge concerning the relatively high resistance of zebu-type cattle and their crosses to a number of diseases and adverse environmental conditions is reviewed and related to recent findings which show that Droughtmaster cattle carry about ten times fewer ticks than cattle of British breeds. Zebu-type cattle are also considerably more resistant to babesiosis. Events when Queensland herds were first infected with ticks and babesiosis clearly show that, within a breed, bulls were most and calves least susceptible to babesiosis.

These facts concerning disease resistance are considered to be important in relation to the development of cattle industries in tropical countries.

Résumé de l'auteur : L'étude passe en revue les connaissances graduellement accumulées concernant la résistance relativement élevée des races zébu et croisées de zébu à diverses maladies et aux conditions écologiques défavorables. Il les relationne avec les constatations récentes montrant que la race nommée " Droughtmaster " porte une densité de tiques dix fois moindre que les races exotiques britanniques. De plus, les races zébu sont plus résistantes à la babésiose. Il est apparu clairement qu'à l'époque où les troupeaux du Queensland ont été infestés d'abord par les tiques, et ensuite par la babésiose, c'était dans une race *per se* les taureaux qui se sont montré les plus réceptifs et les veaux qui ont été les moins prédisposés à la babésiose.

Ces faits, concernant la résistance à la maladie, sont considérés comme importants du point de vue du développement des industries animales dans les pays tropicaux.

IBAH/67 17. VERSTER, A. **Cysticercosis, Hydatidosis and Coenurosis in the Republic of South Africa.** (Cysticercoses, hydatidoses et coenuroses en République d'Afrique du Sud.)
J. S. Afr. vet. med. Ass. (1966), **37**, 37.

Author's summary : 1. The incidence of cysticercosis was determined from data submitted by 121 abattoirs covering a period varying from four to six years.

(*a*) *Cysticercus bovis* has an average incidence of 3·031% in the Republic, with the highest average incidence, 6·946%, in the Transvaal Bushveld.

(*b*) *Cysticercus cellulosae* has an average incidence of 1·479%, with the highest regional incidence, 2·907%, in the Middleveld.

2. The incidence of hydatidosis, based on data from 40 abattoirs for periods varying from eight to 24 months, is about 1% in all species of slaughter stock. The following regions have the highest average incidence:

(*a*) Eastern Cape Province, 13·67%, in cattle.

(*b*) Western Cape Province, 3·55%, in sheep and 5·93% in pigs.

Résumé de l'auteur : 1. Les données de 121 abattoirs sur les cysticercoses animales pendant une période allant de quatre à six ans ont été examinées pour déterminer les incidences par espèces et par provinces.

a) *Cysticercus bovis* a une incidence moyenne de 3,031% dans la République; la plus haute incidence moyenne est dans le Bushveld du Transvaal, avec 6,946%.

b) *Cysticercus cellulosæ* a une incidence moyenne de 1,479% et la plus haute incidence moyenne est dans le Middleveld avec 2,907%.

2. L'incidence des hyatidoses, basée sur les données de 40 abattoirs pour des périodes variant de huit à 24 mois est d'environ 1% dans toutes les espèces de bêtes abattues. Les régions suivantes ont les plus hautes incidences moyennes :

a) Province Orientale du Cap : 13,67% chez les bovins.

b) Province Occidentale du Cap : 3,55% chez les moutons et 5,93% chez les porcins.

IBAH/67 18. HOLMAN, H. H., DEW, SALLY M. **The Blood Picture of the Goat.** (Etudes hématologiques chez les chèvres.) *Res. Vet. Sci.* (1966), **7**, 276.

Authors' summary : Moving averages of 10 goats bled each month for three years suggested the following seasonal changes. Packed cell volumes were higher in the late summer and autumn, and this was reflected in higher values for erythrocyte counts, haemoglobin values, viscosity and the sp. gr. of whole blood. The leucocyte counts were higher in spring and the sp. gr. of plasma was highest in summer. Coagulation time was quickest in autumn. Body-weight, M.C.V., M.C.H.C. and fragility varied irregularly.

Changes during pregnancy were indefinite and were limited to a quicker rise in body-weight and a quicker fall in leucocyte count with some low viscosity values in the fourth and fifth month. At parturition there was an increase in viscosity extending from the day before to the day after kidding, and the only suggestion of stress was a slight increase in leucocyte counts and a slight increase in neutrophyl percentage in some of the goats. During lactation changes were more definite and consisted of a fall in weight and a fall in packed cell volume over the first five months. This fall in P.C.V. was due mainly to a decrease in cell size and the fall was reflected in the haemoglobin values, the sp. gr. of whole blood and the viscosity.

A comparison between males and females showed that, after the age of three months, males had a higher erythrocyte count which was balanced by a fall in corpuscular size, so that the value for packed cell volume and haemoglobin remained similar to those of the female. The leucocyte count of males over three months in age was lower than those in the female.

Few of the above changes were definite enough to form a reliable basis for the prediction of changes that would occur on future occasions, and the cause of the wide variation between individuals remains without explanation.

Résumé des auteurs (abrégé) : Dix chèvres d'expérience ont été saignées mensuellement pendant une période de trois ans. On décrit les modifications du sang selon les saisons ; le taux d'érythrocytes, d'hémoglobine, de viscosité et de poids spécifique. On étudie également ces changements pendant la gestation et l'on fait une comparaison entre les sexes.

On conclut que peu de constatations obtenues sont assez définitives pour qu'elle puissent servir de base pour pouvoir prédire les modifications que l'on pourrait attendre en d'autres occasions. La raison des variations constatées, si diverses entre les individus d'expérience, reste inexplicable.

IBAH/67 19. SOLIMAN, M. K., ZAKI, K., SOLIMAN, F. A. **Haematological changes following administration of the tranquillizer Ro-4-0403 in Friesian Cattle.** (Les modifications haematologiques suivant l'administration du tranquillisant Ro-4-0403 aux bovins de race frisonne.) *J. Vet. Sci. U.A.R.* (1965), **2**, 37.

Authors' summary : 1. The blood picture of Friesian bulls was examined before and after the administration of various doses of Ro-4-0403 (0·5, 1·0 and 2·0 mg./kg. body weight).

2. Following the injection of this tranquillizer there was a decrease in the erythrocyte number and haemoglobin content. A momentary leucopaenia, eosinopenia, lymphopenia and neutrophilia with a shift to the left was observed. The normal blood picture was restored within 24 hours.

3. Clinically the animals were well tranquillised, their temperature dropped from 0·5–1·2° C. while the respiratory rate and pulse were slightly increased.

Résumé des auteurs : 1. Une série d'examens du sang a été pratiquée sur des taureaux de race frisonne avant et après l'administration de doses variables de ce composé tranquillisant.

2. A la suite de l'injection, on observe une diminution de densité érythrocytique et d'hémoglobine, un état transient de leucopénie, d'eosinopénie, de lymphopénie et de neutrophilie à gauche. L'état normal du sang a été rétabli en 24 heures.

3. Cliniquement, les animaux ont été bien tranquillisés ; la température du corps a baissé de 0,5 à 1,2° C et les taux respiratoires et cardiaques ont augmenté un peu.

IBAH/67 20. KASSAB, S., STEGENGA, Th. **Causes of Variation in Birth Weight of Friesian Calves.** (Les causes des variations des poids de naissance des veaux de race Frisone.)
J. Anim. Prod. U.A.R. (1964), 4, 27.

Authors' summary : The effect of sex of the calf, season of birth, gestation period, weight of dam and age of dam at calving, on birth weight was studied. This study included 302 Friesian calves.

The average birth weight of all the calves studied was 35·86 kg. Males calves were 3·04 kg. heavier than female calves. These differences were statistically highly significant.

Season of birth had no significant influence on birth weight. However, it does appear that the average birth weights of calves born in autumn were heavier than those dropped in the other seasons.

There was a general tendency that, as the gestation period for calves increased, their birth weight also increased slightly. Birth weight increased gradually as the dams weight increased. The correlation coefficients between weight of dam in different ages (2–3 years, 3–4 years and four years old and over) and birth weight of the calf were 0·399, 0·648 and 0·438 respectively. The average birth weight of calves increases with the increase of age of dam up to six years old.

Résumé des auteurs : Une étude portant sur l'influence sur le poids à la naissance, des facteurs suivants : sexe du veau, saison de naissance, période de gestation, poids et âge de la mère au moment du velage, a été faite sur 302 veaux de race Frisone.

Le poids moyen à la naissance des veaux est 35,86 kg. Les mâles pèsent 3,04 kg de plus que les femelles. Ces différences sont statistiquement hautement significatives.

La saison des naissances n'a aucune influence significative sur le poids à la naissance. Cependant, il apparaît nettement que la moyenne des poids de naissance des veaux nés durant l'automne est supérieure à celle des poids des veaux nés pendant les autres saisons.

Il y a une tendance générale à une légère augmentation des poids des naissances quand la période de gestation s'allonge. Le poids à la naissance augmente graduellement lorsque le poids des femelles augmente. Les coefficients de correction entre le poids de la mère aux différents âges (2–3 ans, 3–4 ans, 4 ans et plus) et le poids à la naissance des veaux sont respectivement 0,399, 0,648 et 0,438. Le poids moyen à la naissance des veaux augmente avec l'âge de la mère jusqu'à 6 ans.

IBAH/67 21. KASSAB, S., STEGENGA, Th. **Growth in Friesian Calves During the first year of Age (52 weeks).** (La croissance des veaux de race Frisone pendant la première année (52 semaines).)
J. Anim. Prod. U.A.R. (1964), 4, 35.

Authors' summary : Growth data on 100 heifers and 52 Friesian bull calves were used to determine the effects of birth weight, season of birth, sex and age of dam on weight gains to 52 weeks of age.

Calves that were heavier at birth were able to maintain their weight advantage through 52 weeks of age in both sexes, particularly bull calves. It must be considered that bulls were usually kept on a somewhat better feeding system than heifers. Correlation of birth weight with weight at 12, 24, 36 and 52 weeks of age were 0·514, 0·375, 0·438 and 0·443, respectively. All these correlations were highly significant. There are wide variations in the growth of calves born in autumn or in the other seasons. Average weight of autumn heifer calves at birth and at 12 months were heavier than that of other seasons. The average differences between male and female calves for birth weight and weight at 52 weeks of age were 4·1 and 44·9 kg., respectively, in favour of male calves. Bulls gained 0·112 kg. per day more than heifers, from birth to 52 weeks of age. Average gain per day from birth to 52 weeks of age, for calves born from dams 2–2–6 years of age, was 0·712 kg., and for those from the dams 2[6] years and over was 0·756 kg.

Résumé des auteurs : Les renseignements sur la croissance de 100 génisses et 52 veaux mâles de race Frisone ont été utilisés pour déterminer les effets du poids à la naissance, de la saison de naissance, du sexe du veau et de l'âge de la mère sur le gain de poids jusqu'à la 52ème semaine.

Les veaux qui étaient plus lourds à la naissance ont gardé cet avantage les 52 premières semaines dans les deux sexes, mais particulièrement les mâles. Il faut considérer que le régime alimentaire des mâles fut généralement meilleur que celui des femelles. La corrélation entre les poids à la naissance et à 12–24–36 et 52 semaines ont été respectivement de 0,514–0,375–0,438 et 0,443. Toutes ces corrélations sont hautement significatives. Il existe de grandes

variations de croissance entre les veaux nés en automne et ceux nés pendant les autres saisons. Les poids moyens des veaux femelles de l'automne, à la naissance et à 12 mois sont plus élevés que ceux des femelles nées pendant les autres saisons. Les différences des poids à la naissance et à 52 semaines, des mâles et des femelles, sont respectivement de 4,1 et 44,9 kg en faveur des mâles. Le gain de poids journalier des mâles est supérieur de 0,112 kg à celui des femelles, depuis la naissance jusqu'à 52 semaines. Le gain journalier moyen de la naissance à 52 semaines, des veaux nés de femelles âgées de deux à six ans est de 0,712 kg et celui des veaux nés de femelles de 6 ans et plus, est de 0,756 kg.

IBAH/67 22. EL MEKKAWI, F. M. **Progesterone and Pregnant Mare Serum (P.M.S.) in the Control of Lambing Percentages in Awasi Ewes.** (Utilisation du progestérone et du sérum de jument gravide (S.J.G.) dans le contrôle du pourcentage des agnelages sur les brebis de race Awasi.)
J. Vet. Sci. U.A.R. (1965), **2**, 49.

Authors' summary : 1. This study was carried out in the Sheep Research Unit at Bahtim Experimental Station. Egyptian Agr. Org.

2. The experimental animals consisted of 70 ewes and these ultimately formed one control and three treated groups.

3. Treated animals were injected S/C with 50 mg. progesterone divided into two equal portions and given on two successive days.

4. Two days later, the treated ewes were weighed and were injected with P.M.S.; the dose being calculated according to body weight. The dose levels used were 15, 20, and 25 i.u. P.M.S. per kilogram body weight for the treated groups II, III and IV respectively.

5. The total conception rate percentages were 89·4, 100 and 89·4 in the treated groups, while it was only 80 in the control group.

6. The lambs born per 100 ewes lambing were 105, 141 and 121 in the treated groups respectively and was 80 in the untreated group.

7. The estimated 20 i.u. P.M.S. per kilogram body weight is the most suitable dose level recommended for increasing both lambing and lambing percentages.

Résumé de l'auteur : 1. Cette étude a été entreprise à la section de recherches sur les ovins à la station expérimentale de Bahtim (Egyptian Agr. Org.).

2. Soixante dix brebis furent séparées en un lot témoin et trois lots traités.

3. Les animaux traités reçurent une injection de 50 mg de progestérone en sous-cutanée; cette dose, divisée en deux parties égales, a été injectée deux jours de suite.

4. Deux jours plus tard, les femelles traitées furent pesées et reçurent une injection de S.J.G.; la dose étant calculée suivant le poids vif. Les doses inoculées dans les groupes II, III et IV furent repectivement de 15, 20 et 25 UI S.J.G. par kilo de poids vif.

5. Le taux de conception dans les groupes traités fut de 89,4, 100 et 89,4, tandis qu'il fut seulement de 80 dans le groupe témoin.

6. Le nombre d'agneaux nés pour 100 brebis fut respectivement de 105, 141 et 121 dans les lots traités et de 80 dans le lot témoin.

7. La dose de 20 U.I. de S.J.G. par kilo de poids vif est recommandée pour augmenter le nombre des agneaux et le pourcentage d'agnelage.

IBAH/67 23. ABDEL-RAOUF, M., EL-NAGGAR, M. A. **Studies on Reproduction in Camels (*Camelus dromedarius*). The morphology of the camel spermatozoon.** (Etude sur la reproduction des chameaux (*Camelus dromedarius*). La morphologie des spermatozoïdes de chameau.)
J. Vet. Sci. U.A.R. (1965), **12**, 1.

Authors' summary : The morphological study of the camel spermatozoon revealed that it is generally smaller than that of the other animals. The head is short and narrow. The acrosome is shorter than that of the buffalo and the bull. The middle piece is strikingly short and reaches half the length of that of the bull. The main tail piece, tail and total length are shorter than those of other animals.

The text includes detailed figures concerning the different measurements in comparison to other domestic animals.

Résumé des auteurs : L'étude morphologique du spermatozoïde de chameau montre qu'il est généralement plus petit que celui des autres animaux. La tête est courte et étroite,

L'acrosome est plus court que celui du buffle et du taureau. La pièce intermédiaire est nettement courte et atteint la moitié de la longueur de celle du bœuf. La pièce principale, la queue et la longueur totale sont plus courtes que celles des autres animaux.

Le texte comprend des tableaux détaillés des différentes dimensions, comparées à celles des autres animaux domestiques.

IBAH/67 24. SIMONETTA, R., MOLINARI, G. **Influence of homogenised centrifuged egg yolk semen diluent on the fertility of cattle.** (Influence du diluant de sperme au jaune d'œuf centrifugé et homogénéisé sur la fertilité des bovins.)
Brit. Vet. J. (1966), **122**, 248.

Authors' summary : The fertility rates in cattle inseminated with semen diluted in standard egg yolk-citrate diluent and in homogenised centrifuged egg yolk (U.O.C.) diluent were compared, the semen being used on a split-sample basis on the second and third days after collection. Significant improvements in the pregnancy rates were obtained on both days of use with U.O.C. diluent; the standard diluent showed a significant drop in the pregnancy rates from the second to third day of use whereas with the U.O.C. diluent there were no significant differences over this storage period.

The survival and motility of bovine and human spermatozoa have been found on *in vitro* tests to be higher in a centrifuged yolk-citrate-antibiotic diluent prepared from homogenised egg yolk than in the traditional yolk-citrate-antibiotic diluent (Simonetta, Molinari and Panazzolo, 1965). This was observed in studies with yolks from normally-laid hen eggs, with yolks obtained from hen ovaries, and with yolks from domestic Japanese quail eggs. In view of these observations it was decided to investigate the effect on fertility in cattle of this diluent prepared by the homogenisation and centrifugation technique (U.O.C. = uovo omogeneizzato centrifugato, or homogenised centrifuged egg yolk). Preliminary results from this investigation have been already published (Simonetta, Molinari and Panazzolo, 1964).

Résumé des auteurs : Le taux de fertilité des vaches inséminées avec du sperme dilué avec le diluant standard au jaune d'œuf-citrate a été comparé avec du sperme dilué avec un diluant au jaune d'œuf centrifugé et homogénéisé (U.O.C.); c'est le même échantillon de sperme divisé en deux parties qui est utilisé, le deuxième et le troisième jour après la récolte. Une amélioration significative du taux de fécondité a été observée, les deux jours, avec le diluant U.O.C. Le diluant standard provoque une chute significative du taux de fécondité du second au troisième jour d'utilisation, tandis qu'avec le diluant U.O.C., il n'y a aucune différence significative au cours de cette période de conservation.

La survie et la mortalité des spermatozoïdes bovins et humains se sont montrées plus élevées *in vitro*, dans le diluant jaune d'œuf-citrate-antibiotique centrifugé préparé à partir de jaune d'œuf homogénéisé qu'avec le diluant jaune d'œuf-citrate-antibiotique traditionnel (Simonetta, Molinari et Panazzolo, 1965). Ceci a été observé au cours d'études avec des jaunes d'œufs provenant d'œufs pondus normalement par les poules, avec des jaunes d'œufs provenant des ovaires de poules et avec les jaunes provenant d'œufs de cailles domestiques japonaises. En raison de ces observations, il a été décidé de rechercher l'effet sur la fertilité chez les bovins de ce diluant préparé par la technique d'homogénéisation et de centrifugation (U.O.C. = uovo omogeneizzato centrifugato ou jaune d'œuf centrifugé homogénéisé). Les résultats préliminaires de cette recherche ont déjà été publiés (Simonetta, Molinari et Panazzolo, 1964).

IBAH/67 25. BAICOIANU, C., DIMOFTACHE, C. **Microspectrophotometrical researches aimed at assessing the amount of Feulgen reaction positive material (A.D.N.) in spermatozoa from stored semen of rams.** (Recherches microphotométriques pour la détermination de la quantité de matériel Feulgen positif (A.D.N.) des spermatozoides du sperme conservé de bélier.)
Rev. Zootech. med. vet. (1966), **7**, 44.

Authors' summary : The contents of the A.D.N.-Feulgen material of the spermatozoa of ram semen stored at + 4° C. was studied. The essay took place on the harvesting, the first and fifth day by means of a microspectrophotometer with visible spectrum; with this aim in view the smears were 10% formalin-fixed and submitted to the Feulgen reaction.

The findings showed the consistency of the A.D.N.-Feulgen material in the spermatozoon

head on the harvesting day and the first day, while a drop occurred on the fifth day expressed by a 35·02% decrease to 567 millimicrons.

These results agree with the literature data, which advocate for the existence of a relationship between the decrease in the A.D.N.-amount in the spermatozoon, the increased embryo mortality and the reduced fertility following artificial insemination with stored semen.

Résumé des auteurs : On a étudié le contenu du matériel A.D.N.-Feulgen des spermatozoides du sperme de bélier conservé à + 4° C. Les déterminations ont été faites le jour du prélèvement, le premier et le cinquième jour de conservation, à l'aide de la microphotométrie en spectre visible ; dans ce but les frottis ont été fixés dans du formol 10% et colorés par la méthode de Feulgen.

Les résultats démontrent la constance de la quantité de matériel A.D.N.-Feulgen de la tête du spermatozoide le jour du prélévement et pendant le premier jour de conservation ; le cinquième jour cependant survient une baisse, exprimée par la diminution de l'extinction de 35,02% pour 567 millimicrones.

Les résultats concordent avec ceux de la littérature, qui indiquent une relation entre la diminution de la quantité d'A.D.N. du spermatozoide, l'augmentation de la mortalité embryonnaire et la baisse de la fertilité dans les ensemencements artificiels avec du sperme conservé.

IBAH/67 26. ALTONA, R. E. **Urea and biuret as protein supplements for range cattle and sheep in Africa.** (Urée et biuret utilisés comme supplément azoté sur les bovins et les moutons élevés en ranching en Afrique.)
Outlook Agr. (1966), **5**, 22.
(*Trop. Abstr.* (1966), **21**, 416.)

Author's summary : Since African pastures are deficient in crude protein for 5–9 months of the year, attempts to compensate for this deficiency by supplementary feeding of a non-protein N source were undertaken in the Republic of S. Africa. Adding urea to the diet has given good results, but its toxicity has to be reduced by adding molasses which is converted into acids in the rumen. The mixture has been successfully fed to cattle and sheep by spraying it into dryveld or hay, as a lick, and in form of blocks. However, certain precautions have to be taken and even then poisoning is not always avoided. A better, though more expensive, N source was found in biuret. It is non-toxic and has a neutral taste that does not affect the palatability of any feed to which it is added. It can be fed by adding it to a normal salt/phosphate lick or by mixing it with maize and salt as a supplement for stock fed on roughages.

Résumé de l'auteur : Puisque les pâturages africains manquent de protéines bruts pendant 5–9 mois de l'année, des essais pour compenser cette déficience par une supplémentation avec une source d'azote non protéique ont été entrepris dans la République d'Afrique du Sud. L'apport d'urée au régime a donné de bons résultats, mais la toxicité doit être réduite en ajoutant des mélasses qui sont transformées en acide dans le rumen. Ce mélange a été utilisé avec succès, pour nourrir des bovins et des moutons, en le pulvérisant sur le pâturage ou sur le foin, et sous forme de pierre à lécher. Cependant, certaines précautions doivent être prises et, même alors, des empoisonnements ne sont pas toujours évités. Une meilleure source d'azote, bien que plus onéreuse, a été trouvée dans le biuret. Il n'est pas toxique et son absence de goût ne change pas l'apétabilité de l'aliment auquel il est ajouté. Il peut être donné en l'ajoutant aux pierres à lécher salées et phosphatées habituelles ou en le mélangeant au maïs et au sel donnés comme supplément au bétail alimenté avec des fourrages grossiers.

IBAH/67 27. ABOU-RAYA, A. K., ABOU-HUSSEIN, E. R. M., GHONEIM, A., RAAFAT, M. A., MOHAMED, A. A. **Effect of Ca $(OH)_2$ and Na OH Treatments on the Nutritive Value of Maize Stalks, Sorghum Stalks and Dry Sweet Potato Vines.** (Effets de traitements par Ca $(OH)_2$ et Na OH sur la valeur nutritive des tiges de maïs, de sorgho et des feuilles sèches de patates douces.)
J. Anim. Prod. U.A.R. (1964), **4**, 55.

Authors' summary : Maize stalks, sorghum stalks and dry sweet potato vines were treated with 1·5% Ca $(OH)_2$—Method 1 (soaking, washing and feeding wet), and Method 2 (soaking, draining and drying) and with NaOH, Method 3 (soaking, washing and feeding wet). Twelve digestion trials with duplicate sheep were performed, four with each material using clover hay as a basal ration. The treatments increased appreciably the starch value of the

residues, the increase being higher with NaOH than the other two $Ca(OH)_2$ methods which practically have the same effect. The differences among methods and plant residue and the interaction were statistically studied using the net starch value produced. With the three materials, $Ca(OH)_2$ has practically similar net effect as NaOH, but the former is cheaper and more preferable in practice.

Résumé des auteurs : Des tiges de maïs et de sorgho et des feuilles sèches de patates douces ont été traitées avec 1,5% de $Ca(OH)_2$ — Méthode 1 (trempage, lavage, distribution humide), Méthode 2 (trempage, égouttage et séchage) et avec Na OH, Méthode 3 (trempage, lavage et distribution humide). Douze essais de digestion avec des séries de deux moutons ont été faits, quatre avec chaque produit et en utilisant du foin de trèfles comme ration de base. Les traitements augmentèrent de façon appréciable la valeur amidon de ces résidus, l'augmentation étant plus élevée avec Na OH qu'avec les deux méthodes à la $Ca(OH)_2$ qui pratiquement eurent le même effet. Les différences entre les méthodes et leur action sur les résidus de plantes ont été statistiquement étudiées en utilisant la valeur amidon nette. Avec les trois produits, $Ca(OH)_2$ a pratiquement le même effet que Na OH, mais le premier est moins onéreux et plus facile à utiliser.

IBAH/67 28. TĂRĂBOANTĂ, GH., CUCU, JULIETA ; GRINEANU, A. **The effect of Green Maize crop grown together with soya-bean on Milk Yield in Dairy Cows.** (L'action du maïs fourrager cultivé en mélange avec le soya sur la production laitière.)
Rev. de Zootech. si med. vet. (1966), 6, 42.

Authors' summary : An experiment was conducted at the Podu-Iloaei pilot station on 55 dairy cows aimed at determining the effect of maize green crop grown together with soya-bean. The animals were distributed into two lots—a control and an experimental lot—in such a way that the control lot of the first part of the experiment became, in the second part of the test the experimental lot, and vice versa.

From the results obtained it can be concluded that the rations administered to dairy cows having a 14-litre average daily output of milk can include maize green crop grown together with soya-bean in amounts of 35 to 50 kg.

The administration of maize green crop grown together with soya-bean results in 6·9 to 12·9% increases as against the control period, while the control lot which received maize green crop (alone) registered a 6·3 to 8·6% decrease in milk output. Maize sowing together with soya-bean corresponds to the weather conditions existing in Moldava, and results in increases of some 28 to 30 t./hectare. This mixture can be fed to dairy cows subsequent to winter fodder.

Résumé des auteurs : Dans le but de déterminer l'action du maïs fourrager cultivé mélangé avec le soya, les auteurs ont expérimenté sur 55 vaches laitières de la Station expérimentale agricole Podu-Iloaei. Ces 55 vaches ont été réparties en deux groupes — un lot témoin et un lot expérimental — de telle manière que le lot témoin de la première partie de l'expérience est devenu le lot expérimental de la seconde partie de l'expérience et inversement, le lot expérimental de la première partie de l'expérience devenant le lot témoin de la seconde.

A la suite des résultats obtenus, on peut conclure que dans la ration des vaches laitières ayant une production moyenne de 14 litres de lait par jour, le maïs fourrager cultivé en mélange avec le soya peut y être introduit en quantité de 35 à 50 kg.

Le maïs fourrager cultivé en mélange avec le soya permet d'obtenir une augmentation de la production laitière de 6,9 à 12,9% par rapport à la période de contrôle, tandis que pour le lot témoin nouri seulement avec du maïs fourrager (sans soya) la production laitière a diminué de 6,3 à 8,6%.

La culture du maïs en mélange avec le soya correspond aux conditions climatiques de la Moldavie où elle fournit des productions d'environ 28 à 30 t/ha ; elle peut être utilisée pour l'alimentation des vaches laitères après la vesce de printemps.

IBAH/67 29. KHATAR, A. R., ISKANDER, M., HOSNY, Z. **Pathological Study of a Disease Affecting Donkeys in U.A.R.** (Etudes sur la pathologie d'une maladie chez les ânes en République Arabe Unie.)
Seventh Arab Veterinary Congress, 1966.

Authors' summary : Since the beginning of the last decade, a nervous disease affecting donkeys has been recognised in United Arab Republic. The disease appears usually in form of outbreaks, which differ in severity from one year to another. The first cases used to be

observed in late-autumn and the disease usually disappears in early winter. The affected donkeys manifest symptoms indicating a severe central disorder.

The purpose of this work is to study the characteristic pathological changes, particularly of nervous system in this disease and to compare them with those of other known nervous diseases of equine.

Brains and other internal organs of 42 donkeys died or sacrificed after manifestation of typical symptoms were examined. Materials were mainly collected during the outbreak of the year 1965.

On post-mortem examination, gross lesions were mainly localised in the brain. It revealed in majority of cases certain degree of œdema and congestion of superfecial blood vessels. The most significant macroscopic changes were, however, bilateral or unilateral softened areas which not infrequently showed evidence of haemorrhages (haemorrgagic encephalomalacia). Lesions were mostly found in central white matter of cerebrum and in some cases they could be located in basal ganglia and region of mid-brain. Areas of encephalomalacia were recorded in about 70% of brains examined by naked eye.

On microscopical examination typical areas of malacia were the predominant findings. Changes in wall of blood vessels, perivascular haemorrhages, plasma exudation, demyelination, swelling of axis—cylinders liquefaction, cavities formation and marked cellular reaction constituted the main characteristics of pathological picture in the brain. Changes in other internal organs were particularly observed in liver and kidneys, as varying degrees of serous hepatitis and nephrosis.

Described pathological picture does not resemble that of any known encephalitis of equines. It resembles, however, that described in mouldy corn disease. Gross and histopathological findings as well as results of epidemiological investigations suggest incrimination of mouldy corn as the cause of a nervous disease affecting donkeys in U.A.R. Further experimental work is still under investigation.

Résumé des auteurs (abrégé) : Une maladie nerveuse des ânes est connue en République Arabe Unie depuis dix ans. Elle éclate dans des foyers d'une intensité variable d'une année à l'autre. Commençant vers la fin de l'automne, elle disparait vers le début de l'hiver. Les manifestations, chez les ânes atteints, indiquent un désordre nerveux grave. Cette étude traite de la pathologie caractéristique et la compare avec d'autres maladies nerveuses équines.

Les prélèvements des cerveaux et d'autres organes, dans 42 cas de bêtes mortes ou sacrifiées après des manifestations typiques, ont été faits durant le foyer qui éclata en 1965. Les lésions macroscopiques sont localisées surtout dans le cerveau. Elles sont décrites en détail, ainsi que les modifications microscopiques des tissus.

Ces manifestations lésionelles ne sont pas en rapport avec les autres encéphalites équines connues, mais elles ressemblent à celles décrites dans les cas de toxicité mycotique par les céréales.

IBAH/67 30. HIRST, S. M. **Immobilisation of the Transvaal Giraffe (*Giraffa Camelopardalis Giraffa*) using an Oripavine Derivative.** (L'immobilisation de la girafe du Transvaal (*Giraffa Camelopardalis Giraffa*) à l'aide d'un dérivé d'Oripavine.)
J. S. Afr. vet. med. Ass. (1966), **37**, 85.

Author's summary : 37 Transvaal giraffes (*Giraffa camelopardalis giraffa*) of varying ages and sizes were immobilised using the oripavine derivative M183 (Reckitt). The drug was administered by means of projectile darts shot from a crossbow.

Reactions were favourable, and subsequent capture and loading were easily accomplished. Optimal dosage rate was 1 mg. per 200 to 400 lb. live weight. Animals came under the maximum effects from 4 to 8 minutes after drug administration. Nalorphine hydrobromide was used as an antagonist, and recovery took from 20 to 110 seconds after intravenous administration.

M183 is regarded as a valuable advance in immobilising drugs, particularly for ungulates such as giraffes which are normally difficult to capture and handle.

Résumé de l'auteur (abrégé) : Le composé d'Oripavine M183 (Reckitt), a été administré à 37 girafes au moyen d'une fléchette lancée par une arbalète. Les réactions immobilisantes sur les animaux de divers âges et tailles sont favorables. Le dosage optimum semble d'environ 1 mg/100 kg et l'effet maximum est atteint en 4 à 8 minutes. Le composé M183 est considéré comme le meilleur à l'heure actuelle, surtout dans le cas des ongulés difficiles à capturer.

STRC/OAU

INTER-AFRICAN BUREAU FOR ANIMAL HEALTH
BUREAU INTERAFRICAIN DE LA SANTE ANIMALE

STAFF LIST/PERSONNEL DU BUREAU

Director/Directeur

OSMAN M. M. OSMAN, B.V.Sc. (Cairo)
Vet. Brigadier (retd.)

Deputy Director/Directeur Adjoint

P. G. ATANG, B.V.M.S. (Glas.)—M.R.C.V.S., D.T.V.M. (Edin.)

Deputy Director/Directeur Adjoint

One vacancy/Une vacance

Bilingual Secretary/Secretaire Bilingue

One vacancy/Une vacance

Clerical Assistant/Aides de bureau

J. K. KAMAU

Stephen Austin & Sons Ltd
[illegible]

1967

Bulletin of Epizootic Diseases of Africa Bulletin des Epizooties en Afrique Vol XV No I

OAU/STRC

OAU/STRC