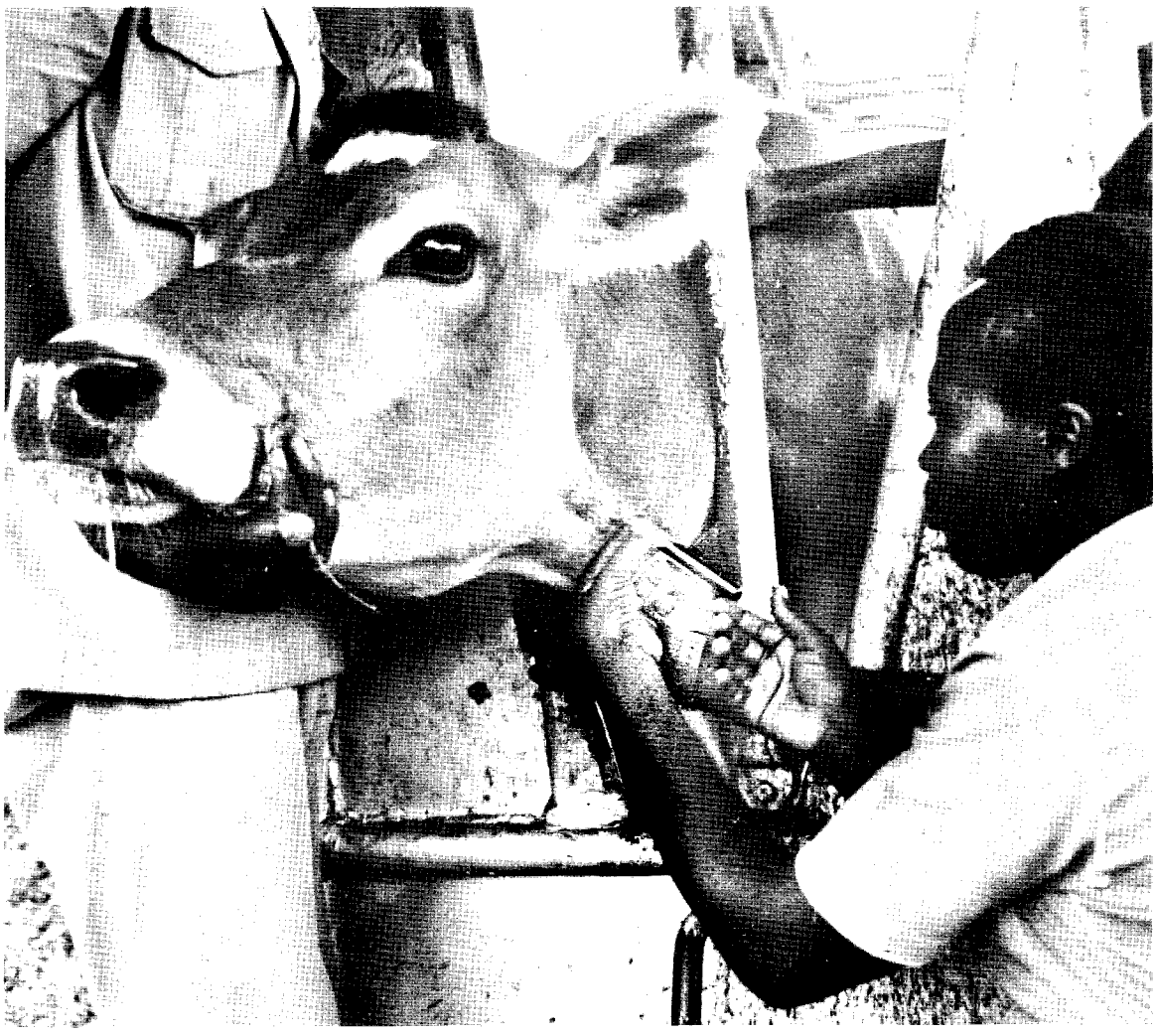

Section 2

Animal Health

Research for the Control of Draught Animal Diseases in West Africa: Needs, Experiences and Methods

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Abstract

Considering the differences in ecological factors and husbandry systems in which the various species and breeds of draught animal survive and function, there will be corresponding variations in draught animal diseases in West Africa. Animals survive in a suboptimal productive state in conjunction with the stress caused by tropical diseases on the one hand and poor nutrition on the other. Exploitation of draught power from these animals is possible only when disease is brought under control. Most West African cattle are dual purpose breeds. Farmers manage them as a group, and almost always select animals for draught work from within their stock. Under such a system of animal husbandry, research for the control of draught animal diseases should be broad enough to encompass all bovids and equids and possibly camelids irrespective of the purpose for which they are maintained. Nevertheless, research relating to the control of those diseases that are specific to draught animals, as well as those problems for which draught work acts as a predisposing factor, must be pursued simultaneously.

Reference is made to a number of health problems of cattle known to occur in West Africa. They include rinderpest, contagious bovine pleuro-pneumonia, foot and mouth disease, trypanosomiasis, tick-borne diseases, brucellosis, endo-parasitic problems, nutritional deficiency diseases, etc. There is a scarcity of literature on diseases of draught horses, donkeys and camels.

Research priorities for the control of draught animal diseases in West Africa and the epidemiological approach to disease control are discussed.

Introduction

Numerous differences can be noticed in draught animals used in West Africa. Some countries use only cattle for draught work (Benin, Côte d'Ivoire, Liberia, Sierra Leone, Togo, etc,) whereas others use cattle, horses and donkeys (The Gambia, Senegal, Mali, etc). The use of camels is also becoming popular in certain countries (Burkina Faso, Chad, Niger and Nigeria). Among the countries using cattle, some use the humpless taurine breeds, while others use the humped Zebu breeds. Utilisation of the humped, the humpless and their various crosses for draught work can also be seen in certain parts of West Africa. The breeds of cattle used for draught work are too many to list, but most important among them are the N'Dama, the Azaouak, the Shuwa, the Sakota, the Admawa, the Fulani, the Borgou and the many subbreeds and crossbreeds of the humped and the humpless.

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The ecology of West Africa ranges from the humid rain forest and the tropical grass savannah to the semi-arid conditions. Consequently, the cropping and animal husbandry practised also vary and include the bush-fallow, the agropastoralist and the mixed crop-livestock husbandrymen. In other words, the draught animal disease situation of West Africa can vary considerably depending upon the species of animal, the breed, ecological factors and the husbandry system in which they are maintained.

In most countries of West Africa, farmers select draught animals from within their stock or purchase from the stock of their neighbour. The state of health of such draught animals will depend greatly upon the disease situation of the herd from which they are chosen. It is well recognised that draught animals should be selected from disease-free herds, if they are to be kept for long term benefits. Further, in many husbandry systems of West Africa, livestock especially cattle are maintained as dual/multipurpose animals (milk/meat/draught) and even

when distinctions exist, animals are either housed together or are managed as a group. Under such a system of animal husbandry, it is unrealistic to consider the control of diseases of draught animals separately from the stock of their origin and/or co-existence. Therefore, research for the present should be broad enough to encompass all bovines and equines and possibly camels irrespective of the purpose for which they are maintained. Nonetheless, research relating to the control of those diseases that are specific to draught animals, as well as those problems for which draught work acts as a predisposing factor must be pursued simultaneously.

This paper has adopted such a view and therefore, research relating to the control of draught animal diseases discussed are not necessarily confined to work animals. Further, for lack of information on the diseases of horses, donkeys and camels used for draught work in West Africa, this paper focuses mainly on bovids.

Research Needs

Livestock survival ability rather than productive ability is the dominating factor in most of the management systems practised in West Africa. Therefore, animals survive in a sub-optimal productive state in conjunction with the stress of tropical diseases on the one hand and poor nutrition on the other. Any effort to increase their productivity (milk/meat/draught) under the situation can upset their physiological equilibrium and lead to catastrophic results. Therefore, exploitation of draught power from these animals is possible only when disease is brought under full control. In other words, animal traction development initiatives should follow and take advantage of the achievements in disease control programmes.

Disease problems of work oxen (N'Dama) purchased from a different area and/or moved from one area to another were stressed by the group discussing work animal management and health during the 2nd West Africa Animal Traction Network Workshop (group discussion 1988). The group noted that death of a work animal can have serious effects on farmer and the surrounding farming community. The farmer will not only lose his capital but also his confidence in animal traction technology, thus creating a detrimental effect on the adoption rate of animal traction in the area. Work animals being sick and unavailable for work can also have similar effects. The group noted with concern that vaccinations against contagious and communicable diseases were often not on a regular basis, given the weak linkage between animal traction projects and the veterinary and animal husbandry departments. Other results of weak linkage include poor management of draught animals, low work output, and even death at village level.

Work animals are equally at risk from all the epidemic diseases that ravage the region. Although much research has already been done and information is available from both Africa and elsewhere on the control of epidemic diseases through vaccination, etc, their effectiveness in West Africa has not been very satisfactory. Therefore, diseases like rinderpest (RP), contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD) and African horse sickness still persist and pose great threats to the introduction and intensification of draught animal programmes.

Present knowledge is limited on the thermoregulation of farm animals working in a thermally stressful environment. The environmental heat load becomes much more severe whenever animals work or their activity level increases (Yousef and Maloiy 1985). Veterinarians must be familiar with the symptoms of heat-stress since they may frequently be similar to symptoms of disease and, in any case reduce the resistance of the animal to diseases (James 1981).

Draught work can also act as a stress factor reducing resistance to many diseases prevalent in West Africa, including trypanosomiasis and many endoparasitic problems. Although the West African N'Dama commonly used for draught work in Liberia, Sierra Leone, Guinea and Ivory Coast possess a certain tolerance to trypanosomiasis, it is by no means absolute. Depending upon the severity of disease challenge, the nutritional status, the production stress and the immune state of the animal, N'Dama can exhibit symptoms of trypanosomiasis such as debility, anaemia, abortion, unproductiveness and even death (Murray et al 1984). Factors affecting the susceptiblilty of N'Dama to trypanosomiasis when relocated from one area to another and when used for draught work needs further investigation. Research is also needed to improve our understanding of the phenomenon of trypanotolerance, and the connection between tsetse challenge and the incidence of the disease in a given area. For controlling trypanosomiasis, a full understanding of the field situation is important.

Although many of the endoparasitic diseases are problems of younger stock, diseases can occur in adults when nutrition is poor and they are under production/work stress. In developing countries of the tropics where hydrological developments have taken place, the prevalence of fascioliasis has increased because the intermediate host, the *Limnea*

auricularia snail, grows in dams, watering points, etc. (Preston and Castelino 1977). Animals working in rice swamps have unlimited opportunities to graze fields contaminated by metacercariae and therefore are at higher risk from fascioliasis. Effective prophylaxis of helminths at farm level is difficult, although methods of treatment are known. In the field of parasitology and entomology inventorying is a permanent task, as research on new control methods is necessarily based on ecological and biological studies.

In many other diseases such as pasteurellosis, bovine papular stomatitis (BPS), etc., the disease-causing agent may remain in the host as a latent infection, and lesions reappear when resistance of the animal is lowered due to stress of transport and/or heavy draught work. Paralytic myoglobinuria of horses and lactation tetany of mares are metabolic disorders associated with draught work (Blood et al. 1979).

Experiences

There were a total of 1,042 outbreaks of RP in Western and Central Africa during the period from 1978 to 1984. The disease ravaged 7 million head in Nigeria and 500,000 in Chad in 1983 (O.A.U./STRC 84). As an aftermath of RP there were several reports of CBPP and a few outbreaks of FMD (Nawathe and Lamorde 1986). However, the outlook for the control and eradication of RP is good but the danger can only be permanently wiped out if the present Pan African Campaign (formerly JP 15) continues to operate with the help of International Organisations, the countries involved and the livestock breeders.

The outlook is less optimistic for FMD and CBPP. The cost of vaccines alone can be a great burden to many national governments. Where infection has become endemic, there is also the question of disease eradication or disease control. Further, our understanding on the serological detection of chronic CBPP carriers for the purpose of eliminating them from the herd needs to be improved, if control programmes are to be implemented satisfactorily. Most of the existing methods are not foolproof. Slide agglutination, which is commonly used under field conditions in particular, gives rise to false positive reactions, and the variability of complement does not detect all animals that exhibit lesions. The technique of fluorescent antibodies can only be carried out by central laboratories, and is considered more an immunological than a diagnostic procedure. The combined vaccine used for RP and CBPP resulted in severe post vaccinal reaction at the site of inoculation for many and death for a few in Liberia in 1986. The vaccine for CBPP appears to be the best available with immunity lasting for about 18 months, but its production is limited and the cost is high.

With many disease problems, Africa cannot draw on the experiences of the more developed countries. As an example, let us take the scourges of trypanosomiasis and tickborne diseases. Preliminary observation on the loss of trypanotolerance of 18 N'Dama draught cattle possessing trypanosome antibodies in their serum samples, relocated from Suakoko to Zwedru in Liberia (approx. 275 km), showed parasitaemia *(T. congolense)* for 50% of the group within 4 months. The loss of trypanotolerance was attributed to the difference in *T. congolense* serodemes circulating in Zwedru to which the trypanolytic activity of animals brought from Suakoko was noticed low (Ravindran and Sachs 1989). In another experiment, the trypanolytic action of serum antibodies of N'Dama cattle of CARI/Liberia to *T. congolense* isolates derived from the same herd was noted at 60%–90%.

However, when *T. congolense* stock derived from Yanyesh (approx. 50km from CARI) was used, the lytic activity of CARI cattle serum antibodies was reduced to 50% and that of stock isolated from Avetonou/Togo was 5% (Horchner et al. 1987). This indicates that trypanolysis is based on homologous antibody serodeme complexes occurring in prescribed areas and that lytic activity may be reduced when animals come in contact with different serodemes circulating in other regions. The 18th ISCTRC meeting at Harare, Zimbabwe, in 1985 noted that trypanosomes can be neutralised by homologous immunoglobulin Igm or IgG. Further, it was also indicated that trypanosomiasis causes immunosuppression in cattle and this immunosuppression may be reversible on treatment of infected animals. These two findings are relevant in the field and should always be borne in mind, especially in large scale vaccination of cattle against other diseases such as rinderpest (OAU/STRC 1985).

The tick species of Boophilus, Dermacenter and Amblyomma, vectors of the diseases babesiosis, anaplasmosis and cowdriosis (heart water) respectively are abundant in the region. The blood sucking flies such as tabanids and stomoxys found almost everywhere cattle are raised are also implicated in the transmission of anaplasmosis. There are reports of these tick borne diseases occurring in West Africa but their prevalence and economic importance for many countries have not been evaluated. Serology on 5 different herds using fluorescent antibody test for antibody activity to *Babesia bovis B. bigemina*, *Anaplasma marginale*, *Theileria parva* and *T.*

mutans in Mali indicated that probably *B.bigemina* and *T. mutans* are the only potential problems for cattle tested (Miller 1982). Antibody activity of N'Dama to *A. marginale* was 63 to 88% and that of Zebu 92%. According to the same report N'Dama were almost twice as likely as Zebu to develop antibody activity to *B. bovis* (36% vs. 19%) and *B. bigemina* (61% vs 34%).

Among endoparasitic problems, haemonchiasis, toxocariasis and fascioliasis are important to West Africa. In tropical savannah with long dry seasons or occasional droughts, problems arise when cattle graze in marshy or swampy areas where metacercarid populations have increased towards the end of the rains. Although it is difficult to control the grazing of such areas in times when good grazing is in short supply, efforts should be made to delay the grazing of marshes as long as possible to allow some mortality of surviving metacercariae and reduction in the numbers available (Schellhorn and Veen 1977).

Diseases of lesser frequency in West Africa include pasteurellosis, clostridial infections, bovine papular stomatitis (BPS) Rift Valley fever (RVF), lumpy skin disease, brucellosis, nutritional deficiency diseases and mycotic infections. BPS causing high mortality rates was reported from northern Nigeria and was observed in cattle with severe cutaneous streptothricosis (Polwright and Ferris 1959). Laboratory aids to diagnosis are required since lesions are often mistaken for RP, FMD, mycotic stomatitis, virus stomatitis and viral diarrhoea. RVF caused by a virus and transmitted by several species of mosquitoes occurs in West and Central Africa and possibly Botswana where there is evidence of enzootic maintenance of RVF as indicated by the presence of specific antibodies in the human and domestic animal populations (Davies 1981). It is possible that many West and Central African Countries with heavy tropical forest areas have enzootic cycles for RVF. A recent outbreak of RVF is reported from Senegal River Basin with high incidences of abortion and disease in cattle, sheep and goats (Ksiazek et al 1989). Antigen prevalence was 85%. Serum samples were positive (80%) for both RVF IgG and viral specific IgM antibodies. Lumpy skin disease was reported from Nigeria in 1974 and from Chad in 1973. In Nigeria about 2000 cattle were believed affected where it occurred during the rains and ceased during the dry period (Martin 1981). It affected all breeds of cattle.

Where cows are used for AT, brucellosis is important as a draught animal disease. In West Africa, the herd prevalence rate is close to 30% (Berman 1981). In organised farms the incidence is high irrespective of whether indigenous or exotic breeds are maintained. Both in Africa and India, *Brucella abortus* biotype 1 is most frequent. In village cattle and nomadic herds abortion is uncommon but hygromas and abscesses are the major clinical signs. Incidence and abortion rate is noticed to be more related to rainfall than herd size. The joint FAO/WHO expert committee on brucellosis in its 5th report has recommended programmes for control and eradication but they are costly and require short term intensive activity and therefore are more appropriate for application in developed countries with highly organised veterinary services and financial resources. (Berman 1981). It is possible to eliminate the disease in herds by the control and eradication strategies recommended, but brucellosis-free herds in moderate or high prevalence areas are at great risk of reinfection from neighbouring herds. Therefore minimising transmission through hygienic measures is important for both intensive and traditional husbandry systems. Measures include segregation of preparturient animals and keeping them separate for a week or more after parturition, prompt disposal of aborted foetuses and placentas. Recent information on the response of adult cattle to reduced doses of strain 19 vaccine makes it possible to give emphasis to whole herd vaccination in order to produce the maximum increase in herd immunity in shortest time. Killed 45/20 vaccine can also have a useful place in the tropics.

Diseases origination from nutritional deficiencies in West Africa include osteomalacia, retarded growth and phosphorus deficiency leading to 'botulism'. The direct and indirect effects of hormonal deficiencies originating from poor nutrition are also noticed in many herds. Among mycotic infections, dermatomycosis (ringworm) is the major problem noticed in Liberia.

Methods

Few developing countries can afford the luxury of a research programme which is not primarily oriented to answer the direct needs of the farmer. Most of West Africa is comprised of a multitude of small farms; research in animal health should be geared to solving problems arising under these situations, thus taking advantage of experiences and research findings obtained elsewhere under similar conditions.

Because national animal health programmes have limited financial support, the veterinary department is often confronted with the matter of establishing priorities of veterinary research or disease control. Almost always the latter prevails over the former with the justification that much

research has already been done and much information is already available for application in the field. In reality, no such choices are feasible. There are many control and/or eradication methods recommended for diseases by international laboratories and organisations. But the decision to control or eradicate a disease should depend upon the economic importance of the underlying disease process. The economic feasibility of such a control/eradication measure should also be taken into consideration. For example, in countries where cattle take 3 to 4 years to mature and survive in areas where FMD has become endemic, it may not be economical to consider vaccination. On the other hand, those countries which export animals or meat to countries free of the disease will have to confront the problem. In such cases, the economic analysis should involve not only comparisons of potential benefits of control against no action but also evaluation of alternate control strategies.

The two methods of disease elimination are disease control and disease eradication. The obvious disadvantage of control over eradication is that a continuing effort is required. But in many cases control is the only scientifically realistic or economically feasible goal. In others, control may be the forerunner to an eventual eradication. Epidemic disease control is the highest priority required for the economically developing world (Burridge 1981). The epidemiology of epidemic diseases is relatively straightforward. Therefore, most epidemic diseases lend themselves to proven methods of control which will involve identification and treatment of cases and carriers, removal of reservoirs of infection, quarantine, sanitary measures and mass immunisation programmes.

Nevertheless, some of these diseases have not been controlled because of inadequate veterinary services and lack of financial and technical assistance. In addition, for an effective disease control programme, the veterinarian must be available to the farmer at all times. He should also play a full part in rural leadership and be willing to live in villages and small towns (McIntyre and Ristic 1981).

Many endemic diseases are epidemiologically complex with multiple factors influencing the prevalence and incidence of infection in a given herd (Burridge 1981). It is necessary to demonstrate that in any disease control programme the effect of control measures can result in direct profits to the farmer and consequential profits to the society/ government. Research on the control of diseases should follow the systems approach.

Research Priorities

Research priorities for the control of draught animal diseases in West Africa may therefore be summarised as follows:

- Epidemiological surveys to determine the prevalence, incidence and economic importance of known diseases of the region. Such surveys should also identify and analyse the influence of disease determinants on the frequency and geographical distribution of diseases.
- Economic analysis of available disease control strategies.
- Research on trypanosomiasis to improve our understanding of the phenomenon of trypanotolerance; and the connection between tsetse challenge and the incidence of trypanosomiasis. Factors affecting susceptibility of trypanotolerant cattle to further infection when relocated to another area and also when used for draught work need further clarification.
- Investigations on the extent of mineral deficiencies in draught animals. Studies for the control of mineral deficiencies using local remedies/products.
- Studies on work animal grazing systems with a view to reduce the endoparasitic burden.
- Tick control using herbal medicines such as powdered *Derris elliptica, Lonchocarpus* sp., *Pyrethrum cinerariaefolium,* etc. The toxic properties of certain species of stylosanthes on ticks also need further evaluation. The use of *Solanum acculeastrum* (goat apple/bitter apple) used as remedy for ringworm in cattle and horses needs confirmation.
- Research on stress physiology of draught animals should include thermoregulation of animals working in hot environments and the efficiency of muscular work.
- Compilation and documentation of work animal diseases in West Africa.

It is well known that research and the acquisition of knowledge should take place at a rate that exceeds the speed with which they can be applied. Power- ful social, political and economic factors can sometimes operate against the immediate ap- plication of knowledge. This interplay between the acquisition and application of knowledge determines the overall pattern of development in many countries, but lack of knowledge should be corrected so that it is not allowed to inhibit changes that are necessary economically.

Résumé

Les maladies qui affectent les animaux de trait en Afrique de l'Ouest varient avec les conditions écologiques et les systèmes d'élevage dans lesquels les diverses espèces et races animales évoluent. En raison du stress dû aux maladies tropicales d'une part et à une mauvaise alimentation d'autre part, les animaux se trouvent dans un état de productivité suboptimale. L'exploitation de la force de traction de ces animaux passe par la lutte contre les maladies. La majorité des bovins d'Afrique de l'Ouest sont des animaux à aptitude mixte. Ils sont gérés en un seul groupe et les paysans prélèvent presque toujours les animaux qu'ils utiliseront pour la traction sur leur propre cheptel. Etant donné un tel système d'élevage, le champ de la recherche en prophylaxie des maladies des animaux de trait doit être suffisamment large pour englober l'ensemble des bovidés et des équidés, et éventuellement les camélidés, quelle que soit leur finalité. Parallèlement, il convient de poursuivre des recherches sur la prophylaxie des maladies particulières des animaux de trait et sur les affections auxquelles la traction tend à prédisposer ces animaux.

Cette étude aborde certains des problèmes sanitaires qui affectent les bovins en Afrique de l'Ouest, notamment la peste bovine, la péri- pneumonie contagieuse des bovins, la fièvre aphteuse, la trypnosomiase, les maladies transmises par les tiques, la brucellose, les parasitoses, les maladies dues à des carences nutritionnelles, etc. Les maladies des chevaux, des ânes et des chameaux de traction sont, quant à elles, très peu documentées. Enfin, les domaines prioritaires de recherche sur la prophylaxie des maladies des animaux de trait en Afrique de l'Ouest sont examinés.

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