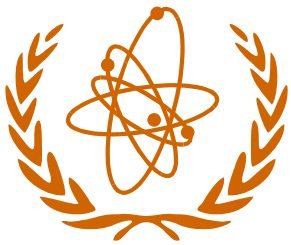
ISSN 0142-193X

TSETSE AND TRYPANOSOMIASIS INFORMATION QUARTERLY

Volume 13
Part 2, 1990
Numbers 6177–6285



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SECTION B - ABSTRACTS

1. GENERAL (INCLUDING LAND USE)

6177 **Agyen-Frempong, M., 1988.** Strategies for livestock development in tsetse infested areas of northern Ghana. *In*: Ferrara, B. (ed.), 1988 (see **13**: no. 6180), pp. 101-110.

Animal Health and Production Department, P.O. Box 97, Pong-Tamale, Northern Region, Ghana.

The valleys of the Northern Region of Ghana are known to be very fertile and have great potential for livestock production. As well as tsetse control, a livestock development programme would need to address the need for the development of forage and water supplies, the genetic improvement of the West African Shorthorn, infrastructural development (roads, transportation, drinking water, schools and health facilities), and the formation of livestock co-operatives and effective linkages with relevant institutions. Firm and sustained political support would be a pre-requisite for the success of such a programme.

6178 **Connor, R.J., 1989.** *Final report of the Regional Trypanosomiasis Expert.* Regional Tsetse and Trypanosomiasis Control Programme for Malawi, Mozambique, Zambia and Zimbabwe, and FGU-Kronberg Consulting & Engineering GmbH. 126 pp.

RTTCP, P.O. Box A560, Avondale, Harare, Zimbabwe.

The Regional Trypanosomiasis Expert (RTE) worked with the RTTCP from January 1987 to December 1989. His duties included assisting with trypanosomiasis surveys, trypanocide use, investigations and training, in addition to assisting with regional co-ordination. A high proportion of his time was spent travelling (he undertook 52 missions), accounting and on other administrative duties; this detracted from his technical contribution. The major constraints of the programme, related to trypanosomiasis, were the shortages of diagnostic equipment, trained manpower and trypanocides. The RTE ordered the necessary equipment for Malawi and Zambia to enable surveys to proceed, and prepared a proposal for part-time postgraduate training. No tangible progress was made in obtaining trypanocides because of administrative/financial problems. Over the three-year period evidence was obtained of the impact of trypanosomiasis on animal health and production, and on rural development. The RTE was closely involved in studies to validate a new diagnostic test, based upon an antigen-detection

immunoassay, which showed great potential. In the absence of vector control, trypanosomiasis control relies heavily on the use of trypanocides: results obtained suggest a strategy for chemoprophylaxis which could reduce costs significantly. The interpretation of survey data was complicated by the unreported use of trypanocidal drugs and the movement of livestock. To obtain more reliable data, surveillance of sentinel cattle was initiated in some areas. Most of the expert's time was spent on missions to Malawi and Zambia. In Malawi, the rapid national survey of bovine trypanosomiasis was completed in August 1989 and a trial to evaluate the efficacy of deltamethrin treatment of cattle to control tsetse was started. In Zambia, trypanosomiasis surveys were started and early results indicated the existence of trypanosomal infections over a wider area than was previously recognised. Surveillance of tsetse control operations with sentinel cattle featured strongly. Pilot studies of tsetse and trypanosomiasis were initiated in the Beira Corridor of Mozambique. In Zimbabwe, trypanosomiasis was largely under control. However, a serological investigation showed the presence of trypanosomal infections in the apparent absence of tsetse. Priorities for further work include: training, particularly at professional level; trypanosomiasis surveillance, with emphasis on developing the ELISA; and development of strategic trypanocidal regimes.
From author's abstract

6179 **Ferrara, B., 1987**. Approche du développement rural intégré et de mise en valeur des zones libérées ou à libérer des glossines. [The approach of integrated rural development and the improvement of areas freed, or to be freed, of tsetse flies.] *Tropicultura*, **5** (1): 34-38.
Projet FAO (GCP/RAF/191/ITA), B.P. 2540, Ouagadougou, Burkina Faso.
The concept and methodology of integrated rural development is discussed and its application to tsetse-freed areas briefly considered.

6180 **Ferrara, B. (ed.), 1988.** *Proceedings of the national seminar on land use in tsetse fly infested and onchocerciasis freed zones of Ghana. Tamale, 24-28 October 1988.* Accra; Republic of Ghana, Ministry of Agriculture. 155 pp.
FAO Project GCP/RAF/191/ITA, B.P. 2540, Ouagadougou, Burkina Faso.
For a long time, sleeping sickness and onchocerciasis served as severe constraints on development in Ghana.

The tsetse control programme, launched in the late 1940s, had controlled sleeping sickness in many parts of northern Ghana by 1956. Some resettlement of the area took place but these gains were quickly reversed by the scourge of onchocerciasis (river blindness). In 1974 a major programme was launched to control this disease which has now been eradicated from Ghana. In spite of the fact that the incidence of sleeping sickness has declined over the years, there is evidence that the disease is still endemic in Ghana, and animal trypanosomiasis remains a major constraint to livestock development. The main topics considered during the seminar were: tsetse eradication/control activities and prospects; land use, land tenure and resettlement in reclaimed areas; socio-economic development with emphasis on livestock production; and planning and integrated rural development. Two papers are abstracted in this issue of *TTIQ* (see nos. 6177, 6203).

6181 **Fio-Ngaindiro, G., 1987**. Développement de l'élevage et amélioration de la santé animale en République Centrafricaine. [Development of cattle raising and improvement of animal health in the Central African Republic.] *Revue scientifique et technique de l'Office international des Epizooties*, **6** (4): 955-967.

Direction Générale de l'Elevage et des Industries Animales, Ministère du Développement Rural, B.P. 707, Bangui, Central African Republic.

In the Central African Republic, cattle raising constitutes 81% of all animal production, with an estimated total of around 2 million heads, mainly zebu. Most cattle are owned by nomadic family groups possessing on average 120 animals. Trypanosomiasis occurs in three-quarters of the cattle-rearing areas but such is the success of the graziers in manipulating trypanocide use that they do not hesitate to take their herds into tsetse-infested areas. Nevertheless, trypanosomiasis is responsible for 10% of calf mortality, 13% of adult mortality and 18% of abortions. An account is given of the steps taken since independence in 1960 to develop and improve cattle breeding by the provision of better veterinary services, training and research.

2. TSETSE BIOLOGY

(a) REARING OF TSETSE FLIES

[See **13**: no. 6188.]

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

6182 **Abbeele, J. van den and D'Haeseleer, F., 1989**. A new eye-colour mutant, *brick*, in the tsetse fly *Glossina palpalis palpalis*. *Entomologia experimentalis et applicata*, **52** (3): 257-259.
Laboratorium voor Biochemie en Algemene Dierkunde (Abbeele) and Centraal Animalarium (D'Haeseleer), RUCA, Groenen-borgerlaan 171, B-2020 Antwerp, Belgium.
A new eye-colour mutant, *brick*, in *G. p. palpalis* is described. The *brick* gene is sex-linked and recessive to the wild-type allele, as in other eye-colour mutants, and reciprocal crosses between *brick* and *tan* revealed that the two mutations are non-allelic on the X-chromosome. During an 80-day test period, homozygous *brick* females had a higher mortality than heterozygotes and produced markedly fewer offspring, possibly due to low feeding response. No differences were observed for pupal weight, puparial period or emergence rate. The *brick*-allele had no influence on the capacity of *G. p. palpalis* to develop a *Trypanosoma brucei brucei* midgut infection. The *brick*-mutant can be used, together with *tan*, as markers of the X-chromosome in genetic studies.

6183 **Elsen, P., Lil, E. de and Roelants, P., 1989.** Première mise en évidence de chromosomes polytènes chez les glossines adultes. [First demonstration of polytene chromosomes in adult *Glossina*.] *Annales de la Société belge de Médecine tropicale*, **69** (3): 245-250.
Laboratoire d'Entomologie, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp, Belgium.
The polytene chromosomes in adult *Glossina* are demonstrated for the first time. They are situated in the nuclei of the cells of the aorta. The technique to reveal them and the results are described and discussed.
Authors' abstract

6184 **Ingram, G.A. and Molyneux, D.H., 1990**. Lectins (haemagglutinins) in the haemolymph of *Glossina fuscipes fuscipes*: isolation, partial characterization, selected physico-chemical properties and carbohydrate-binding specificities. *Insect Biochemistry*, **20** (1): 13-27.
Department of Biological Sciences, University of Salford, Salford M5 4WT, UK.
G. f. fuscipes haemolymph contained agglutinins (lectins), titre range 2^{-11}-2^{-18}, against red blood cells (RBC) of human ABO(H) blood group with highest values detected against `AB' RBC. The use of protease- and neuraminidase-treated RBC in many cases increased titres whilst treatment with galactosidases or glucosidases caused decreased levels. Haemolymph

adsorption with `O' RBC reduced titres against `O' and `AB' but to a lesser extent anti-A or -B activity indicating lectin heterogeneity. The carbohydrate-binding specificities for human RBC were directed towards *N*-acetylated and deoxy derivatives of glucose and/or galactose. In addition the haemagglutinins were reactive against some oligosaccharides, ribose, deoxymannose, deoxygalactose, xylose and xylan with certain of the RBC types. The agglutinins were glycoprotein in nature, thermo-labile, affected by storage, freezing and thawing treatments and exposure to a high dosage of γ-radiation, possessed limited disulphide and hydrogen bonds, and depended upon slightly acid to neutral conditions for optimum agglutination. The haemagglutinins did not require the presence of divalent cations (Ca^{2+}, Mn^{2+} or Cu^{2+} ions) for activity although an elevated concentration of Mg^{2+} ions resulted in increased endpoint titres. However, heavy metal ions (Pb^{2+} and Fe^{2+}) in the buffer lowered agglutinin levels. The intact lectin molecule had an isoelectric point of 6.2, a relative molecular weight of 710 kDa and comprised approximately 70 kDa subunits. Authors' abstract

6185 **Jura, W.G.Z.O. and Kaaya, G.P., 1989**. Subcellular degeneration of mycetomal endocytobionts in tsetse, *Glossina morsitans morsitans*, inoculated twice with *Escherichia coli*. *Current Microbiology*, **19** (6): 347-351. ICIPE, P.O. Box 30772, Nairobi, Kenya. (Reprint requests to Kaaya.)

Specimens of mycetome, a portion of anterior midgut harbouring intracellular bacterioids (endocytobionts), obtained from both untreated control female tsetse, *G. m. morsitans*, and those inoculated twice with strain D31 of *E. coli*, were processed for routine electron microscopy, and the endocytobionts were examined for structural alterations. In the controls, mycetocytes contained intact bacterioids with numerous electron-dense ribosomal particles in the cytoplasm. Female *G. m. morsitans* subjected to two haemocoelic inoculations with the live *E. coli* showed severe degeneration of the subcellular components of the endocytobionts, characterised by advanced lysis and rarefaction. The observed endocytobiotic degeneration is attributed to effects of induced humoral antibacterial factors. Authors' abstract

6186 **Kaaya, G.P., 1989**. Assessment of antibiotic potentials of insect antibacterial factors. *Insect Science and its Application*, **10** (3): 341-346.

ICIPE, P.O. Box 30772, Nairobi, Kenya.
Immune haemolymphs from the giant silkmoth *Hyalophora cecropia* and, to a lesser extent, from the tsetse *Glossina morsitans morsitans* possess antibacterial activities against several species of bacteria known to be pathogenic to man, animals and poultry, as demonstrated by *in vitro* bacterial growth inhibition assays. The possibility of developing a broad-spectrum antibiotic modelled on insect immune factors is discussed.
From author's abstract

6187 **Miyan, J.A., 1989.** The thoracic mechanism for eclosion and digging during the extrication behaviour of Diptera. *Physiological Entomology*, **14** (3): 309-317.
Department of Zoology, University of Edinburgh, West Mains Road, Edinburgh EH9 3JT, UK.
Dipteran flies escape from the puparium by coordinated contractions of all segments of the body. Whereas special eclosion muscles have been identified in the abdomen and head, none has previously been described in the thorax. Three pairs of large thoracic muscles, which are involved solely with eclosion, are described in late pupae of *Glossina morsitans morsitans*, *Sarcophaga argyrostoma*, *Lucilia sericata*, *Musca domestica* and *Drosophila*. They have ultrastructures consistent with an ability to supercontract and all three degenerate within 48 h following escape from the puparium. Recordings of electrical activity show them to be rhythmically active, coincident with thoracic contractions during eclosion. Many of the non-fibrillar flight muscles are also incorporated in the eclosion motor pattern and have a precise sequence of activity. Following escape there is a rapid switch from eclosion to flight motor and this is discussed with reference to afferent mediation and changing inputs to the muscles.
Author's abstract

6188 **Wall, R., 1989**. Ovulation, insemination and mating in the tsetse fly *Glossina pallidipes*. *Physiological Entomology*, **14** (4): 475-484.
TRL, University of Bristol, Langford, Bristol BS18 7DU, UK.
Analyses of the ovulation, insemination and mating of female *G. pallidipes* were carried out in the field and laboratory. In unmated females, ovulation was delayed until at least the fifteenth day of adult life. The predictable pattern of growth and development of eggs was used to age nulliparous females to the nearest day in the field. Inseminated females first appeared at 5-6 days old and most females became inseminated at 8-10

days of age. There were no significant differences in the age at insemination in Zimbabwe or Kenya. Ovulation had occurred in the field by 10-11 days old. Mating therefore occurs at or just before ovulation. Females were able to mate at up to 12 days old and still produce a viable larva from their first egg. In laboratory flies originating from Uganda, factors which reduced and minimised the effects of disturbance maximised insemination rate, so that under the best conditions the age at mating was identical to that found in the field. Nevertheless, the insemination rate of F1 generation Zimbabwe flies reared from wild-caught females was negligible. The differences in the laboratory mating behaviour of the Zimbabwe flies and the flies from the long-established colony of Uganda origin are considered to be due to wild *G. pallidipes* being easily disturbed under laboratory conditions, whereas colony breeding rapidly selects for passivity. The concept of gross differences in *G. pallidipes* mating behaviour between geographic areas is thus rejected. Author's abstract

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

[See also **13**: no. 6207.]

6189 **Brady, J., Gibson, G. and Packer, M.J., 1989**. Odour movement, wind direction, and the problem of host-finding by tsetse flies. *Physiological Entomology*, **14** (4): 369-380.

Brady, Packer: Department of Pure and Applied Biology, Imperial College, Silwood Park, Ascot, Berks, SL5 7PY, UK; Gibson: Department of Medical Parasitology, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

Movement of host odour was modelled in natural tsetse habitats with smoke and ultra-light 7-cm-long wind vanes; the speed and direction of the air movements were analysed from video recordings thereof. Wind of <1 m s^{-1} did not move in straight lines, since large packets of air (>10 m across) often changed direction together. The rate of this change of direction (meander) correlated negatively with windspeed. In open woodland with a shrubby understorey (in which windspeed was reduced by a factor of >5 from that above the canopy, to a x 0.3 m s^{-1}), this wind meander fell by 2□ s^{-1} change of direction for each 0.1 m s^{-1} increase in windspeed (r^2=0.96). Over open ground without shrub cover, the meander fell by 0.5□ s^{-1} per 0.1 m s^{-1} increase in windspeed (r^2=0.85). In both situations,

such meandering virtually ceased in winds of >1 m s^{-1}. In woodland, the relationship between the direction of air movement near the surface of bare earth (one potential tsetse landing site) and that *c*. 0.5 m above ground level (flight height) was often weak (r^2=0.2-0.4), but this problem would be reduced if the fly averaged the ground-level wind for at least 30 s. Odour (smoke) travelling from a source 15 m `upwind' over open ground arrived at a notional tsetse fly for 80% of the time from a direction within 10□ of the true source direction. In typical tsetse woodland, however, the `odour' arrived from all directions (including >90□ away from the source), with only a 30% bias towards the true source direction (□10□). Evidently, tsetse must navigate up odour plumes by means that get round these difficulties - simple, moth-type upwind anemotaxis alone seems unlikely to be adequate.
Authors' abstract

6190 **Sachs, R. and Mehlitz, D., 1988**. Observations on the bio-ecology of *Glossina* (Diptera, Glossinidae) in the Liberian rain-forest: fly density and activity, host preferences and trypanosome infection rates. *Zeitschrift für angewandte Zoologie*, **75** (4): 455-469.
Bernhard-Nocht-Institut für Tropenmedizin, Bernhard-Nocht-Strasse 74, D-2000 Hamburg 4, Federal Republic of Germany.

Investigations on the bio-ecology of *Glossina palpalis palpalis*, *G. pallicera pallicera* and *G. nigrofusca nigrofusca* were carried out in the rain-forest of Liberia (Nimba County) throughout a one-year cycle. 89.5% of the tsetse flies sampled were *G. palpalis*, 5.9% *G. pallicera* and 4.8% *G. nigrofusca*. The apparent density of *Glossina* of the *palpalis* group was highest at the beginning of the rainy season (May-June), followed by a depression during the months of highest rainfall (August-September) and by two more peaks in October and November. The density was lowest during the dry season (January) followed by a steady increase towards April. The density of *G. nigrofusca* was highest in July-August. The diurnal activity of *G. palpalis* was highest between 15.00 and 16.00 h and of *G. nigrofusca* during the early morning and evening hours. Suidae were the preferred hosts for the three species. All blood meal samples of *G. pallicera* and *G. nigrofusca* contained pig blood; of *G. palpalis* the distribution was for blood of pigs 64.9%, of man 24.3%, of reptiles 2.2%, of ruminants 0.7%, and a mixture of blood of pigs and man 5.9%, and of pigs and ruminants 2.9%. The overall infection rates with *Trypanosoma* spp.

(immature and mature infections) were for *G. palpalis* 8.7%, for *G. pallicera* 15.9% and for *G. nigrofusca* 34.7%. For *T. (Duttonella) vivax* and *T. (Nannomonas) congolense* the highest infection rates with mature (infective) trypanosomes were diagnosed in *G. nigrofusca* with 21.9% and 6.6%, respectively. Only one mature *T. (Trypanozoon) brucei* infection was diagnosed in *G. palpalis* (0.025%). The overall infection rate with trypanosomes was lower in the early rainy season than during the remaining year, probably due to the higher number of non-infected teneral flies during the time of increased reproduction of the flies in April-July. All three *Glossina* species examined have to be considered as important vectors of animal trypanosomiasis in Liberia. Sleeping sickness was not diagnosed in the study area.
Authors' abstract

6191 **Tenabe, S.O., 1985**. Reproductive status of a wild population of *Glossina tachinoides* Westwood (Diptera, Glossinidae). *Nigerian Journal of Entomology*, **6** (1/2): 1-4. Entomology Section, NITR, Vom, Nigeria.
Data on the reproductive capacity of a wild population of female *Glossina* could indicate whether a population is under stress or is likely to collapse. Such data are of primary importance in a tsetse control programme involving the use of the sterile insect technique. A total of 2176 *G. tachinoides* were collected using Challier and Laveissière traps. Out of this, 50.28% (i.e. 1094) were females. Three hundred females (27.4% of the total females) were examined for the occurrence of mating scars and were dissected for an evaluation of follicular development, spermathecal filling and uterine content. The results showed that 68% of the females were parous, 82% of the total females, or 96.5% of the females older than 10 days, were inseminated with motile sperm, and 18% were virgin. Three percent of the females had two pairs of mating scars indicating that they had mated twice and 2.7% showed evidence of reproductive abnormality which suggested abortion. The low incidence of reproductive abnormality in this species indicates that the population was well fed, the females were reproducing normally and there was no evidence of adverse stress conditions often imposed on the species by the environment.
Author's abstract

6192 **Torr, S.J., 1989**. The host-orientated behaviour of tsetse flies (*Glossina*): the interaction of visual and olfactory stimuli. *Physiological Entomology*, **14** (3): 325-340.

NRI, Central Avenue, Chatham Maritime, Chatham, Kent, ME4 4TB, UK.
Studies were made in Zimbabwe of the propensity of *G. pallidipes* and *G. morsitans morsitans* to divert from flying upwind in plumes of host odour to various visual features (termed targets). Using various arrangements of electrocuting nets with targets placed downwind of an odour source it was found that 45% diverted to a square target, *c*. 30% diverted to a black vertical oblong and there was no significant diversion to a bark-coloured vertical oblong that simulated the bole of a tree. The relative propensity of tsetse to divert to variously coloured targets decreased in the order: black = blue > red > yellow; for different shapes it decreased in the order: circle > square > horizontal oblong = vertical oblong. Changes in the composition or concentration of the odour, or loss of contact with it, did not markedly affect the percentage that diverted. Tsetse that diverted to a target and subsequently flew away from it showed an upwind bias in the presence of odour. In the absence of odour there was a slight crosswind bias. If these crosswind fliers then flew into a plume of host odour they turned *c*. 50□ upwind.
Author's abstract
6193 **Torr, S.J., 1990**. Dose responses of tsetse flies (*Glossina*) to carbon dioxide, acetone and octenol in the field. *Physiological Entomology*, **15** (1): 93-103.
NRI, Central Avenue, Chatham Maritime, Chatham, Kent, ME4 4TB, UK.
Studies were conducted in Zimbabwe of the catch of *Glossina pallidipes* from an electric net plus target baited with mixtures of acetone plus carbon dioxide or 1-octen-3-ol (octenol) plus carbon dioxide. For acetone dispensed alone at 5-50,000 mg h^{-1}, ten-fold increments in the dose increased the catch 1.7 times. For carbon dioxide dispensed alone, dose increments from 12 to 120 l h^{-1} doubled the catch, but the catch was not further increased by dispensing carbon dioxide at 600-1200 l h^{-1}. For mixtures of these two odours, ten-fold increments in the dose of carbon dioxide between 12 and 12,000 l h^{-1} increased the catch *c*. 2.5 times if acetone was also dispensed at >50 mg h^{-1}; changes in the dose of acetone between 50 and 50,000 mg h^{-1} did not affect the catch. The addition of octenol (0.05 mg h^{-1}) to carbon dioxide (12-1200 l h^{-1}) doubled the catch. Ten-fold increments in the dose of ocetenol between 0.05 and 5 mg h^{-1} did not increase the catch significantly and the

catch was independent of changes in the dose of carbon dioxide between 120 and 1200 l h^{-1}. The behavioural basis of the dose-response curves was investigated using an incomplete ring of electric nets to assess the flight orientation of tsetse in different odours. Upwind flight was not elicited by acetone or octenol alone, or by carbon dioxide unless it was at very high doses; however, mixtures of carbon dioxide with acetone or octenol elicited upwind flight. It is suggested that the attractiveness of mixtures of acetone and carbon dioxide is a function of the region of overlap of these two odours at above threshold concentration. Acetone and octenol on their own appear to increase the responsiveness of flies to visual cues.
Author's abstract.

6194 **World Health Organization, 1989.** *Geographical distribution of arthropod-borne diseases and their principal vectors*. WHO document no. WHO/VBC/89.967. 134 pp.

WHO, 1211 Geneva 27, Switzerland.
This manual provides short texts and distribution maps of the diseases and their vectors. For African trypanosomiasis, a distribution map of sleeping sickness foci is given, together with maps of the distributions of *Glossina morsitans* and *G. palpalis* groups, *G. palpalis, G. tachinoides, G. fuscipes* group, *G. morsitans* complex, *G. longipalpis* and *G. pallidipes,* and *G. austeni* and *G. swynnertoni.*

3. TSETSE CONTROL (INCLUDING ENVIRONMENTAL SIDE EFFECTS)

6195 **Anonymous, 1989**. Tsetse control in Somalia. *International Pest Control*, **13** (4): 84-85.
A brief account is given of the ODA-funded tsetse control project in the upper Shebelle River area of Somalia where 3900 km^2 of dense scrub and riverine woodland are being treated by aerial spraying of endosulfan. The effectiveness of the spray programme is being monitored by the use of tsetse traps, followed by the introduction of disease-free test herds of cattle which will be regularly checked for trypanosomiasis.

6196 **Barclay, H.J. and Driessche, P. van den, 1989**. Pest control models of combinations of sterile releases and trapping. *Insect Science and its Application*, **10** (2): 107-116.
Pacific Forestry Centre, 506 W. Burnside Road, Victoria, B.C., Canada V8Z 1M5; Department of Mathematics, University of Victoria, Victoria, B.C., Canada V8W 2Y2.

Four pest control models which combine sterile releases with trapping are analysed. The traps are baited with either female sex pheromone or food/host odour and may contain either insecticides or sterilants. The efficiency for control or eradication is greater when control methods are used in combination than when either control method is used in isolation. The most efficient combination for pest species with high fertility rates is the release of steriles together with the use of pheromone traps containing sterilant. For pest species with very low fertility rates and high survivorship, such as tsetse, sterile releases combined with food traps containing insecticides are most efficient.
Authors' abstract

6197 **Bauer, B., Meyer, F. and Kabore, L., 1989**. Effects of flumethrin pour-on against *Glossina palpalis gambiensis* (Diptera, Glossinidae) during releases in a fly proof stable. *Tropical Medicine and Parasitology*, **40** (4): 478-479. CRTA, B.P. 454, Bobo-Dioulasso-01, Burkina Faso.
Two thousand males and females of *Glossina palpalis gambiensis* were released in the presence of a Zebu treated with flumethrin pour-on in a fly-proof stable. From the first day after treatment until day 15, the flies were released at intervals of 2 days. The mortalities were highest during the first 5 days after treatment. With the exception of the first two releases, the `knock down' effects were distinctly higher than the corresponding mortalities, ranging between 60% and 100% during the observation period.
Authors' abstract

6198 **Ejezie, G.C., 1985**. Physiological control agents for tsetse flies. *Nigerian Journal of Entomology*, **6** (1/2): 78-80. National Institute for Medical Research, P.M.B. 2013, Yaba, Lagos, Nigeria.
The physiology of the female tsetse fly is dominated by two phenomena: adenotrophic viviparity and obligate haematophagy. Ways in which physio-logically active substances might be used to disrupt the fly's unique reproductive physiology are outlined, and their possible use as tsetse control agents is discussed. Such agents include antibiotics fed to host animals to eliminate symbiotic micro-organisms in the flies and consequently reduce their fecundity, insect growth regulators such as diflubenzuron applied to flies to disrupt pupariation, juvenile hormone analogues and ecdysterone fed to livestock to induce abortions in feeding flies, and precocene II which causes sterility

in flies.

6199 **Greekmore, C., 1989**. Tsetse trapped by buffalo urine. *Agriculture International*, **41** (4): 99.

The author describes briefly the use of biconical traps baited with attractants extracted from buffalo urine for catching *Glossina pallidipes*, together with other methods of tsetse control. (Based on interview with M. Owaga of ICIPE.)

6200 **International Programme on Chemical Safety, 1989.** *Deltamethrin health and safety guide.* (IPCS Health and Safety Guide no. 30.) Geneva; WHO. 32 pp.

WHO, 1211 Geneva 27, Switzerland.

The guide contains technical information about the chemical and advice on preventive and protective measures and emergency action.

6201 **Johnstone, D.R., Cooper, J.F., Dobson, H.M. and Turner, C.R., 1989**. The collection of aerosol droplets by resting tsetse flies, *Glossina morsitans* Westwood (Diptera: Glossinidae). *Bulletin of Entomological Research*, **79** (4): 613-624.

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

Insecticidal aerosols dispersed from aircraft are used in control measures against *Glossina* spp., and the interpretation of spray monitoring data in terms of the likely effect on the flies requires some knowledge of variation of the collection efficiency of the flies under a range of appropriate conditions. A low-speed wind tunnel was used to measure the collection efficiencies of the various component parts of an adult of *G. morsitans* when at rest on cylinders simulating the branches and twigs of the natural habitat. The wind speed range was from 0.25 to 1.5 m/s and monodisperse droplets 10, 15, 20 and 25 μm in diameter were used. Although certain body zones exhibited very high apparent collection efficiencies (primarily due to interception), the average overall efficiencies varied from as low as 0.8% for 10 μm droplets at 0.25 m/s up to 22% for 25 μm droplets at 1.5 m/s.

Authors' abstract

6202 **Leygues, M. and Gouteux, J.P., 1989**. La lutte communautaire contre une endémie tropicale: croyances surnaturelles et pièges à tsétsé au Congo. [Community participation in the control of an endemic tropical disease: supernatural beliefs and tsetse traps in the Congo.] *Social Science and Medicine*, **28** (12): 1255-1267.

B.P. 5057, Dakar, Senegal; Place Jean Sénac, 32170 Miélan, France. (Correspondence to Gouteux.)

It is generally admitted that a community participation

approach requires a dialogue between the project teams and the rural populations. To ensure that this dialogue results in self-development, it must be based on an effective local social structure. In the control of sleeping sickness, it has become highly desirable for vector control to be carried out at the same time as the treatment of patients. Trapping tsetse flies is an ingenious and effective anti-vectorial method which has been tested in 55 villages in the Congo. These trials have demonstrated the feasibility of local communities taking over the responsibility for the traps, while at the same time revealing certain obstacles. Indeed, the efficacy of this method depends on the optimisation of trapping. This involves the determination of strategic capture sites by periodically harvesting the flies, and the regular maintenance of the traps (repairs, checking the capture bag, clearing vegetation). However, although these activities would appear to be feasible at community level, they are not always carried out satisfactorily. This results in the insufficient viability of the traps and finally the reinvasion of the treated area by tsetse. This study presents aspects of the present-day Congolese socio-cultural environment characterised by the revitalisation of traditional Bantu mysticism and religious worship. It attempts to interpret the villagers' behaviour encountered over the two years during which the communities were responsible for the traps. In Central Africa, illnesses are most often understood as manifestations of supernatural powers. In the Congo, where Animism, Christianity and Marxism are closely intermingled, knowledge of the current attitude towards trypanosomiasis is essential for all those engaged in control projects. Such an approach suggests that the project teams must recognise that considerable emphasis is being placed on the supernatural by the local population. Projects involving innovations succeed when they are accepted, that is, adapted to local beliefs and mentalities. To help in the understanding of these beliefs and mentalities, we are proposing psychosociological surveys. Support structures for long-term community action will thus be determined according to region, ethnic group and village.
Authors' abstract

6203 **Mahama, C.I., 1988.** Prospects for integrated control of riverine tsetseflies in parts of Ghana, using environmentally-safe techniques. *In*: Ferrara, B.

(ed.), 1988 (see **13**: no. 6180), pp. 13-18.
Tsetse and Trypanosomiasis Control Unit, Ghana.
Trypanosomiasis continues to be a major constraint to livestock development in Ghana. Although a large proportion of the cattle are trypanotolerant, there is no breeding policy designed to conserve the trypanotolerance gene pool. It is suggested that vector control would offer a more lasting solution. Two riverine species of tsetse, *Glossina tachinoides* and *G. palpalis*, are present throughout the country, while the savanna species, *G. morsitans submorsitans*, occurs mainly in and around game parks. Since human population density is very sparse in the *G. morsitans* areas, tsetse control there cannot be economically justified unless there is a clear demand for the land for development. For the riverine species, the most appropriate approach would be the selection of a target area for integrated tsetse control and livestock development. The use of insecticide-impregnated biconical traps and screens together with the sterile insect technique is recommended.

6204 **Mitteault, A., 1987**. *Etude de l'utilisation du piège biconique Challier-Laveissière, dans le piégeage des glossines en Afrique intertropicale*. [A study of the use of the Challier-Laveissière biconical trap in the trapping of tsetse flies in tropical Africa.] Thesis, Diplôme d'Etat de Docteur Vétérinaire, Faculté de Médecine, Nantes, France.
After a brief account of the history of tsetse trapping, the author describes the Challier-Laveissière biconical trap and the insecticides used in control campaigns. He then discusses the present state of research into improving tsetse trapping and recounts his own work on the attractivity of 3 methyl-indole for *Glossina morsitans submorsitans*.
Author's abstract.

6205 **Mulder, J., 1989**. Control of the tsetse fly in Africa and the environment. *Courier*, no. 115: 11-12.
Directorate-General for Development, Commission of the European Communities, Brussels, Belgium.
The methods of tsetse and trypanosomiasis control are briefly reviewed, with particular reference to the financial contribution of the European Development Fund. The EDF stresses the importance of land use development planning and environmental monitoring in all tsetse control projects with which it is associated and the necessity for an integrated approach.

6206 **Putt, S.N.H., Leslie, J. and Willemse, L., 1988**. The economics of trypanosomiasis control in Western Zambia. *Acta*

Veterinaria Scandinavica, Suppl. 84: 394-397.
PAN Livestock Services, Department of Agriculture, P.O. Box 236, Reading, UK.
This paper presents some preliminary findings of an applied research project to investigate the technical and economic feasibility of controlling *Glossina morsitans centralis* with odour-baited insecticide-impregnated targets in a 2000 km^2 area in the Senanga-West District of the Western Province of Zambia. Since 1953, *G. m. centralis* has made considerable advances from the south-west into this area which contains some 12,000 cattle. Targets were installed in a trial block of 500 km^2 by June 1987 and in the main block of 1500 km^2 by December 1987, resulting in a collapse of the tsetse population. Trypanosomiasis continues to occur in a monitored cattle herd within the main block but this is consistent with an expected time lag between tsetse decline and disease decline. A comparison of the discounted costs of targets and chemoprophylaxis over a ten-year period shows the cost of chemoprophylaxis to be lower both per animal and per km^2. However, as cattle densities increase and target densities are reduced in the cleared area, targets become a relatively more attractive option, so that with a 25-year planning horizon the costs of the two methods become more closely comparable.

4. EPIDEMIOLOGY: VECTOR-HOST AND VECTOR-PARASITE INTERACTIONS

[See also **13**: nos. 6184, 6189, 6190, 6233, 6239.]

6207 **Kabeya, N.M., Pochet, A. and Mandiangu, M., 1988.** Evolution et épidémiologie des trypanosomiases humaines africaines (THA) au Zaire. [Evolution and epidemiology of African human trypanosomiasis in Zaire.] *Médecine Tropicale*, **48** (3): 277-283.

Bureau Central de la Trypanosomiase, Département de la Santé Publique, B.P. 7782, Kinshasa I, Zaire; ibid.; Laboratoire de Parasitologie, Université de Kinshasa, Kinshasa, Zaire.
The authors describe, with the aid of maps, the main traditional groups of sleeping sickness foci in Zaire. Their distribution in 1987 is very similar to that reported in 1930 when sleeping sickness was at a peak. During the past 10 years, the number of new cases has risen from 4817 in 1980 to 10,524 in 1986. Although cases occur in all nine regions of Zaire, the majority are reported in Bandundu, Bas-Zaire, Kivu-Maniema and Kasai Oriental, in spite of the fact that tsetse occur

throughout the country. Nine species and subspecies of *Glossina* have been confirmed as occurring in Zaire: *G. palpalis palpalis*, *G. fuscipes quanzensis*, *G. f. fuscipes*, *G. f. martinii*, *G. morsitans morsitans* *G. pallidipes*, *G. fusca congolensis*, *G. severini* and *G. tabaniformis*, while another 11 have been reported but not yet confirmed. Zaire is in a transition zone between the East and West African forms of sleeping sickness and it is likely, though not yet proven, that both *Trypanosoma brucei gambiense* and *T. b. rhodesiense* occur. The authors discuss the possible reasons for the heterogeneous distribution of cases, the normally low prevalence and the recrudescence of certain foci. Further epidemiological studies are needed, and the fact that six of the nine bordering countries have foci which are continuous with those in Zaire makes bilateral collaboration crucial.

6208 **Matha, V., Lukes, S. and Soldán, T., 1989**. Passive transfer of humoral resistance against adults of the tsetse fly, *Glossina palpalis palpalis* (Diptera, Glossinidae), in rabbits. *Folia Parasitologica*, **36** (4): 375-377.

Institute of Entomology (Matha, Soldán) and Institute of Parasitology (Lukes), Czechoslovak Academy of Sciences, Ceské Budejovice, Czechoslovakia.

The possibility of passive transfer of rabbit humoral immunity against tsetse fly bites was investigated for the first time. Partial immunity of recipient animals was achieved after two intravenous injections of 15 ml of serum from immunised (donor) rabbits during 48 h. This treatment induced an apparent increase of resistance in the passively immunised group of rabbits expressed as direct mortality (`killing effect') of sucking flies within the following 72 h period. The immunological state of immune sera of both donors and recipients was examined by ELISA, using the water-soluble proteins of tsetse salivary glands as antigen. No direct correlation between the titre of antibodies and the killing of *Glossina* was detected. These results indicate that these antibodies were not the only humoral factor responsible for tsetse mortality since their titre did not substantially change in the course of 7 days while the `killing effect' had disappeared from the recipient's blood within 72 h.

Authors' abstract

6209 **Maudlin, I. and Welburn, S.C., 1989**. A single trypanosome is sufficient to infect a tsetse fly. *Annals of Tropical Medicine and Parasitology*, **83** (4): 431-433.

TRL, ODA/University of Bristol, Langford, Bristol BS18 7DU, UK.

Groups of 100 male *Glossina morsitans morsitans* were infected as tenerals one day after emergence with *Trypanosoma congolense* at 10 different infective doses ranging from 77,710 to 0.00007 trypanosomes per 19 mg bloodmeal, and their midguts and mouth parts examined 21 days later. Results suggested that, above a certain threshold level (>7 trypanosomes per fly), infection rates are independent of the trypanosome dose taken in by the fly. Infection rates fall rapidly as the infective dose drops below this level (22% midgut infection rate at infective dose of 7 trypanosomes per fly, 4% at 0.7, 2% at 0.07, 0% at 0.007 and below). The proportion of midgut infections maturing into hypopharyngeal infections (82-100%) was independent of dose. It is concluded that a single trypanosome is sufficient to infect a tsetse fly, provided that fly is susceptible to infection.

6210 **Minter-Goedbloed, E. and Minter, D.M., 1989**. Salivary gland hyperplasia and trypanosome infection of *Glossina* in two areas of Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **83** (5): 640-641.

Department of Medical Parasitology, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

Glossina pallidipes from two areas of Kenya (Kiboko and Sindo) were examined to look for correlations between salivary gland hyperplasia (SGH) and trypanosome infection. Altogether 174 flies with SGH and 174 normal control flies were dissected. In both areas the incidence of *Trypanozoon* infection in enlarged salivary glands did not differ significantly from that in glands of control flies. However, if all trypanosome infections (proboscis, gut and glands) are considered, there was a significantly higher overall infection rate in Kiboko flies with SGH (20.3% compared with 4.7% in controls), but not in Sindo flies with SGH, and when results of the two groups are pooled there was again no significant difference between SGH and normal flies. It is concluded that SGH does no predispose flies to trypanosome infection.

6211 **Mohamed-Ahmed, M.M., Ahmed, A.I. and Ishag, A., 1989**. Trypanosome infection rate of *Glossina morsitans submorsitans* in Bahr El Arab, South Darfur Province, Sudan. *Tropical Animal Health and Production*, **21** (4): 239-244.

Veterinary Research Administration, P.O. Box 8067, Khartoum, Amarat, Sudan.

The trypanosome infection rate of *G. m. submorsitans* in Bahr El Arab fly belt, Sudan, was investigated in four areas

using fly rounds with screens and bait animals together with traps during the dry season, February to May 1985. The overall infection rate of tsetse flies captured in the four areas was 5.1%. *Vivax* group trypanosome infections comprised 64.7% of total infections, *congolense* group 31.2% and *brucei* group trypanosomes 3.9%: 27.3% of the *vivax* and 31.3% of the *congolense* were immature infections. Mixed trypanosome infections were encountered in a few flies. Trypanosome infection rate of flies differed with the sampling technique employed. A linear positive correlation existed between the physiological age of males and their trypanosome infection rates.
Authors' abstract

6212 **Moloo, S.K. and Shaw, M.K., 1989**. Rickettsial infections of midgut cells are not associated with susceptibility of *Glossina morsitans centralis* to *Trypanosoma congolense* infection. *Acta Tropica*, **46** (4): 223-227.
ILRAD, P.O. Box 30709, Nairobi, Kenya.
Teneral and 30-day-old non-teneral *G. m. centralis*, from a laboratory-bred colony, were fed on a goat infected with *T. congolense* clone IL 1180. They were then maintained on an uninfected rabbit, and dissected on day 30 after the infected feed. The midgut infection rates were 38.1% and 8.1%, with the mature infection rates of 28.7% and 4.3%, respectively. Electron microscopical examination revealed the presence of rickettsia-like organisms (RLOs) within the mycetomes and the midgut epithelial cells of all the teneral and non-teneral tsetse examined, the RLOs being more numerous in the older tsetse. Also, when the infected feed was given to teneral tsetse, maintained as above and dissected 30 days later, RLOs were observed in the tsetse with mature and immature *T. congolense* infections, as well as in those tsetse which completely lacked the trypanosomes. It appears that susceptibility of the laboratory-reared *G. m. centralis* to *T. congolense* infection was not associated with RLOs within the midgut epithelial cells.
Authors' abstract

6213 **Onah, J.A., Onyeka, J.O.A. and Tenabe, S.O., 1985**. Studies on trypanosome infection rates of *Glossina* species (Diptera: Glossinidae) in Pandam Wildlife Park, Nigeria. *Nigerian Journal of Entomology*, **6** (1/2): 53-59.
Onah, Tenabe: NITR, Vom, Nigeria; Onyeka: Zoology Department, University of Jos, Jos, Nigeria.
A comparative study on the trypanosome infection rates of *Glossina palpalis palpalis*, *G. tachinoides* and *G. longipalpis* was

carried out at Pandam Wildlife Park, which is located within the Southern Guinea Savanna Zone of Nigeria. Flies were caught with Challier and Laveissière traps, identified, and their proboscis, salivary glands and midgut dissected for the presence of trypanosomes. Out of 1029 tsetse flies dissected, 139 (13.5%) were infected with trypanosomes. Female flies had higher infection rates than males. Among the infected flies, *Trypanosoma vivax* type of infection occurred in 58.7%, 56.8% and 50.0% of *G. p. palpalis*, *G. tachinoides and G. longipalpis* respectively, while *T. congolense* was seen in 38.1%, 38.6% and 46.1% and *T. brucei* in 3.2%, 4.6% and 3.1%. The results showed that the three *Glossina* species studied are important transmitters of both human and animal trypanosomes. The epidemiological implications of these results are discussed in relation to the presence of human settlements in the vicinity of the park. Authors' abstract

6214 **Welburn, S.C. and Maudlin, I., 1990**. Haemolymph lectin and the maturation of trypanosome infections in tsetse. *Medical and Veterinary Entomology*, **4** (1): 43-48.
TRL, ODA/University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK. (Correspondence to Maudlin.)

The tsetse immune system has recently been shown to be involved in trypanosome maturation; lectin secreted in the midgut, normally responsible for preventing the establishment of midgut infections, induces established midgut trypanosomes to mature. We now show that a second lectin, present in the haemolymph of *Glossina m. morsitans* and *G. p. palpalis*, is essential to complete the maturation process of *Trypanosoma congolense* and *T. brucei rhodesiense*. Interactions between tsetse lectins and parasite surface coats probably determine trypanosome transmissibility and may be partly responsible for the distribution of trypanosomiasis in Africa. Authors' abstract

5. HUMAN TRYPANOSOMIASIS

(a) SURVEILLANCE

[See also **13**: no. 6207.]

6215 **Bourgue, A.-M., 1987**. *La trypanosomiase humaine en Haute-Volta pendant la période coloniale: genèse d'une endémo-epidémie et influence de l'évolution des structures de lutte 1928-1952*. [Human trypanosomiasis in Upper Volta in the colonial period: genesis of an endemo-epidemic situation and influence of the development of organised control measures 1928-1952.] Thesis, Doctorat d'Université, Université de Paris VII, UER Lettres et Sciences humaines. 849 pp.

This historical sociological study is based on extant documents and on the testimony of surviving witnesses. It illustrates the effectiveness and superiority of prophylaxis applied to rural populations in the control of sleeping sickness. The creation of a specialised service dedicated to the control of a single disease was dictated by the urgency of the situation. The service had administrative and financial autonomy and motivated specialist staff who travelled throughout the country to carry out mass screening and treatment of the rural populations. Details are given of the diagnostic methods and treatment used. One chapter describes another effective control method: the destruction of vegetation harbouring tsetse around watering places.

6216 **Deville, W., 1987**. La trypanosomiase en Guinée-Bissau. Utilisation du test d'agglutination sur carte (Testryp Catt) dans une zone endémique. [Trypanosomiasis in Guinea-Bissau. Use of the card agglutination test (Testryp CATT) in an endemic area.] *Médecine d'Afrique Noire*, **34** (5): 425-427.

Epidémiologie et Médecine Communautaire, Université d'Anvers, Universiteitsplein 1, 2610 Antwerp, Belgium.

A survey was conducted in the north of Guinea-Bissau to determine the prevalence of trypanosomiasis in adults in two villages where sleeping sickness was known to occur. 13% of 134 adults tested by the card agglutination test were found to be positive.

Author's abstract

6217 **Löscher, T., Nothdurft, H.D., Taelman, H., Boogaerts, M., Omar, M. and Sonnenburg, F. von, 1989**. Schlafkrankheit bei deutschen Tropenreisenden. [African trypanosomiasis in German visitors to Rwanda.] *Deutsche Medizinische Wochenschrift*, **114** (31/32): 1203-1206.

Löscher, Nothdurft, Sonnenburg: Abteilung für Infektions- und Tropenmedizin, Medizinische Klinik Innenstadt der Universität München, Leopoldstrasse 5, 8000 Munich 40, Federal Republic of Germany; Taelman: Institut für Tropenmedizin Leopold II, Kronenburgstraat 43/3, B-2000 Antwerp, Belgium; Boogaerts, Omar: Centre Médico-social Kanombe, Kigali, Rwanda.

A brother and sister (the latter having been resident in Rwanda for 3 years) fell ill with African trypanosomiasis (sleeping sickness) after a 2 day safari in the Akagera National Park. Cardinal symptoms were fever, lymphadenopathy and the typical primary lesion (trypanosomal chancre). The diagnosis was confirmed by demonstrating trypanosomes in the peripheral blood. There was no CNS involvement in either case. Administration of suramin, 1 g weekly intravenously for 6 weeks, quickly brought about regression of the symptoms and the parasitaemia. According to the number of cases reported since 1970, the risk for German travellers to certain African areas of contracting trypanosomiasis is about 0.3 per 100,000. Since in Africa the incidence of the disease is increasing, in some parts considerably, one must reckon with an increasing risk for tourists.

Authors' abstract

6218 **Pepin, J., Guern, C., Milord, F. and Mpia Bokelo, 1989**. Intégration de la lutte contre la trypanosomiase humaine africaine dans un réseau de centres de santé polyvalents. [Integration of African human trypanosomiasis control in a network of multipurpose health centres.] *Bulletin of the World Health Organization*, **67** (3): 301-308.
Pepin: MRC Laboratories, P.O. Box 273, Banjul, Gambia; Guern, Milord: Université de Sherbrooke, Sherbrooke, Quebec, Canada; Guern, Milord, Mpia Bokelo: Zone de Santé Rurale de Nioki, Nioki, Zaire.
The authors relate their experience of integrating sceening for African human trypanosomiasis caused by *Trypanosoma brucei gambiense* in a network of multipurpose health centres at Nioki, Zaire. From 1983 to 1987 the proportion of new cases detected by the health centres rose from 0% to 31.1%, while the returns of the mobile teams diminished as the disease regressed. Nevertheless, only 22.1% of the new cases detected by the health centres had normal CSF, as opposed to 64.8% of the new cases detected actively by the mobile teams. The authors conclude that these two approaches are complementary and that it is possible to improve further the contribution of the health centres to screening of the disease.
Authors' abstract

(b) PATHOLOGY AND IMMUNOLOGY

[See also **13**: no. 6247.]

6219 **Asonganyi, T., Lando, G. and Ngu, J.L., 1989**. Serum antibodies against human brain myelin proteins in Gambian trypanosomiasis. *Annales de la Société belge de Médecine tropicale*, **69** (3): 213-221.
Immunology Service, Centre Universitaire des Sciences de la Santé, Université de Yaoundé, Yaoundé, Cameroon.
ELISA and immunoblotting have shown that antibodies against human brain myelin proteins exist in sera collected from Gambian trypanosomiasis patients. The antibodies were more prevalent in patients with CNS involvement since of 21 sera from patients with more than 4 cells/ml CSF, 15 (71.4%) had antimyelin antibodies, as compared to 3 of 13 (23.1%) from patients with less than 4 cells/ml CSF. Thus, of 18 sera that had antimyelin antibodies, 15 (83.3%) were from patients with CNS involvement. Using the immunofluorescence test, selected sera detected antigens in cryocuts of human brain.
Authors' abstract

6220 **Boersma, A., Noireau, F., Hublart, M., Boutignon, F., Lemesre, J.L., Racadot, A. and Degand, P., 1989**. Gonadotropic axis and *Trypanosoma brucei gambiense* infection. *Annales de la Société belge de Médecine tropicale*, **69** (2): 127-135.

Boersma, Hublart, Boutignon, Degand: Unité INSERM no. 16, Place de Verdun, 59045 Lille Cédex, France; Noireau, Lemesre: Laboratoire d'Entomologie Médicale, ORSTOM, B.P. 181, Brazzaville, Congo; Racadot: Laboratoire de Biochimie Endocrinologique, USNA Centre Hospitalier Regional, rue du Professeur Laguesse, 59037 Lille Cédex, France.

A gonad endocrine survey on 46 Congolese patients (15 women and 31 men) with parasitologically confirmed trypanosomiasis found amenorrhoea in 60% of the women and impotence in 70% of the men. The basic gonad endocrine examination showed a decrease in oestradiol levels in about 65% of the women. Both amenorrhoea and low oestrogen levels were observed in the second phase (P2) of the disease, but low oestrogen levels were sometimes noted in the first phase of the disease (P1). In the men, about 50% of the cases (P2) showed a decrease in testosterone. However, as in the women, the variation of testosterone was also observed in the first phase (P1). A static and dynamic examination of the hypothalamic-pituitary-gonadal axis was undertaken in order to investigate the origin of these hypogonadisms. A supra- or extra-hypophyseal origin is discussed.

Authors' abstract

6221 **Buguet, A., Gati, R., Sèvre, J.P., Develoux, M., Bogui, P. and Lonsdorfer, J., 1989**. 24 hour polysomnographic evaluation in a patient with sleeping sickness. *Electroencephalography and Clinical Neurophysiology*, **72** (6): 471-478.

Laboratoire de Physiologie (Buguet, Gati) and Laboratoire de Parasitologie (Develoux), Faculté des Sciences de la Santé, Université de Niamey, B.P. 12109, Niamey, Niger; Sèvre: Dispensaire Central, Niamey, Niger; Bogui, Lonsdorfer: Laboratoire de Physiologie, Faculté de Médecine, Abidjan, Côte d'Ivoire.

A 24 h polysomnographic recording was performed in a patient with sleeping sickness presenting an atypical neurological syndrome. *Trypanosoma brucei gambiense* was found in a lymph gland puncture and the CSF, and a serologic immunofluorescence test was positive. The scoring technique of the polygraphic traces had to be adapted because of the presence of a permanent EEG delta wave activity during the NREM sleep stages, and the method used by Schwartz and Escande (1970) was applied. REM sleep and wakefulness presented normal polygraphic characteristics. The patient had 8 sleep episodes throughout the recording period, occurring during the daytime and at night, forming the classical

diurnal sleepiness and nocturnal restlessness of sleeping sickness. All but one episode represented 1-3 complete REM-NREM sleep cycles. On all occasions, REM latency was short and 2 SOREM episodes were observed. The nychthemeral organisation of the stages of vigilance differed from one state to another. Wakefulness and REM sleep had a circadian rhythmicity, while NREM sleep, total sleep time and deep sleep (corresponding to stages 3 and 4) had an ultradian periodicity. The concordance between the higher pressure for wakefulness and lower pressure for sleep around 20.00 h defined the time of occurrence of a `forbidden zone' for sleep.
Authors' abstract

6222 **Seed, J.R. and Sechelski, J.B., 1989**. Nature of the trypanocidal factor in human serum. *Journal of Parasitology*, **75** (6): 1003-1006.
Department of Parasitology and Laboratory Practice, School of Public Health, University of North Carolina, Chapel Hill, NC 27599-7400, USA.
The chemical nature of the trypanocidal factor in human serum was investigated. The results show that although the trypanocidal factor is contained within the high density lipoprotein (HDL) fraction of human serum, it is apparently not one of the major apolipoproteins of the HDL complex such as apolipoprotein A-I, A-II, or apolipoprotein B. The factor would appear to be a minor component of the HDL fraction whose chemical nature is still uncertain.
Authors' abstract

(c) TREATMENT
[See also **13**: no. 6266.]

6223 **Benhamou, P.H., Chandenier, J., Schechter, P.J., Epelbaum, S., Tell, G.P., Haegele, K.D., Pautard, J.C. and Piussan, C., 1989**.
Trypanosomiase africaine de l'enfant traitée par éflornithine. Un cas. [A case of childhood African trypanosomiasis treated with eflornithine.] *Presse médicale*, **18** (24): 1199-1202.
Service de Pédiatrie I (Benhamou, Epelbaum, Pautard, Piussan) and Service de Parasitologie (Chandenier), Centre Hospitalier Régional et Universitaire, place Victor Pauchet, B.P. 3006, F-80030 Amiens Cedex, France; Schechter, Tell, Haegele: Merrell Dow Research Institute, F-67000 Strasbourg, France. (Reprint requests to Tell.)
We report the case of a 14-year-old African girl presenting with late-stage African *Trypanosoma brucei*

gambiense trypanosomiasis. She was treated with eflornithine. Two treatment courses were necessary to achieve an apparent cure after 1 year, but a longer follow-up will be required to confirm whether or not the cure is permanent. Drug concentrations in plasma and cerebrospinal fluid were determined during the second treatment course. Side effects were easily controlled.
Authors' abstract

6224 **Eozenou, P., Jannin, J., Ngampo, S., Carme, B., Tell, G.P. and Schechter, P.J., 1989**. Essai de traitement de la trypanosomiase à *Trypanosoma brucei gambiense* par l'eflornithine en République Populaire du Congo. [Clinical trial of eflornithine for *T. b. gambiense* trypanosomiasis in the Congo.] *Médecine tropicale*, **49** (2): 149-154.
Service de l'Epidémiologie et des Grandes Endémies, Brazzaville, Congo; Programme National de Lutte contre la Trypanosomiase, Brazzaville, Congo; ibid.; Laboratoire de Parasitologie, Institut National des Sciences Sociales et de la Santé Appliquée, Brazzaville, Congo; Merrell Dow Research Institute, Strasbourg, France; ibid.
In a multiclinic trial in Brazzaville, Congo, 14 patients with late-stage *T. b. gambiense* trypanosomiasis were treated with eflornithine (DFMO). All cases had previously been treated with one or several courses of melarsoprol. Eflornithine treatment consisted of 400 mg/kg/day intravenously for 14 days followed by 300 mg/kg/day orally for 21 days. This treatment resulted in the disappearance of trypanosomes from the cerebrospinal fluid of all patients, normalisation of the CSF white blood cell count and a clear, rapid and lasting improvement of any neurological signs present before treatment. Neither clinical nor biological adverse effects necessitated modifying or discontinuing treatment.
Authors' abstract

6225 **Nkanga, N.G., Mutombo, L., Kazadi, K. and Kazyumba, G.L., 1988**. Neuropathies arsenicales après traitement de la trypanosomiase humaine au mélarsoprol. Observations cliniques à propos de 5 cas. [Arsenical neuropathies after treatment of human trypanosomiasis with melarsoprol. Clinical observations on five cases.] *Médecine d'Afrique Noire*, **35** (1): 73-76.
Centre Neuro-Psycho-Pathologie du Mont Amba (Nkanga, Mutombo, Kazadi) and Laboratoire de Parasitologie,

Faculté de Médecine (Kazyumba), Université de Kinshasa, B.P. 825, Kinshasa XI, Zaire.
Five cases of neuropathies following melarsoprol treatment of trypanosomiasis are described. Symptoms started to develop between 2 and 5 weeks after the beginning of treatment and affected the limbs in particular, ranging from heaviness and difficulty in walking, pain in the legs, hand tremors, coldness, tingling and loss of sensation in the extremities, to partial or even complete paralysis of the limbs. Rash around the mouth, thickening of the skin and abdominal swelling were also seen in one case.

6226 **Pepin, J., Guern, C., Milord, F., Ethier, L., Bokelo, M. and Schechter, P.J., 1989**. Utilisation de la difluorométhylornithine dans la trypanosomiase congénitale à *Trypanosoma brucei gambiense*. [Use of difluoromethylornithine in congenital *T. b. gambiense* trypano-somiasis.] *Médecine tropicale*, **49** (1): 83-85.

MRC Laboratories, P.O. Box 273, Banjul, Gambia; Université de Sherbrooke, Sherbrooke, Canada; ibid.; ibid.; Zone de Santé Rurale de Nioki, Nioki, Zaire; Merrell-Dow Research Institute, Strasbourg, France.
Difluoromethylornithine (DFMO) was administered orally to two new-born babies with congenital *T. b. gambiense* trypanosomiasis at a rate of 300 mg/kg/day divided into four doses. One baby aged 3 months was treated for 35 days, without side effects, and has remained healthy throughout a follow-up period of more than 2 years. The other baby, aged 1 month, was very seriously ill and, despite treatment, deteriorated and died after 4 days. DFMO may be particularly suitable for treating congenital *T. b. gambiense* trypanosomiasis because of its good absorption by the oral route and its ability to penetrate the CSF especially in the presence of meningeal inflammation.

6227 **Pepin, J., Milord, F. and Guern, C., 1989**. Trypanosomiase humaine africaine et normalité du liquide céphalorachidien. [Human African trypanosomiasis and normality of cerebrospinal fluid.] *Médecine tropicale*, **49** (1): 29-31.

MRC Laboratories, P.O. Box 273, Banjul, Gambia; Université de Sherbrooke, Sherbrooke, Canada, and Zone de Santé Rurale de Nioki, Nioki, Zaire; ibid.
The drug chosen to treat *Trypanosoma brucei gambiense* trypanosomiasis is usually determined according to the number of white blood cells (WBC) in the cerebrospinal fluid: patients whose CSF is considered normal are given pentamidine and/or suramin, while those whose CSF

is abnormal are given melarsoprol. However, the limit of normality is variously considered to be 3 or 5 WBC/ml. When the authors treated 341 patients whose CSF showed 1-3 WBC/ml with a combination of pentamidine and suramin, 8.8% relapsed. Of 66 with CSF showing 4-5 WBC/ml, and treated similarly, 13.6% relapsed. This difference is not statistically significant, indicating that a combination of pentamidine and suramin remains an acceptable treatment for patients having up to 5 WBC/ml in their CSF.
Based on authors' abstract

6228 **Pepin, J., Milord, F., Mpia Bokelo, Meurice, F., Ethier, L., DeGroof, D. and Bruneel, H., 1989**. An open clinical trial of nifurtimox for arseno-resistant *Trypanosoma brucei gambiense* sleeping sickness in central Zaire. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **83** (4): 514-517.
Pepin: MRC Laboratories, P.O. Box 273, Banjul, Gambia; Milord, Ethier: Université de Sherbrooke, Sherbrooke, Canada; Milord, Mpia Bokelo, Ethier: Zone de Santé Rurale de Nioki, Nioki, Zaire; Meurice: Hôpital de Mushie, Mushie, Zaire; DeGroof, Bruneel: Hôpital de Bagata, Bagata, Zaire.
Twenty-five patients with arseno-resistant *T. b. gambiense* sleeping sickness were treated with oral nifurtimox, 12-17 mg/kg/day for 60 days. During treatment, trypanosomes disappeared from the cerebrospinal fluid (CSF) of 7/7 patients; the CSF leucocyte count was significantly lower at the end of treatment than before it was begun (pre-nifurtimox: 124.2 (□149.3) per μl; post-nifurtimox: 11.9 (□12.1) per μl; $P<0.001$). Nifurtimox was well tolerated, with gastro-intestinal disturbances in 6 patients and a reversible cerebellar syndrome in 2 patients. Among the 19 patients seen at least once at follow-up, 12 (63%) relapsed. The other 7 patients have been followed for 3-18 months, and the CSF has remained completely normal in 4 of them. This study confirms that nifurtimox has some activity against *T. b. gambiense*, but a daily dosage higher than 15 mg/kg/day will be necessary to achieve cure of most patients.
Authors' abstract

6229 **Veeken, H.J.G.M., Ebeling, M.C.A. and Dolmans, W.M.V., 1989**. Trypanosomiasis in a rural hospital in Tanzania. A retrospective study of its management and the results of treatment. *Tropical and Geographical Medicine*, **41** (2): 113-117.
Kabanga Hospital, Kigoma Region, Tanzania; ibid.; Department of Tropical Medicine, St Radboud University Hospital, P.O. Box 9101, 6500 HB Nijmegen, Netherlands. (Correspondence to Dolmans.)

A retrospective analysis was done of the management and the results of treatment in 158 trypanosomiasis patients seen in a rural hospital in Tanzania during 1985. The distribution of cases in the population and during the year reflected an endemic situation. 109 patients (68.9%) were in the meningoencephalitic (ME) stage and 49 (31.1%) in the haematolymphatic (HL) stage of the disease. In total 19 patients (12.0%) died, 17 with ME and 2 with HL trypanosomiasis. Encephalopathy was seen in 19 (17.9%) of 106 patients treated with melarsoprol, and 10 of them died. In 15 (24.4%) of 64 HL trypanosomiasis patients who were discharged, evidence of CNS involvement was found during follow-up after 3 and/or 9 months.
Authors' abstract

6. ANIMAL TRYPANOSOMIASIS
(a) SURVEY AND DISTRIBUTION
[See also **13**: no. 6245.]
6230 **Agu, W.E., Kalejaiye, J.O. and Olatunde, A.O., 1989**. Prevalence of bovine trypanosomiases in Kaduna and Plateau States of Nigeria. *Bulletin of Animal Health and Production in Africa*, **37** (2): 161-165.

Department of Parasitology and Entomology, Anambra State University of Technology, Awka Campus, P.M.B. 5025, Awka, Anambra State, Nigeria; NITR, Vom, Plateau State, Nigeria; ibid.
A survey of bovine trypanosomiasis was carried out in Kaduna and Plateau States of Nigeria from October 1983 to September 1986 involving White Fulani Zebu cattle belonging to settled Fulani herdsmen. Wet film and stained thin film examination, rat inoculation and the haematocrit centrifugation technique were used to detect trypanosomes from the peripheral blood of animals. Tsetse flies were caught in the survey area and were later dissected and examined for parasites. Drug sensitivity tests were carried out on some of the isolates using cattle, sheep, goats and guinea-pigs as experimental animals. The results showed that out of a total of 1318 animals examined, 108 were infected, giving a prevalence rate of 8.2%. *Glossina tachinoides* and *G. palpalis* were caught in the area. Eight out of 79 flies caught had mature trypanosome infections, giving an infection rate of 10.1%. The results of the drug sensitivity tests showed that, out of a total of 15 isolates tested, 4 were resistant to Berenil at 7 mg/kg body weight.
Authors' abstract
6231 **Dirie, M.F., Wallbanks, K.R., Aden, A.A., Bornstein, S. and Ibrahim, M.D., 1989**. Camel trypanosomiasis and its vectors in Somalia. *Veterinary Parasitology*, **32** (4): 285-291.

Department of Biological Sciences, University of Salford, Salford M5 4WT, UK; ibid.; Regional Veterinary Coordinator, North-western Region, Hargeisa, Somalia; National Veterinary Institute, P.O. Box 1703, Uppsala, Sweden; Regional Veterinary Coordinator, Galgadud Region, Dhusamareeb, Somalia.

Blood samples from 3000 Somali camels (*Camelus dromedarius*) were examined for trypanosome infection. Of these, 160 (5.33%) were infected with *Trypanosoma evansi*, one (0.03%) with *T. congolense* and one (0.03%) with *T. brucei*. Camel trypanosomiasis occurred in most areas of tabanid infestation throughout the country. The tabanids *Philoliche zonata* and *P. magretti* are incriminated as the major vectors of the disease.

Authors' abstract

6232 **Fassi-Fehri, M.M., 1987**. Les maladies des camélidés. [The diseases of camelids.] *Revue scientifique et technique de l'Office international des Epizooties*, **6** (2): 315-335.

Département de Microbiologie, Institut Agronomique et Vétérinaire Hassan II, B.P. 6202, Rabat (Instituts), Morocco.

The author discusses the diseases of camelids in Africa and Asia in the light of replies to a questionnaire sent out by OIE to member states. The incidence of *Trypanosoma evansi* infection varies considerably from one region to another but is greatest in marshy areas and along rivers, particularly where conditions favour the development of the vectors *Tabanus* and *Stomoxys*. In Africa, the infection rate is low and sporadic in the north-sahelian zones but rises to 30-35% in the south-sahelian and sudano-sahelian zones where rainfall is greater than 500 mm. The dromedary is also susceptible to tsetse-transmitted *T. brucei* and *T. congolense* which give rise to an acute fatal disease and constitute a limiting factor to the spread of the dromedary into tropical Africa.

6233 **Makumyaviri, A., Mehlitz, D., Kageruka, P., Kazyumba, G.L. and Molisho, D., 1989**. Le réservoir animal de *Trypanosoma brucei gambiense* au Zaire: infections trypanosomiennes dans deux foyers du Bas-Zaire. [Animal reservoir hosts of *T. b. gambiense* in Zaire: trypanosome infections in two foci in Lower Zaire.] *Tropical Medicine and Parasitology*, **40** (3): 258-262.

Bernhard-Nocht-Institut für Tropenmedizin, Bernhard-Nocht-Strasse 74, D-2000 Hamburg 36, Federal Republic of Germany; ibid.; Institut de Médecine Tropical Prince Léopold, Nationalestraat 155, B-2000 Antwerp, Belgium;

Bureau Central de la Trypanosomiase, B.P. 7782, Kinshasa 1, Zaire; ibid.
The prevalence of *Trypanosoma* spp. infections in domestic animals was estimated in a forest (Boma) and a savanna (Kimpese) sleeping sickness focus in Lower Zaire. The miniature anion-exchange centrifugation technique was used to determine the infection rates with *T. congolense*, *T. vivax* and *T. brucei* sspp. in 505 animals. *T. congolense* predominated in both foci with the highest prevalence in pigs (76.2%), followed by sheep (31.3%), dogs (30.6%) and goats (7.4%). *T. vivax* was seen only on two occasions. In the forest zone, *T. brucei* sspp. infections were frequent (pigs 16.5%, sheep 6.2%, dogs 3.4%, goats 1.1%) in contrast to the savanna area where only one *T. brucei* sspp. infection was diagnosed. Twenty-five primary isolations of *T. brucei* were done using different isolation and stabilation approaches. Isolates and stocks await behavioural, bio-chemical and molecular biological identification to discriminate between *T. b. brucei* and *T. b. gambiense* of domestic animal origin.
Authors' abstract

6234 **McOdimba, F.A., 1990**. The effect of temperature and storage on the infectivity and motility of African animal trypanosomes in the blood of different hosts. *Acta Tropica*, **47** (1): 53-60.
ILRAD, P.O. Box 30709, Nairobi, Kenya.
Blood from mice, rats, goats or cattle infected with *Trypanosoma congolense*, *T. vivax* or *T. brucei* was stored at 0-4□C, 20-25□C, 30-35□C or 36-40□C. Each sample was examined after set intervals to determine the maximum period the trypanosomes could remain motile and infective. *T. brucei* in blood remained motile for 96 h at 0-4□C, being the longest period that was observed, but remained infective for only 8 h. *T. vivax* survived poorly in rodent blood, but did well in ruminant blood, especially at 20-25□C, whereas *T. congolense* and *T. brucei* survived well in rodent blood. The infectivity and motility of the three species of trypanosomes were adversely reduced at temperatures above 36□C.
Author's abstract

6235 **Ouhelli, H. and Dakkak, A., 1987**. Les maladies à protozoaires du dromadaire. [Protozoan diseases of the dromedary.] *Revue scientifique et technique de l'Office international des Epizooties*, **6** (2): 407-415.
Département de Parasitologie et Maladies Parasitaires, Institut Agronomique et Vétérinaire Hassan II, B.P. 6202, Rabat-Instituts, Morocco.

The trypanosomiases are by far the most important of the protozoan diseases of dromedaries. *Trypanosoma evansi*, transmitted by biting flies, is the dominant species responsible, but *T. vivax*, *T. congolense* and *T. brucei* infection is also seen in areas where tsetse occur: Somalia, Kenya and Sudan. The pathology, diagnosis and treatment are reviewed.

6236 **Touratier, L., 1987**. Huitième réunion internationale sur *Trypanosoma evansi*: Rapport du Groupe de Travail, Paris, 20 mai 1987. [Eighth international meeting on *T. evansi*: Report of the Working Group, Paris, 20 May 1987.] *Revue scientifique et technique de l'Office international des Epizooties*, 7 (2): 395-402.
228 boulevard du Président Wilson, 33000 Bordeaux, France.

More precise information regarding the epidemiological situation in certain African and Asian countries has been obtained particularly by the application of some new diagnostic tests (CATT, chemoluminescent immuno-enzyme technique) which should be verified by reference to the immunolysis technique. The role of cattle and small ruminants as reservoirs of *T. evansi* has come to light. The development of new trypanocides is being pursued, on the one hand by means of fundamental research on the metabolism and biochemistry of the trypanosome in association with the development of antimitotics, on the other hand by screening medicinal substances. A new organic arsenical derivative seems to give promising results in experimental infection of the dromedary with *T. evansi*.
Author's abstract.

(b) PATHOLOGY AND IMMUNOLOGY

6237 **Anosa, V.O. and Kaneko, J.J., 1989**. Ultrastructural pathology of hemopoietic organs in *Trypanosoma vivax* infection of goats. *Veterinary Pathology*, **26** (1): 78-83.
Department of Veterinary Pathology, University of Ibadan, Nigeria; Department of Clinical Pathology, School of Veterinary Medicine, University of California, Davis, CA 95616, USA. (Reprint requests to Kaneko.)

Three healthy adult castrated West African dwarf goats were infected intraperitoneally with a strain of *T. vivax*. Three similar goats acted as controls. Haematological data were obtained from these animals 2 days prior to infection and daily post-infection (p.i.). One infected goat was killed on day 14 p.i. when its PCV had dropped from 29% to 8%, another on day 16 p.i. when its PCV had dropped from 28% to 18%, at

which time a control animal was also killed. Samples of bone marrow, spleen and thoracic haemolymph nodes were fixed, embedded, sectioned and examined by transmission electron microscopy. The platelet count as well as PCV fell during the first 8 days p.i. In the infected goats there was an increase in bone marrow haemopoietic volume associated with a drop in numbers of fat cells coupled with an increase in cell density of the red marrow, and there was a proliferation of plasma cells and lymphocytes. Megakaryocytes were larger in infected goats, with wider marginal zones with many pseudopods or blebs on the surface. Spleens and haemolymph nodes of infected goats were moderately enlarged and showed a marked proliferation of plasma cells and macrophages with a concomitant decrease in lymphocytes. Macrophages in infected goats showed considerable phagocytic activity. The mechanisms of thrombocytopenia suggested by this study are discussed.

6238 **Assoku, R.K.G. and Gardiner, P.R., 1989**. Detection of antibodies to platelets and erythrocytes during infection with haemorrhage-causing *Trypanosoma vivax* in Ayrshire cattle. *Veterinary Parasitology*, **31** (3-4): 199-216. Department of Animal Science, University of Ghana, Legon, Accra, Ghana; ILRAD, P.O. Box 30709, Nairobi, Kenya.

Aryshire cattle, which were infected with a stock of *T. vivax* from Galana, Kenya, which produced haemorrhagic disease, were examined for the presence of antibodies to erythrocytes and platelets. Antibodies to normal erythrocytes and platelets were detected in the plasma of infected animals using the enzyme-linked immunosorbent assay (ELISA). The antibodies were detectable following the first peak of parasitaemia (10-15 days after infection) and antibody activity was maximal 30-35 days after infection. Plasma from cattle, taken 32 days after infection, precipitated radiolabelled proteins from autologous platelets and, less efficiently, from autologous erythrocytes. Fluorescence-activated cell sorter (FACS) assays demonstrated that erythrocytes and platelets from infected cattle bound IgM and IgG *in vivo*, and that both normal blood cell types could adsorb these antibodies following incubation in plasma from infected animals. Complement (C_3) was similarly adsorbed to erythrocytes during infection. Antibodies adsorbed to infected erythrocytes could be eluted and the eluted antibodies bound to normal erythrocytes, as detected by immunofluorescence, but they did not react with the

infecting trypanosome. It is hypothesised that although anti-blood cell antibodies may not be the primary cause of the severe anaemia and thrombocytopenia which accompany the haemorrhagic syndrome, they could play an important role in the maintenance of these signs of disease, adversely affecting the outcome of *T. vivax*-associated haemorrhagic disease in the field.
Authors' abstract

6239 **Dennig, H.K., 1989**. La chèvre, réservoir potentiel de *Trypanosoma evansi*. [The goat, a potential host reservoir of *T. evansi*.] (Meeting abstract.) *Revue de Médecine vétérinaire*, **140** (8-9): 763.
Institut für Parasitologie und Tropenmedizin der Tierärtzlichen Fakultät, Leopoldstrasse 5, D-8000 Munich 40, Federal Republic of Germany.
T. evansi infections (surra) in equines, camels and dogs are usually fatal. In cattle, both chronic and acute forms of the disease occur. Goats are supposed to be rather resistant to the disease. Our research shows that goats can occasionally suffer an acute form of surra and can even die. Furthermore, it has been shown that persistent infections can occur without clinical signs. Animals suffering this latent form of the disease may act as a parasitic reservoir and are therefore of considerable epidemiological significance.
Author's abstract

6240 **Dwinger, R.H., Murray, M. and Moloo, S.K., 1990**. Parasite kinetics and cellular responses in goats infected and superinfected with *Trypanosoma congolense* transmitted by *Glossina morsitans centralis*. *Acta Tropica*, **47** (1): 23-33.
ITC, P.M.B. 14, Banjul, Gambia; Department of Veterinary Medicine, Glasgow University Veterinary School, Bearsden Road, Glasgow G61 1QH, UK; ILRAD, P.O. Box 30709, Nairobi, Kenya.
T. congolense-infected tsetse were fed on the flanks of goats at sites drained by the prefemoral lymph node. The efferent lymphatic of this lymph node was surgically cannulated and the lymph was collected daily and examined for appearance of parasites, lymph flow and cells. Trypanosomes were detected in the lymph 4 days after infection, which was 2 days prior to the appearance of the local skin reaction or the presence of parasites in the blood. Once the animal became parasitaemic, trypanosomes were found to recirculate in the lymphatic system, appearing in the lymph of the contralateral lymph node 11 days after infection. In goats infected with *T. congolense* and superinfected 12 or

13 days later with a different tsetse-transmitted *T. congolense* serodeme, parasites belonging to the second serodeme were apparently delayed in their development in the skin and appeared up to 7 days later in the efferent lymph when compared to control animals. This delay in development might have implications for field situations where superinfections frequently occur: it might result in limiting the number of serodemes of *T. congolense* an animal can be infected with at any one time.
Authors' abstract

6241 **Gardiner, P.R., Assoku, R.K.G., Whitelaw, D.D. and Murray, M., 1989**. Haemorrhagic lesions resulting from *Trypanosoma vivax* infection in Ayrshire cattle. *Veterinary Parasitology*, **31** (3-4): 187-197.
Gardiner, Whitelaw: ILRAD, P.O. Box 30709, Nairobi, Kenya; Assoku: Department of Animal Science, University of Ghana, Legon, Accra, Ghana; Murray: Department of Veterinary Medicine, Glasgow University Veterinary School, Bearsden Road, Glasgow G61 1QH, UK.
Infection of Ayrshire cattle with a stock of *T. vivax* from the Galana Ranch, Kenya, resulted in an acute disease characterised by profound anaemia and haemorrhage, which reached maximum severity between 3 and 5 weeks after infection. Bleeding from the ears, nose and rectum occurred. At necropsy, petechial and ecchymotic haemorrhages were widespread, but were particularly severe in the gastrointestinal tract. In confirmation of the gross findings, congestion, haemorrhage and degenerative changes in most tissues and organs were found histologically. Thrombi were seen in the lymphatic vessels and clots of fibrin were present in the ventricles of the brain. The anaemia was a consequence of frank blood loss through haemorrhaging, exacerbated by erythrophagocytosis of deformed red blood cells, whose occurrence was indicative of microangiopathic changes. Animals were euthanised between 23 and 36 days after infection when they became recumbent with PCV values as low as 9%. There is no doubt that animals affected by this syndrome in the field would die within a few weeks of infection, if left untreated.
Authors' abstract

6242 **Hauner, G., Cwik, S., Weiland, G. and Schmid, D.O., 1989**. Leukozytenmigrationshemmung nach experimenteller Trypanosomen-infektion beim Rind. [Leukocyte migration inhibition after experimental trypanosome infections in cattle.] *Journal of Veterinary Medicine (B)*, **36** (10): 746-756.

Hauner, Cwik: Institut für Blutgruppenforschung und Immun-biologie der Tierzuchtforschung e. V. München-Grub; Schmid: Institut für Medizinische Mikrobiologie, Infektions- und Seuchen-medizin der Universität München; correspondence to Weiland: Institut für Vergleichende Tropenmedizin und Parasitologie der Universität München, Leopoldstrasse 5, 8000 Munich 40, Federal Republic of Germany.
Blood serum from cattle experimentally infected with trypanosomes was tested for its ability to influence granulocyte migration. Pooled porcine granulocytes were used in the migration assay. The inhibitory migration activity observed in serum samples of trypanosome-infected animals implies the presence of mediators of cellular immunity. Values of migration indices express reciprocal inhibitory and stimulating events in infected animals. This study allowed at least some aspects of the very complex cellular immune system and its functioning to be followed. The observed differences in migration values in the serum of different animals suggest an individual immunological capacity to defy trypanosome infections. The variability in occurrence of the first inhibitory activity after infection supports the view of individual responsiveness. Distinct differences in migration values were observed in Dahomey cattle after primary and secondary challenge with trypanosomes. Serum from reinfected animals exhibited a marked decrease in inhibitory activity as compared to samples obtained after first infection. These observations suggest a modulation of the individual immune response after multiple challenge with trypanosomes of the same strain. This study demonstrates the involvement of cell mediated immune responses to trypanosome infections
Authors' abstract

6243 **Kimeto, B.A., Mugera, G.M. and Nyaga, P.N., 1990**.
Haemorrhagic pancarditis in cattle infected with *Trypanosoma vivax*. *Veterinary Parasitology*, **34** (4): 295-301.
Department of Veterinary Pathology and Microbiology, University of Nairobi, P.O. Box 29053, Kabete, Kenya.
Haemorrhagic pancarditis has been studied microscopically and ultra-structurally. Haemorrhages, oedema, mononuclear cell infiltration, degeneration, fragmentation, atrophy and lysis of myofibres, and extravascular localisation of the parasite were observed.
Authors' abstract

6244 **Mutayoba, B.M. and Gombe, S., 1989**. Effect of African trypanosomiasis on plasma cortisol and thyroxine concentration in goats. *Research in Veterinary Science*, **47** (3): 315-318.
Faculty of Veterinary Medicine, Sokoine University of Agriculture, P.O. Box 3017, Morogoro, Tanzania; Reproductive Biology Unit, NCRR, P.O. Box 30197, Nairobi, Kenya.
Changes in plasma cortisol and thyroxine (T_4) levels were measured weekly in female goats experimentally infected with *Trypanosoma congolense*. Values for plasma cortisol (range 10 to 25 nmol l^{-1}) and T_4 (range 65 to 120 nmol l^{-1}) were within normal ranges in all goats before infection and in control animals throughout the 24 weeks of study. Cortisol/T_4 ratios of 0.23 to 0.15 (or 1:4 to 1:7) were obtained. In the infected goats a significant increase in cortisol and decline in T_4 were simultaneously observed within one week of the onset of parasitaemia and fever. A peak cortisol/T_4 ratio of 2.0 (2:1) was obtained 4 weeks after infection when cortisol levels rose to 59.0 □ 8.9 nmol l^{-1} and T_4 declined to 29.4 □ 2.2 nmol l^{-1}. Thereafter the mean levels fluctuated but remained high (over 30 nmol l^{-1}) for cortisol and low (under 50 nmol l^{-1}) for T_4 up to 18 weeks after infection. Both hormones tended to return to normal levels towards the end of the study. The changes in mean cortisol levels showed a significant inverse correlation with changes in T_4 ($r = -0.57$, $P<0.001$, $n = 26$). It is suggested that in trypanosomiasis, hypothalamic stress causes increases in plasma cortisol levels and at the same time suppresses the activity of the thyroid gland.
Authors' abstract

6245 **Röttcher, D., Schillinger, D. and Zweygarth, E., 1987**. Trypanosomiasis in the camel (*Camelus dromedarius*). *Revue scientifique et technique de l'Office international des Epizooties*, **6** (2): 463-470.
Röttcher, Zweygarth: Chemotherapy of Trypanosomiasis Research Project (GTZ), Veterinary Research Laboratory, P.O. Box 29231, Kabete, Kenya; Schillinger: MSD-AGVET, Tölzerstrasse 1, 8022 Grünwald, Federal Republic of Germany.
Trypanosomiasis in dromedaries is caused predominantly by *Trypanosoma evansi* which is transmitted by biting flies. The pathology, diagnosis and treatment of the disease are reviewed. The course of the disease varies widely. In Kenya, some animals die within 2-5 months of contracting the disease, some live for up to 4 years

with subclinical infections and some eventually self-cure. Abortion and death of new-born calves are common and the overall productivity of a herd is greatly impaired. For mass screening of herds, a simplified ELISA and a card agglutination test, adapted from the human CATT, have recently been developed. Suramin and quinapyramine are the recommended trypanocides for treatment and prophylaxis but numerous strains of *T. evansi* have developed resistance to one or both of these drugs. Isometamidium is curative in acute cases and melarsoprol at later stages but both cause severe local reactions unless given intravenously.

6246 **Yagoub, I.A. and Ahmed, A.H., 1989**. Field and laboratory investigations on a parasitaemic form of *Trypanosoma theileri* in a bull in the eastern region of the Sudan. *Bulletin of Animal Health and Production in Africa*, **37** (2): 185-187. Regional Veterinary Research Laboratory, P.O. Box 237, Kassala, Sudan.

An adult Zebu bull taken to Kassala Veterinary Clinic for treatment showed severe parasitaemia with *T. theileri*. A reduction in blood parameters was reported and compared with values in cattle naturally and experimentally infected with trypanosomes. Stress conditions were found to be the main factors that enhanced the pathogenicity of this trypanosome. Authors' abstract

6247 **Zwart, D., 1989**. Aspects of comparative pathology and pathogenesis of trypanosomal infections in Africa. *Annales de la Société belge de Médecine tropicale*, **69** (2): 105-112. Department of Tropical Animal Production, Marijkeweg 40, 6709 PG Wageningen, Netherlands, and Department of Tropical and Protozoan Diseases, Faculty of Veterinary Medicine, Utrecht, Netherlands.

The author briefly reviews the pathology and pathogenesis of trypanosomiasis in man, livestock and experimental animals, emphasising the pathways by which the trypanosomes act upon the host. Although the processes involved are not unique to trypanosomiasis, the constant antigenic variation of the trypanosomes results in the release of large amounts of biologically active products and the formation of immune complexes which are major factors in triggering a variety of clinical and pathological changes.

6248 **Zwart, D., Brun, R., Dwinger, R.H., Miert, A.S.J.P.A.M. van, Franssen, F.F.J., Nieuwenhuijs, J. and Kooy, R.F., 1990**. Influence of fever and flurbiprofen on trypanosome growth. *Acta Tropica*, **47** (2): 115-123.

Zwart, Dwinger, Franssen, Nieuwenhuijs, Kooy: Department of Tropical Veterinary Medicine and Protozoology, Univerisity of Utrecht, P.O. Box 80165, 3508 TD Utrecht, Netherlands; Brun: Swiss Tropical Institute, Basel, Switzerland; Miert: Department of Veterinary Basic Sciences, Division of Pharmacology, Pharmacy and Toxicology, University of Utrecht, Utrecht, Netherlands.
The administration of flurbiprofen, a potent non-steroidal anti-inflammatory drug (NSAID), to goats infected with trypanosomes resulted in high elevated parasitaemia and suppression of fever. In contrast to goats, rats infected with trypanosomes do not show febrile reactions. Therefore, the role of body temperature was investigated with yeast-induced fever in *Trypanosoma evansi* and *T. brucei* infected rats. These investigations did not support the hypothesis that a high body temperature causes a drop in parasitaemia. In goats infected with trypanosomes, it is also unlikely that fever has an inhibitory influence on the parasitaemia. In these animals, rises in parasitaemia could be provoked by doses of flurbiprofen as low as 1/20 of the normal doses and these doses did not or only partly suppressed fever. No effect on parasite growth could be obtained when flurbiprofen was added in concentrations up to 32 μg/ml directly to *T. brucei* cultures. Moreover, no growth-promoting factor(s) could be identified *in vitro* in serum from flurbiprofen-treated goats.
Authors' abstract

(c) TRYPANOTOLERANCE

6249 **Trail, J.C.M., d'Ieteren, G.D.M. and Teale, A.J., 1989**. Trypanotolerance and the value of conserving livestock genetic resources. *Genome*, **31** (2): 805-812.
ILCA, P.O. Box 46847, Nairobi, Kenya; ibid.; ILRAD, P.O. Box 30709, Nairobi, Kenya.
Studies have been made in two main areas of genetic research on African trypanotolerant (N'Dama) cattle. The first is of the significance for performance and the heritability of trypanotolerance traits and the second is the search for markers of the breed type and the traits of interest. Results demonstrate significant effects of the ability of an animal to control parasitaemia and anaemia on its performance. Initial estimates suggested that parasitaemia measures had a very low heritability, but ability to maintain packed cell volume levels when detected as parasitaemic

and to generate an immune response could form the basis of a practical selection approach. The search for markers has so far concentrated on the major histocompatibility complex and on a polymorphic system of common leukocyte antigens. Phenotypes that appeared more characteristic of the N'Dama in comparison with those of East African zebu cattle were examined for associations with trypanotolerance traits. One major histocompatibility complex encoded phenotype and two common leukocyte antigens gave indications of important associations. Planned research will further characterise the breed and define traits of importance to assist in increasing its productivity in Africa and thus in its conservation. The addition of a molecular genetics component to an integrated genetics research programme, principally through involvement in development of a linkage map of the bovine genome, will strengthen these efforts and make it possible to conserve specific N'Dama genes related to productivity. Authors' abstract

(d) TREATMENT

[See also **13**: nos. 6236, 6245.]

6250 **Anika, S.M. and Onyeyili, P.A., 1989**. Effects of trypanosomal infection on the pharmacokinetics of diminazene aceturate in dogs. *Tropical Medicine and Parasitology*, **40** (4): 419-421.

Department of Veterinary Physiology and Pharmacology, University of Nigeria, Nsukka, Nigeria.

The pharmacokinetics of diminazene aceturate (3.5 mg/kg) was investigated in normal mongrel dogs and in those infected with *Trypanosoma brucei brucei*. Results indicate that infection markedly retards the total body clearance of diminazene and also hastens the distribution of the drug when administered intravenously.

From authors' abstract

6251 **Connor, R.J., Mukangi, D.J.A. and Halliwell, R.W., 1989**. Bovine trypanosomiasis in southern Tanzania: investigation into the incidence of infection and duration of chemoprophylaxis. *Tropical Animal Health and Production*, **21** (2): 135-140.

RTTCP, P.O. Box A560, Avondale, Harare, Zimbabwe; Veterinary Investigation Centre, P.O. Box 129, Mwanza, Tanzania; Faculty of Veterinary Science, University of Zimbabwe, P.O. Box MP 167, Mount Pleasant, Harare, Zimbabwe.

Before implementing chemoprophylaxis to control bovine trypanosomiasis, it is essential to have epidemiological data upon which to base control regimes. A study was conducted under natural tsetse challenge with two groups each of 12 calves grazing their first season. Group 1 received isometamidium treatments prophylactically at intervals during the rainy season, and calves in group 2 were treated individually with diminazene as they became infected with trypanosomes. Infections were first detected in the unprotected calves and indicated that the onset of challenge was approximately 4 weeks after the rainy season began. *Trypanosoma vivax* accounted for 21 of the 30 infections detected in blood smears and, although one infection remained unspeciated, the remaining eight were *T. congolense*. It was concluded that a prophylactic regime beginning one month after the start of the rains with repeat treatments of isometamidium at 1 mg/kg at intervals of 10 weeks could be expected to give good control of trypanosomiasis at this location.
Authors' abstract

6252 **Kinabo, L.D.B. and Bogan, J.A., 1988**. Pharmacokinetic and histopathological investigations of isometamidium in cattle. *Research in Veterinary Science*, **44** (2): 267-269.
Department of Veterinary Pharmacology, University of Glasgow Veterinary School, Bearsden Road, Bearsden, Glasgow G61 1QH, UK.

The absorption and distribution patterns of the trypanocidal drug isometamidium and its effect on tissues in cattle were characterised. After intramuscular administration of a prophylactic dose of 0.5 mg kg^{-1} bodyweight, the drug was rapidly detectable in serum at a mean maximum concentration of only 20 ng ml^{-1} and declined to concentrations of lower than 10 ng ml^{-1} within 2 h. High drug concentrations were maintained at the injection site and in the liver and kidney for at least 6 weeks. At the injection site, tissue damage was severe and extensive, whereas in the liver and kidney no histopathological lesions were seen.
Authors' abstract

6253 **Kinabo, L.D.B. and Bogan, J.A., 1988**. The pharmacology of isometamidium. *Journal of Veterinary Pharmacology and Therapeutics*, **11** (3): 233-245.
Department of Veterinary Pharmacology, University of Glasgow Veterinary School, Bearsden Road, Bearsden, Glasgow G61 1QH, UK.

The authors review the chemistry of isometamidium; its antitrypanosomal activity *in vitro*, in tsetse flies, in therapeutic and prophylactic trials, its mode of action, resistance to the drug and its use in combination with other drugs; pharmacokinetic studies; adverse effects; dosage and administration; its place in therapy and prophylaxis; and residues in meat.

6254 **Moloo, S.K. and Kutuza, S.B., 1990**. Expression of resistance to isometamidium and diminazene in *Trypanosoma congolense* in Boran cattle infected by *Glossina morsitans centralis*. *Acta Tropica*, **47** (2): 79-89. ILRAD, P.O. Box 30709, Nairobi, Kenya.

Investigations were conducted on the sensitivity to isometamidium chloride (Samorin) and diminazene aceturate (Berenil) of derivatives of three of the *T. congolense* stocks isolated between 1978 and 1983 from Zebu cattle in the Bobo-Dioulasso region of Burkina Faso. Boran cattle were used in the drug-sensitivity tests and were infected using *G. m. centralis*. The results showed that *T. congolense* stock IL 2466 isolated in 1978 was sensitive to the standard therapeutic dose of isometamidium chloride (0.25 mg kg^{-1}) and of diminazene aceturate (a.i. 3.5 mg kg^{-1}). However, *T. congolense* stock IL 2468 isolated in 1982 was resistant to both the prophylactic (0.5 and 1.0 mg kg^{-1}) as well as the therapeutic doses of isometamidium chloride (up to 1.0 mg kg^{-1}) although the sensitivity to the therapeutic dose of diminazene aceturate (3.5 mg kg^{-1}) was not affected. The *T. congolense* stock IL 2856 isolated in 1983 was highly resistant to the therapeutic action of diminazene aceturate (up to 10.5 mg kg^{-1}), as well as to the prophylactic (up to 1.0 mg kg^{-1}) and therapeutic action of isometamidium chloride (up to 2.0 mg kg^{-1}). The infection rates of the drug-resistant stocks of *T. congolense* in *G. m. centralis*, when goats were used as reservoir hosts, were as high (range, 22.3-56.3%) as of the drug-sensitive stock (49.5%). The resistance trait in the two stocks remained stable after their cyclical development in the tsetse vectors. The rate of transmission of the drug-resistant stocks to mice by the infected tsetse was also high (mean 81.3%).

Authors' abstract

6255 **Sones, K.R., Holmes, P.H. and Urquhart, G.M., 1989**. Interference between drug-resistant and drug-sensitive stocks of *Trypanosoma congolense* in goats. *Research in Veterinary Science*, **47** (1): 75-77.

RMB Animal Health, Dagenham, Essex, UK; University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK; ibid.
A study was undertaken in goats to investigate the ability of two unrelated stocks of *T. congolense*, one of which is highly sensitive to isometamidium chloride and one of which is drug-resistant, to become established in the presence of an existing infection with the other stock. The goats, which were initially infected with the sensitive strain and were then challenged with the resistant strain, were cured by treatment at 0.1 mg kg^{-1} isometamidium, indicating that the resistant stock did not establish an infection. Goats initially infected with the resistant stock, which were then challenged with the sensitive stock, experienced temporary remission of infection followed by relapse after treatment at 0.1 mg kg^{-1} isometamidium. In contrast, the goat infected only with the resistant stock remained parasitaemic following treatment at 0.1 mg kg^{-1}. This suggests that superinfection with the sensitive stock resulted in the establishment of infection, which suppressed the resistant stock to below the limit of detection of the method used. These observations suggest that isometamidium-resistant stocks may be less viable than sensitive strains, and could explain the relative scarcity of isometamidium resistance in the field.
Authors' abstract

6256 **Zelleke, D., Kassa, B. and Abebe, S., 1989**. Efficacy of RM110, a novel trypanocide, in the treatment of *Trypanosoma evansi* infections in camels. *Tropical Animal Health and Production*, **21** (4): 223-226.
Veterinary Services Department, Ministry of Agriculture, P.O. Box 62347, Addis Ababa, Ethiopia.
Camels artificially infected with a field stock of *T. evansi* isolated from a camel near Gewane, Ethiopia, were cured by treatment with RM110 (Cymelarsan), administered by subcutaneous injection at 0.3 or 0.6 mg/kg body weight. Local reactions were mild and transient. Further evaluation of RM110 is indicated, in particular the determination of minimum curative doses for this and other *T. evansi* stocks in camels.
Authors' abstract

7. EXPERIMENTAL TRYPANOSOMIASIS

(a) DIAGNOSTICS

6257 **Ijagbone, I.F., Staak, C. and Reinhard, R., 1989.** Fractionation of trypanosome antigens for species-specific sero-

diagnosis. [*T. brucei, T. congolense, T. evansi;* rabbits.]
Veterinary Parasitology, **32** (4): 293-299.
Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Nigeria; Institute of Veterinary Medicine, Federal Health Office, Berlin, Federal Republic of Germany; ibid.

6258 **Liu, M.K., Cattand, P., Gardiner, I.C. and Pearson, T.W., 1989.** Immunodiagnosis of sleeping sickness due to *Trypanosoma brucei gambiense* by detection of anti-procyclic antibodies and trypanosome antigens in patients' sera. *Acta Tropica*, **46** (4):257-266.

Liu, Gardiner, Pearson: Department of Biochemistry and Microbiology, University of Victoria, Victoria, B.C., Canada V8W 2Y2; Cattand: WHO Trypanosomiasis Applied Research Project, Daloa, Côte d'Ivoire.
(Correspondence to Pearson.)
Documented sera from 39 *T. b. gambiense* sleeping sickness patients from Côte d'Ivoire were tested using the procyclic agglutination trypanosomiasis test (PATT) for the presence of anti-trypanosome antibodies and using an antigen-capture double antibody enzyme-linked immunosorbent assay (ELISA) for the presence of trypanosomal antigens. All 39 sera contained antiprocyclic antibodies and trypanosome antigens whereas five control sera did not. The results show that the PATT (for antibody detection) and the double antibody ELISA (for antigen detection) are useful for immunodiagnosis of African sleeping sickness due to *T. b. gambiense* and that these assays should be simplified for further testing and evaluation in the field.
Authors' abstract

(b) PATHOLOGY AND IMMUNOLOGY
[See also **13**: nos. 6248, 6276.]
6259 **Amole, B., Sharpless, N., Wittner M. and Tanowitz, H.B., 1989.** Neurochemical measurements in the brains of mice infected with *Trypanosoma brucei brucei* (TREU 667). *Annals of Tropical Medicine and Parasitology*, **83** (3): 225-232.
Faculty of Health Sciences, University Obafemi Awolowo, Ile-Ife, Nigeria; deceased; Departments of Pathology (Division of Parasitology) (Wittner, Tanowitz) and Medicine (Division of Infectious Diseases) (Tanowitz), Albert Einstein College of Medicine, Bronx,

New York City, NY 10461, USA. (Correspondence to Tanowitz.)

6260 **Nwagwu, M., Inyang, A.L., Molokwu, R.I. and Essien, E.M., 1989.** Platelet-aggregating acitivity of released factor(s) from *Trypanosoma brucei brucei.* [Rat.] *African Journal of Medicine and Medical Sciences,* **18** (4): 283-287.
Departments of Zoology (Nwagwu, Molokwu) and Haematology (Essien), University of Ibadan, Ibadan, Nigeria; Inyang: Department of Pharmacology, University of Calabar, Calabar, Nigeria. (Correspondence to Inyang.)

6261 **Schultzberg, M., Olsson, T., Samuelsson, E.-B., Maehlen, J. and Kristensson, K., 1989**. Early major histocompatibility complex (MHC) class I antigen induction in hypothalamic supraoptic and paraventricular nuclei in trypanosome-infected rats. [*T. b. brucei*.] *Journal of Neuroimmunology*, **24** (1-2): 105-112.
Departments of Pathology (Neuropathology) (Schultzberg, Samuelsson, Maehlen, Kristensson) and Neurology (Olsson), Karolinska Institute, Huddinge Hospital, S-141 86 Huddinge, Sweden.

(c) CHEMOTHERAPEUTICS

6262 **Bouteille, B., Darde, M.L., Pestre-Alexandre, M., Dumas, M., Nicolas, J.A., Breton, J.C. and Catanzano, G., 1987**. Action des médicaments testés *in vitro* en milieu acellulaire et *in vivo* chez la souris Swiss et le mouton, modèle expérimental infecté par *Trypanosoma brucei brucei*. [Action of drugs tested *in vitro* in acellular medium and *in vivo* in the Swiss mouse and in the sheep, experimental model infected with *T. b. brucei*.] [Melarsoprol, DFMO, Ro 15-0216, triacetyl benzene trisguanylhydrazone.] *Bulletin de la Société française de Parasitologie*, **5** (1): 3-13.
Institut d'Epidémiologie et de Neurologie Tropicale, Faculté de Médecine, 2 rue du Docteur Marcland, 87032 Limoges Cédex, France. Also: Service de Parasitologie-Mycologie (Bouteille, Darde, Pestre-Alexandre), Service de Biochimie (Breton) and Service d'Anatomopathologie (Catanzano), C.H.U. Dupuytren, avenue A. Carrel, 87042 Limoges, France; Nicolas also: Laboratoire Départemental, rue du Dr Larrey, 87 Limoges, France.

6263 **Brun, R., Baeriswyl, S. and Kunz, C., 1989**. *In vitro* drug sensitivity of *Trypanosoma gambiense* isolates. *Acta Tropica*, **46** (5-6): 369-376.

Swiss Tropical Institute, Postfach, CH-4002 Basel, Switzerland.

6264 **Brun, R. and Kunz, C., 1989**. *In vitro* drug sensitivity test for *Trypanosoma brucei* subgroup bloodstream trypomastigotes. *Acta Tropica*, **46** (5-6): 361-368.
Swiss Tropical Institute, Postfach, CH-4002 Basel, Switzerland.

6265 **Deken, R. de, Geerts, S., Kageruka, P., Ceulemans, F., Brandt, J., Schacht, E., Pascucci, C. and Lootens, C., 1989**. Chemoprophylaxis of trypanosomiasis, due to *Trypanosoma (Nannomonas) congolense*, in rabbits using a slow release device containing homidium bromide. *Annales de la Société belge de Médecine tropicale*, **69** (4): 291-296.
Veterinary Department, Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium; ibid.; ibid.; ibid.; ibid.; Department of Organic Chemistry, State University of Ghent, Krijgslaan 281, B-9000 Ghent, Belgium; ibid.; ibid.
The prophylactic activity of a subcutaneously implanted slow-release device, containing homidium bromide, was assessed in rabbits challenged with different stocks of *T. congolense*, and compared with the classical treatment of 1 mg homidium bromide/kg bodyweight intramuscularly. The prophylactic activity of the intramuscular injection was less than a month, while the slow-release device protected the rabbits against seven challenges with *T. congolense* during a period of more than 300 days. Authors' abstract

6266 **Jennings, F.W., McNeil, P.E., Ndung'u, J.M. and Murray, M., 1989**. Trypanosomiasis and encephalitis: possible aetiology and treatment. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **83** (4): 518-519.
Departments of Veterinary Parasitology (Jennings), Pathology (McNeil) and Medicine (Ndung'u, Murray), University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK.
Studies in mice show that meningo-encephalitis occurs with all trypanosomicidal drugs when used in regimens which allow a delay in eliminating trypanosomes from the CNS. It is suggested that the encephalitis is caused by the `immune cells' concentrating on trypanosomes remaining in the CNS after circulating trypanosomes have been eliminated. Such encephalitis increases the permeability of the blood-brain barrier, permitting nutrients through, with consequent increase in number of parasites, as well as trypanosomicides. Current forms of treatment using suramin or pentamidine to eliminate bloodstream trypanosomes followed by

melarsoprol to eliminate trypanosomes from the CNS may encourage encephalitis. A drug regimen to eliminate CNS trypanosomes at the same time, or before, circulating ones might be better. An alternative approach, which has given good results in mice, might be to pre-treat the patient with an immunosuppressive drug (azathioprine) to suppress encephalitis, followed by normal late-stage trypanosomicidal chemotherapy.

6267 **Kinabo, L.D.B. and Bogan, J.A., 1987**. Binding of isometamidium to calf thymus DNA and lipids: pharmacological implications. *Journal of Veterinary Pharmacology and Therapeutics*, **10** (4): 357-362.

Department of Veterinary Pharmacology, University of Glasgow Veterinary School, Bearsden Road, Bearsden, Glasgow G61 1QH, UK.

6268 **Penketh, P.G., Shyam, K., Divo, A.A., Patton, C.L. and Sartorelli, A.C., 1990.** Methylating agents as trypanocides. [*T. b. rhodesiense*; mice.] *Journal of Medicinal Chemistry,* **33** (2): 730-732.

MacArthur Center for Molecular Parasitology (Penketh, Divo, Patton, Sartorelli) and Department of Pharmacology and Developmental Therapeutics Program, Comprehensive Cancer Center (Shyam, Divo, Sartorelli), Yale University School of Medicine, New Haven, CT 06510, USA. (Correspondence to Sartorelli.)

6269 **Sundberg, R.J., Dahlhausen, D.J., Manikumar, G., Mavunkel, B., Biswas, A., Srinivasan, V., Musallam, H.A., Reid, W.A. and Ager, A.L., 1990.** Cationic antiprotozoal drugs. Trypanocidal activity of 2-(4∫-formylphenyl)imidazo[1,2-*a*]pyridinium guanylhydrazones and related derivatives of quaternary heteroaromatic compounds. [*T. b. rhodesiense*; mice.] *Journal of Medicinal Chemistry,* **33** (1): 298-307.

Department of Chemistry, University of Virginia, Charlottesville, VA 22901, USA; ibid.; ibid.; ibid.; ibid.; ibid.; Division of Experimental Therapeutics, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, DC 20307, USA; ibid.; Center for Tropical Parasitic Diseases, University of Miami, Miami, FL 33177, USA.

8. TRYPANOSOME RESEARCH

(a) CULTIVATION OF TRYPANOSOMES

6270 **Hirumi, H. and Hirumi, K., 1989.** Continuous cultivation of *Trypanosoma brucei* blood stream forms in a medium containing a low concentration of serum protein without feeder cell layers. *Journal of Parasitology,* **75** (6): 985-989.

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

6271 **Turner, C.M.R., 1990**. The use of experimental artefacts in African trypanosome research. [*T. b. brucei*, *T. b. rhodesiense*.] *Parasitology Today*, **6** (1): 14-17. Department of Zoology, University of Glasgow, Glasgow G12 8QQ, UK.

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

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

6272 **Aksoy, S., Williams, S., Chang, S. and Richards, F.F., 1990**. SLACS retrotransposon from *Trypanosoma brucei gambiense* is similar to mammalian LINEs. *Nucleic Acids Research*, **18** (4): 785-792.
Yale MacArthur Center for Molecular Parasitology (Aksoy, Williams, Richards), and Department of Internal Medicine, Yale University School of Medicine (Aksoy, Richards), New Haven, CT 06510, USA; Chang: Rockefeller University, 1230 York Avenue, New York, NY 10021, USA.

6273 **Boutignon, F., Huet-Duvillier, G., Mendonça-Previato, L., Gomes, V., Hublart, M. and Degand, P., 1990**. Variant surface glycoprotein of *Trypanosoma brucei brucei* AnTat 1.1: influence of the isolation conditions upon the disulfide linked dimer/monomer ratio. *Comparative Biochemistry and Physiology (B)*, **95** (2): 281-286.
Unité Inserm no. 16, Place de Verdun, 59045 Lille Cédex, France; Mendonça-Previato: Universidade Federal do Rio de Janeiro and CNPq, Brazil.

6274 **MacRae, T.H. and Gull, K., 1990.** Purification and assembly *in vitro* of tubulin from *Trypanosoma brucei brucei. Biochemical Journal,* **265** (1): 87-93.
Department of Biology, Dalhousie University, Halifax, N.S. B3H 4J1, Canada; Department of Biochemistry and Molecular Biology, School of Biological Sciences, University of Manchester, Manchester M13 9PT, UK.

6275 **Moradbakhti, B., Gutteridge, W.E. and Beebee, T.J.C., 1990**. An RNA-dependent UMP-incorporating activity is associated with the small subunit of cytoplasmic ribosomes in bloodstream forms of *Trypanosoma brucei*. *Biochemistry International*, **20** (2): 311-316.
Moradbakhti, Beebee: Department of Biochemistry, University of Sussex, Falmer, Brighton BN1 9QG, UK; Gutteridge: Department of Biochemical Microbiology, Wellcome Research

Laboratories Ltd, Beckenham, Kent, UK. (Correspondence to Beebee.)

6276 **Rifkin, M.R. and Landsberger, F.R., 1990.** Trypanosome variant surface glycoprotein transfer to target membranes: a model for the pathogenesis of trypanosomiasis. *Proceedings of the National Academy of Sciences of the United States of America,* **87** (2): 801-805.

Rockefeller University, 1230 York Avenue, New York, NY 10021, USA.

6277 **Roditi, I. and Pearson, T.W., 1990.** The procyclin coat of African trypanosomes (or the not-so-naked trypanosome). *Parasitology Today*, **6** (3): 79-82.

Institut für Allgemeine Mikrobiologie, Universität Bern, Baltzerstrasse 4, 3012 Bern, Switzerland; Department of Biochemistry and Microbiology, University of Victoria, Victoria, B.C., Canada V8W 2Y2.

6278 **Ruben, L., Haghighat, N. and Campbell, A., 1990.** Cyclical differentiation of *Trypanosoma brucei* involves changes in the cellular complement of calmodulin-binding proteins. *Experimental Parasitology,* **70** (2): 144-153.

Department of Biological Sciences, Southern Methodist University, Dallas, TX 75275, USA.

6279 **Seebeck, T., Hemphill, A. and Lawson, D., 1990.** The cytoskeleton of trypanosomes. *Parasitology Today,* **6** (2): 49-52.

Institut für Allgemeine Mikrobiologie, Universität Bern, Baltzerstrasse 4, 3012 Bern, Switzerland; ibid.; Department of Biology, Medawar Building, University College, Gower Street, London WC1 6BT, UK.

6280 **Strauss, P.R. and Wang, J.C., 1990**. The *TOP2* gene of *Trypanosoma brucei*: a single-copy gene that shares extensive homology with other *TOP2* genes encoding eukaryotic DNA topoisomerase II. *Molecular and Biochemical Parasitology*, **38** (1): 141-150.

Department of Biology, Northeastern University, Boston, MA 02115, USA; Department of Biochemistry and Molecular Biology, Harvard University, Cambridge, MA, USA.

6281 **Tait, A. and Turner, C.M.R., 1990.** Genetic exchange in *Trypanosoma brucei. Parasitology Today,* **6** (3): 70-75.

Wellcome Unit of Molecular Parasitology, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK; Department of Zoology, University of Glasgow, Glasgow G12 8QQ, UK.

6282 **Volloch, V., Schweitzer, B. and Rits, S., 1990.** Uncoupling of the synthesis of edited and unedited COIII RNA in *Trypanosoma brucei. Nature,* **343** (6257): 482-484.
Department of Metabolic Regulation, Boston Biomedical Research Institute, Boston, MA 02114, USA; Volloch also: Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Boston, MA 02115, USA.

6283 **Webster, P. and Shapiro, S.Z., 1990.** *Trypanosoma brucei*: a membrane-associated protein in coated endocytotic vesicles. *Experimental Parasitology,* **70** (2): 154-163.
ILRAD, P.O. Box 30709, Nairobi, Kenya; Department of Veterinary Pathobiology, University of Illinois, Urbana, IL 61801, USA.

6284 **Woodward, R. and Gull, K., 1990.** Timing of nuclear and kinotoplast DNA replication and early morphological events in the cell cycle of *Trypanosoma brucei. Journal of Cell Science,* **95** (1): 49-57.
Department of Biochemistry and Molecular Biology, School of Biological Sciences, University of Manchester, Stopford Building, Oxford Road, Manchester M13 9PT, UK; Biological Laboratory, University of Kent, Canterbury CT2 7NJ, UK.

6285 **Zweygarth, E., Gumm, I.D., Gray, M.A., Cheruiyot, J.K., Webster, P. and Kaminsky, R., 1989**. *In vitro* development of metacyclic *Trypanosoma simiae* derived from bloodstream trypomastigotes. *Acta Tropica*, **46** (5-6): 277-282.
Zweygarth, Gray: KETRI, P.O. Box 29231, Nairobi, Kenya; Gumm, Webster, Kaminsky: ILRAD, P.O. Box 30709, Nairobi, Kenya; Cheruiyot: Veterinary Research Laboratory, Kabete, Kenya.