

section B - abstracts

1. general (including land use)

9783 **Artzrouni, M. and Gouteux, J.-P., 1996.** Control strategies for sleeping sickness in Central Africa: a model-based approach. *Tropical Medicine and International Health*, **1** (6): 753-764.

Artzrouni: Department of Applied Mathematics (IPRA), University of Pau, 64000 Pau, France.  
Vector control and the detection (followed by treatment) of infected individuals are the two methods currently available for the control of sleeping sickness. The basic reproduction rate of a compartmental model is used to analyse and compare the two strategies. The efficiency of each strategy will depend on two epidemiologic parameters: the intrinsic contamination rate  $Q$  (closely related to the index of new contaminations) that captures the potential spread of the disease, and the intrinsic removal rate from the first stage (intrinsic to the particular trypanosome strain and to the population's susceptibility). The model shows that when the intrinsic removal rate is low (that is, when there is a long first stage characteristic of an endemic situation) the detection of sick individuals is more efficient than vector control. The situation is reversed when the removal rate is high (in an epidemic situation). The conclusions of the analysis are shown to be in general agreement with results obtained in two different sleeping sickness foci of Central Africa.

9784 **Authié, E., Cuisance, D., Force-Barge, P., Frézil, J.L., Gouteux, J.P., Jannin, J., Lancien, J., Laveissière, C., Lemesre, J.L., Mathieu-Daudé, F., Nitcheman, S., Noireau, F., Penchenier, L., Tibayrenc, M. and Truc, P., 1991 [1993].** Some new prospects in epidemiology and fight against human African trypanosomiasis. *Research and Reviews in Parasitology*, **51** (1-4): 29-46.

Authié: ILRI, P.O. Box 30709, Nairobi, Kenya.  
Researchers from ORSTOM discuss the various problems posed, and advances made, in combating sleeping sickness. Topics reviewed include: the genetic variability of *Trypanosoma brucei*; the epidemiological role of the animal reservoir; the relation between trypanotolerance in animals and man; the origin of epidemics; the evaluation of immunoparasitological screening methods; the available treatments, with special mention of eflornithine; the trypanosome cycle in *Glossina*, with reference to lectins and rickettsia-

like organisms; vector control options and the use of traps and screens and pour-on treatment of cattle; and results of large-scale vector trapping campaigns in Côte d'Ivoire, Congo and Uganda.

9785 **Ekwanzala, M., Pépin, J., Khonde, N., Molisho, S., Bruneel, H. and Wals, P. de, 1996.** In the heart of darkness: sleeping

sickness in Zaire. *Lancet*, **348** (9039): 1427-1430.

Pépin: Centre de Santé Internationale, Centre Universitaire de Santé de l'Estrie, 3001 12ème Avenue Nord, Sherbrooke, Quebec J1H 5N4, Canada.

The history and epidemiology of Gambian sleeping sickness in Zaire is described, starting in 1926 and focusing on the 1985-94 period. During the colonial era, extensive programmes were carried out to control human African trypanosomiasis (HAT) in the Belgian Congo but there were no reliable incidence data before 1926. An all-time peak of 33,562 HAT cases was reported in 1930 but the annual number of cases decreased progressively over the next three decades to about 1000 cases in 1959. Zaire became independent in 1960 and, almost immediately, several regions of the country were devastated by a civil war that continued until 1967. During this time, the public health system was disorganised and no active case-finding could be done. The country has been relatively peaceful since 1968 but mismanagement and corruption have led to a severe social and economic crisis. New cases reported rose from between 4000 and 6000 per year during 1969-81 to 10,000 per year at the end of the 1980s. With the withdrawal of most bilateral donors since 1991, the health system has largely broken down. Active case finding by mobile teams has been seriously curtailed although activities partially resumed in 1993-94. Without active case-finding, the proportion of patients detected in early-stage disease fell to less than half of the case load, resulting not only in an increase in the reservoir of infectious individuals and an enhancement of transmission, but also to a higher cost and toxicity of treatment. During 1994 case-finding surveys in the Bandundu and Equateur endemic areas, very high prevalence rates were recorded, reaching 718 per 1000 in the village of Kimbanzi. Estimation of the true incidence of HAT in Zaire in 1994 is difficult since only part of the at-risk population has been examined. However, taking all factors into consideration, a true total incidence (active plus passive detection) of 34,400 new cases is suggested. It is also estimated that as many as 15,000 undetected

patients could have died, as well as 1935 patients diagnosed but untreated because of drug shortage, and 1740 suffering from encephalopathy or treatment failure. The only way to break the epidemiological chain of transmission and reduce the human reservoir is by mass screening and treatment not only of parasitologically confirmed cases but also of serological suspects. Without such action, the epidemic may soon spill over into Congo, the Central African Republic and Angola.

9786 **Jabbar, M.A., 1994.** Evolving crop-livestock farming systems in the humid zone of West Africa: potential and research needs. *Journal for Farming Systems Research-Extension*, 4 (3): 47-60.

ILRI, Humid Zone Programme, P.M.B. 5320, Ibadan, Nigeria.

This paper assesses the status and potential of livestock development in the humid zone of West Africa and determines research needs and priorities. The incidence of tsetse flies and trypanosomiasis has been the single most important determinant of the distribution of livestock. However, some breeds of cattle, goats and sheep have developed trypanotolerance. Changing climatic patterns, land and bush clearance for agriculture due to population pressure, and tsetse control programmes have contributed to an expansion of the tsetse-free areas. This has resulted in the humid zone now having several times more cattle and small ruminants than two decades ago, and an increasing number of these cattle are trypanosusceptible Zebus. Cattle production systems are discussed. Crop-livestock farming is commoner in the drier zone than in the humid zone, and crop-cattle farming in the humid zone is a recent development. As crop-livestock farming systems evolve and probably become the dominant system in the savanna and sub-humid zones, research and development strategies should adopt a resource management approach using land as the critical resource. Research will also be needed to develop appropriate milk processing and preservation options for small and medium scale producers.

9787 **Lyons, M., 1993.** African trypanosomiasis (sleeping sickness). In: Kiple, K.F. (ed.), *The Cambridge world history of human disease* (Cambridge, UK and New York, USA; Cambridge University Press), pp. 552-561.

Institute of Commonwealth Studies, University of London, 27-28 Russell Square, London WC1B 5DS, UK.

A brief introduction to human African trypanosomiasis

summarises the etiology, epidemiology, distribution and incidence, clinical manifestations and pathology, and immunology of the disease. The history and geography covers mainly the colonial period from the turn of the century to the early 1960s, with a brief mention of the post-colonial period. The arrival of the colonial powers in Africa and their encounter with various tropical diseases led to an intense interest in research in parasitology and tropical medicine. The main discoveries of the period are described, together with the political approach to the epidemics and the different public health initiatives taken by the British, French and Belgian authorities.

9788 **McMillan, D.E. and Meltzer, M.I., 1996.** Vector-borne disease control in sub-Saharan Africa: a necessary but partial vision of development. *World Development (Oxford)*, **24** (3): 569-588.

University of Florida, Gainesville, Florida, USA.

A comparison of control programmes against four vector-borne diseases, onchocerciasis, bovine trypanosomiasis, malaria and East Coast fever, shows numerous similarities in the technical reasons why they break down. A distinction is made between trypanosomiasis and onchocerciasis, where vector control opens up new lands, and malaria and East Coast fever, where control primarily improves agricultural productivity in areas of existing settlement by reducing morbidity and mortality of individuals or herds. It is concluded that simpler control technologies are urgently needed and that more attention should be given to socioeconomic planning, including land use planning, for the full economic and social potential of control programmes to be realised.

9789 **Omolo, E.O., Ssenyonga, J.W., Ngugi, A., Kiros, F. and Okali, C., 1995.** Community mapping exercises: an evaluation. *Overseas Development Institute Agricultural Administration (Research and Extension) Network Paper*, no. 52: 24 pp.

Maps and diagrams are key tools in participatory rural appraisal (PRA). This paper describes a PRA activity designed to assess the value of maps and diagrams for assisting community decision-making about tsetse trap placement in the Lambwe Valley, western Kenya.

Researchers from ICIPE had already conducted a community mobilisation campaign before carrying out this PRA exercise which involved drawing up a village resource map and two transects as a basis for discussion. There was a positive response to the mapping exercise: almost all homesteads were

represented and, during the final meeting, those who had participated talked about encouraging other villages to use the same techniques. The researchers agreed that both they and the villagers had benefited from the exercise but doubted whether the villagers would find time to follow up on the activity. Two other issues were raised: firstly the problem of defining community boundaries for natural resource management in locations with dispersed settlement and non-resident users of the resources concerned, and secondly the ability of extension to provide the necessary institutional support in such a context. In the case discussed here, a new community management organisation has been formed with considerable support from ICIPE.

9790 **Otsyina, R., Minae, S. and Cooper, P., 1996.** A never-ending story: rotational woodlots for soil conservation, wood and fodder. *Agroforestry Today*, **8** (2): 8-10. Tanzania-ICRAF Agroforestry Research Project, P.O. Box 797, Shinyanga, Tanzania.

Miombo woodlands used to cover a vast part of the highland plateau that stretches from Tanzania southwards to Zimbabwe, but this century has brought great changes to the region, with the woodlands receding as populations grow. In addition, particularly in Tanzania, the 1920s brought massive deforestation campaigns aimed at eliminating tsetse flies and trypanosomiasis, so that people there now find themselves chronically short of fuelwood and fodder. The rotational woodlot is proposed as a suitable system for reintroducing trees into existing crop- and shrub-land in a way that will restore the benefits of long fallows, while solving problems of land degradation and shortages of fuelwood and fodder.

9791 **Rowlands, G.J., 1995.** Statistical evaluation of impacts of animal health interventions on livestock productivity. *In: Proceedings of a meeting of the Society for Veterinary Epidemiology and Preventive Medicine, University of Reading, 29-31 March 1995*, pp. 64-73.

ILRI, P.O. Box 30709, Nairobi, Kenya.

Reliable estimates of impacts of animal health interventions on productivity are essential for valid assessments of the economic benefits of such interventions. Two tsetse control campaigns, one around Boundiali in northern Côte d'Ivoire, the other near Ghibe in southwest Ethiopia, are used to illustrate the inherent difficulties in obtaining such estimates. Four different methods are compared.

Method 1 compares animal productivity before and after tsetse control: this is dangerous and requires several years of data, both before and after, to minimise effects of other confounding factors. The use of control herds (method 2) is not really practicable because of the difficulty of finding two identical areas, and adds to the expense. Method 3 does not apply a health intervention at all but predicts the potential outcome from the productivity of diseased and non-diseased animals with no tsetse control: this ignores other possible limiting factors and the possibility that those factors and trypanosomiasis may not be additive. Method 4, which utilises herd-to-herd variations in the primary impact of tsetse control on disease prevalence to investigate secondary impacts on production, is the only one that is statistically valid. It requires a large number of herds to be followed, but biologically significant results can be achieved over a period of time shorter than that required by methods 1 or 2. The size of such a study in terms of sample size, however, may be prohibitive. There may thus be scope for novel approaches in the development of statistical models that can be utilised in conjunction with results from field study research.

9792 **Stevens, W.J., Abbeele, J. van den and Bridts, C.H., 1996.**

Anaphylactic reaction after bites by *Glossina morsitans* (tsetse fly) in a laboratory worker. *Journal of Allergy and Clinical Immunology*, **98** (3): 700-701.

Stevens: Universitaire Instelling Antwerpen, Immunology UIA, Universiteitsplein 1, B-2610 Antwerp, Belgium. The case is described of a 32-year-old doctoral student suffering from an anaphylactic reaction (including urticarial plaques over the entire body) after three bites by a tsetse fly, occurring during his laboratory work. He had worked for 4 years with *Glossina palpalis gambiensis* followed by 2 years with *G. morsitans morsitans*. In the first year of his work he had let uninfected *G. palpalis* bite his ankle daily for 2 months in order to feed them. To confirm the presumptive diagnosis of IgE-mediated anaphylaxis to tsetse fly, specific IgE was determined against salivary glands of *G. p. gambienses* and *G. m. morsitans* by means of a dot blot technique. The patient's serum reacted with both salivary gland extracts, whereas no reaction was observed with negative control sera from healthy individuals never exposed to tsetse. One of five individuals exposed to tsetse in the same institute, and bitten at least once without anaphylactic symptoms, had a positive reaction

to both extracts.

9793 **Uilenberg, G., 1996.** Lutte intégrée contre les parasitoses animales tropicales. [Integrated control of tropical animal parasitoses.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **49** (2): 124-129.

'A Surgente', Route du Port, 20130 Cargèse, Corsica. In the past, parasite control in domestic animals has relied mainly on the use of drugs and pesticides. Although these compounds are still of great importance in the prevention and treatment of parasitic diseases, in recent years the emphasis has shifted to a more flexible approach, integrating various other control measures. The main reasons for this change are: the development of resistance to the compounds used; reduced development of new compounds to overcome resistance because of the limited market and increasing cost of new products for consumers; and problems associated with toxicity, environmental pollution and residues in animal products. Where African trypanosomiasis is concerned, resistance of trypanosomes of domestic animals to available drugs has already been seen and is an important problem, but since isometamidium was put on the market about 30 years ago only one new drug, MelCy, has become available. The situation for human trypanosomiasis is no better: although one new drug, eflornithine, has been developed recently, the treatment time is too long, and the price too high, for African conditions.

Fortunately, tsetse flies have not (yet) developed resistance to the insecticides used. Integrated parasite management makes use, where possible, of biological and mechanical control, of acquired and innate host resistance, and genetical, ecological, sanitary and regulatory procedures, although chemical control can seldom be entirely eliminated. Examples of these methods in trypanosomiasis control include the use of trypanotolerant breeds of cattle and small ruminants, genetic control of tsetse flies using the sterile male technique, the use of tsetse traps and screens with or without insecticides, sometimes using odour attractants, the use of pour-on formulations of insecticides on cattle, and the use of chemosterilants or growth regulators in tsetse traps. Cost-effectiveness and sustainability in all respects are of primary importance.

9794 **World Health Organization, 1995.** *Tropical disease research: progress 1975-94: highlights 1993-94.* Geneva, Switzerland; WHO. 168 pp.

WHO, 1211 Geneva 27, Switzerland.

This book provides an account of the achievements of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) over the past twenty years. It gives an introduction to and history of the Programme, and discusses many aspects of TDR's target diseases: malaria, schistosomiasis, lymphatic filariasis, onchocerciasis, leprosy, African trypanosomiasis, Chagas' disease and leishmaniasis. Individual chapters present an account of each disease's problems, solutions, progress, diagnostics, treatment regimens, research highlights of 1993-94, and interviews with scientists representing afflicted communities. Also covered are biological control of vectors and socioeconomic research.

## 2. tsetse biology

### (a) REARING OF TSETSE FLIES

[See **20**: no. 9792.]

### (b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

[See also **20**: no. 9792.]

9795 **Geoffroy, B., Bialota, F., Bossy, J.P., Ravallec, M., D'Amico, F. and Cuisance, D., 1996.** Les chimiorécepteurs de l'aile chez *Glossina pallidipes* (Diptera: Glossinidae) et *Stomoxys nigra* (Diptera: Muscidae). [Chemoreceptors on the wing of *G. pallidipes* and *S. nigra*.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **49** (2): 141-148.

Geoffroy: Département Santé, ORSTOM, B.P. 5045, 34032 Montpellier Cedex 1, France.

A comparative study has been made of the wing sense organs, specifically the chemoreceptors, of two trypanosomiasis vectors, *Glossina pallidipes* (cyclical transmission) and *Stomoxys nigra* (mechanical transmission). Chemoreceptor morphology, distribution and role are analysed in relation to sexual differences and interspecific variations. Comparisons are made with other *Glossina* spp. and with *Musca domestica*. Overall and by sections, *G. pallidipes* have more chemoreceptors (males: 138.26; females: 135.33) than *S. nigra* (males: 89.85; females: 95.68) but less than *G. m. morsitans* (males: 173.17; females: 168), *G. m. submorsitans* (males: 169.29; females: 169.52) or *G. austeni* (males: 160.58; females: 156.47). The difference in chemoreceptor numbers between males and females within the same species is not significant. Section E of *S. nigra* is better provided with chemoreceptors in both sexes, and sections A and F are devoid of them. The distribution

of chemoreceptors along the costal vein is limited to sections B, C, D and E, while chemoreceptors occur along the whole of the costal vein in tsetse flies. The possible role of the chemoreceptors is discussed. 9796 **Sang, R.C., Jura, W.G.Z.O., Otieno, L.H. and Ogaja, P., 1996.** Ultrastructural changes in the milk gland of tsetse *Glossina morsitans centralis* (Diptera; Glossinidae) female infected by a DNA virus. *Journal of Invertebrate Pathology*, **68** (3): 253-259.

Sang: Virus Research Centre, Kenya Medical Research Institute, P.O. Box 54628, Nairobi, Kenya. Milk glands, dissected out and collected from *G. m. centralis* females, artificially inoculated at the third-instar larval stage with a virus suspension obtained from hypertrophied salivary glands of wild-caught virus-infected *G. pallidipes*, were processed for routine electron microscopy and examined for pathological changes. They were compared to milk glands dissected out from normal female *G. m. centralis* at the same stage of the pregnancy cycle. Notable physical differences were seen between control and virus-infected milk glands. Histologically, some areas of the gland developed severe degeneration while other areas developed less severe pathological changes. Ultrastructural studies revealed the presence of virus particles in the secretory cell nuclei and within the cytoplasm and also showed that the nucleus was the site of virogenesis with mature naked virions budding through the nuclear membrane and acquiring the envelope from the nuclear membrane. Milk glands from normal females showed normal cellular organisation of the secretory cells and secretory vesicles around the collecting gland lumen. The demonstration of virus particles in the secretory cell nuclei and cytoplasm suggests another mode of transmission of the virus from the infected mother to the larva *in utero*.

9797 **Zdárek, J., Weyda, F., Chintawi, M.M.B. and Denlinger, D.L., 1996.** Functional morphology and anatomy of the polypneustic lobes of the last larval instar of tsetse flies, *Glossina* spp. (Diptera: Glossinidae). *International Journal of Insect Morphology and Embryology*, **25** (3): 235-248.

Zdárek: Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, Flemingovo nám. 2, 16610 Praha 6, Czech Republic.

This study examines the external and internal anatomy of the polypneustic (respiratory) lobes in eight species of tsetse larvae. In the more primitive *fusca*

group, the respiratory lobes are either ring-like (*G. longipennis*) or partially divided into two lobes (*G. brevipalpis*). Two distinctly separated lobes are present in the *palpalis* group (*G. palpalis*, *G. tachinoides*, *G. fuscipes*) and in the *morsitans* group (*G. morsitans*, *G. pallidipes*, *G. austeni*). Air enters the polypneustic lobes through narrow slits (stigmata) on the tips of numerous small spiracular papillae that are arranged in rows on both the outer and inner surfaces of the polypneustic lobes. The openings on the spiracular papillae connect to an air tube that is sculptured with septa and pegs. The air tubes connect to an outer air chamber that is likewise replete with a network of pegged septa. The outer air chamber is connected to a felt chamber containing a dense network of filamentous septa (spicules) that appear to function as an air filter. The felt chamber opens into a large, sculptured inner air chamber that connects directly to the regular tracheal trunk. The polypneustic lobes are unusually hard and brittle due to strong sclerotisation of the cuticle and are permeated with numerous cuticular pores. There is no evidence that trichomes or other structures present on the respiratory lobes are innervated.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

9798 **Jarry, M., Gouteux, J.-P. and Khaladi, M., 1996.** Are tsetse fly populations close to equilibrium? *Acta Biotheoretica*, **44** (3-4): 317-333.

Jarry: Laboratoire de Mathématiques Appliquées, URA CNRS 1204, IPRA, Université de Pau et des Pays de l'Adour, Avenue de l'Université, 64000 Pau, France. Tsetse flies form a unique group of insects with remarkable characteristics. They are viviparous with a slow rhythm of reproduction (one larva approximately every 10 days) determined by the regular ovulation of alternate ovaries. This unusual physiology enables the age of the females to be estimated by examining the ovaries. The resulting ovarian age structure of tsetse fly populations has been used to develop research into the demography of tsetse flies. Several authors have proposed methods of estimating population growth rates from ovarian age distribution data. However, such methods are applicable only when the growth rate ( $\lambda$ ) is equal to 1 (i.e. the intrinsic rate of increase  $r$  is equal to 0). In fact, in this type of estimation, the adult survival rate  $a$  (or equivalently the mortality rate) cannot be dissociated from the growth rate.

Other independently determined demographic parameters must be used to remove this lack of identifiability. We have built a matrix model of the dynamics of tsetse fly populations which enables the growth rate to be calculated from the pupal survival rate, the pupal period and the adult survival rate. Assuming that the age-groups of the population studied have reached a stable distribution, it is possible to calculate the probabilities for the observed sample of belonging to each of the age-groups, to construct a likelihood function and thus to obtain an estimate of the 'apparent survival rate'  $\beta = a/\lambda$ . If the pupal survival rate and the pupal period are known,  $a$  and  $\lambda$  can then be calculated from  $\beta$ . The application of this method to data collected for over two annual cycles in a savanna habitat (Burkina Faso) showed a high overall stability in the populations of *Glossina palpalis gambiensis*. Seasonal fluctuations could be easily interpreted as being the result of climatic changes between the dry and rainy seasons.

9799 **Torr, S.J., Mangwiro, T.N.C. and Hall, D.R., 1996.** Responses of *Glossina pallidipes* (Diptera: Glossinidae) to synthetic repellents in the field. *Bulletin of Entomological Research*, **86** (5): 609-616.

Torr: NRI, Central Avenue, Chatham Maritime, Chatham, Kent ME4 4TB, UK.

In Zimbabwe, studies were made of the responses of *G. pallidipes* to known and candidate repellents. Various chemicals, dispensed at *c.* 5-10 mg/h, were placed beside Epsilon traps already baited with a blend of acetone, octenol, 4-methylphenol and 3-*n*-propylphenol. Pentanoic or hexanoic acids or aceto-phenone halved the catch and 2-methoxyphenol reduced the catch by 90%. There were no consistent differences in the responses of males and females. Pentanoic acid or acetophenone or 2-methoxyphenol at an unbaited trap reduced the catch by 40%, 75% and 60%, respectively. Baiting traps with a combination of pentanoic acid, acetophenone and 2-methoxyphenol did not reduce the catch below that produced by 2-methoxyphenol alone. Pentanoic acid and 2-methoxy-phenol reduced the efficiency of traps from *c.* 40% to 20% but acetophenone had no significant effect. Acetophenone and 2-methoxyphenol halved the numbers of tsetse attracted to a target baited with acetone, octenol and phenols but none had a significant effect on the proportion that landed. 2-Methoxyphenol significantly reduced the numbers of tsetse attracted to a source of natural ox odour but only pentanoic acid

had a significant effect on feeding responses, reducing the proportion that fed on an ox from 59 to 45%. It is concluded that these repellents do not provide any useful degree of protection against trypanosomiasis. In areas where tsetse are abundant (500 bites/ox/day) and infection rates in tsetse are high (> 5%) it is highly unlikely that any repellents would be useful. However, in areas where tsetse are less abundant (1 bite/ox/day) and/or infection rates are low (c. 0.5%), the potent, unidentified repellents present in human odour might effectively complement the control of disease using trypanocidal drugs.

3. tsetse control (including environmental side-effects)

[See also **20**: nos. 9783, 9788, 9789, 9793.]

9800 **Amsler-Delafosse, S., Kabore, I. and Bauer, B., 1995.** Lutte contre les vecteurs de la trypanosomose animale africaine au Burkina Faso. [Control of the vectors of African animal trypanosomiasis in Burkina Faso.] *Cahiers Agricultures*, **4** (6): 440-443.

CIRDES, 01 B.P. 454 Bobo-Dioulasso 01, Burkina Faso. Following a request from livestock owners, a campaign to eradicate tsetse flies (*Glossina tachinoides* and *G. palpalis gambiensis*) was conducted in Dafinso, Burkina Faso, during 1993-94, using cypermethrin-impregnated traps and treatment of cattle with deltamethrin. In February 1993, before the campaign started, mixed infections of *Trypanosoma congolense*, *T. vivax* and *T. brucei* were found in 9 of 31 cattle and *T. congolense* in 1 of 2 donkeys tested. The initial tsetse trapping rate was 11.7/trap/day for *G. tachinoides* and 0.19/trap/day for *G. p. gambiensis*. By July 1993, two months after the start of the campaign, the rates had fallen to zero. Entomological surveys throughout the period confirmed the rapid and almost total disappearance of the tsetse population. During 1994, no tsetse were caught. Livestock owners were actively and financially involved in the campaign from start to finish, demonstrating the importance of cooperation from rural communities for successful and sustainable campaigns against trypanosomiasis.

9801 **Gouteux, J.P., 1996.** Note préliminaire sur l'efficacité comparée des pièges *mono-screen* et *bipyramidal*. Essai sur *Glossina fuscipes fuscipes* en République centrafricaine. [Preliminary comparison of *mono-screen* and *bipyramidal* traps for catching *G. f. fuscipes* in the Central African Republic.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **49** (2): 130-131.

ORSTOM, Département de Mathématiques Appliquées, URA-CNRS 1204, IPRA-UPPA, Avenue de l'Université, 64000 Pau, France.

A comparative trial using the Latin square technique showed that the bipyramidal trap is 4.4 and 1.9 times more efficient than the mono-screen trap for catching *G. f. fuscipes* males and females, respectively.

9802 **Leak, S.G.A., Peregrine, A.S., Mulatu, W., Rowlands, G.J. and d'Ieteren, G., 1996.** Use of insecticide impregnated targets for the control of tsetse flies (*Glossina* spp.) and trypanosomiasis occurring in cattle in an area of south-west Ethiopia with a high prevalence of drug resistant trypanosomes. *Tropical Medicine and International Health*, **1** (5): 599-609.

Leak: ILRI, P.O. Box 30709, Nairobi, Kenya.

In the Ghibe valley, south-west Ethiopia, a tsetse control trial using deltamethrin-impregnated targets was started in May 1990. The mean relative density of the main vector, *Glossina pallidipes*, fell from 2.1 flies per trap per day in the 12 months prior to introduction of tsetse control to 0.41 flies per trap per day in the 12 months after tsetse control was initiated. The annual mean prevalence of *Trypanosoma congolense* infections in cattle fell from 32% in the 2 years before tsetse control to 13% in the 2 years following deployment of targets. The largest reduction occurred in the first quarter of 1991 when the mean monthly trypanosome prevalence was 5%. There was also a decrease of approximately 75% in the estimated rate of relapse of trypanosome infections in cattle after treatment with diminazene aceturate. However, in June 1991, socio-political disturbances occurred in Ethiopia and were associated with substantial thefts of targets.

Following these thefts, the mean relative density of *G. pallidipes* rose from 0.41 flies per trap per day in the period May 1990-April 1991, to 1.29 flies per trap per day in the period April 1992-March 1993. Associated with this rise, the mean trypanosome prevalence in cattle increased from 13% in the period May 1991-April 1992 to 28% in the period May 1992-April 1993. This was similar to the mean trypanosome prevalence in cattle during the pre-control period. Thus, while effective tsetse control methods can be used to reduce the transmission of trypanosomes, their long-term impact is dependent on their sustainability.

9803 **Muzari, M.O. and Hargrove, J.W., 1996.** The design of target barriers for tsetse flies, *Glossina* spp. (Diptera: Glossinidae). *Bulletin of Entomological Research*, **86** (5): 579-

583.

Hargrove: Tsetse and Trypanosomiasis Control Branch, P.O. Box CY52, Causeway, Harare, Zimbabwe.

Two small-scale experiments were carried out to test the effectiveness of narrow target barriers against re-invasion by *G. pallidipes* and *G. morsitans morsitans*. The barriers consisted of either one or two lines of targets, with the targets placed at distances of *c.* 16 m apart within the lines. At this spacing the targets are so close together that a fly could scarcely fail to see at least one target as it crossed the barrier. Nonetheless, in both cases, flies penetrated the barriers with probability *c.* 10% as judged by catches in odour-baited traps on either side of the barrier. Narrow barriers, even at very high target density, are ineffective against tsetse invasion. This accords with previous theoretical predictions and mark-recapture studies, and suggests that wider barriers are needed for the prevention of re-invasion of cleared areas by tsetse.

9804 **Nhachi, C.F.B., Urombo, R., Murambiwa, W. and Kasilo, O.M.J., 1995.** The use and status of DDT in Zimbabwe. *African Journal of Health Sciences*, **2** (3): 331-332.

Department of Clinical Pharmacology, School of Medicine, P.O. Box A178, Avondale, Harare, Zimbabwe. A short history of the use of DDT in Zimbabwe is presented. DDT was first used in 1946 against *Glossina* and other species such as *Anopheles*, *Busseola fusca* and *Agrotis*. In 1982 its use was legally restricted to tsetse fly and mosquito control, and it was completely banned in 1991. Studies of DDT residues in Zimbabwe are presented, including continuing evaluation of human exposure. Deltamethrin is the main insecticide to replace DDT in Zimbabwe.

4. epidemiology: vector-host and vector-parasite interactions

[See also **20**: nos. 9792, 9799.]

9805 **Gidudu, A.M., Cuisance, D., Reifenberg, J.M. and Frézil, J.L., 1996.**

Emission de *Trypanosoma congolense* dans la salive et dans la goutte anale chez *Glossina morsitans morsitans* et *Glossina tachinoides* (Diptera: Glossinidae) au laboratoire.

[Emission of *T. congolense* in the saliva and in the anal drop of *G. m. morsitans* and *G. tachinoides* in the laboratory.]

*Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **49** (2): 132-140.

Gidudu: Department of Entomology, Ministry of Agriculture, Animal Industry and Fisheries, P.O. Box

102, Entebbe, Uganda.

The emission dynamics of *T. congolense* EATRO 325 (savanna type) was quantitatively and qualitatively followed by microscopic examination of the saliva and the anal drop collected every three days according to a method perfected with *G. morsitans* (males and females) and *G. tachinoides* (females). In these two tsetse flies, the appearance of trypanosomes took place in the anal drop on day 3, and in the saliva on day 14. During the observation period (60 days), the average percentage of flies with positive saliva was identical in males and females of *G. m. morsitans* (21.3% and 24.5%), and much higher than in *G. tachinoides* females (12.5%). With age, the percentage of positive saliva tended to increase in females. From the first positive salivas (day 14), ejection of trypanosomes was greater in females than in males of *G. m. morsitans*. It was also considerable in females of *G. tachinoides*. The average number of trypanosomes emitted varied greatly (1 to 500) in each test. If the short metacyclic forms appeared early (day 14), they became progressively dominant compared to long forms, but more rapidly in females than in males of *G. m. morsitans* or in *G. tachinoides* females. Over a 60 day period, the average percentage of positive anal drops was no different from that of saliva in *G. m. morsitans* and *G. tachinoides* females, but was lower in *G. m. morsitans* males. However, both sexes of *G. m. morsitans* showed the same maturation rate (trypanosomes in saliva). The emission curves in both liquids were very close. Examination of anal drops revealed large emission fluctuations (1 to 1000 trypanosomes). The joint examination of both liquids gives the opportunity to monitor, in live insects, the establishment and maturation dynamics of trypanosomes with a cyclic evolution.

9806 **Gouteux, J.P. and Gibson, W.C., 1996.** Detection of infections of *Trypanosoma grayi* in *Glossina fuscipes fuscipes* in the Central African Republic. *Annals of Tropical Medicine and Parasitology*, **90** (5): 555-557.

Gibson: Department of Genetics, University of Leicester, Leicester LE1 7RH, UK.

DNA probes are frequently used to identify trypanosome infections in wild tsetse flies. Despite technical improvements, field surveys continue to produce many unidentifiable trypanosome infections in midgut samples. In particular, *palpalis* group flies take a high proportion of bloodmeals from reptiles and may therefore have infections of Stercorarian trypanosome species such as *T. grayi* which may be confused with

immature infections of Salivarian trypanosomes. During September 1992 and January 1993 a study was carried out in the Commune d'Elevage d'Ouro-Djafon, Bambari, Central African Republic, following a trial of pour-on insecticide. A total of 355 *G.f. fuscipes* was dissected and samples taken for bloodmeal and touch-blot analysis. Stercorarian trypanosomes were distinguished from Salivarian trypanosomes by their long spindly form and their characteristic rapid vibratory movements during microscopical examination. Such infections were by far the most common (85%); the combined prevalence of salivary gland infections (*T. brucei* ssp.) and infections of both proboscis and midgut (*Nannomonas*) was < 1%, and no proboscis-only infections (*T. vivax*) were found. Touch-blots were subsequently hybridised with a *T. grayi* DNA probe. Overall, 18 of the 355 touch-blots gave a positive hybridisation: these included 5 of the 9 presumed *T. grayi*, or mixtures including *T. grayi*, identified by microscopy after the September mission, and only 6 of 40 presumed *T. grayi* after the January mission. A considerable increase in the prevalence of monitor lizard bloodmeals was found on the second mission, and the non-hybridising presumed *T. grayi* may therefore have been other, as yet uncharacterised, reptilian species.

9807 **Hide, G., Tait, A., Maudlin, I. and Welburn, S.C., 1996.** The origins, dynamics and generation of *Trypanosoma brucei rhodesiense* epidemics in East Africa. *Parasitology Today*, **12** (2): 50-55.

Hide: Wellcome Unit of Molecular Parasitology, Anderson College, University of Glasgow, Glasgow G11 6NU, UK. Molecular methodology has shed new light on the genetic makeup of the organisms involved in recent sleeping sickness epidemics in East Africa. The authors review recent as well as earlier studies on distinguishing *T. b. rhodesiense* from *T. b. brucei*, the animal reservoir of sleeping sickness, 'new strains' and epidemics, the movement of people and trypanosomes, the origins of human trypanosome strains, and population genetics, clonality and genetic exchange. From a detailed study of the 1988-90 Tororo epidemic, it is clear that the *T. b. rhodesiense* stocks circulating in the district are a population distinct from the *T. b. brucei* stocks circulating in domestic cattle. This distinction and lack of genetic exchange between the two populations, their co-existence in time and space, and the stability of the *T. b. rhodesiense* strain group over the period 1960-90 all serve to reinforce the validity of the

subspecific taxonomic status of these two populations. A combination of the temporal stability of the human strain group and the reservoir potential provided by domestic cattle may imply a mechanism for the maintenance of the characteristically stable nature of *T. b. rhodesiense* foci. Furthermore, the clear distinction between the *T. b. rhodesiense* populations from the Tororo and Zambia foci suggests that at least two different strain groups (and possibly subspecies) form the genetic makeup of *T. b. rhodesiense*.

9808 **Kazadi, J.M., Kageruka, P., Martin, O., Losson, B and Hees, J. van, 1996.** Infection expérimentale de *Glossina morsitans morsitans* (Mall) par *Trypanosoma congolense* (ZRE/G143/90). Cycle du parasite et compétence vectorielle de la glossine. [Experimental infection of *G. m. morsitans* by *T. congolense* (ZRE/G143/90). Cycle of parasite and vectorial competence of the tsetse fly.] *Veterinary Research*, **27** (6): 579-587.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince-Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium.

This paper presents the results of an experimental study of the life cycle of *T. congolense* (ZRE/G143/90) in relation to the vectorial competence of *G. m. morsitans*. The rate of engorgement at the time of an infectious meal and the mortality before day 15 of the life cycle were not significantly different between male and female flies. The mesocyclic forms of trypanosomes were regularly observed in the proventriculus, crop duct, oesophagus, cibarium and proboscis, but not in the crop. On day 12 of the cycle, epimastigote forms were predominant in the proboscis. On day 13 of metacyclogenesis, four out of six rats (67%) used for feeding the flies were positive for trypanosomes upon buffy coat examination. These results demonstrate the short incubation period of trypanosomes in the vertebrate host and precociousness of the vectorial competence of some individuals of *G. m. morsitans*. Among the three cyclic stages, only the procyclic forms in the intestine showed a significant difference between the sexes, the male flies being more infected than the females. Metacyclogenesis undergoes three cleavages leading to the successive and permanent establishment of the procyclic, mesocyclic and metacyclic forms in the midgut, proventriculus and proboscis respectively.

9809 **Reifenberg, J.M., Cuisance, D., Gidudu, A., Cuny, G., Duvallet, G. and Frezil, J.L., 1996.** Evaluation de la capacité vectorielle de *Glossina tachinoides* (Diptera, Glossinidae) vis-à-vis de

*Trypanosoma (Nannomonas) congolense*: implications épidémiologiques. [Evaluation of the vectorial capacity of *G. tachinoides* for *T. (N.) congolense*: epidemiological implications.] *Parasite*, **3** (3): 267-276. Reifenberg: CIRAD, c/o ORSTOM, Laboratoire d'Epidémiologie des Maladies à Vecteurs, B.P. 5045, F-34032 Montpellier Cedex, France.

A total of 182 *G. tachinoides* were infected with *T. congolense* savanna type. Infection rates were determined by microscopical examination of dissected flies and by PCR on the proboscis. Different techniques of trypanosome detection in the saliva of live tsetse flies were compared. Results showed a high percentage of immature infections. PCR amplification of trypanosomes in the proboscis confirmed parasitological observations. The salivation technique showed large fluctuations in the number of trypanosomes deposited with saliva. Variability between individual flies was observed in the mean number of parasites ejected, the rate of positive salivates detected by PCR and the rate of infected mice. The PCR technique was as efficient as the parasitological technique for detecting trypanosomes in the salivates. Mouse infectivity was the least efficient method. These results improve our knowledge of *G. tachinoides*' vectorial competence *vis-à-vis T. congolense* savanna type in the laboratory, and help to improve our understanding of the role of this tsetse species in the epidemiology of the disease.

## 5. human trypanosomiasis

### (a) SURVEILLANCE

[See also **20**: nos. 9783, 9785, 9812, 9831.]

9810 **Kanmogne, G.D., Asonganyi, T. and Gibson, W.C., 1996.**

Detection of *Trypanosoma brucei gambiense*, in serologically positive but aparasitaemic sleeping-sickness suspects in Cameroon, by PCR. *Annals of Tropical Medicine and Parasitology*, **90** (5): 475-483.

Gibson: Department of Genetics, University of Leicester, Leicester LE1 7RH, UK.

Diagnosis of Gambian sleeping sickness is problematic because of the very low levels of parasitaemia encountered in the field. A PCR method developed for the sensitive detection of *T. brucei* was used to diagnose parasitologically negative suspects in a recent survey in Cameroon. Individuals were screened in two foci (Mbam and Fontem), firstly with the card agglutination test for trypanosomiasis (CATT) as a primary serological test, together with palpation and puncture

of enlarged cervical lymph glands. Any suspects found positive by CATT (CATT+) and any clinical suspects were then subjected to several parasitological tests (examination of thick blood films and use of haematocrit centrifugation, mini-anion-exchange chromatography and a commercial kit for *in vitro* isolation). Overall, 43 of the 1703 subjects screened in the Mbam focus were CATT+ and three (two of whom were CATT+) had enlarged glands. In Fontem, 56 of the 1210 subjects screened were CATT+, 78 (24 of whom were CATT+) had enlarged glands and two (both CATT+) had trypanosomes in their gland juice. However, all the suspected cases of sleeping sickness, including the two gland-positives, gave negative results in the secondary, parasitological tests. Blood samples from 28 suspects from Mbam and 30 from Fontem were selected for PCR analysis on the basis of high CATT response or clinical grounds. For each suspect, DNA was prepared from 0.5 ml blood by phenol extraction or differential lysis and then amplified by PCR using specific primers for *T. brucei* ssp. Four samples from Mbam and nine from Fontem, including the two gland-positives, were found positive by PCR. Compared with the other parasitological techniques, therefore, PCR was the most sensitive diagnostic method in this study, with an estimated sensitivity of 25 trypanosomes/ml blood. Although PCR analysis is too expensive for routine diagnosis, it could be very useful in determining which sleeping sickness suspects should be closely followed up.

9811 **Ponce-de-León, S., Lisker-Melman, M., Kato-Maeda, M., Gamboa-Domínguez, A., Ontiveros, C., Behrens, R.H. and González-Ruiz, A., 1996.** *Trypanosoma brucei rhodesiense* infection imported to Mexico from a tourist resort in Kenya. *Clinical Infectious Diseases*, **23** (4): 847-848.

Ponce-de-León (reprints): Department of Infectious Diseases, Instituto Nacional de la Nutrición 'Salvador Zubirán', C.P. 14000, Mexico City, Mexico. González-Ruiz (correspondence): Department of Clinical Parasitology, Hospital for Tropical Diseases, 4 St. Pancras Way, London N1 0PE, UK.

A case of *T. b. rhodesiense* infection acquired by a tourist in the Masai Mara game reserve is reported. The 57-year-old Mexican male was bitten on the leg during a 4-day stay in a tented camp on the banks of the Mara River. Microscopic examination of exudate from a painful necrotic chancre 10 days later on his return to Mexico City showed trypomastigotes. Therapy with i.v.

pentamidine isethionate was started until suramin became available. Clinical deterioration and trypanosomes in the peripheral blood prompted a follow-up examination of the CSF a week later. Rat inoculation with this CSF specimen suggested CNS involvement, whereupon the patient received three cycles of melarsoprol therapy, and remained asymptomatic at follow-up visits up to 2 years later. This appears to be the first case in this non-endemic area in almost 50 years and should alert physicians to the existence of this infection in an area previously considered safe.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **20**: no. 9842.]

9812 **Mbala, L., Matendo, R., Kinkela, T., Mavangu, M. and Mashako, M., 1996.** Congenital African trypanosomiasis in a newborn child with current neurologic symptomatology. *Tropical Doctor*, **26** (4): 186-187.

Mbala: Department of Paediatrics, Hospital of IME-Kimpese, B.P. 68, Bas-Zaïre, Zaïre.

Congenital African trypanosomiasis, transmitted from mother to child via placental damage, is relatively rare. A fatal case of the disease in a newborn child at Yongo, Lower Zaïre, is reported. Examination suggested meningitis, intra-cranial haemorrhage, perinatal asphyxia or metabolic disorder. The discovery of trypanosomes in a thick blood smear and clinical manifestations of involvement of the nervous system led to the conclusion that the infant was suffering from trypanosomiasis in the meningo-encephalitic stage, and the early appearance of these features at 10 days of age suggested congenital transmission. This diagnosis prompted examination of the asymptomatic mother who was found to be in the haemolympathic stage of trypanosomiasis with one enlarged lymph node. The difficulties of diagnosing congenital trypanosomiasis are discussed. The finding of trypanosomiasis in the mother without any clear symptoms and minimal clinical signs of lymph node enlargement emphasises the importance of general prenatal examination of pregnant women and the need to exclude trypanosomiasis in both mother and child when enlarged lymph nodes are found in endemic trypanosomal areas.

(c) TREATMENT

9813 **Bronner, U., Brun, R., Burri, C., Doua, F., Ericsson, Ö., Rombo, L. and Gustafsson, L.L., 1996.** Determination of melarsoprol

concentrations in plasma, urine and CSF in patients with human African trypanosomiasis using HPLC and bioassay. (Meeting abstract no. 30.) *Tropical Medicine and International Health*, **1** (6): A37-A38.

Bronner: Unit of Tropical Pharmacology, Karolinska Institute, Huddinge University Hospital, S-14186 Huddinge, Sweden.

Plasma, urine and CSF samples were obtained from eight patients with late-stage *Trypanosoma brucei gambiense* trypanosomiasis who were given one dose of melarsoprol i.v. daily for 4 days. Results indicated that melarsoprol was rapidly eliminated from plasma and to a very low extent excreted unchanged in urine. There was a large discrepancy between the results obtained by the two methods used. Bioassay indicated much higher concentrations in plasma and urine than HPLC; in CSF low but detectable activity was found by bioassay while HPLC detected no melarsoprol. These results indicate that melarsoprol is transformed into active metabolites.

9814 **Burri, C. and Blum, J., 1996.** A case of reactive encephalopathy after treatment with suramin of first stage sleeping sickness. (Meeting abstract no. 29). *Tropical Medicine and International Health*, **1** (6): A36-A37.

Swiss Tropical Institute, Socinstrasse 57, CH-4002 Basel, Switzerland.

Reactive encephalopathy was commonly assumed to be connected to the use of the organoarsenical drug melarsoprol as well as the presence of trypanosomes in the CNS. However, similar symptoms of CNS toxicity (convulsions, psychotic reactions, status epilepticus and lethal encephalitis) have recently been reported during treatment of late-stage sleeping sickness with other non-arsenical trypanocidal drugs. A case is reported of a patient who died of an encephalopathy-like syndrome after the use of suramin for treatment of first-stage Gambiense trypanosomiasis.

9815 **Gustafsson, L.L., Bronner, U. and Ericsson, Ö., 1996.** Rational and simplified drug dosage regimens for therapy of parasitic diseases. (Meeting abstract no. 22) *Tropical Medicine and International Health*, **1** (6): A32.

Gustafsson: Unit of Tropical Pharmacology, Karolinska Institute, Huddinge University Hospital, S-14186 Huddinge, Sweden.

Recently demonstrated interethnic differences in drug metabolism suggest that population-specific dosage regimens should be developed in order to achieve rational use of new and old drugs. Pharmacokinetic

data on pentamidine suggest that a shorter treatment course may be introduced, thereby reducing the total administered dose and increasing drug safety.

9816 **Nkwadiolandu, A. and Tshibas, P., 1996.** Un cas de rechute précoce après traitement à la difluorométhyl ornithine de la trypanosomiase à *Trypanosoma brucei gambiense* chez l'enfant. [A case of early relapse after treatment with difluoromethylornithine of *T. b. gambiense* trypanosomiasis in a child.] *Médecine d'Afrique Noire*, **43** (5): 307-308.

Nkwadiolandu: Département de Pédiatrie, Cliniques Universitaires, B.P. 123, Kinshasa XI, Zaïre.

The case is presented of a 5-year-old girl from Bandundu who suffered a relapse 2 months after being treated i.v. with DFMO for *T. b. gambiense* infection. She was then successfully treated with melarsoprol (no relapse after follow-up of 3 years). Although DFMO has proved effective in treating arsenoresistant cases of trypanosomiasis, 9% of patients relapse. There appear to be certain predisposing factors: (i) a CSF cell count of more than 100/mm<sup>3</sup>; (ii) the oral route of treatment, where only 54% of the dose is absorbed; and (iii) the age of the patient, where the serum and CSF concentration of DFMO in children under 12 reaches only a third of that in adults. The DFMO concentration in the CSF of arsenoresistant patients is better than that in new patients. In the case described, relapse can be explained by the child's age and the absence of resistance to melarsoprol, as well as by her high CSF cell count (313.4/mm<sup>3</sup>). In view of the possibility of relapse in children, it would be desirable to commence treatment of *T. b. gambiense* trypanosomiasis in patients under 12 years with melarsoprol.

9817 **Taelman, H., Clerinx, J., Bogaerts, J. and Vervoort, T., 1996.**

Combination treatment with suramin and eflornithine in late stage rhodesian trypanosomiasis: case report. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **90** (5): 572-573.

Clerinx: Instituut voor Tropische Geneeskunde, Kronenburgstraat 43/3, B-2018 Antwerp, Belgium.

A case of late-stage *Trypanosoma brucei rhodesiense* trypanosomiasis in a 19-year-old Rwandan student is presented. The patient was treated with suramin 1 g i.v. once a week for 5 weeks and eflornithine 800 mg/kg/day i.v. for 2 weeks followed by 400 mg/kg/day i.v. for 4 more days. Treatment was then continued with oral eflornithine 300 mg/kg/day for 10 more days. The patient was afebrile 4 days after starting

treatment, and no significant side effect was observed. By the end of the treatment period, all symptoms except cervical lymphadenopathy had disappeared. Trypanosomes were rapidly cleared from the blood from the second day onwards, and from the CSF. The CSF cell count and IgM level also decreased significantly. Further follow-up at 3 months showed normal CSF cell count and IgM level. The serum IgM level was normal 6 months after treatment and remained so until the end of follow-up at 2 years post-treatment. This case of effective combination treatment of late-stage rhodesian trypanosomiasis and tolerance of high-dose eflornithine is encouraging but requires further confirmation in view of the fact that some isolates appear to be resistant to eflornithine.

9818 **World Health Organization, 1995.** *WHO model prescribing information: drugs used in parasitic diseases*, 2nd edition. Geneva, Switzerland; WHO. 146 pp.

WHO, 1211 Geneva 27, Switzerland.

Prescribing information is presented on 48 drugs used for the prevention and treatment of protozoal and helminthic infections. Each of the drug descriptions contains general information and clinical information covering uses, dosage and administration, contraindications, precautions, adverse effects, drug interactions, overdose, and storage. This second edition (first edition published in 1990) contains updates of the sections on malaria, African trypanosomiasis, cestode infections, schistosomiasis and onchocerciasis.

## 6. animal trypanosomiasis

### (a) SURVEY AND DISTRIBUTION

9819 **Kalu, A.U., 1996.** Acute trypanosomiasis in a sedentary herd on the tsetse-free Jos Plateau, Nigeria. *British Veterinary Journal*, **152** (4): 477-479.

Department of Veterinary Public Health and Preventive Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Borno State, Nigeria.

An outbreak of acute *Trypanosoma vivax* infection among intensively reared (sedentary) 4-year-old Friesian dairy cows on the Jos Plateau is reported. Sensitivity tests in goats showed that the parasite was resistant to diminazene aceturate at both 3.5 and 7.0 mg/kg body weight but sensitive to isometamidium chloride at 0.5 mg/kg. The cattle were therefore treated with the latter drug and remained healthy during a 9 month observation period. The Jos Plateau is considered to be tsetse-free and several study visits over a 4-week

period failed to trap any tsetse. Nevertheless, *Glossina palpalis palpalis* and *G. tachinoides* are reared at the BICOT project station only 1 km from the farm, and a few tsetse flies have been caught outside the station, although none was infected. NITR, which uses tsetse for research purposes, is also only 1 km from the farm. It is not known whether either of these sources precipitated the outbreak or whether the infection was transmitted mechanically by biting flies (tabanids and *Stomoxys*) or ticks which are all prevalent in the area.

(b) PATHOLOGY AND IMMUNOLOGY

[See also 20: nos. 9791, 9842.]

9820 **Dam, J.T.P. van, Schrama, J.W., Hel, W. van der, Verstegen, M.W.A. and Zwart, D., 1996.** Heat production, body temperature, and body posture in West African dwarf goats infected with *Trypanosoma vivax*. *Veterinary Quarterly*, **18** (2): 55-59.

Dam: Department of Animal Husbandry, Wageningen Agricultural University, P.O. Box 338, 6700 AH Wageningen, Netherlands.

The relationships between heat production, body temperature and body posture (standing/lying) were studied in goats suffering from trypanosomiasis. Sixteen goats were selected and infected with  $1 \times 10^6$  *T. vivax* and eight goats served as controls. In weeks 2, 4 and 6 p.i., heat production, body posture and body temperature were measured at 15 min intervals. Heat production was higher ( $P < 0.01$ ) in infected goats ( $342 \text{ kJ/kg}^{0.75}/\text{day}$ ) than in controls ( $306 \text{ kJ/kg}^{0.75}/\text{day}$ ), and body temperature was also higher ( $P < 0.001$ ) in infected animals ( $39.78^\circ\text{C}$  compared with  $38.51^\circ\text{C}$  for controls). The standing related energy costs per day were lower in infected goats than in controls (27 and  $36 \text{ kJ/kg}^{0.75}/\text{day}$  respectively). Infected animals therefore masked part of the energy costs of infection by reducing the standing time. The heat production of infected goats was increased by  $21 \text{ kJ/kg}^{0.75}/\text{day}$  per  $1^\circ\text{C}$  fever (7% increase). During periods of standing, body temperature increased with time, whereas during lying periods it decreased. The number of standing periods was increased in infected animals. It was discussed whether postural behaviour is influenced by thermoregulatory mechanisms.

9821 **Lutje, V., Taylor, K.A., Kennedy, D., Authié, E., Boulangé, A. and Gettinby, G., 1996.** *Trypanosoma congolense*: a comparison of T-cell-mediated responses in lymph nodes of trypanotolerant and trypano-susceptible cattle during primary infection. *Experimental Parasitology*, **84** (3): 320-

329.

Lutje: ILRI, P.O. Box 30709, Nairobi, Kenya.

A comparison of T-cell mediated immune responses in trypanotolerant N'Dama and susceptible Boran cattle during primary infection with tsetse-transmitted *T. congolense* was conducted to assess whether different patterns of T-cell activation occurred during trypanosome infection. Proliferation and IFN- $\gamma$  synthesis in response to trypanosome antigens and to the mitogen Con A were measured in lymph node cells before infection and 10 and 35 days p.i. Phenotypic analysis of lymph node cells was also carried out. No significant differences in the *in vitro* proliferation of lymph node cells to VSG, to hsp70/BiP or to Con A were detected between the breeds. In contrast, IFN- $\gamma$  production in response to Con A was higher in Boran cattle at 35 days p.i. A reduction in the number of CD2<sup>+</sup> and CD4<sup>+</sup> T-cells and an increase in the percentage of B-cells, CD8<sup>+</sup> T-cells and  $\gamma\delta$  T-cells during infection in both N'Dama and Boran was revealed by cytofluorimetric analysis of lymph node cells.

9822 **Okech, G., Watson, E.D., Luckins, A.G. and Makawiti, D.W., 1996.**

The effect of *Trypanosoma vivax* infection on late pregnancy and postpartum return to cyclicity in Boran cattle. *Theriogenology*, **46** (5): 859-869.

Okech: KETRI, P.O. Box 362, Kikuyu, Kenya.

A study was designed to examine the effect of infection with *T. vivax* KETRI 2501 on the maintenance of pregnancy and postpartum return to reproductive function in susceptible Galana ( $n = 6$ ) and trypanotolerant Orma Boran ( $n = 6$ ) heifers during the third trimester of pregnancy. Of the 12 study animals, three Galana and three Orma Boran heifers served as controls. One of three Galana heifers calved prematurely with subsequent perinatal loss. Of the two heifers that produced live calves, one calf died shortly after birth, while the other survived. Two of three Orma heifers calved prematurely and all three calves died shortly after birth. The six control heifers produced live calves at term, all of which survived. Infection with *T. vivax* during the third trimester of pregnancy delayed the resumption of ovarian activity after calving, with the Ormas taking a significantly ( $P < 0.05$ ) shorter time from calving to ovulation. There was no clear evidence that premature birth was associated with pathological changes in reproductive organs. Results from this study demonstrated that infection with pathogenic *T. vivax* during late pregnancy influenced the outcome of

pregnancy in both susceptible Galana and trypanotolerant Orma Boran heifers, resulting in premature births, perinatal loss, retained placentae, low birth weights and a prolonged period to the onset of postpartum ovarian activity.

9823 **Olaho-Mukani, W., Munyua, W.K. and Njogu, A.R., 1996.**

Haemolytic complement and class-specific antibody levels in goats during infection with *Trypanosoma evansi* and after treatment with diminazene aceturate. *Small Ruminant Research*, **22** (3): 241-247.

Olaho-Mukani: KETRI, P.O. Box 362, Kikuyu, Kenya.

Following infection with *T. evansi*, goats mounted a strong class-specific antibody response, characterised by elevation of IgM and IgG antibody levels. Concomitant with the rising antibody levels and parasitaemia, was a drop ( $P < 0.0001$ ) in the total haemolytic complement. These changes were accompanied by pyrexia ( $> 39^{\circ}\text{C}$ ), slight dyspnoea, and fall in haematocrit levels ( $P < 0.01$ ). Clinical examination revealed evidence of muscle wasting, lethargy and paleness of mucous membranes. Post-mortem examination carried out on one goat showed enlargement of lymph nodes, spleen and liver and oedema of the lungs and kidneys and a flabby heart. There was accumulation of sero-sanguineous fluid in the peritoneal, thoracic and pleural cavities and petechial haemorrhages on the serosa, pleura and intestinal mucosae. The brain was oedematous and showed evidence of congestion and meningeal petechiation. CSF taken from infected goats did not show changes suggestive of any CNS invasion by the parasites. Following treatment with diminazene aceturate, and the disappearance of parasites from the blood, the haematocrit status and haemolytic complement levels recovered by the 4th week. There was a rapid fall in the IgM-specific antibodies to near pre-infection levels. However, IgG-specific antibody levels were still elevated by the end of the study. The study shows that infection with this parasite may significantly affect goat production, because it causes changes which may lead to immunosuppression and organ failure. With the exception of IgG class-specific antibodies, these changes are quickly reversed by chemotherapeutic intervention. Levels of IgM and IgG class-specific antibodies may be a suitable indicator of the exposure status of goats to this parasite because the former fall rapidly after treatment or cure, while the latter may persist for long periods.

9824 **Onah, D.N., Hopkins, J. and Luckins, A.G., 1996.**

Haematological changes in sheep experimentally infected with *Trypanosoma evansi*. *Parasitology Research*, **82** (8): 659-663. Onah: Department of Veterinary Parasitology and Entomology, University of Nigeria, P.M.B. 011, Nsukka, Enugu State, Nigeria.

Eight 6- to 18-month-old sheep were each infected with  $2 \times 10^6$  *T. evansi* TREU 2143 through the external jugular vein. The parasite kinetics and the effects on body temperature, PCV, erythrocyte counts and total and differential white blood cell counts were monitored twice weekly for 3 months. The results showed that *T. evansi* produced a chronic form of the disease in sheep, characterised by low-level and often cryptic parasitaemia, with self-cure occurring in two cases; mild anaemia as evidenced by decreases in PCV and erythrocyte counts; and significant ( $P < 0.02$ ) leucocytosis by day 22 p.i. The leucocytosis was a result of marked lymphocytosis whose significant rises ( $P < 0.02$ ) paralleled the rises in total white blood cell counts. These changes were less obvious in the animals that underwent self-cure. We conclude that *T. evansi* produces pathological changes in the peripheral blood of sheep similar to those produced by its tsetse-transmitted counterparts. It would thus appear that the sheep/*T. evansi* model is suitable for long-term study of the immunopathology of pathogenic trypanosomes since the sheep is easily available, easy to handle and a natural host to all pathogenic trypanosomes.

9825 **Taylor, K., Lutje, V. and Mertens, B., 1996.** Nitric oxide synthesis is depressed in *Bos indicus* cattle infected with *Trypanosoma congolense* and *Trypanosoma vivax* and does not mediate T-cell suppression. *Infection and Immunity*, **64** (10): 4115-4122.

Taylor: ILRI, P.O. Box 30709, Nairobi, Kenya. Suppression of cellular immune responses is a feature of trypanosomiasis in bovine, human and murine hosts. Some aspects of immunosuppression in the murine model are mediated by nitric oxide (NO) produced by gamma interferon (IFN- $\gamma$ )-activated macrophages. We have investigated whether a similar mechanism is responsible for T-cell unresponsiveness in bovine trypanosomiasis. Bovine monocytes and macrophages from uninfected cattle and activated *in vitro* with IFN- $\gamma$  produced NO; however, this response was down-regulated in infected cattle. Similarly, the expression of inducible NO synthase messenger RNA was depressed in macrophages of infected cattle. Proliferation of mononuclear cells of trypanosome-infected cattle cultured with mitogen or trypanosome antigens was unchanged by the addition of an NO synthase inhibitor. Lymphocytes of infected cattle secreted interleukins with T-cell growth factor activity after *in vitro* activation with mitogens but not after activation with trypanosome antigens. Although lymph node cells secreted IFN- $\gamma$  after *in vitro* activation, *ex vivo* expression of mRNA was depressed. In contrast, the level of expression of interleukin 10 mRNA was higher during infection. We conclude that NO is not involved in the loss of T-cell proliferative function associated with trypanosomiasis in cattle and that, in contrast to the mouse model, the capacity of monocytes and macrophages to produce NO is actually down-regulated in infected cattle.

9826 **Wieggers, P., 1996.** *Bildung von Tumornekrosefaktor und Interferon bei der Infektion mit Intrazellularen (Theileria spp.) und Extrazellularen (Trypanosoma spp.) Parasiten.* [*Production of tumour necrosis factor and interferon during infection with intracellular (Theileria spp.) and extracellular (Trypanosoma spp.) parasites.*] Thesis, Freie Universität, Berlin, Germany. 134 pp.

The influence of TNF and IFN- $\gamma$  was examined in theileriosis of cattle and trypanosomiasis of dogs. Two West African pariah dogs were infected with *Trypanosoma congolense* and two with *T. brucei*. Those infected with *T. congolense* survived, whereas those infected with *T. brucei* died after 4 weeks. TNF was not detected in any of the sera examined. IFN was detected in all four dogs, even on the first day after infection. IFN (but

not TNF) was detected in *Theileria annulata* and *T. parva* cell cultures. Northern blot analyses showed that the IFN- $\gamma$  gene was activated in *Theileria*-infected cells.

9827 **Zapf, F., 1994.** *Untersuchungen bei Trypanotoleranten Tieren (Rind, Hund) zur Übertragung maternalen, lytischer Antikörper gegen Trypanosoma congolense (Broden, 1904) sowie zur Spezifität und Stabilität eines T. congolense Serodems.* [Maternal transmission of specific lytic antibody to *T. congolense* in trypanotolerant cattle and dogs, and the specificity and stability of a *T. congolense* serodeme.] Thesis, Fachbereich Veterinärmedizin, Freie Universität, Berlin, Germany. 87 pp.

Four Liberian pariah bitches were infected with one of two *T. congolense* strains through the bite of *Glossina morsitans*. Antibody capable of lysing 79-100% of trypanosomes was present in serum from their 17 pups. Colostral transmission of lytic antibody was also demonstrated in the offspring of 18 naturally infected cows in Togo. Antigenic variation was present in two strains from Liberia and two strains from Togo.

(c) TRYPANOTOLERANCE

[See also 20: no. 9822.]

9828 **Baker, R.L., 1995.** Genetics of disease resistance in small ruminants in Africa. In: Gray, G.D., Woolaston, R.R. and Eaton, B.T. (eds), *Breeding for resistance to infectious diseases in small ruminants* (Canberra, Australia; Australian Centre for International Agricultural Research), pp. 119-138.

ILRI, P.O. Box 46847, Nairobi, Kenya.

This review focuses on genetic variation in resistance to helminthiasis and trypanosomiasis, breeding programmes for disease resistance, and the possible use of molecular genetic markers and marker-assisted selection in breeding for disease resistance. Studies on cattle, sheep and goats are discussed.

(d) TREATMENT

[See also 20: nos. 9793, 9819.]

9829 **Eisler, M.C., Maruta, J., Nqindi, J., Connor, R.J., Ushewokunze-Obatolu, U., Holmes, P.H. and Peregrine, A.S., 1996.** Isometamidium concentrations in the sera of cattle maintained under a chemoprophylactic regime in a tsetse-infested area of Zimbabwe. *Tropical Medicine and International Health*, 1 (4): 535-541.

Eisler: University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK.

An experiment was carried out to determine the concentrations of the trypanocidal drug isometamidium

chloride in the sera of cattle maintained under a chemoprophylactic regimen at Rekomitjie, Zimbabwe, an area of high tsetse challenge in the Zambezi valley. In February 1993, 24 cattle at this site were treated i.m. with isometamidium chloride at a dose of 1.0 mg/kg body weight. Thereafter all animals were monitored regularly for 6 months for the presence of trypanosomes, and sera were collected to determine the concentrations of isometamidium using an ELISA. Isometamidium-treated cattle appeared to be protected against trypanosome infections for at least 18 weeks following treatment. Thereafter, three trypanosome infections were detected, between 20 and 22 weeks following treatment. In contrast, in 18 untreated control cattle at the same site, nine trypanosome infections were detected over the first 18 weeks of the experiment. Quantification of the isometamidium concentration in sera from the drug-treated cattle indicated that the apparent half-life of isometamidium in these animals was 23 days. This was similar to the half-life observed previously in cattle treated under laboratory conditions. The isometamidium ELISA was shown to be capable of quantifying drug levels in 20 out of 23 cattle for at least 70 days after treatment. There was no evidence of drug-resistant trypanosomes at this site.

9830 **Murilla, G.A., Mdachi, R.E. and Karanja, W.M., 1996.**

Pharmacokinetics, bioavailability and tissue residues of [ $^{14}\text{C}$ ]isometamidium in non-infected and *Trypanosoma congolense*-infected Boran cattle. *Acta Tropica*, **61** (4): 277-292.

Murilla: Radioisotope Laboratory, KETRI, P.O. Box 362, Kikuyu, Kenya.

The pharmacokinetics, bioavailability and tissue residues are reported in non-infected and *T. congolense*-infected Boran steers following either i.v. or i.m. injection of [ $^{14}\text{C}$ ]isometamidium at a dose rate of 1 mg/kg body weight. Two differently labelled compounds of isometamidium were used: 6- $^{14}\text{C}$  (ISMM-1) and ring-U- $^{14}\text{C}$  (ISMM-2). The cattle were divided into five groups: group 1 consisted of three non-infected cattle treated with ISMM-1 by i.v. injection; group 2 consisted of two non-infected cattle treated with ISMM-1 by i.m. injection; group 3 consisted of two *T. congolense*-infected cattle given similar treatment as group 2 cattle; group 4 consisted of three non-infected and group 5 of two infected cattle treated with ISMM-2 by i.m. injection. Radioactivity was measured in

plasma, urine, faeces and tissues, and drug concentrations were calculated. Data obtained following i.v. treatment were best described by tri-exponential equations with half-lives of 0.13, 1.22 and 120.7 h. Bioavailability of the i.m. dose was 58% in group 2 cattle. The major route of excretion was in faeces. Approximately 80% of the i.v. dose given was excreted within 21 days, of which only 18% was through urine. Total residues accounted for approximately 15% of the total dose given. Drug residues remained high in organs with excretory functions, including the liver and kidneys.

## 7. experimental trypanosomiasis

### (a) DIAGNOSTICS

[See also 20: no. 9837.]

9831 **Harris, E., Detmer, J., Dungan, J., Doua, F., White, T., Kolberg, J.A., Urdea, M.S. and Agabian, N., 1996.** Detection of *Trypanosoma brucei* spp. in human blood by a nonradioactive branched DNA-based technique. *Journal of Clinical Microbiology*, **34** (10): 2401-2407.

Agabian: Program in Molecular Pathogenesis, University of California, 521 Parnassus Avenue C-740, San Francisco, CA 94143-0422, USA.

We have developed a nonradioactive branched DNA (bdNA)-based assay for the diagnosis of the African trypanosomiasis in simple buffy coat preparations of human blood. Two repetitive DNA sequences specific to the *T. brucei* complex were chosen as targets of the bdNA assay, a technique which amplifies the signal from a target molecule rather than the target itself. Comparable sensitivities were observed with cloned target sequences, purified *T. brucei* DNA, procyclic trypanosomes and bloodstream trypomastigotes. The results of bdNA analysis of human blood samples from Côte d'Ivoire ( $n = 50$ ) showed excellent agreement with those of buffy coat microscopy. The bdNA technology offers certain advantages over alternative molecular biological techniques, including the simplicity of sample preparation and of the procedure itself, the stability of the reagents, the ability to process large numbers of samples simultaneously, and freedom from cross-contamination artifacts. We have successfully applied the bdNA technique to the detection of *T. brucei* in clinical samples from regions where *T. brucei* infection is endemic; to our knowledge, this is the first report of the molecular detection of *T. brucei* in human blood.

## (b) PATHOLOGY AND IMMUNOLOGY

[See also 20: no. 9878.]

9832 **Amole, B.O., Thomas, K.D., Jones, B.R. and Nelson, C.A., 1994.**

Acetylcholinesterase levels in brains of rabbits infected with *Trypanosoma brucei brucei*: a preliminary study. *In*: Llewellyn, G.C., Dashek, W.V. and O'Rear, C.E. (eds), *Biodeterioration research 4* (New York, USA, and London, UK; Plenum Press), pp. 429-436.

Department of Medical Microbiology and Parasitology, Faculty of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria.

9833 **Baetselier, P. de, 1996.** Mechanisms underlying trypanosome-induced T-cell immunosuppression. [*T. brucei*; mice.]

*In*: Mustafa, A.S., Al-Attayah, R.J., Nath, I. and Chugh, T.D. (eds), *T-cell subsets and cytokines interplay in infectious diseases* (Basel, Switzerland; S. Karger AG), pp. 124-139.

Unit of Cellular Immunology, Institute for Molecular Biology, Vrije Universiteit Brussel, B-1640 Sint Genesius Rode, Belgium.

9834 **Bakhiet, M., Jansson, L., Büscher, P., Holmdahl, R., Kristensson, K. and Olsson, T., 1996.**

Control of parasitemia and survival during *Trypanosoma brucei brucei* infection is related to strain-dependent ability to produce IL-4. [Mice.] *Journal of Immunology*, **157** (8): 3518-3526.

Bakhiet: Division for Neurology, Huddinge University Hospital, S-14186 Huddinge, Sweden.

9835 **Bundy, R.E., Owen, J.S., Lima, V.L.M. and Chaves, E.M.C., 1996.**

Trypanolytic activity *in vivo* of plasma from patients with schistosomiasis against the African trypanosome, *Trypanosoma brucei brucei*. [Mice.] *Biochemical Society Transactions*, **24** (3): 439S.

Bundy: Medical Unit, Royal Free Hospital School of Medicine, London NW3 2PF, UK.

9836 **Christenson, J., Lundkvist, G., el Tayeb, R.A.K., Peng, Z.-C., Bentivoglio, M. and Kristensson, K., 1996.**

*Trypanosoma brucei* dysregulates the circadian pacemaker in the rat suprachiasmatic nucleus *in vitro*. (Meeting abstract no. 808.15.) *Society for Neuro-science Abstracts*, **22** (3): 2057.

Christenson: Department of Neuroscience, Karolinska Institute, S-17177 Stockholm, Sweden.

9837 **Joshua, R.A., Neils, J.S. and Oladosu, L.A., 1996.** Heterophile antibodies to chicken erythrocytes in sheep infected with *Trypanosoma congolense*. *Onderstepoort Journal of Veterinary Research*, **63** (3): 253-258.

Joshua: Department of Paraclinical Veterinary

- Studies, University of Zimbabwe, P.O. Box MP167, Mount Pleasant, Harare, Zimbabwe.
- 9838 **Li, G.Q., Wang, Z.K. and Shen, Y.L., 1996.** [Identification of a trypanocidal factor against *Trypanosoma evansi* in human serum.] (In Chinese with English summary.) *Chinese Journal of Veterinary Science*, **16** (2): 146-150.  
Li: College of Veterinary Medicine, Nanjing Agricultural University, Nanjing 210095, China.
- 9839 **Lomo, P.O., Makawiti, D.W. and Konji, V.N., 1996.** Thyroid status and adenosine triphosphatase activity in experimental *Trypanosoma congolense* infection in rabbits. *British Veterinary Journal*, **152** (6): 659-667.  
Makawiti: Department of Biochemistry, University of Nairobi, P.O. Box 30197, Nairobi, Kenya.
- 9840 **Müller, N., Mansfield, J.M. and Seebeck, T., 1996.** Trypanosome variant surface glycoproteins are recognized by self-reactive antibodies in uninfected hosts. *Infection and Immunity*, **64** (11): 4593-4597.  
Müller: Institute of Parasitology, University of Berne, P.O. Box 8466, CH-3001 Berne, Switzerland.  
The variant surface glycoproteins (VSGs) of African trypanosomes form a dense surface coat on the bloodstream parasites. VSGs are immunodominant antigens that stimulate a rapid antibody response in trypanosome-infected individuals. In the present study, we examined VSG-specific antibodies present not only in sera from infected individuals but also in sera from individuals that had never been exposed to trypanosomes. Native antibodies against different VSGs were detected in sera from uninfected mice, bovines and humans; the antibodies were revealed to be exclusively directed against variable determinants of the antigens. Further experimentation demonstrated that such native antibodies immunoreact with cellular components of mice and thus are most likely produced by the self-reactive B-cell compartment of the murine immune system.
- 9841 **Owen, J.S., Lorenz, P. and Betschart, B., 1996.** HDL particles as the trypanosome-killing factor in human serum: an exclusive or inconclusive role? (Letter.) *Parasitology Today*, **12** (6): 250-251.  
Owen: University Department of Medicine, Royal Free Hospital School of Medicine, Rowland Hill Street, London NW3 2PF, UK.  
Recently published conflicting data on the trypanolytic role of HDL are discussed. Although it is clear that bulk HDL or bulk apoA-I are poor correlates of

trypanolytic activity, it remains far from proven either that normal human serum contains a trypanolytic factor completely unrelated to HDL or that apoA-I is not a component of all native lytic particles. It now seems clear that human serum does not contain a single uniquely trypanolytic factor.

9842 **Velthuisen, M.-L.F. van, 1996.** Glomerulopathy associated with parasitic infections. *Parasitology Today*, **12** (3): 102-107.

Department of Pathology, University of Rotterdam, P.O. Box 1738, 3000 DR Rotterdam, Netherlands.

Recent research on glomerular disease associated with malaria, schistosomiasis, leishmaniasis and trypanosomiasis and theories on the pathogenesis of glomerular lesions are reviewed. Experimental African trypanosomiasis has shown that immune complexes are involved, but further studies are required to elucidate the role of other parts of the defence system.

(c) CHEMOTHERAPEUTICS

[See also **20**: nos. 9866, 9867, 9870-9873, 9884.]

9843 **Berger, M.R., Zillmann, U., Konstantinov, S.M., Kaminsky, R. and Brun, R., 1996.** Anticancer alkylphosphocholines have inhibitory effects against certain medically important African trypanosomes. [*T. brucei*; mice.] (Meeting abstract no. 27.) *Tropical Medicine and International Health*, **1** (6): A35-A36.

Berger: AG Toxikologie und Chemotherapie, Krebsforschungs-zentrum, Im Neuenheimer Feld 280, 69120 Heidelberg, Germany.

9844 **Brun, R., Freiburghaus, F., Kaminsky, R. and Nkunya, M.H.H., 1996.** Evaluation of African plants for *in vitro* antitrypanosomal activity. (Meeting abstract no. 17.) *Tropical Medicine and International Health*, **1** (6): A29-A30.

Brun: Swiss Tropical Institute, Socinstrasse 57, CH-4002 Basel, Switzerland.

Based on literature searches and information obtained from healers in south-eastern Uganda, 33 African plant species belonging to 23 families which are reported to be used as traditional remedies for sleeping sickness were collected. Crude extracts of various plant parts were screened for *in vitro* activity against *Trypanosoma brucei rhodesiense* and for cytotoxicity using a human fibroblast-like cell line. Of 268 extracts tested, the most active extracts with IC<sub>50</sub> values below 1 µg/ml were derived from the following plants: *Albizia gummifera* (Mimosaceae), *Annona senegalensis* (Annonaceae), *Bussea occidentalis* (Caesalpinaceae), *Ehretia amoena* (Boraginaceae),

*Entada abyssinica* (Fabaceae), *Physalis angulata* (Solanaceae), *Securinega virosa* (Euphorbiaceae) and *Vernonia subuligera* (Compositae). All showed cytotoxicity, but the ratios of cytotoxicity/antitrypanosomal activity were in a modest range (< 20) and best for *E. abyssinica*, *S. virosa* and *V. subuligera*.

9845 **Freiburghaus, F., Ogwal, E.N., Nkunya, M.H.H., Kaminsky, R. and Brun, R., 1996.** *In vitro* antitrypanosomal activity of African plants used in traditional medicine in Uganda to treat sleeping sickness. *Tropical Medicine and International Health*, **1** (6): 765-771.

Brun: Swiss Tropical Institute, P.O. Box, CH-4002 Basel, Switzerland.

In Uganda, as in many other African countries, herbal treatment of various diseases is still common. In the present study, nine plant species collected from Tanzania and Uganda and used by traditional healers in south-eastern Uganda for the treatment of human African trypanosomiasis were extracted and screened for their *in vitro* activity against *Trypanosoma brucei rhodesiense*. Eight lipophilic extracts of five plants revealed very promising antitrypanosomal activity with IC<sub>50</sub> values below 1 µg/ml; among them were extracts prepared from *Albizia gummifera* (2), *Ehretia amoena* (1), *Entada abyssinica* (2), *Securinega virosa* (1) and *Vernonia subuligera* (2). Activity with IC<sub>50</sub> values between 1 and 10 µg/ml was determined for 15<sup>50</sup> further extracts. Cytotoxicity of active extracts, tested on a human fibroblast cell line (WI-38), was found to be high, and therefore selectivity indices resulted in less favourable ranges than those for the few commercially available drugs. Nevertheless, the results confirm the potential of ethno-botanically selected plants as remedies against sleeping sickness and call for phytochemical studies.

9846 **Jennings, F.W., Atouguia, J.M. and Murray, M., 1996.** Topical chemotherapy for experimental murine African CNS-trypanosomiasis: the successful use of the arsenical, melarsoprol, combined with the 5-nitroimidazoles, fexinidazole or MK-436. [*T. b. brucei*.] *Tropical Medicine and International Health*, **1** (5): 590-598.

Jennings: Department of Veterinary Parasitology, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK.

9847 **Kaminsky, R., Schmid, C. and Brun, R., 1996.** An 'in vitro selectivity index' for evaluation of cytotoxicity of antitrypanosomal compounds. (Meeting abstract no. 28.) *Tropical Medicine and International Health*, **1** (6): A36.

Kaminsky: Swiss Tropical Institute,

- Socinstrasse 57, CH-4002 Basel, Switzerland.
- 9848 **Kuzoe, F., 1996.** A common approach to drug development for African trypanosomiasis, Chagas' disease and leishmaniasis. (Meeting abstract no. 21.) *Tropical Medicine and International Health*, **1** (6): A32. UNDP/World Bank/WHO Special Programme (TDR), WHO, CH-1211 Geneva 27, Switzerland.
- New therapies are urgently needed for African trypanosomiasis, Chagas' disease and leishmaniasis. The parasites causing these diseases have many biochemical features in common which could be attractive targets for chemotherapy as they often differ from related mammalian metabolic pathways. In 1991, TDR decided to group together all activities related to the search and development of new drugs for the three diseases to maximise efforts and optimise resources. Three main priority areas are being investigated: polyamine/S-adenosyl methionine/trypanothione biosynthesis inhibition, sterol biosynthesis inhibition, and protease inhibition. Lead compounds found include an inhibitor of sterol biosynthesis for Chagas' disease, a diamidine which interferes with SAM metabolism for African trypanosomiasis and the alkyl-lysophospholipids for visceral leishmaniasis.
- 9849 **Räz, B., Gafner, S., Hostettmann, K. and Brun, R., 1996.** Phytochemical investigation of the African medicinal plant *Ehretia amoena* for the identification of trypanocidal molecules. (Meeting abstract no. 19.) *Tropical Medicine and International Health*, **1** (6): A30-A31. Räz: Swiss Tropical Institut, Socinstrasse 57, CH-4002 Basel, Switzerland.
- The leaves of *Ehretia amoena* (Boraginaceae) are used in Uganda as a traditional remedy for sleeping sickness. The dichloromethane extract of the leaves was active against bloodstream forms of *Trypanosoma brucei rhodesiense* *in vitro* showing an  $IC_{50}$  value of 7.0  $\mu\text{g/ml}$ . Six pure compounds were isolated from the extract by bioassay-guided fractionation. The most active compound was identified as 5,4'-dihydroxy-3,6,7,3'-tetramethoxyflavone (Chryso-splenetin), showing an  $IC_{50}$  value of 1.1  $\mu\text{g/ml}$ .
- 9850 **Werbovetz, K.A., Bacchi, C.J. and Englund, P.T., 1996.** Trypanocidal analogs of myristate and myristoyllysophosphatidylcholine. [*T. b. brucei*; mice.] *Molecular and Biochemical Parasitology*, **81** (1): 115-118.
- Werbovetz: Department of Biological Chemistry, Johns Hopkins University School of Medicine,

Baltimore, MD 21205, USA.

9851 **Yardley, V., Snowdon, D., Croft, S. and Hazra, B., 1996.** *In vitro* activity of diospyrin and derivatives against *Leishmania donovani*, *Trypanosoma cruzi* and *Trypanosoma brucei brucei*. *Phytotherapy Research*, **10** (7): 559-562.

Hazra: Department of Pharmacology, Jadavpur University, Calcutta 700-032, India.

8. trypanosome research

(a) CULTIVATION OF TRYPANOSOMES

9852 **Vassella, E. and Boshart, M., 1996.** High molecular mass agarose matrix supports growth of bloodstream forms of pleomorphic *Trypanosoma brucei* strains in axenic culture. *Molecular and Biochemical Parasitology*, **82** (1): 91-105.

Boshart: Max-Planck-Institut für Biochemie - Genzentrum, Am Klopferspitz 18a, D-82152 Martinsried, Germany.

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

[See **20**: no. 9807.]

(c) LIFE CYCLE, MORPHOLOGY, BIOCHEMICAL AND MOLECULAR STUDIES

9853 **Bastin, P., Matthews, K.R. and Gull, K., 1996.** The paraflagellar rod of the Kinetoplastida: solved and unsolved questions. [*T. brucei*.] (Review.) *Parasitology Today*, **12** (8): 302-307.

Matthews: School of Biological Sciences, University of Manchester, 2.205 Stopford Building, Oxford Road, Manchester M13 9PT, UK.

9854 **Beattie, D.S. and Howton, M.M., 1996.** The presence of rotenone-sensitive NADH dehydrogenase in the long slender bloodstream and the procyclic forms of *Trypanosoma brucei brucei*. *European Journal of Biochemistry*, **241** (3): 888-894.

Beattie: Department of Biochemistry, West Virginia University, Health Sciences Center, P.O. Box 9142, Morgantown, WV 26506, USA.

9855 **Borst, P., Rudenko, G., Taylor, M.C., Blundell, P.A., Leeuwen, F. van, Bitter, W., Cross, M. and McCulloch, R., 1996.** Antigenic variation in trypanosomes. [*T. brucei*, *T. evansi*, *T. congolense*, *T. vivax*, *T. equiperdum*.] (Review.) *Archives of Medical Research*, **27** (3): 379-388.

Borst: Division of Molecular Biology, Netherlands Cancer Institute, Plesmanlaan 121, 1066 CS Amsterdam, Netherlands.

9856 **Carrington, M. and Boothroyd, J., 1996.** Implications of conserved structural motifs in disparate trypanosome surface proteins. [*T. brucei*.] (Review.) *Molecular and Biochemical Parasitology*, **81** (2): 119-126.

Boothroyd: Department of Microbiology and Immunology, Fairchild Building D-305, Stanford University School of Medicine, Stanford, CA 94305-5402, USA.

9857 **Carruthers, V.B., Navarro, M. and Cross, G.A.M., 1996.**

Targeted disruption of expression site-associated gene-1 in bloodstream-form *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **81** (1): 65-79.

Cross: Laboratory of Molecular Parasitology, Rockefeller University, 1230 York Avenue, New York, NY 10021-6399, USA.

9858 **Clayton, C.E. and Michels, P., 1996.** Metabolic compartmentation in African trypanosomes. [*T. brucei*.] (Review.) *Parasitology Today*, **12** (12): 465-471.

Clayton: Zentrum für Molekulare Biologie, Universität Heidelberg, Im Neuenheimer Feld 282, 69120 Heidelberg, Germany.

9859 **Ersfeld, K., Docherty, R., Alsford, S. and Gull, K., 1996.** A fluorescence *in situ* hybridisation study of the regulation of histone mRNA levels during the cell cycle of *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **81** (2): 201-209.

Ersfeld: School of Biological Sciences, 2.205 Stopford Building, University of Manchester, Oxford Road, Manchester M13 9PT, UK.

9860 **Field, H., Blench, I., Croft, S. and Field, M.C., 1996.** Protein isoprenylation in *Trypanosoma brucei brucei*. *Biochemical Society Transactions*, **24** (3): 433S.

H. Field: Laboratory of Cell Biology, Department of Biochemistry, Imperial College of Science, Technology and Medicine, Exhibition Road, London SW7 2AY, UK.

9861 **Field, H., Blench, I., Croft, S. and Field, M.C., 1996.**

Characterisation of protein isoprenylation in procyclic form *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **82** (1): 67-80.

H. Field: Laboratory of Cell Biology, Department of Biochemistry, Imperial College of Science, Technology and Medicine, Exhibition Road, London SW7 2AY, UK.

9862 **Gardiner, P.R., Nene, V., Barry, M.M., Thatthi, R., Burleigh, B. and Clarke, M.W., 1996.** Characterization of a small variable surface glycoprotein from *Trypanosoma vivax*. *Molecular and Biochemical Parasitology*, **82** (1): 1-11.

Gardiner: ILRI, P.O. Box 30709, Nairobi, Kenya.

9863 **Graham, S.V. and Barry, J.D., 1996.** Polysomal, procyclin mRNAs accumulate in bloodstream forms of monomorphic

and pleomorphic trypanosomes treated with protein synthesis inhibitors. [*T. brucei*.] *Molecular and Biochemical Parasitology*, **80** (2): 179-191.

Barry: Wellcome Unit of Molecular Parasitology, Anderson College, University of Glasgow, 56 Dumbarton Road, Glasgow G11 6NU, UK.

9864 **Hanau, S., Rippa, M., Bertelli, M., Dalocchio, F. and Barrett, M.P., 1996.** 6-Phosphogluconate dehydrogenase from *Trypanosoma brucei*: kinetic analysis and inhibition by trypanocidal drugs. *European Journal of Biochemistry*, **240** (3): 592-599.

Barrett: Department of Medical Parasitology, LSHTM, Keppel Street, London WC1E 7HT, UK.

9865 **Kable, M.L., Seiwert, S.D., Heidmann, S. and Stuart, K., 1996.** RNA editing: a mechanism for gRNA-specified uridylyate insertion into precursor mRNA. [*T. brucei*.] *Science*, **273** (5279): 1189-1195.

Stuart: Seattle Biomedical Research Institute, Seattle, WA 98109, USA.

9866 **Kaminsky, R., Iten, M., Mett, H., Littlewood, A. and Brun, R., 1996.** Alterations in ornithine decarboxylase characteristics account for tolerance of *Trypanosoma brucei rhodesiense* to D,L- $\alpha$ -difluoromethyl-ornithine (DFMO). (Meeting abstract no. 23.) *Tropical Medicine and International Health*, **1** (6): A32-A33.

Kaminsky: Swiss Tropical Institute, Socinstrasse 57, CH-4002 Basel, Switzerland.

9867 **Krieger, S., Biebinger, S., Steverding, D. and Clayton, C., 1996.** The use of reverse genetics to assess possible drug targets in trypanosomes. [*T. brucei*.] (Meeting abstract no. 2.) *Tropical Medicine and Inter-national Health*, **1** (6): A20.

Krieger: Zentrum für Molekulare Biologie, Universität Heidelberg, 69120 Heidelberg, Germany.

9868 **Maier, A. and Steverding, D., 1996.** Low affinity of *Trypanosoma brucei* transferrin receptor to apotransferrin at pH5 explains the fate of the ligand during endocytosis. *FEBS Letters*, **396** (1): 87-89.

Steverding: Hygiene-Institut der Ruprecht-Karls-Universität, Abteilung Parasitologie, Im Neuenheimer Feld 324, D-69120 Heidelberg, Germany.

9869 **Maser, P. and Kaminsky, R., 1996.** ABC transporters in *Trypanosoma brucei brucei*. (Meeting abstract no. 25.) *Tropical Medicine and International Health*, **1** (6): A34.

Maser: Swiss Tropical Institute, Socinstrasse 57, CH-4002 Basel, Switzerland.

9870 **Minagawa, N., Yabu, Y., Kita, K., Nagai, K., Ohta, N., Meguro, K.,**

- Sakajo, S. and Yoshimoto, A., 1996.** An antibiotic, ascocofuranone, specifically inhibits respiration and *in vitro* growth of long slender bloodstream forms of *Trypanosoma brucei brucei*. *Molecular and Biochemical Parasitology*, **81** (2): 127-136.  
Minagawa: Department of Biochemistry, Niigata College of Pharmacy, 5-13-2 Kamishin'ei-cho, Niigata 950-21, Japan.
- 9871 **Oppendoes, F.R., 1996.** Glycolytic enzymes of parasites as drug targets. [Incl. *T. brucei*.] (Meeting abstract no. 9.) *Tropical Medicine and International Health*, **1** (6): A25.  
Research Unit for Tropical Diseases, International Institute of Cellular and Molecular Pathology, 74 avenue Hippocrate, B-1200 Brussels, Belgium.
- 9872 **Pilch, D.S., Kirolos, M.A. and Breslauer, K.J., 1995.** Berenil binding to higher ordered nucleic acid structures: complexation with a DNA and RNA triple helix. *Biochemistry*, **34** (49): 16107-16124.  
Breslauer: Department of Chemistry, Rutgers - The State University of New Jersey, New Brunswick, NJ 08903, USA.
- 9873 **Pilch, D.S., Kirolos, M.A., Liu, X., Plum, G.E. and Breslauer, K.J., 1995.** Berenil [1,3-bis(4'-amidinophenyl)triazene] binding to DNA duplexes and to a RNA duplex: evidence for both intercalative and minor groove binding properties. *Biochemistry*, **34** (31): 9962-9976.  
Breslauer: Department of Chemistry, Rutgers - The State University of New Jersey, New Brunswick, NJ 08903, USA.
- 9874 **Ruben, L., Akins, C.D., Haghighat, N.G. and Xue, L., 1996.** Calcium influx in *Trypanosoma brucei* can be induced by amphiphilic peptides and amines. *Molecular and Biochemical Parasitology*, **81** (2): 191-200.  
Ruben: Department of Biological Sciences, Southern Methodist University, Dallas, TX 75275, USA.
- 9875 **Samson, I., Aerschot, A. van, Samyn, B., Beeumen, J. van and Herdewijn, P., 1995.** Screening of a synthetic peptide library against glycosomal phosphoglycerate kinase of *Trypanosoma brucei*. *Letters in Peptide Science*, **2** (3-4): 217-219.  
Samson: Rega Institute of Medical Research, Katholieke Universiteit Leuven, Minderbroedersstraat 10, B-3000 Leuven, Belgium.
- 9876 **Samson, I., Rozenski, J., Aerschot, A. van, Samyn, B., Beeumen, J. van and Herdewijn, P., 1995.** Screening of a synthetic pentapeptide library composed of D-amino acids against

fructose-1,6-biphosphate aldolase. [*T. brucei*.] *Letters in Peptide Science*, **2** (3-4): 259-260.

Samson: Rega Institute of Medical Research,  
Katholieke Universiteit Leuven,  
Minderbroedersstraat 10, B-3000 Leuven,  
Belgium.

9877 **Schmid, B., Read, L.K., Stuart, K. and Göringer, H.U., 1996.**

Experimental verification of the secondary structures of guide RNA-pre-mRNA chimaeric molecules in *Trypanosoma brucei*. *European Journal of Biochemistry*, **240** (3): 721-731.

Göringer: Laboratorium für Molekulare Biologie  
- Genzentrum, Max-Planck-Institut für  
Biochemie, Universität München, Am  
Klopferspitz 18a, D-82152 Martinsried,  
Germany.

9878 **Schuster, J.P., Mehlhorn, H. and Raether, W., 1996.**

Ultrastructural changes on various *Trypanosoma* spp. after a 30-year storage period in liquid nitrogen. [*T. evansi*, *T. equinum*, *T. brucei*, *T. congolense*.] *Parasitology Research*, **82** (8): 720-726.

Mehlhorn: Institut für Zoomorphologie,  
Zellbiologie und Parasitologie, Heinrich Heine  
Universität, Universitätsstrasse 1, D-40225  
Düsseldorf, Germany.

9879 **Scory, S. and Steverding, D., 1996.** Intoxication of *Trypanosoma brucei* with ricin. (Meeting abstract no. 18.) *Tropical Medicine and Inter-national Health*, **1** (6): A30.

Scory: Institut für Tropenhygiene und  
Öffentliches Gesundheits-wesen, Universität  
Heidelberg, Im Neuenheimer Feld 324, 69120  
Heidelberg, Germany.

9880 **Shapiro, T.A. and Englund, P.T., 1995.** The structure and replication of kinetoplast DNA. [Incl. *T. brucei*.] (Review.) *Annual Review of Microbiology*, **49**: 117-143.

Shapiro: Department of Medicine, Division of  
Clinical Pharmacology, Johns Hopkins  
University School of Medicine, Baltimore, MD  
21205, USA.

9881 **Sollner-Webb, B., 1996.** Trypanosome RNA editing: resolved. *Science*, **273** (5279): 1182-1183.

Department of Biological Chemistry, Johns  
Hopkins University School of Medicine,  
Baltimore, MD 21205, USA.

9882 **Stebeck, C.E., Baron, G.S., Becroft, R.P. and Pearson, T.W., 1996.**

Molecular characterization of the kinetoplastid membrane protein-11 from African trypanosomes. [*T. b. rhodesiense*.] *Molecular and Biochemical Parasitology*, **81** (1): 81-88.

Pearson: Department of Biochemistry and Microbiology, University of Victoria, P.O. Box 3055, Victoria, BC V8W 3P6, Canada.

9883 **Tosomba, O.M., Coetzer, T.H.T. and Lonsdale-Eccles, J.D., 1996.**

Localisation of acid phosphatase activity on the surface of bloodstream forms of *Trypanosoma congolense*.

*Experimental Parasitology*, **84** (3): 429-438.

Lonsdale-Eccles: Department of Biochemistry, University of Alabama, Birmingham, AL 35294, USA.

9884 **Turrens, J.F., Watts, B.P., Zhong, L. and Docampo, R., 1996.**

Inhibition of *Trypanosoma cruzi* and *T. brucei* NADH fumarate reductase by benzimidazole and anthelmintic imidazole derivatives. *Molecular and Biochemical Parasitology*, **82**(1): 125-129.

Turrens: Department of Biomedical Sciences, University of South Alabama, Mobile, AL 36688-0002, USA.

9885 **Vassella, E., Roditi, I. and Braun, R., 1996.** Heterogeneous transcripts of RIME/ingi retroposons in *Trypanosoma brucei* are unspliced. *Molecular and Biochemical Parasitology*, **82** (1): 131-135.

Braun: Institut für Allgemeine Mikrobiologie, Universität Bern, Baltzerstrasse 4, CH-3012 Bern, Switzerland.

9886 **Wiemer, E.A.C., IJlst, L., Roy, J. van, Wanders, R.J.A. and Opperdoes, F.R., 1996.** Identification of 2-enoyl coenzyme A hydratase and NADP<sup>+</sup>-dependent 3-hydroxyacyl-CoA dehydrogenase activity in glycosomes of procyclic *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **82** (1): 107-111.

Opperdoes: Research Unit for Tropical Diseases, International Institute of Cellular and Molecular Pathology, 74 avenue Hippocrate, B-1200 Brussels, Belgium.