INTRODUCTION

To put the subject matter of this chapter in its proper perspective, it should first be made clear that the development of a vaccine against trypanosomiasis of cattle and sheep is perhaps the last practical possibility which would occur to most people whose daily business is concerned with the control of trypanosomiasis in the field in Africa today. The simple fact is that no one has yet evolved a technique of immunization which has been clearly shown to confer a significant degree of protection to domestic animals grazing in endemic areas.

In contrast, some considerable success has attended both the eradication of the tsetse fly vector by insecticides or bush clearing and the use of drugs with curative and prophylactic properties. Before embarking on an intensive study of immunoprophylaxis, it therefore seems desirable to consider briefly the merits and demerits of these techniques that are currently not only more efficacious but have the benefit of being immediately applicable.

The destruction of the tsetse fly by bush clearing and the use of ground or aerial insecticides has been practiced for many years with an increasing degree of sophistication. There is little doubt that tsetse flies may now be almost completely eradicated in many areas by these techniques, particularly by the use of insecticides. Unfortunately, very few areas of tsetse infestation have circumscribed boundaries, and unless cleared areas are vigorously and permanently settled, reinvasion of tsetse inevitably occurs. For a variety of reasons in the past, such settlement has not usually occurred. Perhaps the problem, i.e., the geographical and strategic use of insecticides, requires a degree of inter-African cooperation, sponsored by the United Nations, such as has led to the virtual
eradication of rinderpest in the last few years. The second control technique, chemotherapy or chemoprophylaxis with trypanocidal drugs, has been of inestimable benefit in the control of trypanosomiasis, particularly in areas on the periphery of the tsetse belts. In areas of high tsetse challenge, however, two problems arise. First, the frequency of the treatment has to be stepped up, often to economically unacceptable levels. Secondly, one is frequently faced with the eventual emergence of drug-resistant strains, and unfortunately there are relatively few trypanocidal drugs available. Possibly both of these problems could be overcome by the sophisticated administration of a program incorporating a system of monitoring the duration of prophylaxis between chemotherapy, but areas of endemic trypanosomiasis, because of the very presence of the disease, are usually undeveloped and lacking in trained personnel and laboratory facilities.

It seems to us, therefore, that neither of these techniques, as used at present, offers an ideal answer to the control of trypanosomiasis, and that there is every justification for examining the prospects of immunization. Incidentally, our remarks are confined to trypanosomiasis of domestic animals and laboratory animal model systems, although the development and exploitation of a practical vaccine for bovine and ovine trypanosomiasis would perhaps increase the incidence of disease in man in at least some areas. This potential problem, however, might be countered in the future by development of a vaccine against human trypanosomiasis.

Unfortunately, we immediately run into the problem of antigenic variation. It now seems well established (see review by Gray 1967; Goedbloed et al. 1973; Wilson et al. 1973; Dar et al. 1973) that the numbers of antigenic variants of *T. brucei*, *T. vivax*, and *T. congoiense* circulating as metacyclic (infective) trypanosomes in wild tsetse are very large indeed. Moreover, one fly may inoculate a mixture of antigenic variants on a single occasion (Dar et al. 1973). There is, it is true, considerable evidence to show that these variant antigens are responsible for the production of a very effective protective immunity, but this is directed solely against the particular variant inoculated and apparently confers no protection against other variants. On these grounds most workers have conceded that the possibility of vaccination is remote. Perhaps one should mention that this situation is also bedevilled by the fact that the detection, isolation, and serological typing of these isolates as currently practiced is laborious, inefficient, and expensive, particularly in the case of *T. vivax*, which will not readily infect laboratory animals.