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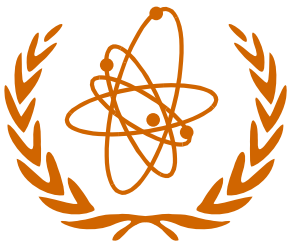

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section b — abstracts
1. general (including land use)

6683 **Frezil, J.L., 1983.** La trypanosomiase humaine en République Populaire du Congo. [Human trypanosomiasis in Congo.] *Travaux et Documents de l'ORSTOM*, no. 155: 165 pp.
ORSTOM, Centre de Montpellier, B.P. 5045, 3403 Montpellier Cedex, France.
This publication consists of a synthesis of about 30 published papers on trypanosomiasis in the Congo which were presented as a thesis at the University of Paris. The first section of the book reviews the history and geography of human trypanosomiasis in the Congo. The second section is on Glossinidae in the Congo (with information on eight species of *Glossina*, including distribution, habitats, biology, infection with *Trypanosoma vivax, T. congolense* and *T. brucei*, and trapping methods). The third section is on detecting trypanosomiasis, and the fourth and fifth sections are on *T. b. gambiense* in man and animals, respectively. Epidemiology and treatment are dealt with in two further chapters. Control methods against tsetse vectors of trypanosomiasis are reviewed in a final chapter before some conclusions are drawn and prospects discussed.

6684 **Hoste, C. and Toure, S.M., 1987.** Deux projets régionaux de la FAO pour le développement de l'élevage dans les zones infestées par les glossines. [Two FAO regional projects for livestock development in tsetse-infested areas.] *Tropicultura*, **5** (2): 65-68.
FAO, B.P. 2540, Ouagadougou, Burkina Faso.
The two regional projects described are: `Improvement, multiplication and conservation of trypanotolerant livestock in West Africa' (E. Chalon), and `Subregional support unit to development under FAO programme for the control of African animal trypanosomiasis and related development'.

6685 **Lambrecht, F.L., 1990.** *Where the mopane bloom: a biologist in Ngamiland, Botswana*. Wakefield, New Hampshire, USA; Longwood Academic. 190 pp.
Between 1966 and 1968, the author was assigned by WHO to investigate the epidemiology of sleeping sickness in Ngamiland in north-western Botswana where an upsurge in trypanosomiasis threatened both the human population and the economically important cattle industry. His assignment was to map the distribution of *Glossina morsitans*, its ecology and trypanosome infection rates, while his colleague, Dr David Scott, studied the epidemiology of the human disease through medical surveys and hospital records. The book provides a detailed account, partly in the form of diary entries, of his life and travels in the Okavango Delta area. Accounts of the work are interspersed with descriptions of the country, its flora and fauna and the native population. By the end of the project, enough information had been gathered on two tsetse fronts – in the eastern and western Okavango – to warrant a large-scale tsetse control trial using ground-sprayed dieldrin which successfully eliminated the fly in the Chobe target area of 880 square miles.

6686 **Odhiambo, T.R., 1990.** Keynote address. *Insect Science and its Application*, **11** (3): 259-263.
ICIPE, P.O. Box 30772, Nairobi, Kenya.
This keynote address formed the introduction to the International Study Workshop on Tsetse Population and Behaviour, held by ICIPE in Nairobi from 6

to 10 August 1989, the Proceedings of which are published as *Insect Science and its Application*, **11** (3) (the 23 papers published in these Proceedings are all abstracted in this issue of *TTIQ*). The keynote address briefly discusses some of the problems of tsetse and trypanosomiasis control and then outlines ICIPE's approach which is based on (i) gaining a thorough understanding of individual tsetse species and their holistic world, (ii) adopting a high-profile community approach to vector and disease management, (iii) stressing the need for sustainability, and (iv) using the ICIPE super-trap as the foundation for community-orientated tsetse and trypanosomiasis management.

6687 **Ormerod, W.E., 1990.** Africa with and without tsetse. *Insect Science and its Application*, **11** (3): 455-461.

The Old Rectory, Padworth, Reading RG7 4JD, UK.

The main reason for tsetse eradication, in the past, has been to remove the restraint of disease on cattle production. It is now argued that the major restraint is not disease but poor land made worse by overgrazing. An association between overgrazing and drought is recognised in South America, Central America and Australia. In Africa there is strong but circumstantial evidence that overgrazing may be linked to climatic change. Tsetse populations may in the past have been a major restraint on overgrazing but with new advances in technology it is now possible for such populations to be `managed' in order to protect vulnerable rangelands. Such a concept would mean changes in the attitude of society to tsetse which should come to regard them as a potential asset rather than as a liability.

6688 **Sindiga, I., 1987.** Sleeping sickness in Kenya. *Erdkunde*, **41** (2): 133-146.

The study of sleeping sickness in South Nyanza District, Kenya, reveals a history of fragmentary and uncoordinated efforts to reduce the disease's incidence. The sleeping sickness problem in the district and especially in the Lambwe Valley is both a medical and veterinary issue, but seldom have the two departments mounted sustained joint programmes. Since 1990, the greatest efforts to fight the disease have come only after an epidemic outbreak. Considerable measures have been taken to eliminate tsetse through destroying their habitat, but nothing has been done to influence cultural practices which enhance the survivability of trypanosomes. Local people have never been involved in the search for a permanent cure to the problem. Isolated treatment of human cases and inoculations of cattle are insufficient to contain trypanosomiasis.

6689 **Tarimo, C.S., 1988.** Tsetse and trypanosomiasis research programme in Tanzania. *In: Proceedings of the National Workshop on National Agricultural and Livestock Research in Tanzania, AICC, Arusha, 25-30 April 1988* (Dar es Salaam; Tanzania Ministry of Agriculture), pp. 413-425.

Tanzania Livestock Research Organization, P.O. Box 6910, Dar es Salaam, Tanzania.

Past research on the control of tsetse and trypanosomiasis in East Africa, especially Tanzania, is summarised. The techniques of tsetse control used (environmental management, game elimination, insecticides, ground spraying, aerial spraying, defoliation and sterile male release) are discussed and evaluated. Recommendations based on past research are given, especially their acceptability to local farmers and the government. Current research on tsetse and

trypanosomiasis in Tanzania is highlighted and priorities for future strategies proposed, including *in vivo* and *in vitro* rearing of *Glossina austeni* with a view to sterile male release, field studies on the ecology of tsetse (especially *G. austeni*), the epidemiology of human trypanosomiasis, and the implementation of an integrated control programme.

2. tsetse biology

(a) REARING OF TSETSE FLIES

[See also **14**: no. 6692.]

6690 **Gao, M.K., Chalo, O. and Bakuli, B., 1990.** Laboratory maintenance of tsetse flies on membranes. Tanzania Ministry of Agriculture and Livestock Development *Research and Training Newsletter,* **5** (2): 16-18.
TTRI, P.O. Box 1026, Tanga, Tanzania.
The laboratory rearing of *Glossina austeni* using an *in vitro* system is described. The blood diet is collected from the local abattoir and fed to the flies through silicone rubber membranes. Earlier heavy mortalities due to bacterial contamination have been minimised by sterilisation of feeding plates and membranes at 120□C overnight, sterilisation of the blood diet at 150 kRad before feeding, general cleanliness of the laboratory and workers, minimum handling of flies, quality control testing of the diet, etc. The colony now stands at over 40,000 females. It is aimed to expand the colony to 60,000 females which should produce 25,000 excess males monthly for sterile male release.

6691 **Gooding, R.H., 1990.** Genetic aspects of quality control in tsetse colonies. *Insect Science and its Application*, **11** (3): 385-398.
Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3, Canada.
Tsetse colonised either for laboratory studies or for release in SIT programmes are assumed to be healthy and genetically similar to flies in natural populations. However, insect colonies are subjected to many of the same evolutionary forces that influence genetic changes in natural populations, i.e. drift, selection, hitch-hiking, mutations, assortative mating and immigration. The influence of these on genetic structure of tsetse fly colonies is outlined, and examples are presented from several species. There is little or no evidence for adaptation during the early phases of laboratory colonisation of five species of tsetse. A model is presented indicating that with as little as a 5% fitness difference between males, some colonies have existed long enough to have undergone significant changes in the relative numbers of males having `standard' and `enhanced' fitness. Slight changes in heterozygosity of colonised flies is documented by comparing colonies and field-collected flies and by comparisons within colonies over periods of several generations or years. An example of hitch-hiking is illustrated with the closely linked genes *Sr* (sex ratio) and *Est-X* in *Glossina morsitans submorsitans*. A possible interaction between alleles at these loci is discussed. A summary is presented of polyacrylamide gel electrophoretic methods for monitoring 16 polymorphic loci distributed among the X chromo-some and autosomes of tsetse.

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

6692 **Davies-Cole, J.O.A. and Chaudhury, M.F.B., 1990.** Mating efficiency in females of *Glossina pallidipes*. *Insect Science and its Application*, **11** (3): 355-361.
ICIPE, P.O. Box 30772, Nairobi, Kenya.
Female sexual receptivity was studied in F_1 laboratory-reared *G. pallidipes* originating from Nguruman in the Rift Valley of Kenya. Females mated as early as 6 days old but reached peak receptivity at 9-13 days old (60-80%). Females did not immediately mate with more than one male. The mean spermathecal value was highest between 7 and 14 days of age, and declined thereafter. The duration of copulation was comparatively short (mean = 24 min), and did not vary significantly with age. High female receptivity corresponded with maturity of ovariole A, which reached maximum length at an age of 10 days. These results are discussed in relation to mass rearing of *G. pallidipes*.

6693 **Langley, P.A. and Wall, R., 1990.** The implications of hunger in the tsetse fly, *Glossina pallidipes*, in relation to its availability to trapping techniques. *Journal of Insect Physiology*, **36** (12): 903-908.
TRL, University of Bristol, Langford, Bristol BS18 7DU, UK.
Mean fat and haematin levels of both sexes of trap-caught *G. pallidipes* were significantly lower than those of flies intercepted approaching the trap or of those departing from the trap without having entered. At the lower end of the haematin range the fat levels of trap-caught flies, for specified levels of haematin, were also lower than those of flies in the other two categories. It is suggested that many of the relatively well fed flies that come to a trap would feed opportunistically on a host animal but do not enter the trap. Hence, feeding intervals estimated from trap catches are more likely to represent maximal intervals between feeds than average feeding intervals, because they are based largely on sampling the hungriest portion of the population. Inconsistent relationships were found between fat and haematin values in flies caught by different methods. Wide variations in fat contents for given haematin contents were found and wide variations in haematin contents for given times since feeding have been recorded in field-collected flies of both sexes. For these reasons it is proposed that haematin contents of tsetse cannot be used to estimate reliably the time lapse since the previous blood meal was ingested and that any relationship between fat and haematin content of a tsetse is a poor indicator of rates of fat consumption. The history of feeding success of a fly is better reflected in its fat content alone for a male and its fat content in relation to its pregnancy state for a female.

6694 **Miller, N. and Lehane, M.J., 1990.** *In vitro* perfusion studies on the peritrophic membrane of the tsetse fly *Glossina morsitans morsitans* (Diptera, Glossinidae). *Journal of Insect Physiology*, **36** (11): 813-818.
School of Biological Sciences, University of Wales, Bangor, Gwynedd LL57 2UW, UK.
An *in vitro* perfusion system for the study of peritrophic membranes is described. Data obtained using this system indicate that the tsetse peritrophic membrane is impermeable to catalase (240,000 MW) and blue dextran (2,000,000 MW) but permeable to alkaline phosphatase (140,000 MW) and trypsin (24,000 MW). Hence, under our experimental conditions, the tsetse peritrophic membrane is a molecular filter with a cut-off point of approximately 9 nm.

6695 **Randolph, S.E., Rogers, D.J. and Kiilu, J., 1990.** Rapid changes in the reproductive cycle of wild-caught tsetse, *Glossina pallidipes* Austen, when brought into the laboratory. *Insect Science and its Application*, **11** (3): 347-354.
Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS, UK; ibid.; ICIPE, P.O. Box 30772, Nairobi, Kenya.
This paper describes differences in reproductive and nutritional conditions that develop within 2 weeks of the transfer of wild-caught female *G. pallidipes* to apparently ideal laboratory conditions. In order to investigate the relative sampling efficiency of baited NG2B traps for female *G. pallidipes* and the flies' changing feeding behaviour on different days of the pregnancy cycle, samples of female *G. pallidipes* taken directly from the field and those held in the laboratory for a known number of days after larviposition were subjected to both ovarian dissection (including the measurement of the uterine content and the two largest ovarioles) and fat and haematin analysis. Under the laboratory conditions of slightly lower mean temperature (buffered against diurnal fluctuations), lower activity and higher feeding frequency than in the field, the interlarval period was prolonged, the third larval instar was disproportionately prolonged, the ovarioles and larvae *in utero* showed differential growth rates, pupal size was increased and the fat reserves of post-partum females was depleted. It is concluded that tsetse are very responsive to the precise environmental conditions in which they find themselves and that absolute quantitative measurements made in the laboratory cannot be applied directly to the field situation.

6696 **Tenabe, S.O., 1987.** The functional morphology of the `hector' in *Glossina* (Diptera: Glossinidae). *Nigerian Journal of Entomology*, **8** (1-2): 103-105.
Department of Zoology, University of Benin, Benin City, Nigeria.
The `hector' is a large, bilobed, raised, sclerotised plate situated immediately anterior to the hypopygium on the ventral side of the fifth segment of the abdomen of male tsetse. Its function is assumed to be to assist the male in holding the female during copulation. In order to investigate further its functional significance, specimens of *G. m. morsitans* were studied by stereoscan, electron microscopy and serial section. The posterior end of the hector can be raised or lowered by means of a pair of abdominal retractor muscles and hence the hector helps to keep the hypopygium flexed under the abdomen when not in use. The hector bears numerous posteriorly directed setae of two types: long and stout with 12 longitudinal ridges, and shorter and thinner. In form they resemble the mechanoreceptors of other insects and may therefore be used to enable the male to feel the position of the female abdomen during mating. Numerous small setae, of unknown function, are also present.

6697 **Tenabe, S.O., 1987.** The significance of multiple mating and mixed insemination by sterile and fertile males of *Glossina palpalis palpalis*. *Nigerian Journal of Entomology*, **8** (1-2): 106-113.
Department of Zoology, University of Benin, Benin City, Nigeria.
The influence of the duration of intervals between successive copulation of sterile and fertile males on female fecundity in *G. p. palpalis* was examined. Results indicated that there was no difference in the receptivity of females to alternate mating chances with sterile or fertile males from three mating tests carried out within a period of 24 h, when females were 3 days old. Older females were less

receptive to multiple mating. The first mating had a predominant effect on the productivity of the twice- or thrice-mated females. However, sperm mixing was likely to have occurred in the spermathecae since the second or third mating with either sterile or fertile males produced significant effects on the productivity of the mated females. This was irrespective of the order in which the types of males were presented. Where mixed insemination occurred, the sterile sperm from males treated with 12 kRad gamma rays in air were found to be competitive with fertile sperm in *G. p. palpalis*. Because multiple mating behaviour affects the ultimate goal of the sterile insect technique only if the sperm from the sterile insects are not competitive, multiple mating and mixed insemination in *G. p. palpalis* are not likely to be detrimental to the success of SIT for tsetse control.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

6698 **Elsen, P., Amoudi, M.A. and Leclercq, M., 1990.** First record of *Glossina fuscipes fuscipes* Newstead, 1910 and *Glossina morsitans submorsitans* Newstead, 1910 in southwestern Saudi Arabia. *Annales de la Société belge de Médecine tropicale*, **70** (4): 281-287.

Department of Entomology, Prince Leopold Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium; College of Sciences, King Saud University, Riyadh, Saudi Arabia; General Zoology and Applied Entomology, Faculty of Agricultural Sciences, Gembloux, Belgium.
Fourteen tsetse flies, caught during a fly survey in 1984, have been identified as seven males and one female of *G. m. submorsitans* and one male and five females of *G. f. fuscipes*. The catching sites, along the river wadi Gizan, are at 17□N, the highest latitude recorded for any *Glossina* species, and 1000 km outside the known distribution limits. The riverine vegetation in the area is dense but not continuous, forming a mosaic of low trees and thickets.

6699 **Hargrove, J.W., 1990.** Age-dependent changes in the probabilities of survival and capture of the tsetse, *Glossina morsitans morsitans* Westwood. *Insect Science and its Application*, **11** (3): 323-330.
ODA Tsetse Research Project, c/o Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, P.O. Box 8283, Causeway, Zimbabwe.
In April-May 1986, 180 male and 218 female *G. m. morsitans*, each less than 1 day old, were marked uniquely and released unfed on Redcliff Island, Lake Kariba, Zimbabwe. Flies were recaptured on ox fly-rounds carried out twice daily for 6 months; marks were recorded and the flies released. For females, 56% were recaptured at least once; the capture probability for a given 9-day period changed with age, falling from 0.32 after birth to 0.16 by 30 days and rising above 0.5 by 80 days. For males, 57% were recaptured; the probability was 0.21 for age less than 9 days, but > 0.77 for all older flies. The capture probabilities and fly-round catches were used to estimate the change with age in the daily mortality. Female mortality was 6.8% shortly after emergence, < 1% for ages 20-50 days and rose to 5% by 130 days – a pattern similar to that for laboratory-reared tsetse. Male daily mortality was 8.3% after emergence, fell to 5.5% by 9 days, then rose continuously to more than 10% by 30 days. The mortality changes are related to age rather than climate. Tsetse caught on ox fly-rounds

from a natural population were aged using ovarian dissection and wing-fray analysis. The age distribution (corrected using the capture probabilities from Redcliff) was consistent with the idea that, here too, mortality increased with age.

6700 **Hargrove, J.W. and Lange, K., 1989.** Tsetse dispersal viewed as a diffusion process. *Transactions of the Zimbabwe Scientific Assoc-iation*, **64** (1): 1-8.

ODA Tsetse Research Project, Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, P.O. Box 8283, Causeway, Zimbabwe.

Tsetse dispersal is viewed as a diffusion process, with the position of the fly relative to its origin a normally distributed random variable. Defining R as the mean distance of a diffusing particle from its origin and $R_d = R$ for $0 < R < d$, and 0 otherwise, the moments of R_d are calculated. These are used, in turn, to compute the conditional moments ($E(R^k|R<d)$); together these define the diffusion of a particle out of a circular domain. Similar results are produced for diffusion out of a rectangle into adjoining rectangles. The results are used to model the dispersal of tsetse flies as measured in mark-recapture experiments; they provide a reasonable description of C.H.N. Jackson's classical `square spiral' data, but his `large square' data do not conform well to the simplest diffusion model. An age dependent coefficient of diffusion, or a prolonged `escape reaction', are possible reasons which would need to be invoked unless more complex models of movement are involved. The classical data do not allow us to separate between these possibilities.

6701 **Kaminsky, R., 1983.** Untersuchungen zur Biologie, Ökologie und Infektion von Tsetsefliegen (Diptera, Glossinidae) in einem Regenwaldgebiet Liberias. [Studies on the biology, ecology and infection of tsetse flies in a rain forest region of Liberia.] *Göttinger Beiträge zur Land- und Fortwirtschaft in der Tropen und Subtropen*, no. 2: 144 pp.

Institut für Pflanzenbau und Tierhygiene in den Tropen und Subtropen, Universität Göttingen, D-3400 Göttingen, Germany.

Following a review of the relevant literature and a description of the study area, details are given of the biology, ecology and infection by *Trypanosoma brucei gambiense*, *T. vivax* and *T. congolense* of *Glossina* in a rain forest region of Liberia on the basis of studies carried out by the author. Most of the flies captured during the study were *G. palpalis gambiensis* and *G. pallicera pallicera*. Details are given of their feeding sites, host preferences, breeding sites, seasonal and diurnal activity patterns and infection rates as well as the reservoirs of *Trypanosoma* in man, livestock and wild animals. The results are discussed in relation to the epidemiology of trypanosomiasis in the West African rain forest.

6702 **Madubunyi, L.C., 1990.** Ecological studies of *Glossina austeni* at Jozani Forest, Unguja island, Zanzibar. *Insect Science and its Application*, **11** (3): 309-313.

ICIPE, P.O. Box 30772, Nairobi, Kenya.

In an attempt to overcome the problem of catching *G. austeni* in reasonable numbers, which hitherto has hindered studies of its ecology in Zanzibar, a new tsetse trap (the Chuka trap) was developed. Its sky-blue-coloured version proved superior to the white- and grey-coloured versions, the biconical trap, the Epsilon trap and the three-dimensional `target' in catching *G. austeni*. The Chuka trap

helped to establish that *G. austeni* is a very low flyer and most trappable in the `forest floor' biotope of Jozani Forest.

6703 **Mwangelwa, M.I., Dransfield, R.D., Otieno, L.H. and Mbata, K.J., 1990.** Distribution and diel activity patterns of *Glossina fuscipes fuscipes* Newstead on Rusinga island and mainland in Mbita, Kenya. *Insect Science and its Application*, **11** (3): 315-321.

ICIPE, P.O. Box 30772, Nairobi, Kenya; ibid.; ibid.; University of Zambia, Department of Biology, P.O. Box 32379, Lusaka, Zambia.

A study of population ecology and vectorial capacity of *G. f. fuscipes* was initiated on Rusinga island and mainland of Mbita Division, South Nyanza District, Kenya. As part of the overall study, investigations into fly distribution and diel activity patterns were carried out using biconical traps. The distribution of flies was found to be confined to a strip of dense vegetation of several metres in width along the lake shore. Trap catches indicated unimodal diel activity patterns for both sexes. Catches were recorded between 0700 and 1900 h with peaks for females at 0900 h and for males at 1000 h. Of the physical factors (solar radiation, relative humidity, temperature and windspeed), solar radiation was found to be the main factor significantly influencing the catches of both males and females during the day. For males $Y = -29.46 + 6.30X_1 + 0.40X_2$ ($r^2 = 0.59$, $P = 0.0053$ and $P = 0.0425$, where X_1 = solar radiation and X_2 = relative humidity, respectively). For females, $Y = 3.63 + 5.13X_1$ ($r^2 = 0.20$, $P = 0.0960$, where X_1 = solar radiation).

6704 **Offor, I.I. and Nlumanze, S.E., 1986.** The pattern of tsetse catches within 1973-1983 at Abuja, Niger State, Nigeria. *Nigerian Journal of Entomology*, **7** (1-2): 78-81.

NITR, P.M.B. 2077, Kaduna, Nigeria; NITR, Vom, Jos, Nigeria.

Tsetse were caught by routine fly rounds, normally on 5 days per week, at nine locations in the Abuja area during the period 1973-83. Puparia were also collected. Distribution curves of the mean monthly numbers of *Glossina palpalis* and *G. longipalpis* caught show that very few flies were available during the cold harmattan months between January and March, but that large numbers were present during the rainy season. *G. palpalis* was more abundant than *G. longipalpis* and male flies were more abundant than females (*G. palpalis* 3:2; *G. longipalpis* 3:1). Peak numbers of male and female *G. palpalis* and of female *G. longipalpis* occurred in June/July, while male *G. longipalpis* peaked in September. *G. palpalis* puparia were abundant throughout the dry season, with peak collection in February. Only low numbers of *G. longipalpis* puparia were found.

6705 **Rogers, D.J., 1990.** A general model for tsetse populations. *Insect Science and its Application*, **11** (3): 331-346.

Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS, UK.

The development of simple models for describing the population dynamics of species with overlapping generations is briefly described. The paper then presents a minimally complex simulation model for tsetse populations in which seasonally varying density-independent mortality, generally applied only to the adult stage, is combined with density dependence acting on both puparia and adults. Density dependence regulates population size within limits determined by

an interaction between the strength of the density-dependent relationships and the variability of the seasonal density independence. Population data sets for *Glossina palpalis* and *G. morsitans* in Nigeria and *G. pallidipes* in Kenya are adequately described by the model. Relationships discovered between the density-independent mortality and climatic variables for the Lambwe Valley data set allow predictions of population changes in other sites on the basis of their climatic conditions. Attempts to predict changes in the population of *G. pallidipes* in Somalia highlight the difficulties of this exercise. A tsetse's demographic response to climate may vary from region to region, making extensive predictions from local data sets difficult. There seems, however, no need to make more complex models to describe observed changes in tsetse populations.

6706 **Saini, R.K., 1990.** Responses of tsetse, *Glossina* spp. (Diptera: Glossinidae) to phenolic kairomones in a wind tunnel. *Insect Science and its Application*, **11** (3): 369-375.
ICIPE, P.O. Box 30772, Nairobi, Kenya.
Responses of tsetse *Glossina morsitans morsitans* and *G. pallidipes* to host-derived phenolic kairomones were investigated using a wind tunnel. Activation behaviour of *G. m. morsitans* depended on the mixture of the phenols but not on the dose or ratio of the blend used. Upwind orientation behaviour and actual contact with the odour source depended on both the phenolic mixture and the ratio of the phenols in the blend. In the present studies, a 4:1 blend of 4-cresol and 3-*n*-propylphenol, respectively, consistently induced more of the flies to fly upwind and contact the odour source as compared to any other combination of the phenols or even when these two crucial phenols were mixed in a ratio of 9:1, the ratio in which they are found in a typical sample of buffalo urine. Comparison of the responses of the two species indicates that significantly fewer *G. m. morsitans* fly upwind and contact the odour source on stimulation with a blend of 4-cresol and 3-*n*-propylphenol as compared to *G. pallidipes*. This may explain why phenols only produce small improvements in the catches of *G. m. morsitans* as compared to *G. pallidipes*. The simple wind tunnel developed provides not only a useful tool for rapidly screening candidate attractants but also a means to investigate how various compounds alone or in various combinations affect tsetse behaviour.

3. tsetse control (including environmental side-effects)

[See also **14**: no. 6697.]

6707 **Allsopp, R., 1991.** *Aerial Spraying Research and Development Project final report – volume 2: A practical guide to aerial spraying for the control of tsetse flies (*Glossina *spp.).* Chatham, UK; Natural Resources Institute, for the European Economic Community (RTTCP). 48 pp.
NRI, Central Avenue, Chatham Maritime, Chatham, Kent, ME4 4TB, UK.
This guide to the sequential application of low-dosage aerosols for tsetse control consists of four parts. The first chapter, on planning the operation, considers in general terms the operational design of control programmes (treatment area, airstrip, seasonal timing, prevention of reinvasion, entomological surveys, insecticide) and planning a strategy (contractual requirement, major equipment

requirements, flying charges, insecticide requirements and flow rate calculation, estimation of the operational flying time per aircraft). The second chapter considers various aspects of tenders and contracts for aerial spraying and insecticides. Chapter 3 gives details of operational procedures relating to the setting and calibration of spray gear, insecticide loading and handling, crew training and rostering, track guidance/navigation, timing the applications, and emergency precautions. The final chapter provides information on monitoring: physico-chemical (droplet sampling), meteorological, eco-technical, operational and entomological. The guide refers primarily to the use at night of small fixed-wing aircraft, e.g. Piper Aztec, Beechcraft Baron, Cessna 401, etc. It does not cover operations using larger aircraft such as the Dakota DC3 or those confined to daylight spraying, nor the use of helicopters. The procedures described in the guide are based largely on experiences within the RTTCP in southern Africa but are applicable to tsetse control throughout Africa.

6708 **Cuisance, D., 1988.** *La lutte contre les glossines dans la zone d'action agro-pastorale de Yérémo (République centrafricaine).* [Control of tsetse flies in the Yérémo grazing land action area (Central African Republic).] Maisons-Alfort, France; CIRAD-IEMVT. 68 pp.
IEMVT-CIRAD, Centre ORSTOM, 2051 avenue du Val-de-Montferrand, B.P. 5045, 34032 Montpellier Cedex, France.
A survey of the whole Yérémo area (about 700 km of gallery forest) provided the basis for drawing up a map of tsetse fly distribution (1:50,000). It shows the presence of two riverine species, including the omnipresent *Glossina fuscipes fuscipes* and the uncommon *G. fusca congolensis. G. f. fuscipes* is the major vector (mean relative density: 3.38 tsetse flies/trap/day), which is closely correlated with sites used by livestock and man, particularly around slaughterhouses. On the basis of known climatic, ecological, entomological and agropastoral data, methods used by animal producers are analysed. Initially traps were recommended for slaughterhouses and for livestock producers themselves. An effective trap exists. Tests are now being carried out to select the simplest and cheapest model. An initial control trial, limited to three livestock producers, was carried out during the dry season and showed the effectiveness and the feasibility of the technique (fewer tsetse flies and a drop in recurrence of the disease). Tests should now be carried out during the rainy season, which is a relatively sedentary period for ZAGROP livestock producers. Using this simple and effective control measure in and by the grazing community is a transfer of technology that requires preparation of livestock producers with training and information that are essential to proper use of the method. A work programme is presented. It places particular emphasis on setting up rainy season control in 10 to 15 livestock producer camps. These camps are selected before extension, and surveying is continued in other agropastoral areas. A certain number of recommendations were formulated concerning the personnel, equipment, vehicles and sites.

6709 **Cuisance, D., Politzar, H., Tamboura, I. and Mérot, P., 1990.** Coût de l'emploi de barrières de pièges et d'écrans insecticides pour la protection de la zone pastorale d'accueil de Sidéradougou, Burkina Faso. [Cost of using barriers of traps and screens impregnated with insecticides for the protection of the Sidéradougou pastoral area, Burkina Faso.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (2): 207-217.

IEMVT-CIRAD, Centre ORSTOM, 2051 avenue du Val-de-Montferrand, B.P. 5045, 34032 Montpellier Cedex, France; OAU-IBAR, P.O. Box 30786, Nairobi, Kenya; CRTA, B.P. 454, Bobo-Dioulasso 01, Burkina Faso; ibid.
The CRTA of Bobo-Dioulasso (Burkina Faso) has operated over a 4 year period an integrated campaign against tsetse in a pastoral area of 300,000 ha where 7200 insecticide-impregnated screens were set up during the dry season followed by the release of irradiated males during the rainy season. During the preliminary phase, three barriers were built against riverine tsetse species. They consisted either of non-impregnated traps or of impregnated traps or screens (deltamethrin e.c.) placed at 100 m intervals. Regular observations for more than 3 years have shown the high efficiency of these systems whose installation and running costs during the first year were about 200,000 F CFA/km for the non-impregnated traps, 190,000 F CFA/km for the insecticide traps and 150,000 F CFA/km for the insecticide screens. During the following years, maintenance costs were 70,000 F, 85,000 F and 64,000 F CFA/km, respectively, per year. In this climatic area and for this type of river and gallery forest, a satisfactory barrier is obtained with 7 km of insecticide traps or 10 km of capture traps against *Glossina tachinoides* and *G. palpalis gambiensis*. The combined use of traps and screens could be an interesting solution. The mixed use of screens and insecticide traps in an area infested with the savanna species, *G. morsitans morsitans*, proved to be efficient, but too expensive in terms of setting up and maintenance. This cost could probably be reduced by using odour attractants.

6710 **Gao, M.K., Mramba, F., Bakuli, B. and Chakale, B., 1990.** Efficacy of Decatix (deltamethrin 5%) cattle dip on tsetse flies at Mkwaja Ranch, Tanga Region. Tanzania Ministry of Agriculture and Livestock Development *Research and Training Newsletter*, **5** (1): 3-5.
TTRI, P.O. Box 1068, Tanga, Tanzania.
The Mkwaja Ranch area of 49,000 ha is infested with *Glossina pallidipes, G. morsitans morsitans, G. brevipalpis* and *G. austeni* which transmit *Trypanosoma congolense* (most important), *T. vivax* and *T. brucei*. The tick-borne disease, anaplasmosis, causes high mortality as a result of inter-current trypanosomiasis disease stress. Ever-increasing doses of isometamidium chloride have been necessary, to a point where there was considered to be a danger of drug toxicity as well as the operation becoming uneconomical. In 1989 a tsetse control project commenced, based on a cattle dip of Decatix (5% deltamethrin) every 14 days, or 7 days in wet weather. Tsetse populations were monitored with NGU and biconical traps baited with acetone, cow urine and sachets of propylphenol/octenol/methylphenol. Populations showed a sharp decline within 3 months from the start of dipping, and after 8 months *G. pallidipes, G. m. morsitans* and *G. brevipalpis* had been reduced by 90%, 100% and 70% respectively. *G. austeni* was not easy to trap but is believed to exist in negligible numbers. *G. brevipalpis* is most active when the cattle are in their shelters, perhaps explaining its slower decline.

6711 **Ikeshoji, T., Langley, P. and Gomulski, L., 1990.** Genetic control by trapping. *In*: Curtis, C.F. (ed.), *Appropriate technology in vector control* (Boca Raton, Florida, USA; CRC Press), pp. 159-172.

Ikeshoji: Department of Agricultural Biology, University of Tokyo, Bunkyo-Ku, Tokyo 113, Japan; Langley: TRL, University of Bristol, Department of Veterinary Medicine, Langford, Bristol BS18 7DU, UK.
Genetic control of insect populations in the past has generally involved the rearing of large numbers of insects in insectaries for sterilisation and release. This has several disadvantages, one of which is that the maintenance of such large stocks of insects requires specialist staff, making the technique inappropriate for local use by a community. The present chapter describes work aimed at genetic control utilising insects trapped from wild populations which can then be chemosterilised and released, thus circumventing these and other objections. First results of modelling a hypothetical population representing *Glossina* are used to demonstrate the superiority of sterilising and releasing trapped insects rather than simply killing them. Attempts to chemosterilise tsetse using bisazir are reviewed. This chemical, however, is volatile and somewhat unstable, and in recent years attention has turned to insect growth regulators to disrupt tsetse reproduction, in particular synthetic juvenile hormone analogues such as S-31183. Female tsetse treated with S-31183 produce pupae which fail to develop beyond day 20. Females can pick up a sufficient dose by tarsal contact and may also receive sterilising doses from contaminated males during mating. Experiments on trapping and chemosterilising mosquitoes are also described.

6712 **Kaaya, G.P. and Okech, M.A., 1990.** Microorganisms associated with tsetse in nature: preliminary results on isolation, identification and pathogenicity. *Insect Science and its Application*, **11** (3): 443-448.
ICIPE, P.O. Box 30772, Nairobi, Kenya.
Six genera of bacteria, *Serratia, Providencia, Enterobacter, Aeromonas, Cedecea* and *Bacillus*, were isolated from field-collected *Glossina pallidipes*. Four genera, *Serratia, Providencia, Enterobacter* and *Aeromonas*, were isolated from insectary-reared *G. morsitans morsitans*. All bacteria except *Bacillus* spp. and *Providencia alcalifaciens* were pathogenic for teneral *G. m. morsitans*. Bacteria isolated from insectary-reared tsetse were more pathogenic than those isolated from the field. Fungi of three genera were also isolated from field-collected adult *G. pallidipes*: *Penicillium, Aspergillus* and *Fusarium*. Five genera, *Aspergillus, Penicillium, Rhizopus, Mucor* and *Trichoderma*, were isolated from field-collected *G. pallidipes* pupae. The fungi, however, were only mildly pathogenic for adult tsetse and were not pathogenic for pupae.

6713 **Kuria, J.N. and Bwogo, R.K., 1986.** Aerial application of pyrethrum ULV formulation for control of *Glossina pallidipes* Aust. (Diptera: Glossinidae) in Lambwe Valley, Kenya. *Pyrethrum Post*, **16** (2): 52-60.
Pyrethrum Board of Kenya, P.O. Box 420, Nakuru, Kenya.
Aerial spray of pyrethrum, a non-pollutant natural insecticide, using 0.65% pyrethrins u.l.v. formulation for control of tsetse fly *G. pallidipes* was tested in Lambwe Valley between June and October 1983 using a fixed-wing aircraft. The operation achieved 60%, 67%, 69% and 72% reduction of tsetse in the first, second, third and fourth spray cycles respectively. Presence of heavy canopy layers in the forested thickets at the valley floor prevented low flights by the aircraft and consequently droplets from penetrating to the tsetse hideouts. Ground-spraying with a pyrethrum emulsifiable concentrate formulation to

supplement aerial spray in the thicket area has been contemplated as a possible solution.

6714 **Laveissière, C., Eouzan, J.-P., Grébaut, P. and Lemasson, J.-J., 1990.** The control of riverine tsetse. *Insect Science and its Application*, **11** (3): 427-441.

ORSTOM, IPR/OCCGE, B.P. 1500, Bouaké, Côte d'Ivoire.

Riverine tsetse are difficult to control because of the specific nature of their habitat and behaviour. Nowadays, however, the problem is practical rather than technical because a wide range of efficient control methods exists. The entomologist's scope of action is reduced by his need to pay due regard to the environment, including non-target fauna, and to avoid tampering with wildlife. These considerations mean that vegetation must not be cut down or burnt, and the choice of pesticide and method of application is limited. The world economic crisis has considerably reduced the availability of potential sources of donor funds and African countries cannot individually undertake large-scale eradication campaigns, ruling out the use of aeroplanes, labour-intensive methods and the sterile male release technique. Indeed, many scientists now question the desirability of tsetse eradication, fearing that the freed land may be overexploited, leading finally to total desertification. The challenge therefore is how to control tsetse under these conditions. The use of traps seems to be a good solution. The method is effective, safe for the environment, easy to use and very cheap when undertaken by rural communities. A number of questions still remain, such as whether to kill or sterilise the tsetse, whether it is necessary to impregnate traps with insecticide, whether there is a risk of selecting a `trap-resistant strain' of tsetse, and whether the use of traps can lead to eradication. In fact, in most cases, eradication is wishful thinking and controlling the fly is the only realistic option.

6715 **Laveissière, C., Grébaut, P., Lemasson, J.-J., Meda, H., Couret, D., Doua, F. and Brou, N., 1990.** *Les communautés rurales et la lutte contre la maladie du sommeil en forêt de Côte d'Ivoire*. [Rural communities and sleeping sickness control in the forest zone of Côte d'Ivoire.] OCCGE/ORSTOM Institut Pierre Richet report no. 13/IPR/RAP/90. 135 pp.

ORSTOM, IPR/OCCGE, B.P. 1500, Bouaké, Côte d'Ivoire; ibid.; ibid.; ibid.; ibid.; PRCT, B.P. 1425, Daloa, Côte d'Ivoire; Secteur de Santé Rurale, Daloa, Côte d'Ivoire.

The control of human trypanosomiasis in the forest region has long been a problem on account of the dense vegetation, the rainfall and the dispersed human population. Recently trapping has become a feasible method but would be exorbitantly expensive without peasant labour. Trials in 1987-90 in the Vavoua, sleeping sickness focus aimed to find out whether rural communities could be entrusted with large-scale tsetse control by trapping and whether they would ensure maintenance for long enough to stop disease transmission. The population, which is ethnically heterogeneous and mobile, was first taught about the disease and its vector and the control methods to be used and its responsibility for the success of the campaign. Screens impregnated with deltamethrin were distributed in November 1987 to 3680 planters; each received on average 10.5 screens depending on the characteristics of the plantation, i.e. one screen per 100 m of forest/plantation border, tracks and streams, one or two in camps, working and resting areas and water points. The total area covered by screens was 29,413 ha. Village edges and gallery forest were treated with Vavoua traps.

Insecticide was provided for reimpregnation of screens every 4 months in the first year and every 6 months in the second. Almost 100% of planters took part in the distribution of screens, and medical screening 15 days after screen distribution was attended by 88% of the population. Presentation for distribution of insecticide was around 80% over the 2 years. Participation in maintenance of the screens varied considerably according to ethnic group, and seemed to depend on the social organisation and attitudes in the group. Overall, diligence was greater the older the planter and the larger the plantation but this correlation was not seen in all ethnic groups. In villages with a heterogeneous population, the dominant ethnic group affected the attitude of the rest, either positively or negatively. Other socio-cultural factors such as religion also modified participation. A marked reduction in *Glossina palpalis palpalis* densities was seen: around villages 90% after 1 month, 99.8% after 3 months; in plantations 91% after 1 month, thereafter variable depending on participation and agricultural activities. After 24 months, medical screening showed that disease transmission had ceased. Costs, calculated as though a health sector team had carried out the campaign, were: 957 F CFA per screen; 1961 F CFA per Vavoua trap; 312 F CFA per hectare protected in the first year, 44 F CFA in the second; 12,700 F CFA per planter; 238 F CFA per individual for medical screening. The campaign showed that trapping could indeed be entrusted to rural communities who could maintain it long enough to halt disease transmission. Participation was generally excellent but more research is needed into the reasons for the uncooperative mental attitudes and behaviours of certain groups and into improved ways of educating and mobilising the people. It would be utopian to think that the rural communities can now be entirely autonomous in their control campaigns. For the present, organisation and supervision by a specialist team is still necessary.

6716 **Laveissière, C., Vale, G.A. and Gouteux, J.P., 1990.** Bait methods for tsetse control. *In*: Curtis, C.F. (ed.), *Appropriate technology in vector control* (Boca Raton, Florida, USA; CRC Press), pp. 47-74.

ORSTOM, IPR/OCCGE, B.P. 1500, Bouaké, Côte d'Ivoire; Tsetse and Trypanosomiasis Control Branch, P.O. Box 8283, Causeway, Harare, Zimbabwe; ORSTOM, 213 rue La Fayette, 75010 Paris, France.

The use of baits (visual and olfactory) for tsetse control is described separately for savanna, riverine and forest species. For tsetse of the open savanna (*Glossina morsitans, G. pallidipes*) some effective odour attractants have been developed for use with insecticide-treated traps and screens; these include carbon dioxide (difficult to dispense economically), acetone, butanone, octenol and various phenols. This technology may also be effective against *G. longipennis* in the savanna and against *G. tachinoides, G. brevipalpis* and *G. austeni* in more wooded situations. Using cattle dipped in deltamethrin as tsetse baits also appears promising. Since *G. palpalis* has shown no clear response to odour attractants other than carbon dioxide, control of this and other species in riverine gallery forest depends on the visually attractive biconical trap which is normally impregnated with deltamethrin. In the ecologically complex forest zone it is more difficult to find a cost-effective method of tsetse control. Biconical traps are too expensive for treating a large area and reliance is now placed on the rather less effective but simpler and cheaper impregnated screen. Mobilisation of the rural communities is essential in treating a large area and maintaining (reimpregnating)

the screens. Pyramidal traps, used without insecticides, have shown promising results in very humid areas such as the Congo. Guidelines are provided on the implementation of bait methods in the three biotopes, with discussion of such factors as types of traps and screens, effectiveness of different odour attractants for different species, area to be treated, timing of treatment, positioning of traps and screens, choice of insecticide. Compared with ground or aerial spraying of insecticides, bait methods of tsetse control have many advantages, but it must be recognised that these methods are relatively new and must be applied with special care to observe their effectiveness and practicability, and to assess means of improving their feasibility.

6717 **Opiyo, E.A., Njogu, A.R. and Omuse, J.K., 1990.** Use of impregnated targets for control of *Glossina pallidipes* in Kenya. *Insect Science and its Application*, **11** (3): 417-425.

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

Trials using deltamethrin-impregnated odour-baited targets for control of tsetse have been running in Galana Ranch on the coastal hinterland since 1986. In July 1988, a similar trial was started in Lambwe Valley, western Kenya. *G. pallidipes* is the sole vector in the valley and is present in very high densities. In the Galana Ranch trial, octenol and acetone are used as odours, while in Lambwe Valley natural cow urine is used in addition to acetone and octenol. Tsetse population densities were assessed weekly for 3 weeks before deployment of targets and thereafter at monthly intervals. A herd of cattle is used to monitor the effect of the control measures on disease incidence. On Galana Ranch, the block where the initial trial began has remained free of *G. pallidipes* for a period of 3 years. In a period of 9 months in the second year of the trial, the Berenil index in a herd of cattle was 0.07 in the controlled area compared to 2.5 in the uncontrolled area. In Lambwe Valley a 99.9% reduction in trap catches has been observed in most parts of the park at the end of the first year. The Berenil index has dropped from 6.3 to 0 and there is a general improvement in the health of the animals. Observations are continuing at both sites.

6718 **Santos Grácio, A.J., 1984 [1988].** A técnica dos machos esterilizados no combate às glossinas. História e perspectiva. [The technique of sterile male release in the control of tsetse flies. History and perspectives.] *Anais do Instituto de Higiene e Medicina Tropical*, **10** (1/4): 47-65.

Instituto de Higiene e Medicina Tropical, Universidade Nova de Lisboa, 1300 Lisbon, Portugal.

The author reviews the use of ionising radiation, chemosterilants, hybridisation and genetic manipulation to sterilise males and/or pupae of *Glossina* for use in sterile male release.

6719 **Schlettwein, C.H.G. and Giliomee, J.H., 1990.** The effects of different dosages of the insecticide mixtures endosulfan/alphamethrin on adults of the biological control agent *Cyrtobagous salviniae* (Coleoptera: Curculionidae) against *Salvinia molesta*. *Madoqua*, **17** (1): 37-39.

Department of Water Affairs, Private Bag 13193, Windhoek, Namibia.

The effects of a mixture of endosulfan and alphamethrin (alpha-cypermethrin), which is used to control *Glossina morsitans*, on *Cyrtobagous salviniae*, a biological control agent for the aquatic weed *Salvinia molesta*, were investigated in the laboratory. Endosulfan and alpha-cypermethrin were applied to ponds at a

rate of 6 and 0.1 g a.i./ha, respectively, with one, two or three applications/pond. Adults of *C. salviniae* were susceptible to the insecticides, while larvae were minimally affected at dosages of 6 and 12 g a.i. endosulfan/ha, but were killed at 18 g a.i./ha. Populations treated once or twice recovered after 3 weeks, but those treated three times failed to recover. It is recommended that treatments against *G. morsitans* should only be applied when water temperatures exceed 21□C at intervals of at least 21 days.

6720 **Shaw, A.P.M., 1990.** A spreadsheet model for the economic analysis of tsetse control operations benefiting cattle production. *Insect Science and its Application*, **11** (3): 449-453.

1 Amport Park Mews, Amport, Andover, Hampshire, SP11 8BS, UK.

A spreadsheet computer model of the benefits and costs of tsetse control has been developed. It aims to provide a sufficiently standardised framework for setting these out so that widely different situations can be compared. For this purpose, the main variables are grouped into four categories: cattle production system, disease impact on productivity, tsetse control costs and stocking density (represented by cattle in the area before control and those transferred into the area subsequently). The model covers direct benefit due to changes in productivity resulting from reduced mortality, morbidity and drug use and indirect benefits due to transfers of cattle into the area and the increased use of work oxen. A series of runs of the model based on a cattle production system oriented towards draught power production is used to illustrate how the model can be used to define the conditions under which tsetse control is likely to be economically viable.

6721 **Shereni, W., 1990.** Strategic and tactical developments in tsetse control in Zimbabwe (1981-1989). *Insect Science and its Application*, **11** (3): 399-409.

Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, P.O. Box 8283, Causeway, Harare, Zimbabwe.

Tsetse flies have been eradicated from an area of 48,000 km^2 in Zimbabwe since 1981. The main approach has been pesticidal control, involving ground spraying, aerial spraying, cattle dipping and artificial bait techniques, in some circumstances in combination. This represents a change in tactic from the pre-independence period when control relied solely on ground spraying. Factors which have influenced choice of technique are discussed in the paper, including the scale of the trypanosomiasis problem, technical limitations of the technique, cost-effectiveness and environmental considerations. Ground spraying, the mainstay of tsetse control operations in Zimbabwe prior to 1980, is becoming increasingly unfavourable because of high logistical requirements and environmental reasons, but remains an effective technique under a wide range of circumstances. Aerial spraying has proved very effective for management of crisis situations but is comparatively expensive, capital intensive in hilly terrain and less effective against *Glossina pallidipes* than *G. morsitans*. Vector control by applying insecticide (deltamethrin) to cattle appears technically feasible at a very competitive cost. This is a most promising technique in areas where there are already cattle and few wild hosts. Control of tsetse using odour-baited and insecticide-treated screens has proven technically feasible in a wide range of terrain, and appears economically competitive with ground spraying. Both technical and financial performance of the technique are still being improved.

Bait technology offers scope for new approaches to the control of the fly and defence of cleared areas from reinvasion.

6722 **Stiles, J.K., Molyneux, D.H., Wallbanks, K.R. and Vloedt, A.M.V. van der, 1989.** Effects of γ irradiation on the midgut ultrastructure of *Glossina palpalis* subspecies. *Radiation Research*, **118** (2): 353-363.
Department of Biological Sciences, University of Salford, Salford M5 4WT, UK.
In the sterile insect technique, released sterile males compete for and with fertile wild individuals for mates, thus reducing the population's reproductive rate. *Glossina* populations have been eradicated after release of laboratory-bred flies sterilised by γ irradiation. However, no studies exist on radiation-induced damage to the midgut morphology and function of the radiation-sterilised insects. After *G. palpalis palpalis* and *G. p. gambiensis* were subjected to 130 Gy γ radiation, their midgut damage and recovery were monitored by electron microscopy. The first sign of damage was atrophy and loss of the microvillous border from epithelial cells. The rate of cell degeneration increased, with young as well as old cells being affected and cellular debris filling the ectoperitrophic space. Muscle cells were destroyed, patches of basal lamina were left bare, intracellular virus- and rickettsia-like organisms became more frequent, and many replacement cells became unusually large. Partial recovery occurred from the 10th day post-irradiation. Such changes in midgut ultrastructure and the corresponding inhibition of functions may increase the susceptibility of the fly to trypanosome infection.

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

[See also **14**: no. 6701.]

6723 **Bourzat, D. and Gouteux, J.P., 1990.** Données préliminaires sur le contact glossines-petits ruminants dans le massif forestier du Mayombe, Congo. [Preliminary data on tsetse-small ruminant contact in the Mayombe mountain forest area, Congo.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (2): 199-206.
IEMVT-CIRAD, 10 rue Pierre Curie, 94704 Maisons-Alfort Cedex, France; Centre ORSTOM, B.P. 181, Brazzaville, Congo.
Trapping revealed the presence of *Glossina palpalis palpalis* in the project area and the absence of *fusca* group tsetse which have shown a remarkable regression in recent years. Blood meal analysis revealed marked preferences for suids (34%) and reptiles (21%). Trypanosome infection rates were 46% in females and 29% in males, of which 66% were *Trypanosoma vivax*, 10% *T. congolense* and 15% *T. grayi*. Evidence of the absence of salivary gland infection was given by means of a DNA probe. Serological testing of sheep and goats with Testryp CATT showed that more than 50% were seropositive, suggesting close contact between these animals and *T. vivax*, despite the absence of blood meals from small ruminants. Cellognost tests were all negative, indicating the absence of infection due to *T. brucei*.

6724 **Brady, J., Packer, M.J. and Gibson, G., 1990.** Odour plume shape and host finding by tsetse. *Insect Science and its Application*, **11** (3): 377-384.
Department of Pure and Applied Biology, Imperial College, Silwood Park, Ascot, Berkshire, SL5 7PY, UK.

Plotting the movement of air through typical tsetse habitats in Zimbabwe revealed that it is liable to change direction by over 90□ within a few metres. In winds of < 1 m/s, there was a negative correlation between windspeed and the wind's tendency to meander, whether in thick bush or out in the open, and at the mean windspeed in wet season *mopane* woodland (0.3 m/s), the wind changed direction by *c.* 15□/s. Accordingly, host odour does not move downwind in simple trajectories that tsetse flies could easily follow. Even 5 m from a source, odour (modelled with smoke) approached a notional tsetse fly for a quarter of the time from > 90□ away from the true source direction. Also, air turbulence at common tsetse resting sites generates much nonsense information about the `true' direction of any odour-bearing wind. The suggested answer to how tsetse manage to find distant, invisible hosts, in spite of this confusing information from the wind, is that they progress by a biased random walk which is the outcome of their upwind anemotactic responses to odour-bearing wind and the proportion of the time for which the wind does blow in the `correct' direction. Computer simulation shows that this might work in principle.

6725 **Gashumba, J.K., 1990.** Speciation and subspeciation in *Nannomonas* trypanosomes and their epidemiological significance. *Insect Science and its Application*, **11** (3): 265-269.

TRL, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Trypanosoma congolense and *T. simiae* have been the two recognised species within the subgenus *Nannomonas. T. congolense* is pathogenic to cattle and the small ruminants but not to pigs, while *T. simiae* causes disease only in pigs. The two species are difficult to distinguish from each other because both share the same developmental cycle in the tsetse and are broadly similar morphologically. However, their isoenzyme and DNA characteristics are quite different. Even more confusing is the fact that *T. congolense* itself is composed of a number of `strains' or types: historically the different types of *T. congolense* were often considered as separate species by different workers. Now isoenzyme and DNA characterisation show that *T. congolense* is composed of at least three different types, which are probably equivalent to subspecies. Furthermore, evidence for another species within the subgenus *Nannomonas* has come recently from isolates from tsetse midguts in The Gambia. Specific DNA probes have now been produced for the different kinds of *Nannomonas*. With these, it is now possible to identify the different infections from midgut dissections of wild tsetse. This should now facilitate an elaborate study to determine the distribution and prevalence of the different types across Africa, their association with the different species of tsetse, and the significance of each in the causation of disease in domestic livestock. The information gained will also help to clarify the taxonomic status of each type within the subgenus.

6726 **Gilles, N. and Rémy, G., 1983.** Eléments d'une géographie de la trypanosomiase dans l'espace Ivoiro-Voltaïque. [Elements of the geography of trypanosomiasis in the Côte d'Ivoire-Burkina Faso area.] France; ACCT/CEGET (CNRS) *Travaux et Documents de Géographie tropicale*, no. 48: 157-166.

Ecole des Hautes Etudes en Sciences Sociales, Marseille, France.

The distribution of African trypanosomiasis in Burkina Faso and Côte d'Ivoire is considered in relation to ecological, climatic, landscape and anthropogenic

factors. The current situation, influenced by land clearance programmes, population explosion and urbanisation, is characterised by modified relationships between man and vector, increasing opportunities for encounters between the tsetse flies and man and the displacement of trypanosomiasis foci from the traditional savanna landscapes to forested areas.

6727 **Lancien, J., Muguwa, J., Lannes, C. and Bouvier, J.B., 1990.** Tsetse and human trypanosomiasis challenge in south eastern Uganda. *Insect Science and its Application*, **11** (3): 411-416.

Tsetse Control Department, Ministry of Animal Industry and Fisheries, P.O. Box 7212, Kampala, Uganda; ibid.; Projet Français; ibid.

Pyramidal traps have been used against *Glossina fuscipes fuscipes* to control *Trypanosoma brucei rhodesiense* sleeping sickness in Busoga. Reduction of the apparent tsetse density reached 96.5-97.5% after 6 months and 99% after 9 months, while screening of villagers showed a 90% reduction in cases after 5 months. However, the reduction in tsetse density has to be maintained at 99% or there is an abrupt outburst in disease transmission, related to loss of attractivity of traps. Even after control of the flies, peak disease transmission still occurs in the rainy season but its intensity is not always correlated with tsetse density. During the rainy season, agricultural activities at the forest savanna border bring villagers into contact with favourable tsetse habitats, and mobility of cattle may also play a role in the dynamics of disease transmission.

6728 **Leak, S.G.A., Collardelle, C., Coulibaly, L., Dumont, P., Feron, A., Hecker, P., d'Ieteren, G.D., Jeannin, P., Minengu, M., Minja, S., Mulatu, W., Nankodaba, G., Ordner, G., Rowlands, G.J., Sauveroche, B., Tikubet, G. and Trail, J.C.M., 1990.** Relationships between tsetse challenge and trypanosome prevalence in trypanotolerant and susceptible cattle. *Insect Science and its Application*, **11** (3): 293-299.

Leak, Minja: ILRAD, P.O. Box 30709, Nairobi, Kenya; d'Ieteren, Rowlands, Trail: ILCA, P.O. Box 46847, Nairobi, Kenya; Collardelle, Dumont, Jeannin, Ordner, Sauveroche: OGAPROV, P.O. Box 245, Moanda, Gabon; Minengu: DPP, P.O. Box 8251, Idiofa, Zaire; Feron: Mushie Ranch, P.O. Box 199, Kinshasa, Zaire; Coulibaly, Hecker, Nankodaba: SODEPRA/GTZ/CIPEA, P.O. Box 143, Boundiali, Côte d'Ivoire; Mulatu, Tikubet: Ghibe Valley, ILCA, P.O. Box 5689, Addis Ababa, Ethiopia.

The relationships between estimates of tsetse challenge and trypanosome prevalence in trypanotolerant and susceptible cattle were examined at sites of the African Trypanotolerant Livestock Network. Estimates of tsetse challenge were determined as the product of tsetse relative densities, their trypanosome infection rates and the proportions of feeds taken by them from cattle. Trypanosome prevalence in both trypanotolerant and susceptible breeds of cattle was estimated from monthly examination of groups of ear-tagged cattle. Regression equations between estimates of trypanosome prevalence and tsetse challenge were fitted using an arcsin transformation of trypanosome prevalence and a $\log_{10}$ transformation of tsetse challenge. Highly significant relationships between estimates of tsetse challenge and trypanosome prevalence were found for sites with trypanotolerant cattle ($P < 0.0001$) and sites with susceptible cattle ($P < 0.01$). Mean trypanosome prevalence at a given level of tsetse challenge was at least twice as high in susceptible as in trypanotolerant cattle. The slopes of the

regression lines for the two groups of cattle were significantly different ($P < 0.05$). The results confirm the superior ability of trypanotolerant cattle to withstand tsetse challenge in the field. The curves obtained for the two groups of cattle illustrate the necessity in tsetse control campaigns for a major reduction of tsetse populations to take place before significant decreases in trypanosome incidence in livestock can be achieved.

6729 **Makumyaviri, A.M., 1990.** L'importance épidémiologique de l'hôte experimental et du réservoir animal de *Trypanosoma brucei gambiense*. [The epidemiological significance of experimental host and animal reservoir of *T. b. gambiense*.] *Revue de Médecine vétérinaire*, **141** (11): 873-875.
B.P. 1746, Lubumbashi, Zaire.
The author briefly mentions the domestic and wild animals which have been used in experimental studies of *gambiense* sleeping sickness, some of which are known to act as natural reservoirs. In order to understand the epidemiology of the disease better, however, it is necessary to determine the period during which trypanosomes remain transmissible from their potential reservoir hosts and to evaluate the significance of such reservoirs in parasite transmission.

6730 **Mbulamberi, D.B., 1990.** Possible causes leading to an epidemic outbreak of sleeping sickness: facts and hypotheses. *Japanese Journal of Tropical Medicine and Hygiene*, **18** (1): 11-16.
Uganda National Sleeping Sickness Control Programme, P.O. Box 1241, Jinja, Uganda.
The author gives a brief account of sleeping sickness epidemics which have occurred in south-eastern Uganda since the beginning of the century, and reviews the various hypotheses which have been put forward to explain their periodic occurrence. These epidemics have been partially controlled in the past using the conventional methods of bush clearing, mass diagnostic surveys and treatment. Political, social and economic upheavals, leading to a breakdown in systematic medical and vector surveillance programmes, have been found to be very important factors in the recurrence of these epidemics.

6731 **Milligan, P., 1990.** Modelling trypanosomiasis transmission. *Insect Science and its Application*, **11** (3): 301-307.
Department of Biological Sciences, University of Salford, Salford M5 4WT, UK.
Simple models can be used to study the effects of factors involved in trypanosomiasis transmission, provided rough parameter estimates are available. The models should also be tested against field data; more complex models are needed which relate prevalence to the sensitivity of the diagnostic method, and take account of age-dependent changes in host susceptibility.

6732 **Nitcheman, S. and Jacquiet, P., 1990.** Utilisation de souriceaux pour la mise en évidence de l'infectivité des glossines. [Use of suckling mice for the detection of tsetse flies with mature trypanosome infections.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (2): 219-223.
IEMVT, 10 rue Pierre Curie, 94704 Maisons-Alfort Cedex, France.
To detect infective tsetse fly hosts of metacyclic trypanosomes, flies presumed to be infected were individually fed on suckling mice on three consecutive occasions (one fly per mouse). The blood of the mice was microscopically examined later in order to detect which flies were infective. This `inverse xenodiagnosis' is suitable for the easy detection of infective flies and for the rapid constitution of

infective tsetse stocks for experimental purposes. On the other hand, it can only be used for species or strains of trypanosomes that are infective to mice. The results also confirm that a fly remains a potential vector throughout its life.

6733 **Okech, M. and Hassanali, A., 1990.** The origin of phenolic tsetse attractants from host urine: studies on the pro-attractants and microbes involved. *Insect Science and its Application*, **11** (3): 363-368.

ICIPE, P.O. Box 30772, Nairobi, Kenya.

Phenolic tsetse attractants in host urine were shown to form gradually from pro-attractants identified as a mixture of glucuronates and sulphates. The breakdown of pro-attractants is predominantly due to microbial activity. Of the eight bacteria isolated from buffalo urine three have demonstrated varying ability to give rise to free phenols, the formation of which was monitored by observing the build-up of 4-cresol by means of gas chromatography. These observations may provide a useful biotechnological model for controlled release of these semiochemicals in the field.

6734 **Otieno, L.H., Darji, N. and Onyango, P., 1990.** Electrophoretic analysis of *Trypanosoma brucei* sub-group stocks from cattle, tsetse and patients from Lambwe Valley, western Kenya. *Insect Science and its Application*, **11** (3): 281-287.

ICIPE, P.O. Box 30772, Nairobi, Kenya.

T. brucei stocks (43) isolated from man, cattle and tsetse, all coming from a small area of Lambwe Valley in Kenya, were characterised using isoenzyme analysis. The tsetse isolates revealed the largest number of zymodemes, indicating a lot of heterogeneity among these isolates. Cluster analysis of all the trypanosomes characterised showed that the organisms could be grouped into three distinct trypanosome types: human, cattle and tsetse. The human type was represented in all the three groups. This was not the case either with the cattle or the tsetse *T. brucei* type. The *T. brucei* zymodeme which was found to be predominant during the 1980 outbreak of sleeping sickness was not observed this time round. It is suggested that this zymodeme was either unstable and had changed or it had been eliminated during the insecticide ground spraying operations against *Glossina pallidipes*. It is concluded that the heterogeneity observed among the fly isolates is an adaptive mechanism for survival of trypanosomes.

6735 **Stiles, J.K., Ingram, G.A., Wallbanks, K.R., Molyneux, D.H., Maudlin, I. and Welburn, S., 1990.** Identification of midgut trypanolysin and trypanoagglutinin in *Glossina palpalis* sspp. (Diptera: Glossinidae). *Parasitology*, **101** (3): 369-376.

Department of Biological Sciences, University of Salford, Salford M5 4WT, UK; ibid.; ibid.; ibid.; TRL, University of Bristol, Langford, Bristol BS18 7DU, UK; ibid.

A midgut trypanolysin and an agglutinin from *G. palpalis* subspecies were isolated and partially characterised using anion-exchange chromatography and polyacrylamide gel electrophoresis. FPLC fractions of midgut extracts of *G. palpalis* caused agglutination and lysis of two trypanosome species (*Trypanosoma congolense* and *T. brucei brucei*), although *G. p. gambiensis* caused only agglutination. The trypanolysin and agglutinin were active only in the posterior midguts, were heat labile above 50□C, had a periodic cycle of `activity' in response to bloodmeal intake and were not affected by protease

inhibitors or trypsin but were inactivated by pronase. The lytic substance contained two proteins with approximate molecular weights (M_r) of 12,000 and 10,000 Da respectively. The agglutinin had an approximate M_r of 67,000 Da. Gamma-irradiation of the two subspecies caused a temporary inhibition of trypanolytic and agglutinin activities in midgut extracts.

5. human trypanosomiasis

(a) SURVEILLANCE

6736 **Buissonnière, R.F., De Boissieu, D., Tell, G., Bursztyn, J., Belliot, P. and Ponsot, G., 1989.** Uvéo-méningite révélatrice d'une trypanosomiase `ouest-africaine' chez une enfant de 12 ans. [Uveo-meningitis as a manifestation of West African trypanosomiasis in a 12-year-old girl.] *Archives françaises de Pédiatrie*, **46** (7): 517-519.
Buissonnière: Hôpital St Vincent de Paul, Pédiatrie et Puériculture Clinicales, 74 avenue Denfert-Rochereau, F-75674 Paris 14, France.
The case of a 12-year-old European girl who lived in Senegal for 9 months and who presented with West African trypanosomiasis is reported. The diagnosis was made because of the occurrence of uveomeningitis following progressive alteration of her general condition. A favourable outcome was observed after two intravenous courses of eflornithine (DFMO).

6737 **Mbulamberi, D.B., 1990.** Recent epidemic outbreaks of human trypanosomiasis in Uganda. *Insect Science and its Application*, **11** (3): 289-292.
National Sleeping Sickness Control Programme, P.O. Box 1241, Jinja, Uganda.
Epidemics of human trypanosomiasis (sleeping sickness) have been occurring in Uganda since the beginning of the present century. The first such epidemic occurred along the shores of Lake Victoria and claimed millions of human lives. Another outbreak involving about 2500 persons occurred in the same area from Jinja eastwards to the border with Kenya between 1939 and 1945. Since this outbreak, cases continued to be reported within the infected area, though not in epidemic proportions. Between 1960 and 1971, the two main foci of human trypanosomiasis in Uganda were in south-eastern Uganda (Busoga and Bukedi Districts) and West Nile. In 1971, the infection in south-eastern Uganda spilled north of the usual focus and involved up to 169 persons. Following the control of this small epidemic, surveillance programmes were not instituted because of the prevailing political and economic atmosphere in the country at the time. Hence, by 1976, the stage was set for another epidemic outbreak of the disease in the country. This paper presents a detailed review of the present disease situation in the country and a brief review of the past.

6738 **Perez, O., Urban, M., Miyar, R., Fernandes, A., Lastre, M. and Schwalbach, J., 1987.** Padronizaçao da imunodifusao simples e imunofluorescência indirecta no diagnóstico serológico da infecçao por *T. rhodesiense* em Moçambique. [Standardisation of simple immunodiffusion and indirect immunofluorescence for the serodiagnosis of *Trypanosoma brucei rhodesiense* infections in Mozambique.] *Revista Médica de Moçambique*, **3** (3): 17-20.
Instituto Nacional de Saúde, Maputo, Mozambique.
Sera from symptomatic and asymptomatic cases with confirmed parasitaemia due to *T. b. rhodesiense* from the endemic Tete province of Mozambique were tested

by IFAT and simple immunodiffusion (ID) techniques and the results were compared with those obtained in uninfected controls from the non-endemic city of Maputo. The IFAT was positive in 99.6% and the ID in 92.5% of the parasitologically positive cases, demonstrating the high sensitivity of these techniques.

(b) PATHOLOGY AND IMMUNOLOGY

6739 **Huet, G., Lemesre, J.L., Grard, G., Noireau, F., Boutignon, F., Dieu, M.C., Jannin, J. and Degand, P., 1990.** Serum lipid and lipoprotein abnormalities in human African trypanosomiasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **84** (6): 792-794.

Huet, Grard, Dieu: Laboratoire de Biochimie, Hôpital Claude Huriez, Place de Verdun, 59037 Lille Cedex, France; Lemesre, Noireau: ORSTOM, Centre de Montpellier, 2051 avenue du Val de Montferrand, B.P. 5045, 34032 Montpellier Cedex, France; Boutignon, Degand: Unité INSERM No. 16, Place de Verdun, 59045 Lille Cedex, France; Jannin: Service d'Epidémiologie et des Grandes Endémies, B.P. 1066, Brazzaville, Congo.

We have studied the serum lipoprotein system in human African trypanosomiasis (*Trypanosoma brucei gambiense* infection). The study was carried out on 74 Congolese patients suffering from sleeping sickness and 34 Congolese control subjects living in the endemic region of Boko Songho. We have determined the serum concentrations of lipids (triglycerides, cholesterol, phospholipids) and apolipoproteins (apolipoprotein A-I and B), and the separation of serum lipoproteins by electrophoresis. For the patients infected with *T. b. gambiense*, in comparison with control subjects, the results have shown (i) a significant increase in triglyceride concentration and a decrease in cholesterol concentration; (ii) a significant rise in apolipoprotein B concentration and a significant reduction in apolipoprotein A-I concentration; and (iii) an increase in low-density lipoproteins and a decrease in high-density lipoproteins. We conclude, therefore, that human African trypanosomiasis is associated with marked alterations in the composition and levels of host lipoproteins.

6740 **Pentreath, V.W., Rees, K., Owolabi, O.A., Philip, K.A. and Doua, F., 1990.** The somnogenic T lymphocyte suppressor prostaglandin D_2 is selectively elevated in cerebrospinal fluid of advanced sleeping sickness patients. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **84** (6): 795-799.

Department of Biological Sciences, University of Salford, Salford M5 4WT, UK; ibid.; ibid.; ibid.; PRCT, B.P. 1425, Daloa, Côte d'Ivoire.

To help to elucidate the changes induced by *Trypanosoma brucei gambiense* in the CNS in advanced sleeping sickness patients, levels of interleukin-1 (IL-1) and prostaglandins D_2 (PGD_2) and E_2 (PGE_2) were measured by radio-immunoassay in the CSF from 24 patients diagnosed on the criteria of CSF protein, leucocyte count and parasite presence as having CNS (i.e. late-stage) involvement, and from 12 patients without CNS involvement. PGD_2 concentrations were selectively and markedly elevated in the late-stage patients. The increased PGD_2 may in part account for the increased somnolence and the immunosuppression within the CNS. Measurement of PGD_2 levels in CSF may be a useful criterion for CNS involvement.

6741 **Spinazzola, F., D'Amato, C., Demartino, G., De Felici, A., Giannuzzi, R., Paglia, M.G., Struglia, C., Tocci, G., Visco, G., Galeazzi, M., Galgani, S., Cotroneo, E., Afeltra, A. and Bonomo, L., 1990.** Su di un caso di meningo-encefalite da *Trypanosoma brucei gambiense*. Aspetti clinico immunologici, terapeutici e di diagnostica per immagini. [A case of *T. b. gambiense* meningoencephalitis. Clinico-immunological, therapeutic and diagnostic aspects.] *Giornale di Malattie infettive e Parassitarie*, **42** (4): 231-234.
Spinazzola: Ospedale Specializzato per le Malattie Infettive `Lazzaro Spallanzani', USL RM/10 Roma, Rome, Italy.
The case of an 18-year-old Angolan girl, who had been living in Rome for a year and a half and was a carrier of sickle-cell anaemia, is described. She presented in April 1988 with a moderate fever, hepatomegaly and signs of nervous system disturbances. Enzyme immunoassay and parasitological examination of peripheral blood and CSF showed her to be infected with *T. b. gambiense*. Nuclear magnetic resonance imaging (NMR) showed an intense bilateral inflammation of the frontal lobes and white matter. Therapy with alpha-difluoromethylornithine at 300 mg/kg/day i.v. for 11 days and 400 mg/kg/day orally for the next 21 days was given. The drug was well tolerated and parasites disappeared from the blood and CSF after 4 days. The patient's neurological condition did not improve, however, and serum and CSF antibody (IgM and IgG) levels remained high. The patient underwent plasmapheresis on the 15th day of antiparasitic treatment, which was repeated five times at 48-hourly intervals and was well tolerated. This resulted in a rapid improvement in neurological signs and the antibody levels returning to normal. At follow-up one year later, the patient was asymptomatic and parasitologically negative, but still had rather high serum antibody levels. NMR at follow-up 5 months after the beginning of treatment showed a reduction in the inflammation of the frontal lobes, the frontal white matter and the peripheral white matter. It is concluded that this inflammation was due to a leucoencephalitis.

(c) TREATMENT

6742 **Chandenier, J., Benhamou, P.H., Schechter, P.J., Eppelbaum, S. and Haegele, K., 1988.** A propos d'un cas de trypanosomiase africaine traitée en France par l'eflornithine. [On a case of African trypanosomiasis treated in France using eflornithine.] *Bulletin de la Société française de Parasitologie*, **6** (1): 7-10.
Chandenier: Laboratoire de Parasitologie, Hôpital Sud, 80000 Amiens, France; Benhamou, Eppelbaum: Service de Pédiatrie 1 (Pr. Puissan), Hôpital Nord, 80000 Amiens, France; Schechter, Haegele: Institut de Recherche Merrell Dow, 67000 Strasbourg, France.
A 14-year-old girl from central Africa suffering from headaches and insomnia associated with weakness and daytime lethargy was diagnosed in Amiens, France, by lumbar puncture as having trypanosomiasis. The patient had hyperproteinaemia (83 g/litre) and protein in the spinal fluid. Treatment was started with 400 mg/kg body weight/day i.v. eflornithine (α-difluoromethyl-ornithine) for 2 weeks followed by 300 mg/kg/day orally for 4 weeks. Three months later, symptoms recurred and a second course of treatment was given at a higher dose (850 mg/kg/day i.v.; 430 mg/kg/day orally). This was less well

tolerated and necessitated stopping treatment early. This treatment was, however, successful and the patient had had no further relapse 1 year later.

6. animal trypanosomiasis

(a) SURVEY AND DISTRIBUTION

[See also **14**: nos. 6747, 6748.]

6743 **Nyeko, J.H.P., ole-MoiYoi, O.K., Majiwa, P.A.O., Otieno, L.H. and Ociba, P.M., 1990.** Characterization of trypanosome isolates from cattle in Uganda using species-specific DNA probes reveals predominance of mixed infections. *Insect Science and its Application*, **11** (3): 271-280.

Tsetse Control Department, P.O. Box 7033, Kampala, Uganda; ILRAD, P.O. Box 30709, Nairobi, Kenya; ibid.; ICIPE, P.O. Box 30772, Nairobi, Kenya; Veterinary Department, P.O. Box 7141, Kampala, Uganda.

The application of nucleic acid hybridisation techniques in the identification of most protozoan parasites, using species-specific DNA probes, has recently been described by several investigators. Species-specific DNA probes have been employed in the characterisation of trypanosome infections in cattle and tsetse from Uganda. Most infections revealed by our DNA probes were mixed. Using these probes, a mixed infection with *Trypanosoma brucei*, *T. vivax* and both savanna and Kilifi types of *T. congolense* was revealed in one cow. This mixed infection could not have been detected by any of the classical parasitological methods. Isolates made from natural field infections, which had been passaged in laboratory animals, were found to consist of homogeneous trypanosome species. This was demonstrated in all of 47 stabilates which were homogeneous infections either of savanna type *T. congolense* or *T. brucei*. The method of sample preparation for DNA probe analysis was modified to suit field conditions. The samples, which were spot-blotted onto nylon filters and either immediately denatured or left undenatured, could be kept at room temperature for 1 month with only a moderate loss of hybridisation signal intensities. Although hybridisation signals were visible in undenatured samples, those seen with the samples that had been denatured were clearly more intense. This approach eliminates the need for liquid nitrogen and/or an incubator in the field. The simplicity, sensitivity and specificity of this diagnostic technique using species-specifuc DNA probes, make it an important tool for future studies of the epidemiology of African trypanosomiases.

(b) PATHOLOGY AND IMMUNOLOGY

6744 **Boch, J., Weiland, G., Bachthaler, E., Geisselbrecht, K.H., Heinrich, H.D., Willberg, G. and Reiter, I., 1984.** Parasitologische, klinische und serologische Befunde an experimentell mit *Trypanosoma congo-lense* und *T. brucei* infizierten Dahomey-Rindern. [Parasitological, clinical and serological findings in Dahomey cattle experimentally infected with *T. congolense* and *T. brucei*.] *Berliner und Münchener Tierärztliche Wochenschrift*, **97** (11): 398-404.

Institut für Vergleichende Tropenmedizin und Parasitologie, Tierärztliche Fakultät, Universität München, Leopoldstrasse 5, D-8000 Munich 40, Germany.

Parasitological, clinical and serological findings in ten Dahomey cattle experimentally infected with *T. congolense* and *T. brucei* were compared with those obtained from seven Friesians, three Simmentals and three N'dama-Simmental crossbreeds similarly infected. During the initial phase of trypano-

some infections high parasitaemias (4.3 ∃ 10^5 parasites/ml) could be observed 4-12 days post infection, followed by moderate peaks. Parasites could no longer be demonstrated regularly 2-3 (*T. brucei*) to 8 weeks (*T. congolense*) p.i. Dahomeys showed an increased resistance against homologous and heterologous *T. brucei* as well as homologous *T. congolense* superinfections; a *T. brucei* infection, however, did not prevent the development of a *T. congolense* superinfection. Whereas non-tolerant cattle breeds showed a considerable decrease in the number of erythrocytes, haemoglobin concentration and haematocrit, in Dahomeys the changes of the red blood cell count were less significant. Independent of breed and trypanosome species all animals showed irregular fever (up to 40.5□C), neutropenia, and eosinopenia. A gradual leucocytosis observed in Dahomeys led to an increase of leucocytes. The serum enzymes GOT, CK, γ GT and GLDH showed no significant alterations. By means of IFAT and ELISA, specific IgM and IgG antibodies to *T. congolense* and *T. brucei* could first be demonstrated 1-2 weeks p.i. Fixed trypanosomes (IFAT), crude extracts and trypsinised surface material (ELISA) served as antigens. The humoral immune response appeared to be strongest in Dahomeys. IgM and IgG were simultaneously synthesised. Homologous and heterologous superinfections were followed by an increase of serum titres of 1-2 degrees.

6745 **Chicoteau, P., 1989.** *Adaptation physiologique de la fonction sexuelle des bovins Baoulé au milieau tropical sud-soudanien.* [Physiological adaptation of the sexual function of Baoulé cattle in the south Sudanian tropics.] Thèse de Doctorat, Université de Paris 12, Créteil, France. (Unpublished thesis.) 174 pp.

The sexual function of trypanotolerant Baoulé cattle, as a measure of their adaptation to the environment, was found to be analogous to that of cattle elsewhere, particularly in the temperate zone. Seasonal variations are mostly due to the indirect effects of climate on nutrition and pathology. Trypanosomiasis disturbs reproduction in both bulls and cows. Animal behaviour is highly variable in infected animals. Alterations in sexual function seem to be due more to non-specific effects of the disease and degradation of the general condition than to direct action of the trypanosomes (*T. vivax*, *T. congolense*). The sexual function of Baoulé cattle is well adapted to the south Sudanian climate and shows remarkable potential on research stations. Food and pathology, including animal trypanosomiasis, are major limiting factors in Baoulé cattle reproduction.

(c) TRYPANOTOLERANCE

[See **14**: no. 6728.]

(d) TREATMENT

7. experimental trypanosomiASiS

(a) DIAGNOSTICS

6746 **Ambrosio, R.E., Visser, E.S. and Posnett, E.S., 1988.** DNA probes in the detection of parasitic infections of animals. [Incl. *T. equiperdum.*] *South African Journal of Science,* **84** (3): 162-164.

Molecular Biology Section, Veterinary Research Institute, Onderstepoort 0110, South Africa.

6747 **Bocquentin, R. and Duvallet, C., 1990.** Amélioration de la reproductibilité du test ELISA adapté à la détection d'anticorps anti-*Trypanosoma congolense* chez les bovins. [Improvement of the reproducibility of the ELISA

test for anti-*T. congolense* antibody detection in cattle.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (2): 179-186.
CRTA, B.P. 454, Bobo-Dioulasso 01, Burkina Faso.
Simplicity and potential automation make the ELISA test a universal tool for the detection of antibodies, and, more recently, of antigens. But the reproducibility of results is not very good, due to many varying factors. We tried to improve the reproducibility of the ELISA test for the detection of anti-*T. congolense* antibodies in cattle. Buffers were always used at room temperature to avoid temperature gradients in the plates. All volumes were increased to 200 µl per well. Non-activated rabbit serum was used to block non-specific sites and to reduce the background signal. Better results were obtained with a homologous antigen (*T. congolense*) than with a heterologous one (*T. evansi*). Titration of the antigen concentration to be used must be checked for each new batch. An arrangement is proposed to enable testing of each serum four times per plate and thus to calculate the mean and standard deviation for each serum. Finally, we propose that the reading should no longer be a function of time after contact between enzyme and substrate, but a function of the progress of the reaction measured in a target serum. Results show a very good reproducibility and in addition we propose a computerised monitoring system.

6748 **Duvallet, G. and Pagot, E., 1988.** *Evaluation du test d'agglutination sur carte (Testryp CATT) pour les trypanosomoses bovines.* [Evaluation of a card agglutination test (Testryp CATT) for bovine trypanosomiasis.] Bobo-Dioulasso, Burkina Faso; CRTA. 9 pp.
CRTA, B.P. 454, Bobo-Dioulasso 01, Burkina Faso.
The card-type Testryp CATT agglutination test, developed for serological diagnosis of sleeping sickness caused by *Trypanosoma brucei gambiense*, was tested for serological diagnosis of bovine trypanosomiasis caused by *T. congolense*, *T. vivax* and *T. b. brucei*. Reliable results were obtained only for infections by *T. b. brucei*. Using 5 µl of pure serum and 25 µl of CATT reagent, the test becomes positive on day 10 post-infection. For certain sera, the test remains positive up to a dilution of 1:8. In *T. congolense* infection, the results show no correlation with parasitaemia nor with indirect immunofluorescence. In *T. vivax* infection, the test is weakly positive much later. It is necessary to carry out research on trypanosome surface antigens and to analyse serodemes circulating in nature in order to adapt this test to the serological diagnosis of bovine trypanosomiasis.

(b) PATHOLOGY AND IMMUNOLOGY
[See also **14**: no. 6787.]

6749 **Al-Shathir, N., Alnoor, S., Toma, B., Al-Qaiem, M. and Mehdi, A.W., 1990.** Serum, liver tissue and bile cholesterol of *Trypanosoma evansi* inoculated rabbits. *Indian Veterinary Journal*, **67** (11): 1011-1015.
Department of Physiology, College of Veterinary Medicine, University of Baghdad, Baghdad, Iraq.

6750 **Daulouede, S., Vincendeau, P. and Ripert, C., 1988.** Corrélation dans une trypanosomose expérimentale du taux sérique de trois métaux et de la résistance induite par l'hyperthermie. [Correlation in experimental trypanosomiasis between serum levels of three metals and resistance induced by

high environmental temperature.] [*T. equiperdum*; mice.] *Bulletin de la Société française de Parasitologie,* **6** (1): 11-14.

Laboratoire de Parasitologie Médicale, Université de Bordeaux II, 146 rue Léo Saignat, F 33076 Bordeaux Cedex, France.

6751 **Horváth, G., Vetési, F. and Kemenes, F., 1987.** Pathogenicity of *Trypanosoma equiperdum* to different rodents. II. Susceptibility of the common vole (*Microtus arvalis*). *Parasitologia Hungarica* **20**: 33-39.

Horváth: Department of General Zoology and Parasitology, University of Veterinary Science, Landler Jeno utca 2, 1078 Budapest, Hungary.

6752 **Lowell, G.H., Smith, L.F., Ballou, W.R., Zollinger, W.D., Hockmeyer, W.T., Chulay, J.D., Beachey, E.H., Rosenblatt, N. and Chalom, I., 1988.** Proteosome and hydrophobic foot vaccines provide enhanced immunogenicity of malaria, trypanosome, and streptococcal peptides without added adjuvants. [Incl. *T. brucei.*] *In*: Lasky, L. (ed.), 1988 (see **14**: no. 6786), pp. 423-432.

Lowell: Department of Bacterial Diseases, Walter Reed Army Institute of Research, Washington, DC 20307, USA.

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