SECTION B - ABSTRACTS

1. GENERAL (INCLUDING LAND USE)

5816 **Cattand, P., 1988**. Sleeping sickness - re-awakes. *World Health*, **1988** (July): 24-25.

Trypanosomiases and Leishmaniases Unit, WHO, 1211 Geneva 27, Switzerland.

An alarming increase in the number of sleeping sickness cases in many historically endemic areas, where previously good surveillance had reduced incidence to a very low level, demonstrates what can happen when surveillance activities are reduced. Control and preventive measures must be put into effect now before the devastating sleeping sickness situation of the early part of the century is re-experienced. New field-adapted diagnostic methods are now available, a new drug, DFMO, is currently under experiment for patients not responding to the classical trypanocidal drugs, and vector control has been improved considerably with the introduction of efficient, simple and inexpensive tsetse traps. In 1984, WHO launched a programme entitled `Primary health care approach towards the control and prevention of sleeping sickness'. This aims to assist countries in setting up their own national programmes by making available information and training, and also by providing a supply line for equipment, material, reagents and drugs.

2. tsetse biology

(a) REARING OF TSETSE FLIES

5817 **Filledier, J. and Bauer, B., 1988.** L'élevage de *Glossina morsitans submorsitans* Newstead, 1910 (Diptera - Glossinidae) au CRTA de Bobo-Dioulasso, Burkina Faso. I. Adaptation d'une souche sauvage aux conditions d'élevage en laboratoire sur animaux nourriciers. [Rearing of *G. m. submorsitans* at CRTA, Bobo-Dioulasso, Burkina Faso. I. Adaptation of a wild strain to laboratory rearing conditions using host animals.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (1): 87-92.

CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso.

As part of CRTA's programme of research into the control of tsetse, carried out in order to create a `welcome' pasture area at Sideradougou, the need for sterile male *G. m. submorsitans* for release has made necessary the mass breeding of this species. 11,182 pupae, produced in the bush by females captured in the Comoe region (south-western Burkina Faso), were taken to CRTA in 1981 in order to create the parental generation. After a long stationary period of adaptation, the goal was reached during 1984. This article summarises the results obtained from the start of rearing through to June 1984 (beginning of mass production) and describes the difficulties encountered in adapting *G. m. submorsitans* to laboratory conditions using domestic animals (rabbits, goats) as hosts. The

results show that, in order to create a breeding colony of this tsetse species from a wild strain, a 2-year period of adaptation must be expected.
Authors' abstract

5818 **Filledier, J. and Bauer, B., 1988.** L'élevage de *Glossina morsitans submorsitans* Newstead, 1910 (Diptera: Glossinidae) au CRTA de Bobo-Dioulasso, Burkina Faso. II. Caractéristiques biologiques. [Rearing of *G. m. submorsitans* at CRTA, Bobo-Dioulasso, Burkina Faso. II. Biological characteristics.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux,* **41** (4): 407-418.
CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso.
A breeding colony of *G. m. submorsitans* was created in December 1981 at CRTA, Bobo-Dioulasso, from 11,182 pupae produced by wild females bred in the bush in Comoe region (south-western Burkina Faso). Besides this colony, 38 females from the parental generation were bred in individual cages with a view to assessing their biological characteristics. These 38 females and their progeny were followed until the 13th generation. This study focuses on 804 females individually bred from 17 November 1981 to the end of September 1984, and summarises the results obtained. These results allow calculation of the mean coefficient of increase (0.00766) as well as the optimum coefficient of increase (0.01354) of this species. These coefficients can be used to establish breeding predictions for this *G. m. submorsitans* strain on host animals in the laboratory conditions at CRTA.
Authors' abstract

5819 **Madubunyi, L.C., 1989**. Survival and productivity of the tsetse, *Glossina morsitans morsitans* Westwood (Diptera: Glossinidae) maintained under different feeding regimens through four successive reproductive cycles in Zambia. *Insect Science and its Application*, **10** (1): 75-80.
Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria; c/o UNDP Resident Representative, P.O. Box 9182, Dar es Salaam, Tanzania.
Adult survival, puparial production, weight and viability, and the sex ratio of adults emerging from puparia of *G. m. morsitans* maintained through four successive reproductive cycles on daily (S0), every other day (S1) and every third day (S2) feeding regimens, respectively, were investigated at Chilanga, Zambia. Only in puparial production (0.8 under S0 and S1, 0.7 under S2) and puparial weight (25.1 □ 0.2 mg under S0, 24.1 □ 0.3 mg under S1, 22.5 □ 0.3 mg under S2) were significant differences ($P < 0.05$ and < 0.01 respectively) detected between feeding regimens. Nevertheless, a combination of S1 and S2 regimens is recommended for further evaluation as a more convenient and economical alternative to the S0 regimen for tsetse mass production in Africa.
Author's abstract

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

5820 **Gooding, R.H., 1988.** Héritabilité de la capacité vectorielle chez les insectes hématophages. [Inheritance of vectoring ability of haematophagous insects.] *Annales de Médecine vétérinaire,* **132**: 521-532.
Department of Entomology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3.
In this review, covering nearly 50 published papers, susceptibility of insects to vertebrate pathogens is accepted as a measure of the vectoring ability of these insects, and inheritance patterns of susceptibility are reviewed. Among the chromosomal genes controlling or influencing vectoring ability, autosomal genes (with susceptibility being dominant, recessive or incompletely dominant) and sex-linked recessive genes have been demonstrated. Maternally inherited factors influencing vectorial capacity appear to be rickettsia-like organisms.
Author's abstract

5821 **Gooding, R.H., 1989.** Genetic basis of sterility in hybrids from crosses of *Glossina morsitans submorsitans* and *Glossina morsitans morsitans* (Diptera: Glossinidae). *Genome*, **32** (3): 479-485.
Department of Entomology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3.
G. m. submorsitans and *G. m. morsitans* carrying two marker genes on the X chromosome, two in linkage group II and one in linkage group III were hybridised. About 17% of the F_1 and from 33 to 56% of the backcross males fertilised *G. m. submorsitans*, but only one F_1 and two backcross males fertilised *G. m. morsitans*. Similarly, F_1 and backcross females were fertilised by *G. m. submorsitans* but rarely by *G. m. morsitans.* Chromosomal composition of F_1 and backcross males indicated that hybrid male sterility is due to incompatibility of the X chromosome from one subspecies and the Y from the other subspecies or possibly an incompatibility between X chromosomes and autosomes from different subspecies. Results are discussed in the context of a model for evolution of X and Y incompatibility and a model for evolution of maternally inherited factors that cause unidirectional sterility in males. In hybrid females, intrachromosomal recombination was suppressed in the X chromosome and in linkage group II. Fertility of backcross females, mated to *G. m. submorsitans*, could not be related to the chromosomal composition of the females.
Author's abstract

5822 **Gooding, R.H., 1989**. Involvement of the X chromosome in fertility of male and female hybrids of *Glossina morsitans morsitans* and *Glossina morsitans centralis* (Diptera: Glossinidae). *Canadian Journal of Zoology*, **67** (4): 869-871. Department of Entomology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3.
In hybrid females of *G. m. morsitans* and *G. m. centralis* that carried four well-separated marker genes, suppression of intrachromosomal recombination occurred between the loci for glucose-6-phosphate dehydrogenase (*G6pd*) and arginine phosphokinase (*Apk*) on the X chromosome. Fertility of backcross females was not influenced by whether they mated with *G. m. morsitans* or *G. m. centralis*, but it was higher in females that received both of their X chromosomes from *G. m. morsitans* than it was in females that received one X chromosome from *G. m. morsitans* and the other from *G. m. centralis*.
Author's abstract

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

[See also **12**: no. 5839.]
5823 **Hall, M.J.R. and Langley, P.A., 1989.** The responses of individual males in an isolated population of *Glossina morsitans morsitans* Westwood (Diptera: Glossinidae) to pheromone-baited decoy `females'. *Bulletin of Entomological Research*, **79** (2): 319-334.
Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD, UK; TRL, University of Bristol, Langford, Bristol BS18 7DU, UK.
The responses of individually marked males of *Glossina morsitans morsitans* to decoys (9 ∃ 3 mm rectangles of 2 mm thick brushed nylon) baited with sex pheromone (15,19,23-trimethylheptatriacontane) were studied after their release onto an island in Lake Kariba, Zimbabwe. Some 45-60% of resighted flies were seen on decoys, the percentage being greater for flies released at an older age. For flies released on emergence, the mean age at first contact with decoys on a static screen was 6.6 days, an average of 4 days later than their first observed contact with a bait ox. There was great variability in the response towards decoys on successive contacts. In general, the intensity of the responses to decoys in the first minute after contact (the `pre-copulatory' responses) decreased from one encounter to the next in a single 1-2 h observation session, but were restored to high levels after an interval of several hours. The intensity of responses towards decoys *after* this initial period (the `copulatory' responses) were not affected by previous contacts. Neither previous sexual experience nor age

at first contact affected the durations of response on decoys. There were no differences between the responses of wild flies and those from a laboratory colony. The results are discussed in relation to the use of decoys with chemosterilant for tsetse autosterilisation. Over 60% of flies contacting decoys did so more than once, which would increase, cumulatively, the chances of their being sterilised.
Authors' abstract

5824 **Nekpeni, E.B., Dagnogo, M. and Eouzan, J.-P., 1989**. Détermination de la limite géographique entre deux sous-espèces de glossines en Côte d'Ivoire: *Glossina palpalis palpalis* (Robineau-Desvoidy, 1830) et *G. p. gambiensis* (Vanderplank, 1949). [Determination of the geographical limit between two tsetse subspecies in Côte d'Ivoire: *G. p. palpalis* and *G. p. gambiensis*.] *Tropical Medicine and Parasitology*, **40** (1): 12-15.
CEMV, B.P. 2597, Bouaké 01, Côte d'Ivoire; ibid.; IPR, B.P. 1500, Bouaké, Côte d'Ivoire.
A biometric analysis of the male genitalia of samples of *G. p. palpalis* and *G. p. gambiensis* caught along four transects in Côte d'Ivoire enabled the geographic limit between the two subspecies to be determined. *G. p. palpalis* occurs throughout the guinean zone, while *G. p. gambiensis* in found in the sudanese zone. In the humid savanna the two subspecies co-exist and mate to give a small number of hybrids.
Authors' abstract

5825 **Randolph, S.E., Dransfield, R.D. and Rogers, D.J., 1989**. Effect of host odours on trap catch composition of *Glossina pallidipes* in Kenya. *Medical and Veterinary Entomology*, **3** (3): 297-306.
Randolph, Rogers: Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS, UK; Dransfield: ICIPE, P.O. Box 30772, Nairobi, Kenya.
The effect of odour attractants on the composition of samples of *G. pallidipes* was investigated by comparing the age and nutritional status of flies caught in unbaited biconical traps with those caught in traps baited with cow urine and acetone. For both male and female flies, baited traps caught more flies with significantly higher fat content than did unbaited traps. Thus the samples from baited traps were more representative of the population as a whole: males showed a fuller range of the fat/haematin conditions known to occur in the field and proportionately more females were in later stages of the pregnancy cycle, than from unbaited traps.
Authors' abstract

5826 **Wall, R., 1989**. The roles of vision and olfaction in mate location by males of the tsetse fly *Glossina morsitans morsitans*. *Medical and Veterinary Entomology*, **3** (2): 147-152.
TRL, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.
The roles of visual and/or olfactory stimuli in eliciting mating responses from male *G. m. morsitans* were examined, using a system for automatically recording the number and duration of mating strikes made towards decoys, under controlled conditions. The results confirm that there is no olfactory component of the

female sex recognition pheromone sensed by the male antennae, and the attraction of males to females appears to be visual. The absence of male-male mating strikes was the result of the absence of female sex-pheromone, rather than the presence of a repellent mating deterrent in the male cuticle. Experiments with coloured, artificial, sex-pheromone-dosed, cotton decoys showed that colour had only weak effects on attractiveness and number of encounters with decoys, and that no colour caused significant enhancement of mating responses over those shown to decoy females.
Author's abstract

5827 **Wall, R., 1989**. Sexual responses of males of *Glossina morsitans morsitans* Westwood and *G. pallidipes* Austen (Diptera: Glossinidae) to traps and targets in the field. *Bulletin of Entomological Research*, **79** (2): 335-343.
TRL, University of Bristol, Langford, Bristol BS18 7DU, UK.
Studies were conducted in Zimbabwe to determine the nature and degree of sexual responses of males of *G. m. morsitans* and *G. pallidipes* around host animals, traps and targets. Males of both species, after being attracted, appeared to accumulate around a stationary bait. This was supported by observations of concentrations of unfed males of *G. m. morsitans* on bait animals and unfed males of *G. pallidipes* on the surrounding ground. Nutritional analysis confirmed that traps attract males with a range of hunger states but catch mainly hungry males of both species. Movement of electrified targets significantly increased the catches of both sexes of *G. m. morsitans* but not of *G. pallidipes*. Artificial female-mimicking decoys made from black felt sewn onto electrified targets significantly increased the numbers of *G. m. morsitans* males caught when the targets were stationary and of *G. pallidipes* males when they were moving. The electrified targets caught a higher proportion of males of both species than traps, most probably as a result of their killing the males accumulating around the target in search of virgin females. The results show that the behaviour of relatively well-fed males attracted to host animals, traps and targets does appear to have a sexual component in both *G. m. morsitans* and *G. pallidipes* and that it may be possible to exploit the sexual responses of males to increase capture efficiency further. However, targets may have far greater potential for such manipulation than traps.
Author's abstract

5828 **Warnes, M.L., 1989**. Responses of the tsetse fly, *Glossina pallidipes*, to ox odour, carbon dioxide and a visual stimulus in the laboratory. *Entomologia experimentalis et applicata*, **50** (3): 245-253.
TRL, University of Bristol, School of Veterinary Science, Langford, Bristol BS18 7DU, UK.
The responses of male and female *G. pallidipes* to a visual target were recorded in a slow-speed wind tunnel, using a video system. Addition of ox odour or carbon dioxide at an equivalent concentration to the airstream resulted in an increase in flight activity and a marked increase in flies alighting on the visual target. In the absence of ox odour flights were characterised by a number of collisions with the walls and ceiling of the cage used to retain the flies, whereas in the presence of ox odour the flies circled around the centre of the cage avoiding the edges. Removal of the visual target did not alter this response. The results are discussed in the light of field observations on the behaviour of *G. pallidipes* around baited targets. When flies were observed in groups, mutual disturbance increased the activity

during control periods, thus masking the activating effect of ox odour. The activity of individual flies occurred in bursts (22.1 s mean duration) consisting of a number of flights (3.3 s mean duration) and longer periods of inactivity (85.8 s mean duration). The burst length did not change when ox odour was added to the airstream but the number of flights per burst increased. These results are discussed in relation to the random dispersal theory of tsetse populations. Author's abstract

3. TSETSE CONTROL (INCLUDING ENVIRONMENTAL SIDE EFFECTS)

[See also **12**: nos. 5823, 5839.]

5829 **Allsopp, R., 1988.** Latest advances in fight against tsetse fly. *Shell Agriculture,* **1988** (1): 22-25.
ODNRI, Central Avenue, Chatham Maritime, Chatham, Kent, ME4 4TB, UK.
The latest developments in controlling tsetse, particularly with regard to the EEC-funded Regional Tsetse and Trypanosomiasis Control Programme for Southern Africa, are outlined. Aerial spraying is now one of the world's most sophisticated methods of pesticide application. Low doses of insecticide (12-24 g/ha of endosulfan) can be applied as an aerosol by night-flying aircraft assisted by computerised application controls, a method which has minimal impact on non-target organisms. Traps and targets, first successfully used in riverine tsetse habitats in West Africa, are now being developed for use against the more widely dispersed savanna species. These require a powerful attractant based on host odours: currently acetone is being used with sachets containing a mixture of one part 3-propyl phenol: four parts octenol: eight parts 4-methyl phenol. Simpler revolving targets of cloth are used instead of the West African biconical traps, and an application of 400-600 ml of 0.1% deltamethrin per target remains sufficiently toxic for 3 months. These two methods, along with ground spraying of DDT, are of similar overall cost, but a recent development, in areas where cattle dipping for tick control is practised, is to change the insecticide used to a synthetic pyrethroid which kills both ticks and tsetse; this method can be very effective and inexpensive.

5830 **Gouteux, J.P., Toudic, A. and Sinda, D., 1988.** Utilisation d'animaux sentinelles dans l'évaluation de la lutte contre les vecteurs de la maladie du sommeil: premiers résultats dans un foyer congolais. [The use of sentinel animals to monitor antivectorial control of

sleeping sickness: preliminary results in a Congolese focus.] *Acta Tropica,* **45** (4): 331-338.
ORSTOM, B.P. 181, Brazzaville, Congo.
A large-scale control trial against *Glossina palpalis palpalis* was carried out in the Congo using a new trapping technique (permanent killing system). Sentinel animals were used to help monitor the presence of residual or immigrant tsetse populations. 564 domestic animals (pigs, sheep, goats) were examined parasitologically (wet blood films, Woo/HCT) and serologically (Testryp CATT) in six villages. When a large reduction of the tsetse population had been achieved (i.e. zero point of apparent density), animals first became parasitologically negative after 1 year and completely serologically negative after 2 years. If only a relative decrease in the vector's apparent density had occurred, it was related to a lowering of the sero-parasitological prevalence rate. The use of a serological test such as the Testryp CATT, which was able to detect *Trypanosoma congolense* antibodies, is a particularly useful technique for estimating the animal transmission level. These first results give some indication that the use of sentinel animals such as pigs and sheep for continuous parasitological and serological monitoring is a useful means of evaluating the efficiency of a control campaign against sleeping sickness vectors.
Authors' abstract

5831 **Johnstone, D.R., Cooper, J.F., Flower, L.S., Harris, E.G., Smith, S.C. and Turner, C.R., 1989**. A means of applying mature aerosol drops to insects for screening biocidal activity. *Tropical Pest Management*, **35** (1): 65-66.
Pesticide Application and Management Department, ODNRI, Porton Down, Salisbury, Wiltshire, SP4 0JQ, UK.
A new technique (mature aerosol placement) enables single drops of insecticide aerosols to be applied to individual insects. Monodisperse drops are generated in a wind tunnel, collected on silk threads and transferred to the test insects. The technique has been used with tsetse flies and u.l.v. formulations of synthetic pyrethroids.
Authors' abstract

5832 **Kaaya, G.P., 1989**. *Glossina morsitans morsitans*: mortalities caused in adults by experimental infection with entomopathogenic fungi. *Acta Tropica*, **46** (2): 107-114.
ICIPE, P.O. Box 30772, Nairobi, Kenya.
Various strains of the entomopathogenic fungi *Beauveria bassiana, Metarhizium anisopliae, Paecilomyces fumosoroseus* and *P. farinosus* were found to be pathogenic for adult tsetse, *G. m. morsitans*, but *B. bassiana* and *M. anisopliae* were the most pathogenic, often causing mortalities of up to 100%. Dose-mortality relationships were demonstrated for both *B. bassiana* and *M. anisopliae*

and male tsetse were observed to be more susceptible to infection than females. Pure cultures of *B. bassiana* and *M. anisopliae* were isolated from haemolymph and fat body of tsetse previously exposed to fungal spores, and hyphal fragments were often observed floating freely in the haemolymph. No increase in abortions was observed in female pregnant tsetse infected with *B. bassiana* and *M. anisopliae* and pupae produced by the infected females showed no increase in pupal mortality. Furthermore, when larvae were heavily dusted with spores of *B. bassiana* and *M. anisopliae* prior to pupation and incubation, no increase was observed in pupal mortality, suggesting lack of fungal infection.
Author's abstract

5833 **Mawuena, K. and Yacnambe, S., l988.** L'utilisation des pièges et écrans imprégnés d'insecticide pour la lutte contre la trypanosomose animale. [Use of traps and screens impregnated with insecticide for the control of animal trypanosomiasis.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (1): 93-96.

CREAT, Avétonou, Togo. Present address: FAO, AGAH C521, Via delle Terme di Caracalla, 00100 Rome, Italy.

Traps and screens impregnated with persistent insecticide were used in the vicinity of CREAT for the control of animal trypanosomiasis. For the experiments, two herds of indigenous trypanotolerant cattle were chosen; they were both situated close to the riverine vegetation of the River Sio which was infested with *Glossina palpalis* and *G. tachinoides.* The control herd lived in the area without any treatment while the immediate surroundings of the experimental herd were treated with traps and screens impregnated with deltamethrin: 22 Challier biconical traps along 2.2 km of riverine vegetation and 16 blue screens along 32 ha of pasture planted with selected mango and orange trees. Control surveys (entomological and protozoological) were done every month, and animals found to be infected with trypanosomes were treated with diminazene aceturate (3.5 mg/kg), whether in the experimental or the control herd. From December 1985 to December 1986, preliminary results obtained were very encouraging. In the treated area there was not only a decline in tsetse density (per trap per day) from 4.6 at the beginning of the experiment to 0.1 at the end, but also a marked decrease in the trypanosome infection rate in the animals, from 13.6% to 1.66%. Cattle productivity clearly improved (reduction in abortions and in cases of calf mortality, increase in calving rate, etc.). In contrast, there was no change in the control herd, the trypanosome infection rate going from 10% to 10.4%. These preliminary results are

very positive and show the benefit of the use of these insecticide-impregnated traps and screens.
Authors' abstract

5834 **Sholdt, L.L., Schreck, C.E., Mwangelwa, M.I., Nondo, J. and Siachinji, V.J., 1989**. Evaluations of permethrin-impregnated clothing and three topical repellent formulations of deet against tsetse flies in Zambia. *Medical and Veterinary Entomology*, **3** (2): 153-158.
Sholdt: Department of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, MD 20814-4799, USA; Schreck: Insects Affecting Man and Animals Laboratory, ARS, USDA, P.O. Box 14565, Gainesville, FL 32604, USA; Mwangelwa, Siachinji: TDRC, P.O. Box 71769, N'Dola, Zambia; Nondo: Livestock Pest Research Centre, NCSR, P.O. Box 219, Chilanga, Lusaka, Zambia.
Permethrin-impregnated clothing and three topical repellent formulations of deet (diethyltoluamide) were field-tested against natural populations of tsetse flies, mostly *Glossina morsitans centralis*, in central Zambia. Volunteers wore different combinations of clothing impregnated with permethrin 0.125 mg a.i./cm^2 and repellents while riding in a vehicle that was driven slowly ((4-6 km/h), with the windows and rear door open, through fly-infested areas. The mean rate of tsetse bites was about twenty per 75 min for unprotected people. The treatment combination of permethrin-impregnated clothing (blue cotton coveralls) and either of two controlled-release deet formulations on exposed skin of face and arms provided 91% mean protection, but this was not significantly better ($P >$ 0.05) than wearing deet repellent alone (76-87% protection). No significant differences of protection were observed between the three repellent treatments, although the two controlled-release formulations (intended to be more persistent) were applied at approximately half the dosage of the standard 75% deet. Wearing permethrin-impregnated coveralls alone provided relatively poor protection (34%) for the untreated and exposed skin of head and hands. However, olive drab mesh jackets treated with permethrin reduced the tsetse biting rate by 75%.
Authors' abstract

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

[See also **12**: nos. 5825, 5828, 5846, 5866, 5869.]
5835 **Chigusa, Y. and Otieno, L.H., 1988**. Longevity and feeding behaviour of *Glossina morsitans morsitans* infected with *Trypanosoma brucei brucei*. *Japanese Journal of Sanitary Zoology*, **39** (1): 71-75.
Department of Parasitology, Aichi Medical University, Yazako, Nagakute, Aichi-gun, Aichi 480-11, Japan; ICIPE, P.O. Box 30772, Nairobi, Kenya.
Male *G. m. morsitans* experimentally infected with *T. b. brucei* died sooner than uninfected males, but there was no difference in the survival of infected and uninfected female flies. Females in general lived longer than males. No statistically significant differences were seen in the feeding frequency or amount of blood ingested between infected and uninfected flies.

5836 **Ladikpo, E. and Seureau, C., 1988.** *Trypanosoma* (*Nannomonas*) *congolense* Broden, 1904 (Kinetoplastida, Trypanosomatidae) dans les cellules épithéliales du segment antérieur de l'intestin moyen de *Glossina morsitans morsitans* Westwood, 1850 (Diptera, Glossinidae). [*T.* (*N.*) *congolense* in the anterior midgut epithelial cells of *G. m. morsitans*.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (2): 165-167.
IEMVT, 10 rue Pierre Curie, 94704 Maisons-Alfort Cédex, France; Laboratoire d'Histophysiologie fondamentale et appliquée, Université de Paris VI, 12 rue Cuvier, 75005 Paris, France.
The midgut of *G. m. morsitans*, infected with *T.* (*N.*) *congolense* after a single blood meal, was examined using the electron microscope. Trypanosomes were found within the anterior midgut epithelial cells of the flies. They were located close to the basement membrane, nucleus and microvilli of the cells. Some intracellular parasites were unharmed, others were in the process of degeneration.
Authors' abstract

5837 **Makumyaviri, A.M. and Vloedt, A.A. van der, 1989**. *Trypanosoma congolense*: taux d'infection de *Glossina palpalis palpalis* élevée en laboratoire. [*T. congolense*: infection rates in *G. p. palpalis* from a laboratory-bred colony.] *Revue de Médecine vétérinaire*, **140** (3): 221-224.
Laboratoire de Protozoologie, Institut de Médecine Tropicale, Nationalestraat 155, B-2000 Antwerp, Belgium; Seibersdorf Laboratory, IAEA, Wagramerstrasse 5, P.O. Box 100, A-1400 Vienna, Austria.
The susceptibility of *G. p. palpalis* from a laboratory-bred colony to *T. congolense* was evaluated. The metacyclic infection rate was very low (0.13%, n = 759). Procyclic infection rates revealed striking differences between male (35.06%) and female (7.31%) flies where either bloodstream or culture procyclic forms of trypanosomes were involved. Far fewer cases of procyclic infection (2.70% of males, 2.89% of females) were found in flies which had been given trypanocidal treatment in the blood meal.
Authors' abstract

5838 **McNamara, J., Dukes, P., Snow, W.F. and Gibson, W.C., 1989**. Use of DNA probes to identify *Trypanosoma congolense* and *T. simiae* in tsetse flies from The Gambia. *Acta Tropica*, **46** (1): 55-61.
TRL, Department of Veterinary Medicine, Langford, Bristol BS18 7DU, UK; ibid.; ITC, P.M.B. 14, Banjul, Gambia; University of Bristol, School of Veterinary Science, Langford, Bristol BS18 7DU, UK.
Species- and strain-specific DNA probes were used to identify patent midgut infections in *Glossina morsitans submorsitans* and *G. palpalis gambiensis* captured at four sites in The Gambia. 52% of mature *Nannomonas* infections and 12% of immature infections were identified. *T. (N.) simiae* accounted for the majority of identified infections in *G. m. submorsitans*, indicating the importance of distinguishing this species from the closely related *T. (N.) congolense* when

assessing the trypanosomiasis challenge to cattle. Both the savanna and riverine-forest groups of *T. congolense* were present, although the riverine-forest form was found only in *G. p. gambiensis* at Pirang, an isolated area of forest. Two-thirds of the samples remain unidentified by probes specific for *Trypanozoon*, *T. congolense* savanna, riverine-forest and Kenya coast forms, *T. simiae*, and *T. vivax*, probably owing in part to low numbers of trypanosomes. However, the failure to identify several heavy *Nannomonas* infections strongly suggests the presence of a further, as yet unknown, kind of *Nannomonas*.
Authors' abstract

5839 **Mérot, P., Filledier, J. and Mulato, C., 1988.** Pouvoir attractif, pour *Glossina tachinoides*, de produits chimiques isolés des odeurs animales. [Attractive efficiency for *Glossina tachinoides* of chemical products isolated from animal odours.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (1): 79-85.
CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso.
Experiments were carried out by CRTA at Bobo-Dioulasso, Burkina Faso, to identify products, which, in animal odour, are attractive for *G. tachinoides*. Phenolic derivatives partially simulated the effect of bovine odour. Addition of octenol, which was not effective on its own, reinforced this attractive effect. These results suggest that, in the medium term, it may be possible to use traps with attractants for riverine tsetse flies.
Authors' abstract

5840 **Moloo, S.K. and Gray, M.A., 1989**. New observations on cyclical development of *Trypanosoma vivax* in *Glossina*. *Acta Tropica*, **46** (3): 167-172.
ILRAD, P.O. Box 30709, Nairobi, Kenya; KETRI, P.O. Box 362, Kikuyu, Kenya.
It is widely held that cyclical development of *T. vivax* in *Glossina* is confined to the proboscis. This view has been re-examined in a series of experiments. Teneral *G. morsitans centralis* were fed on a goat infected with *T. vivax* IL 1392 and dissected 1-2 h after feeding. The infection rates in the labrum and hypopharynx were 40% and 0%, in contrast to 82% and 58%, respectively, observed in a control group dissected on day 25. This suggested that in a significant number of tsetse, cyclical development of *T. vivax* was initiated at sites other than the proboscis. Subsequent experiments revealed the presence of trypomastigotes, pre-epimastigotes and epimastigotes in the cibarium/ oesophageal region of tsetse dissected 1-48 h after an infected feed. To investigate this further, tsetse proboscides were excised at intervals beginning 1 h after an infected feed, and transferred to *in vitro* culture conditions. Parasite multiplication and full cyclical development were only observed in proboscides excised 4 h or later after the infected bloodmeal. Thus, it would appear that at least in a number of tsetse, *T. vivax* cyclical development initially occurs in the cibarium/oesophageal region from where parasites migrate to the food canal of the proboscis and development is completed to infective metatrypanosomes in the hypopharynx.
Authors' abstract

5841 **Mulla, A.F. and Rickman, L.R., 1988** The isolation of human serum-resistant *Trypanosoma* (*Trypanozoon*) species from zebra and impala in Luangwa Valley, Zambia. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **82** (5): 718.
Parasitology Unit, TDRC, P.O. Box 71769, Ndola, Zambia.
During July 1987 a survey of wildlife for trypanosomiasis was undertaken in the Luangwa Valley, which has a very heavy population of *Glossina morsitans morsitans*, a wide range of wild mammal species, low human population density and very low sleeping sickness endemicity. Two isolates, from healthy zebra and impala, both appeared morphologically to belong to the *T. brucei* complex, and when characterised by the standard BIIT gave responses typical of *T. b. rhodesiense*. This result is rather surprising since these animals are not commonly fed on by tsetse and are rarely infected with trypanosomes. Infection may be due to non-cyclical transmission by biting flies or it may be that tsetse, in the absence of preferred hosts, adapt to alternative hosts. Thus, in the Luangwa Valley zebra and impala may play a minor role in the transmission of human trypanosomiasis.

5842 **Noireau, F., Paindavoine, P., Lemesre, J.L., Toudic, A., Pays, E., Gouteux, J.P., Steinert, M. and Frezil, J.L., 1989.** The epidemiological importance of the animal reservoir of *Trypanosoma brucei gambiense* in the Congo. 2. Characterization of the *Trypanosoma brucei* complex. *Tropical Medicine and Parasitology*, **40** (1): 9-11.
Noireau, Lemesre, Toudic, Gouteux: Centre ORSTOM, B.P. 181, Brazzaville, Congo; Paindavoine, Pays, Steinert: Department of Molecular Biology, Free University of Brussels, 67 rue des Chevaux, B-1640 Rhode St Genèse, Belgium; Frezil: ORSTOM, Centre de Montpellier, Montpellier Cedex, France.
Biological and biochemical characterisation of 36 human and 5 animal Congolese stocks of *Trypanosoma brucei* were performed. One human and all the animal stocks showed a quick adaptation to the rodent host whereas the other 35 human stocks were characterised by a low virulence degree (group 1 of *T. b. gambiense*). The virulent stocks showed hybridisation patterns specific to the *gambiense* subspecies. Our results confirm the absence of the *T. b. brucei* subspecies in the Congo and the low prevalence of domestic animals infected with *T. b. gambiense* (0.5%). Two cycles of human trypanosomiasis may thus occur in Central Africa: a predominant man-to-man cycle with group 1 trypanosomes and a minor cycle involving an animal reservoir.
Authors' abstract

5843 **Welburn, S.C. and Gibson, W.C., 1989**. Cloning of a repetitive DNA from the rickettsia-like organisms of tsetse flies (*Glossina* spp.). *Parasitology*, **98** (1): 81-84.
TRL (Welburn) and Department of Pathology, University of Bristol (Gibson), Langford, Bristol BS18 7DU, UK.
Three DNA fragments from the genome of the rickettsia-like organism (RLO) symbiotic in tsetse flies (*Glossina* spp.) have been cloned. One of these fragments represents a family of highly conserved repeats, which occurs in RLO from all species of tsetse examined and has been amplified in the original RLO culture from which the DNA is cloned. This fragment serves as a highly sensitive

and specific probe for the detection of RLO in tsetse midguts. As few as 30 organisms were unequivocally identified by dot blot hybridisation of homogenised midgut preparations. Since the presence of RLO within tsetse midguts is associated with susceptibility to trypanosome infection, this technique provides a rapid and reliable method of assessing the potential susceptibility of a tsetse population to *Trypanosoma brucei s. l.* and *T. congolense* infections.
Authors' abstract

5844 **Welburn, S.C. and Maudlin, I., 1989**. Lectin signalling of maturation of *T. congolense* infections in tsetse. *Medical and Veterinary Entomology*, **3** (2): 141-145.
TRL, University of Bristol, Langford, Bristol BS18 7DU, UK. (Correspondence to Maudlin.)
The process of maturation of *Trypanosoma congolense* in tsetse has been shown to be initiated by lectin secreted in the fly midgut. In the present study the duration of lectin signal required to induce maturation was determined by the sequential addition or removal of a specific lectin inhibitor (D+glucosamine) to the diet of infected male *Glossina morsitans*. An established midgut infection of *T. congolense* was found to require, at most, 72 h exposure to midgut lectin to begin the process of maturation. Longer exposure to midgut lectin increased the frequency of maturation, suggesting that clonal variation in response to lectin stimulation occurs within trypanosome stocks. It is suggested that this variation corresponds to differences in lectin binding sites on the trypanosome surface. Midgut trypanosomes retained their ability to mature throughout their life in the fly; when lectin activity in the midgut was inhibited, the trypanosomes remained as procyclic forms but when this inhibition was removed maturation was able to proceed. This indicates that the process of maturation is dependent upon a signal from the fly and is not predetermined by the trypanosomes undergoing a fixed number of division cycles. The possible role of lectins in the maturation of trypanosomes *in vitro* is discussed.
Authors' abstract

5. human trypanosomiasis

(a) SURVEILLANCE

5845 **Edeghere, H., Olise, P.O. and Olatunde, D.S., 1989**. Human African trypanosomiasis (sleeping sickness): new endemic foci in Bendel State, Nigeria. *Tropical Medicine and Parasitology*, **40** (1): 16-20.
Pathology Division (Edeghere, Olatunde) and Epidemiology Division (Olise), NITR, P.M.B. 2077, Kaduna, Nigeria.
Human African trypanosomiasis surveys were conducted in five communities in Ethiope and Ndokwa Local Government Areas of Bendel State, Southern Nigeria. Of 670 individuals screened for the disease with the CATT, 84 (12.53%) were positive, while 45 (6.72%) had traces of antibodies against *Trypanosoma brucei gambiense* in their blood. Trypanosomes were also demonstrated in the gland juices of 22 individuals following gland punctures and microscopic examination of the aspirates. Analysis of 86 serum samples obtained from the blood randomly collected from individuals in the localities, using the qualitative methods of CATT and Cellognost (indirect haemagglutination), showed that 58 (67.44%) and 57 (66.28%) respectively were seropositive for sleeping sickness. Further titration of 72 of these serum samples using the Cellognost quantitative method

showed 50 samples with antibody titres above 1:20. The clinical manifestations of sleeping sickness recorded in positive individuals included cervical lymphadenopathy, somnolence, psychosis, unsteady gait and tremors, and reproductive abnormalities reflected by secondary amenorrhoea and poor obstetric histories. Our observations indicate that the parts of Bendel State surveyed are probably endemic foci of sleeping sickness hitherto unreported. The effectiveness of the CATT in mass screening of populations at risk from the disease is also highlighted.
Authors' abstract

5846 **Noireau, F., Lemesre, J.L., Gouteux, J.P., Mpolesha-Kapiamba, K. and Frezil, J.L., 1988**. Epidémiologie et aspects evolutifs de la trypanosomiase dans le foyer de la Sangha (Congo). [Epidemiology and evolution of trypanosomiasis in the Sangha focus (Congo).] *Annales de la Société belge de Médecine tropicale*, **68** (4): 331-341.
ORSTOM, Centre de Brazzaville, B.P. 181, Brazzaville, Congo; ibid.; ibid.; INSSSA, B.P. 2672, Brazzaville, Congo; ORSTOM, Centre de Montpellier, B.P. 5045, 3403 Montpellier Cedex, France.
The study of 75 cases of Gambian trypanosomiasis from the Sangha focus between 1977 and 1986 seems to indicate that sleeping sickness is recrudescent in this area. 89.3% of patients presented an abnormal CSF. In 1987, a survey was carried out in five villages in order to determine the extent of the focus and its level of endemicity. The serological prevalence rate was 8.4% in the village with heaviest infection. 43 parasitologically confirmed new cases were identified. 62.8% were in the first biological period and only 9.3% of the patients were asymptomatic. Contamination occurred mainly outside the villages which explains the distribution of the disease in the human population and the low prevalence of infection in domestic animals.
Authors' abstract

5847 **Zondag, A.M., Nouwen, J.L., Sluiters, J.F., Meirvenne, N. van, Magnus, E. and Muhlig, R.S., 1988.** Prevalence of *Trypanosoma brucei rhodesiense* infections in the population of South Luangwa Valley, Zambia as indicated by an immunofluorescence assay. *Tropical and Geographical Medicine*, **40** (3): 282.
Department of Clinical Microbiology, Erasmus University, Rotterdam, Netherlands; ibid.; ibid.; Laboratory of Serology, Prince Leopold Institute of Tropical Medicine, B-2000 Antwerp, Belgium; ibid.; Kamoto Hospital, Chipata, Zambia.
Out of 1649 people examined, the sera of 76 (4.6%) gave a weak reaction, 78 (4.7%) gave a positive reaction and 12 (0.7%) gave a strongly positive reaction. Trypanosomes were detected in only one thick blood film of the seropositive persons. Although malaria parasites were seen in 55.8% of thick blood films, at least 90% of these infected persons were serologically negative for trypanosomiasis, suggesting that malaria has no major impact on the specificity of the test system.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **12**: no. 5899.]

5848 **Anosa, V.O., 1988.** Haematological and biochemical changes in human and animal trypanosomiasis. Part I. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux,* **41** (1): 65-78. Part II. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (2): 151-164. (8 pp. of references are available separately on request from the journal publisher, IEMVT, Maisons-Alfort, France.)
Department of Veterinary Pathology, University of Ibadan, Nigeria.
Trypanosome infections are generally characterised by anaemia, leucopenia, thrombocytopenia, as well as biochemical aberrations such as hypoglycaemia, elevated blood urea nitrogen, hypoalbuminaemia, and hypogammaglobulinaemia primarily due to elevated IgM levels. Despite the variations in hosts (man, domestic and experimental animals) and trypanosomes (*Trypanosoma brucei, T. gambiense, T. rhodesiense, T. evansi, T. vivax, T. congolense*), the severity of the haematological and biochemical changes associated with varous host-parasite combinations is determined by the level of parasitaemia which develops during the early phase of infection. Three phases of trypanosome infections are recognisable including the `acute crisis' characterised by high parasitaemia and accelerated destruction of erythrocytes, development of thrombocytopenia and leucopenia, and of marked biochemical perturbations. A `chronic crisis' supervenes in surviving animals and is characterised by lower levels of parasitaemia but with persistence of the haematological changes, reversal of some biochemical changes such as hypoglycaemia and persistence of others such as the plasma protein changes. A third phase, `recovery', occurs in animals that survive the two previous phases, and is characterised by abatement of parasitaemia or even sterilisation, accompanied by gradual reversal of the abnormalities previously developed. Whether a host passes through these three phases depends on the severity of the lesions that develop during acute and chronic crises, the existence of secondary infections, and the level of the host's nutrition. The haematological and biochemical abnormalities induced by trypanosomes arise from their direct and indirect effects via their products, on host cells such as red blood cells, white blood cells, platelets, and tissues such as liver, kidney, bone marrow and lymphoid organs, resulting in cell destruction and organ malfunction, as well as from extractions from and additions to host chemistry associated with parasite metabolism.

Author's abstract

5849 **Barth, P., 1989**. A new method for the isolation of the trypanocidal factor from normal human serum. *Acta Tropica*, **46** (1): 71-73.
Swiss Tropical Institute, Basel, Switzerland. (Correspondence to D. Betschart, Swiss Tropical Institute, Postfach 4002, Basel, Switzerland.)
A novel procedure to isolate the trypanocidal factor from normal human serum (NHS) was developed, using four chromatographic steps: one affinity chromatography, then two anion exchange columns, and a final gel filtration. The isolated fraction showed the same lytic activity against *Trypanosoma brucei brucei* strains as NHS, whereas NHS-resistant trypanosomes of the *T. b rhodesiense* subspecies remained unaffected. The factor is a protein complex of high molecular mass (>1000 kDa) comprised of four peptides which were visualised under reducing conditions using SDS-polyacrylamide gel electrophoresis. No high density lipoproteins were detectable in the active fraction.
Author's abstract

5850 **Boersma, A., Hublart, M., Boutignon, F., Noireau, F., Lemesre, J.L., O'Herbomez, M. and Degand, P., 1989**. Alterations in thyroid function in patients with *Trypanosoma brucei gambiense* infection. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **83** (2): 208-209.
Boersma, Hublart, Boutignon, Degand: Unité INSERM no. 16, Place de Verdun, 59045 Lille Cedex, France; Noireau, Lemesre: Laboratoire d'Entomologie Médicale, ORSTOM, B.P. 181, Brazzaville, Congo; O'Herbomez: Laboratoire de Médecine Nucléaire, Rue du Professeur Laguesse, 59037 Lille Cedex, France.
Thyroid hormone levels and clinical symptoms of thyroid deficiency were examined in a double-blind study of 20 Congolese patients with parasitologically confirmed trypanosomiasis (18 in the second stage of the disease) and 21 healthy controls from the same population. Levels of T_3 (3,5,3′ triiodothyronine), FT_3 (free T_3), T_4 (thyroxine), FT_4 (free T_4) and rT_3 (reverse T_3) were significantly decreased in the serum of trypanosomiasis patients compared with controls. TSH (thyrotropin), however, appeared to be increased but not significantly. The clinical survey revealed physical and intellectual fatigue in 12 cases, sensation of excessive coldness in 9, constipation in 5, abnormal dry skin in 6, oedema in 3, hair loss in 2, and fragile nails in 1 case.

5851 **Nieman, R.E., Kelly, J.J. and Waskin, H.A., 1989**. Severe African trypanosomiasis with spurious hypoglycemia. (Letter.) *Journal of Infectious Diseases*, **159** (2): 360-362.
Holy Redeemer Hospital and Medical Center, 1648 Huntingdon Pike, Meadowbrook, PA 19046, USA; Division of Parasitic Diseases, Centers for Disease Control, Atlanta, GA, USA; Department of Medicine, Duke University Medical Center, Durham, NC 27710, USA.
A case of East African trypanosomiasis in an American tourist returning from a photographic safari of Kenya and Rwanda is described. A feature of this case was spurious hypoglycaemia, as evidenced by a marked disparity between the low blood glucose value obtained by conventional laboratory testing and the higher values obtained by rapid bedside assay and by laboratory testing of a blood sample immediately placed on ice. Also, no clinical evidence of hypoglycaemia

was seen. This spurious hypoglycaemia was probably caused by *in vitro* utilisation of glucose by trypanosomes.

5852 **Weinberg, J.R., Wright, P.A. and Cook, G.C., 1989** Tropical pyomyositis associated with *Trypanosoma brucei rhodesiense* infection in a Europid. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **83** (1): 77-79.

Department of Clinical Tropical Medicine, Hospital for Tropical Diseases, 4 St Pancras Way, London NW1 OPE, UK. (Correspondence to Cook.)

A 29-year-old European woman became infected with *T. b. rhodesiense* in the Luangwa valley, Zambia. Six days after the initial presentation of this infection she developed evidence of tropical pyomyositis (TP). These diseases, both of which are rare in Europids, were satisfactorily treated. The pathogenesis of TP, which is nearly always caused by *Staphylococcus aureus*, is undetermined. It seems possible that in this case either (i) both infections were introduced simultaneously by a tsetse fly bite, or (ii) *T. b. rhodesiense* produced multiple focal necroses in skeletal muscles which acted as niduses for the staphylococcal infections; immunodepression caused by this parasite might also have been important.

Authors' abstract

(c) TREATMENT

5853 **Maes, L., Vanderveken, M., Hamers, R., Doua, F. and Cattand, P., 1988**. The monitoring of trypanocidal treatment with a sensitive ELISA method for measuring melarsoprol levels in serum and in cerebrospinal fluids. *Annales de la Société belge de Médecine tropicale*, **68** (3): 219-231.

Institute for Molecular Biology, Free University of Brussels, Paardenstraat 65, B-1640 St Genesius-Rode, Belgium; ibid.; ibid.; Projet de Recherches Cliniques sur la Trypanosomiase, B.P. 1425, Daloa, Côte d'Ivoire; Parasitic Diseases Programme, WHO, 1211 Geneva 27, Switzerland.

The chemotherapeutic treatment of human trypanosomiasis by means of melarsoprol may be accompanied by lethal encephalopathies. The rational administration of the drug is complicated by the large variation in individual response. An ELISA method has been developed for measuring melarsoprol levels in human serum and cerebrospinal fluid. This method should allow more rational treatment strategies to be drawn up, enable the metabolism of melarsoprol to be studied and determine pharmacokinetic parameters. The method has a detection threshold of 10 ng/ml. Alternative antisera are currently being evaluated for the detection of melarsoprol metabolites containing the melaminyl group; these immunoreagents will also be useful for the detection of other melaminyl-containing trypanocides such as melarsan and various experimental arsenical compounds which are currently the object of study.

Authors' abstract

5854 **Scena, M.R., 1988**. Melarsoprol toxicity in the treatment of human African trypanosomiasis. Ten cases treated with dimercaprol. *Central African Journal of Medicine*, **34** (11): 264-268.

3410 West 60th Place, Chicago, IL 60629, USA.

An alarming increase in the number of cases of *rhodesiense* sleeping sickness has been observed at Kabanga Hospital, Tanzania, and treatment with melarsoprol often results in death from reactive encephalopathy. The heavy metal antagonist

dimercaprol (BAL) has been used in a trial of ten patients aged 18 to 54, all of whom had developed encephalopathy during treatment with melarsoprol. Three of the patients died and seven recovered completely.

5855 **Spinazzola, F., De Felici, A., Paglia, M.G., Tocci, G., Galgani, S., D'Amato, C., Giannuzzi, R., Struglia, C., Visco, G. and Cotroneo, E., 1989**. Plasmapheresis for late-stage trypanosomiasis. (Letter.) *Lancet*, no. 8648: 1200.
Neurology and Neuroradiology Departments, Hospital `L. Spallanzani' for Infectious Diseases and Hospital `S. Camillo', 00149 Rome, Italy.
An 18-year-old Angolan woman who had lived in Rome for 18 months was admitted to hospital with trypanosomiasis with CNS involvement. Treatment with α-difluoromethylornithine rapidly cleared trypanosomes from the blood and CSF but the neurological condition of the patient failed to improve. Large amounts of IgG and IgM and circulating immune complexes and cold agglutinins were found in the blood and CSF. These were reduced by plasmapheresis and the neurological picture improved rapidly.

6. ANIMAL TRYPANOSOMIASIS

(a) SURVEY AND DISTRIBUTION

5856 **Awan, M.A.Q, Maiga, S. and Bouare, S., 1988**. Bovine trypanosomiasis in the Niger valley of the Republic of Mali: occurrence and seasonal variation. *Bulletin of Animal Health and Production in Africa*, **36** (4): 330-333.
Faculty of Veterinary Medicine, Al-Fateh University, P.O. Box 13663, Tripoli, Libya; Laboratoire Central Vétérinaire, Activité `Terres Nouvelles', B.P. 265, Bamako, Mali; ibid.
Two surveys were carried out on the prevalence of bovine trypanosomiasis and seasonal variations in its occurrence in a selected area of Mali, designated as `Zone 1' (an area of 19,271 km^2 lying between 12□14 ⌈ and 13□40 ⌈N, and 5□48 ⌈ and 8□16 ⌈W). A total of 307 positive cases of bovine trypanosomiasis were confirmed during the dry and wet seasons, out of 7300 cattle examined, an average disease prevalence rate of 4.2% in this zone. The dry and wet season prevalence rates were 3.11% and 5.36%, respectively. *Trypanosoma vivax* was the commonest species, with a prevalence rate of 64.22% and 82.0% in the dry and wet season respectively. Second in rank of prevalence was *T. congolense* (5.69% and 4.0%) and third *T. brucei* (3.25% and 2.0%).
Authors' abstract

5857 **Rae, P.F., Thrusfield, M.V., Higgins, A., Aitken, C.G.G., Jones, T.W. and Luckins, A.G., 1989**. Evaluation of enzyme immunoassays in the diagnosis of camel (*Camelus dromedarius*) trypanosomiasis: a preliminary investigation. *Epidemiology and Infection*, **102** (2): 297-307.
Rae, Jones, Luckins: CTVM, Easter Bush, Roslin, Midlothian, EH25 9RG, UK; Thrusfield: Department of Veterinary Clinical Studies, University of Edinburgh, Royal (Dick) School of Veterinary Studies, Veterinary Field Station, Easter Bush, Roslin, Midlothian, EH25 9RG, UK; Higgins: Aid Section, British Embassy, P.O. Box 801, Khartoum, Sudan; Aitken: Department of Statistics, University of Edinburgh, James Clerk Maxwell Building, King's Buildings, Edinburgh EH9 3JZ, UK.

Three enzyme immunoassays were used for the serodiagnosis of *Trypanosoma evansi* in camels in the Sudan in order to evaluate their ability to discriminate between infected and non-infected animals. Two assays were used for the detection of trypanosomal antibodies, one using specific anti-camel IgG conjugate and another using a non-specific Protein A conjugate. The third assay detected the presence of trypanosomal antigens using anti-*T. evansi* antibodies in a double antibody sandwich assay. Inspection of the frequency distribution of assay results suggested that the ELISA for circulating trypanosomal antibodies using specific antisera and the ELISA for circulating antigens can distinguish between non-infected camels and infected camels exhibiting patent infections or not. The ELISA using Protein A conjugate to bind non-specifically to camel immunoglobulin did not appear to discriminate between infected and non-infected animals.
Authors' abstract

5858 **Takele, A. and Abebe, G., 1988.** A survey of trypanosomiasis in Gamu Gofa region (Ethiopia). *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (3): 271-276.
Service de Physiologie, Ecole Nationale Vétérinaire d'Alfort, 7 avenue du Général de Gaulle, 94704 Maisons-Alfort Cédex, France; ILRAD, P.O. Box 30709, Nairobi, Kenya.
The survey was conducted in three provinces of Gamu Gofa administrative region of Ethiopia, over a period of 8 months. Altogether 1,862 cattle, 111 goats, 37 sheep, 42 donkeys and mules and 2 dogs were considered. In almost 95% of places, infections were found. The general prevalence of trypanosomiasis in the three provinces was 32%. A higher prevalence rate in caprines and equines and susceptibility of these species to trypanosome infection was found in the survey area. In order of relative importance, the trypanosome species encountered were *Trypanosoma congolense, T. vivax, T. brucei, T. theileri* and *T. evansi*. Mixed infections and unidentified species were common. Efficiency was tested between thick, thin and wet blood films and microHCT in the diagnosis of trypanosomiasis. Statistical analysis of body temperature and PCV of naturally infected animals and animals found to be non-infected revealed a statistically significant difference in the mean PCVs and variability in the mean body temperature of these groups.
Authors' abstract

(b) PATHOLOGY AND IMMUNOLOGY

5859 **Cheng, T., Jourdane, J. and Combes, C., 1988**. Stratégies de survie des parasites chez leurs hôtes. [Survival strategies of parasites in their hosts.] *Année biologique*, **27** (2): 73-92.

Marine Biomedical Research Program, Medical University of South Carolina, P.O. Box 12559 (Fort Johnson), Charleston, SC 29412, USA; Département de Biologie Animale, Université, Avenue de Villeneuve, 66025 Perpignan Cedex, France; ibid.
The authors review the known strategies employed by successful parasites (protozoa and helminths) in overcoming their hosts' internal defence mechanisms. Trypanosomes, by expressing variable surface antigens, utilise a `camouflage' mechanism, as do some other parasites. The other main mechanism that parasites employ is an `avoidance' mechanism.

5860 **Dina, O.A. and Arowolo, R.O.A., 1988.** The response of the Nigerian indigenous chicken (*Gallus domesticus*) to trypanosomes. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (4): 365-366.
Department of Veterinary Physiology and Pharmacology, University of Ibadan, Ibadan, Nigeria.
The response of the Nigerian indigenous chicken to *Trypanosoma brucei* 8/18 and *T. vivax* Y58 was investigated. The local chicken used in this study was susceptible to *T. brucei* infection but refractory to *T. vivax* (Y58, a rodent-adapted strain). The *T. brucei* infection was non-clinical in nature.
Authors' abstract

5861 **Dwinger, R.H., Murray, M., Luckins, A.G., Rae, P.F. and Moloo, S.K., 1989**. Interference in the establishment of tsetse-transmitted *Trypanosoma congolense*, *T. brucei* or *T. vivax* superinfections in goats already infected with *T. congolense* or *T. vivax*. *Veterinary Parasitology*, **30** (3): 177-189.
ITC, P.M.B. 14, Banjul, Gambia; Glasgow University Veterinary School, Bearsden Road, Glasgow, G61 1QH, UK; CTVM, Easter Bush, Roslin, Midlothian, EH25 9RG, UK; ibid.; ILRAD, P.O. Box 30709, Nairobi, Kenya.
An interference phenomenon that delays superinfection with a trypanosome species different from that used for the initial infection has been found to occur in goats. Following tsetse transmission of *T. brucei* to goats already infected with *T. congolense*, there was a delay in chancre development, as well as in the appearance of *T. brucei* and anti-*T. brucei* antibodies in the blood when compared to previously uninfected goats. However, there was no delay in the establishment of a tsetse-transmitted superinfection with *T. vivax* in goats already infected with *T. congolense* or in animals already infected with a different serodeme of *T. vivax*.
Authors' abstract

5862 **Igbokwe, I.O. and Anosa, V.O., 1989**. Response to anaemia in experimental *Trypanosoma vivax* infection of sheep. *Journal of Comparative Pathology*, **100** (2): 111-118.
Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria.
T. vivax produced a progressive macrocytic normochromic anaemia in sheep during the acute phase of infection. Reticulocytes were absent from the blood of healthy sheep and of sheep with *T. vivax*-induced anaemia. However, anaemia induced artificially (AHA) in sheep by *in vitro* heat treatment of red cells, which was comparable in classification and degree to the anaemia of *T. vivax* infection, produced a reticulocytosis of 1.5 □ 1.0%. When plasma from the anaemic blood

of sheep infected with *T. vivax* for 2 and 4 weeks was inoculated subcutaneously into mice, the reticulocyte response was similar to that of mice that received no sheep plasma and inferior to that elicited by normal sheep plasma. The anaemic plasma from sheep infected with *T. vivax* for 3 weeks induced a moderate reticulocyte response in mice which was, however, less intense than that induced by plasma from sheep with artificially induced anaemia of comparable intensity. These results indicate that, although the macrocytosis suggests that *T. vivax*-induced anaemia in sheep is slightly responsive, this response is suboptimal since reticulocytes were lacking in the blood of the sheep and their plasma was weakly erythrogenic in mice. This contrasts with the mild reticulocytosis in sheep with AHA of the same intensity and classification, whose plasma also stimulated considerable erythropoiesis in mice. The poor stimulation by plasma from *T. vivax*-infected sheep at 2 and 4 weeks post-infection suggests subnormal erythropoietin at these periods of infection.
Authors' abstract

5863 **Knowles, G., Abebe, G. and Black, S.J., 1989**. Detection of parasite peptidase in the plasma of heifers infected with *Trypanosoma congolense*. *Molecular and Biochemical Parasitology*, **34** (1): 25-34.
ILRAD, P.O. Box 30709, Nairobi, Kenya.

Plasma samples from heifers infected with *T. congolense* were shown to contain a parasite peptidase. In some instances, trypanosome peptidase was detected in plasma samples taken from heifers for up to 14 days after infections had been successfully treated with diminazene aceturate (Berenil). Trypanosome peptidase was detected in plasma using starch gel electrophoresis and also by a dot blot assay in which a McAb, raised against the enzyme, was spotted onto nitrocellulose filters which were then used to absorb enzyme from the samples. The molecular weight of the enzyme was approximately 60,000. The possible role that a trypanosome peptidase may play in inducing pathology and its use in the diagnosis of infection and disease are discussed.
Authors' abstract

5864 **Kyewalabye Kaggwa, E., Kwari, H.D., Ajayi, M.O. and Shinggu, P., 1988.** Clinical parameters of donkeys before and after *Trypanosoma vivax* infection. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (3): 265-269.
Department of Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

In a survey, 20 local donkeys were examined once. Experimentally, 3 local donkeys were kept as uninfected controls and 3 were infected with *T. vivax*. The 6 donkeys were observed for 1 month before and 1 month after infection. Parameters observed were rectal temperatures, pulse rates, respiratory rates, PCV and demeanour. Parasites were checked using thin and thick blood smears, HCT, mouse inoculation and faecal examination. Of the surveyed donkeys, 11 were free of both microfilaria and helminthic eggs, while none had any protozoan parasite. The experimental *T. vivax*

infection was mild and subclinical during the month of observation.
Authors' abstract

5865 **Murray, M. and Dexter, T.M., 1988**. Anaemia in bovine African trypanosomiasis: a review. *Acta Tropica*, **45** (4): 389-432.
Department of Veterinary Medicine, Veterinary School, University of Glasgow, Bearsden Road, Bearsden, Glasgow G61 1QH, UK; Paterson Laboratories, University of Manchester, Manchester M13 9PL, UK.
The paper considers the basic kinetics of trypanosome-induced anaemia, evaluates the possible mechanisms responsible and discusses the factors which are important in influencing the severity of anaemia. The first phase of anaemia appears to depend on the presence of the trypanosome and is likely to have a multifactorial basis, possibly involving trypanosome-generated enzymes, immunological mechanisms, complement activation through trypanosomes and/or antigen-antibody reactions, microangiopathic damage, fever and an expanded and active mononuclear phagocytic system (MPS). It is likely that these factors interact, with trypanosome-derived factors possibly playing the key role in the inductive phase of red cell damage. During the second phase of the disease process, the anaemia can persist despite the apparent absence of the parasite. This appears to be the result of continued increased red cell destruction by the expanded and active MPS and the development of dyshaemopoiesis, as a result of reticuloendothelial iron blockade and possibly a reduction in erythroid progenitor cells. The severity of the anaemia is affected by several factors. These include differences in virulence that exist among different species of trypanosome and among the large number of strains belonging to each species. At the same time, host factors such as age, nutritional status and breed are important.

5866 **Opiyo, E.A., 1984.** *Studies on the biology of* Trypanosoma (Nannomonas) simiae. Ph.D. thesis, University of Nairobi, Kenya.
KETRI, P.O. Box 362, Kikuyu, Kenya.
This thesis is primarily a study of factors which influence the virulence of *T. (N.) simiae* for pigs. The factors investigated include the species of tsetse vectors, size of inocula of trypanosomes injected into pigs and the method of maintenance of the trypanosomes. The rate of development of *T. (N.) simiae* in different species of tsetse and its relationship to the resulting infection in pigs was also investigated. In addition, an attempt was made to adapt *T. (N.) simiae* to laboratory rodents. In this study three stocks of *T. (N.) simiae* were cyclically transmitted through tsetse. Transmitting the isolates through *Glossina morsitans* and *G. pallidipes* resulted in a disease less severe than did syringe inoculations. Pigs infected through tsetse bites survived much longer than had previously been reported, with some pigs exhibiting self-cure after running infection for varying lengths of time. The response of pigs to experimental infection with *T. (N.) simiae* varied

from one animal to another, the pigs appearing to fall into three categories. Pigs in the first group were very susceptible: the parasitaemia built up fast and the pigs died soon after the first appearance of trypanosomes in the peripheral blood circulation. The second group developed parasitaemia and survived more than one parasitaemia peak but eventually succumbed to the infection. The third group became parasitaemic, apparently controlled the parasitaemia for some weeks at very low levels and eventually threw off the infection. Those pigs which experienced chronic, self-limiting infections were from the same farm, suggesting that the course of infection observed might have been determined by the ability of the individual pig to control the infection rather than by the vector. No clear evidence was obtained to show whether or not the species of vector influenced the virulence of *T. (N.) simiae*. Teneral tsetse flies became infected with *T. (N.) simiae* when they were fed on pigs carrying predominantly stumpy trypanosomes in their blood, but the number of trypanosomes circulating in the blood did not appear to influence the infection rate in tsetse. At 25□C *G. morsitans* developed mature *T. (N.) simiae* infections in 19 days and *G. pallidipes* in 23 days. *G. morsitans* was more frequently infected than *G. pallidipes*. In pigs neither the prepatent period nor the period of patency appeared to be related to the rate of development or the infection rate in the tsetse fly. One isolate of *T. (N.) simiae* (EATRO 1786) has been successfully adapted to rats. This rat-adapted strain, which is shorter in length than trypanosomes from the original strain, has remained infective to tsetse and to pigs, and infects mice readily.
From author's abstract

5867 **Suliman, H.B. and Feldman, B.F., 1989** Pathogenesis and aetiology of anaemia in trypanosomiasis with special reference to *T. brucei* and *T. evansi*. (Review.) *Protozoological Abstracts*, **13** (2): 37-45.

Department of Pathology, Veterinary Research Administration, P.O. Box 8067, El-Amarat, Khartoum, Sudan; Department of Clinical Pathology, School of Veterinary Medicine, University of California, Davis, CA 95616, USA.

Anaemia is the most common and predominant clinicopathological finding in trypanosomiasis. It is becoming obvious that the aetiology of anaemia in trypanosome infection is multifactorial, with extravascular and intravascular haemolysis, haemodilution and inhibition of erythropoiesis implicated. However, the major cause of anaemia is attributable to red cell damage. Factors possibly involved in the process include haemolysis produced by trypanosomes, immunological mechanisms, fever, disseminated intravascular coagulation and

nonspecific activation of the mononuclear phagocytic system. Other possible factors await investigation.
Authors' abstract

5868 **Whitelaw, D.D., Bell, I.R. and Holmes, P.H., 1989.** Immunological clearance of ^{75}Se-labelled *Trypanosoma brucei* in goats. *Acta Tropica*, **46** (2): 101-106.
ILRAD, P.O. Box 30709, Nairobi, Kenya; University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK; ibid. (Correspondence to Holmes.)
An experiment was conducted to determine, under different conditions, the capacity of young adult East African goats to eliminate intravenously inoculated [^{75}Se]selenomethionine-labelled *T. brucei* from the bloodstream. Over 80% of labelled trypanosomes, preincubated for 1 h in inactivated normal goat serum, were detectable in the circulation 1 h after inoculation into normal goats. By contrast, after incubation in serum from goats which had been immunised against the homologous trypanosome clone, parasites were largely removed from the bloodstream within 5 min after inoculation. When the goats were necropsied 1 h after the inoculation of radiolabelled trypanosomes, 50% of the injected activity was found in the liver and lungs, the contribution of each organ being dependent to some extent on whether the inoculum was via a mesenteric or the jugular vein. The same result was obtained when labelled parasites were incubated in normal goat serum, and then inoculated into immunised goats; thus, rapid blood clearance occurred, and high activity was detected in the lungs and liver. The results confirm those of previous studies in laboratory mice in which the removal of trypanosomes from the circulation of an immune animal was achieved primarily by uptake of opsonised trypanosomes by elements of the mononuclear phagocytic system.
Authors' abstract

(c) TRYPANOTOLERANCE

5869 **Filledier, J., Duvallet, G. and Merot, P., 1988.** Comparaison du pouvoir attractif des bovins Zébu et Baoulé pour *Glossina tachinoides* Westwood, 1850 et *Glossina morsitans submorsitans* Newstead, 1910 en savane soudano-guinéenne, Burkina Faso. [Comparative study of the attractive power of Zebu and Baoulé cattle for *G. tachinoides* and *G. m. submorsitans* in the Sudano-Guinean savanna.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (2): 191-196.
CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso.
The difference in olfactory attractiveness for tsetse flies between Zebu and Baoulé cattle was studied to find out whether this could be a factor in trypanotolerance. While Baoulé urine was more attractive than that of Zebu, the opposite result was obtained with the odour of whole animals of identical weights. The small difference observed (25%) does not allow a conclusion to be reached on the importance of this factor in the epidemiology of trypanosomiasis.
Authors' abstract

5870 **Mulla, A.F. and Rickman, L.R., 1988**. How do African game animals control trypanosome infections? *Parasitology Today*, **4** (12): 352-354.
Parasitology Unit, TDRC, P.O. Box 71769, Ndola, Zambia.
At least four types of response appear to be involved in the control of parasitaemia by African wild animals: (i) the destruction of parasites by host antibodies; (ii) the utilisation of an efficient phagocytic system; (iii) the control of parasite growth by non-immunological processes; and (iv) in some bovids at least, the action of an innate trypanocidal serum factor. The evidence for these different resistance mechanisms, which appear to be utilised to varying degrees in different species, is reviewed.

(d) TREATMENT
[See also **12**: no. 5881.]
5871 **Dowler, M.E., Schillinger, D. and Connor, R.J., 1989**. Notes on the routine intravenous use of isometamidium in the control of bovine trypanosomiasis on the Kenya coast. *Tropical Animal Health and Production*, **21** (1): 4-10.
Vipingo Estate Ltd, P.O. Box 1, Vipingo, Via Mombasa, Kenya; MSD AGVET, Tolzer Strasse 1, 8022 Grunwald, Federal Republic of Germany; P.O. Box A560, Avondale, Harare, Zimbabwe.
Various chemotherapeutic regimes were used to control trypanosomaisis in 3000 Boran cattle on an estate on the Kenya coast. Recently the therapeutic use of isometamidium by the intravenous route was adopted to treat individual trypanosome-infected cattle. This was in order to overcome tissue reactions encountered after intramuscular injection and also to control a `thin cow' syndrome attributed to chronic trypanosomiasis. Toxic side effects were eliminated by careful attention to the intravenous technique which was safely used in calves, pregnant cattle and bulls. Weekly blood sampling and treatments of infected individuals resulted in a reduction of cases from 2187 to 208 out of 46,495 and 46,329 samples examined in 1985 and 1986 respectively. The standard of management was very high and although this routine successfully controlled bovine trypanosomiasis on this estate its application elsewhere is likely to be limited.
Authors' abstract
5872 **Joshua, R.A., 1988.** Drug resistance in recent isolates of *Trypanosoma brucei* and *Trypanosoma congolense*. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **41** (4): 359-364.
Department of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria.
Studies were carried out in mice to assess the drug sensitivity of recent isolates of *T. brucei* and *T. congolense*. Each of 11 stocks of *T. congolense* and five of *T. brucei* all isolated from cattle was tested for sensitivity to the normal therapeutic dose of isometamidium chloride, diminazene aceturate and homidium chloride. Contemporaneous control tests were carried out on authenticated laboratory stocks of *T. brucei* and *T. congolense*. Six stocks of *T. congolense* were

resistant to diminazene aceturate at 3.5 mg/kg but only one stock was found resistant to 7 mg/kg. Ten isolates of the *T. congolense* group were resistant to homidium chloride at 1 mg/kg. All the *T. congolense* isolates were susceptible to isometamidium chloride at 0.5 mg/kg. Two of the *T. brucei* were resistant to diminazene aceturate at 7 mg/kg while all were resistant to homidium chloride at even 3 mg/kg. All *T. brucei* isolates were sensitive to isometamidium chloride at 0.5 mg/kg. The control trypanosomes were readily sensitive to the three drugs at normal therapeutic doses.
Author's abstract

5873 **Tager-Kagan, P., Itard, J. and Clair, M., 1989.** Essai de l'efficacité du Cymelarsan[ND] sur *Trypanosoma evansi* chez le dromadaire. [Trial of the efficacy of Cymelarsan[ND] against *T. evansi* in the camel.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux,* **42** (1): 55-61.
IEMVT, 10 rue Pierre Curie, 94704 Maisons-Alfort Cédex, France. (Correspondence to Itard.)
Experiments in Niger with a new arsenical drug (Cymelarsan) for the treatment of camel trypanosomiasis due to *T. evansi* showed, during a trial of its effectiveness undertaken on eight young camels (*Camelus dromedarius*) artificially infected with *T. evansi*, a full trypanocidal effect of the drug at the two doses used (0.625 mg/kg and 1.250 mg/kg). The general and local tolerances were satisfactory at the lower dose. At a dose of 3.75 mg/kg (toxicity trial) the drug induced a significant necrosis of the tissues at the point of inoculation, whether the injection was subcutaneous or intramuscular.
Authors' abstract

7. experimental trypanosomiasis

(a) DIAGNOSTICS

[See **12**: no. 5863.]

(b) PATHOLOGY AND IMMUNOLOGY

5874 **Arowolo, R.O.A., Elhassan, E.O. and Amure, B.O., 1988.** Assessing hepatic dysfunction in rabbits experimentally infected with *Trypanosoma brucei. Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux,* **41** (3): 277-281.
Department of Veterinary Physiology and Pharmacology (Arowolo) and College of Medicine (Elhassan, Amure), University of Ibadan, Ibadan, Nigeria.

Blood sera of New Zealand rabbits infected with *T. brucei* 8/18 were collected, and the levels of alkaline phosphatase, bilirubin, cholesterol and cholinesterases biochemically determined to assess the functional state of the liver. Results showed that the infected rabbits had high serum levels of alkaline phosphatase, bilirubin and cholesterol and a low level of cholinesterase. The values indicated a state of depressed liver function in trypanosomiasis. Treatment with diminazene aceturate improved the depressed hepatic function.
Authors' abstract

5875 **Dina, O.A. and Arowolo, R.O.A., 1987.** Increased contractile response of the ileal smooth muscle to histamine, serotonin and carbachol in guinea pigs infected with *Trypanosoma brucei* 8/18. *Animal Technology*, **38** (3): 203-209.

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

5876 **Sileghem, M., Darji, A., Remels, L., Hamers, R. and Baetselier, P. de, 1989**. Different mechanisms account for the suppression of interleukin 2 production and the suppression of interleukin 2 receptor expression in *Trypanosoma brucei*-infected mice. *European Journal of Immunology*, **19** (1): 119-124.

Instituut voor Moleculaire Biologie, Vrije Universiteit Brussel, Paardenstraat 65, B-1640 St-Genesius-Rode, Belgium.

5877 **Turner, C.M.R., 1988.** Trypanosome vaccines. (Letter.) *Parasitology Today*, **4** (12): 360.
Department of Zoology, University of Glasgow, Glasgow G12 8QQ, UK.
Although the current prospects of developing a vaccine for *Trypanosoma brucei* are bleak, it would be unjustified to state that there are no prospects at all, and to apply this statement to all African trypanosomes. (Refers to an earlier symposium report in the journal.)

(c) CHEMOTHERAPEUTICS
[See also **12**: nos. 5897, 5915.]
5878 **Arowolo, R.O.A., 1988.** Effect of trypanocidal drugs on *Trypanosoma vivax* (Y486) infection in Swiss albino mice. *Animal Technology*, **39** (2): 133-136.
Department of Veterinary Physiology and Pharmacology, University of Ibadan, Ibadan, Nigeria.
5879 **Arowolo, R.O.A. and Uche, E.M.I., 1988.** Glycerol in combination chemotherapy of experimental trypanosomiasis. [*T. brucei*; rats.] *Farmaci & Terapia*, **5** (3): 242-246.
Department of Veterinary Physiology and Pharmacology, University of Ibadan, Ibadan, Nigeria.
5880 **Fairlamb, A.H., Henderson, G.B. and Cerami, A., 1989**.
Trypanothione is the primary target for arsenical drugs against African trypanosomes. [*T. brucei*.] *Proceedings of the National Academy of Sciences of the United States of America*, **86** (8): 2607-2611.
Laboratory of Medical Biochemistry, Rockefeller University, New York, NY 10021, USA.
5881 **Kaminsky, R. and Zweygarth, E., 1989**. Effect of *in vitro* cultivation on the stability of resistance of *Trypanosoma brucei brucei* to diminazene, isometamidium, quinapyramine, and Mel B. *Journal of Parasitology*, **75** (1): 42-45.
ILRAD, P.O. Box 30709, Nairobi, Kenya.
A *T. b. brucei* stock resistant to diminazene aceturate, isometamidium chloride, quinapyramine sulphate and Mel B was grown *in vitro* and its response to these drugs compared to that of a drug-sensitive trypanosome stock. There was little if any change of drug sensitivity after *in vitro* propagation as bloodstream forms for 120, 177 and 275 days and after *in vitro* transformation of bloodstream forms into procyclic, epimastigote, and finally metacyclic forms. Drug resistance was stable during *in vitro* maintenance in the absence of drugs in both culture systems. The response of resistant and sensitive *T. b. brucei* to diminazene *in vitro* correlated with their sensitivity pattern *in vivo*. Thus, *in vitro* techniques can be used to study drug resistance in trypanosomes.
Authors' abstract
5882 **Kaminsky, R. and Zweygarth, E., 1989.** Feeder layer-free *in vitro* assay for screening antitrypanosomal compounds against *Trypanosoma brucei brucei* and *T. b. evansi*. *Antimicrobial Agents and Chemotherapy*, **33** (6): 881-885.

ILRAD, P.O. Box 30709, Nairobi, Kenya; KETRI, P.O. Box 362, Kikuyu, Kenya.

5883 **Uche, E.M.I., Arowolo, R.O.A. and Akinyemi, J.O., 1987.** Toxic effects of glycerol in Swiss albino rats. *Research Communications in Chemical Pathology and Pharmacology,* **56** (1): 125-128.

Departments of Veterinary Physiology and Pharmacology (Uche, Arowolo) and Pathology (Akinyemi), University of Ibadan, Ibadan, Nigeria.

8. TRYPANOSOME RESEARCH

(a) CULTIVATION OF TRYPANOSOMES

5884 **Dukes, P., Faye, J., McNamara, J.J., Snow, W.F., Rawlings, P., Dwinger, R.H. and Brun, R., 1989**. Isolation and cultivation *in vitro* to the infective metacyclic stage of *Trypanosoma (Nannomonas) simiae* from *Glossina morsitans submorsitans*. *Acta Tropica*, **46** (3): 191-203.

Dukes, McNamara: TRL, ODA/University of Bristol, Langford, Bristol BS18 7DU, UK; Faye, Snow, Rawlings, Dwinger: ITC, P.M.B. 14, Banjul, Gambia; Brun: Swiss Tropical Institute, Socinstrasse 57, CH-4051 Basel, Switzerland.

5885 **Lee, M.G-S. and Ploeg, L.H.T. van der, 1989**. Colonies of procyclic *Trypanosoma brucei* on semi-solid agarose plates. *Molecular and Biochemical Parasitology*, **34** (2): 193-196.

Department of Genetics and Development, Columbia University, 701 West 168th Street, New York, NY 10032, USA. (Correspondence to Ploeg.)

5886 **Wallbanks, K.R., Molyneux, D.H. and Dirie, M.F., 1989.** Chitin derivatives as novel substrates for *Trypanosoma brucei brucei* attachment *in vitro*. *Acta Tropica*, **46** (1): 63-68.

Department of Biological Sciences, University of Salford, Salford, M5 4WT, UK.

5887 **Zweygarth, E., Kaminsky, R. and Cheruiyot, J.K., 1989.** A simple and rapid method to initiate *Trypanosoma brucei brucei* and *T. brucei evansi* bloodstream form cultures. *Acta Tropica*, **46** (3): 205-206.

KETRI, P.O. Box 29231, Nairobi, Kenya; ILRAD, P.O. Box 30709, Nairobi, Kenya; Veterinary Research Laboratory, P.O. Box 29231, Kabete, Kenya.

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

[See also **12**: nos. 5842, 5892.]

5888 **Mühlpfordt, H. and Berger, J., 1989**. Characterization and grouping of *Trypanosoma brucei brucei*, *T. b. gambiense* and *T. b. rhodesiense* by quantitative DNA-cytofluorometry and discriminant analysis. *Tropical Medicine and Parasitology*, **40** (1): 1-8.

Department of Protozoology, Bernhard-Nocht-Institute for Tropical Medicine, Bernhard-Nocht-Strasse 74, D-2000 Hamburg 4, Federal Republic of Germany; Department of Mathematics and Computer Science in Medicine, Faculty of Medicine, University of Hamburg, Martini-Strasse 32, D-2000 Hamburg 20, Federal Republic of Germany. (Correspondence to Berger.)

5889 **Zweygarth, E. and Kaminsky, R., l989.** *In vitro* differentiation between *Trypanosoma brucei brucei* and *T. b. evansi. Tropical Medicine and Parasitology*, **40** (2): 115-116.

KETRI, P.O. Box 362, Kikuyu, Kenya; ILRAD, P.O. Box 30709, Nairobi, Kenya.

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

5890 **Aline, R.F., Myler, P.J. and Stuart, K.D., 1989**. *Trypanosoma brucei*: frequent loss of a telomeric variant surface glycoprotein gene. *Experimental Parasitology*, **68** (1): 8-16.

Seattle Biomedical Research Institute, 4 Nickerson Street, Seattle, WA 98109-1651, USA; Stuart: also Department of Microbiology, University of Washington, Seattle, WA 98195, USA.

5891 **Aline, R.F. and Stuart, K., 1989.** *Trypanosoma brucei*: conserved sequence organization 3 ∫ to telomeric variant surface glycoprotein genes. *Experimental Parasitology*, **68** (1): 57-66.

Seattle Biomedical Research Institute, 4 Nickerson Street, Seattle, WA 98109-1651, USA; Stuart: also Department of Microbiology, University of Washington, Seattle, WA 98195, USA.

5892 **Barnes, D.A., Mottram, J., Selkirk, M. and Agabian, N., 1989**. Two variant surface glycoprotein genes distinguish between different substrains of *Trypanosoma brucei gambiense*. *Molecular and Biochemical Parasitology*, **34** (2): 135-146.

Barnes, Agabian: Molecular Parasitology-Intercampus Program, School of Pharmacy, University of California at San Francisco, Laurel Heights Campus, San Francisco, CA 94143, USA; Mottram: Wellcome Unit of Molecular Parasitology, Institute of Genetics, University of Glasgow, Glasgow G11 5JS, UK; Selkirk: Department of Biochemistry, Imperial College of Science and Technology, London SW7 2AZ, UK.

5893 **Carrington, M., Bülow, R., Reinke, H. and Overath, P., 1989**. Sequence and expression of the glycosyl-phosphatidylinositol-specific phospholipase C of *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **33** (3): 289-296.

Department of Biochemistry, Cambridge University, Tennis Court Road, Cambridge CB2 1QW, UK; Department of Medical Microbiology, Stanford University School of Medicine, Stanford, CA 94305, USA; Institut für Biochemie der Universität, Universitätsstrasse, D-4800 Bielefeld, Federal Republic of Germany; Max-Planck-Institut für Biologie, D-7400 Tübingen, Federal Republic of Germany.

5894 **Cronín, C.N., Nolan, D.P. and Voorheis, H.P., 1989**. The enzymes of the classical pentose phosphate pathway display differential activities in procyclic and bloodstream forms of *Trypanosoma brucei*. *FEBS Letters*, **244** (1): 26-30.

Qlone Ltd, P.O. Box 80, Sherwood 4075, Queensland, Australia; Department of Biochemistry, Trinity College, Dublin 2, Ireland; ibid. (Correspondence to Voorheis.)

5895 **Fish, W.R., Muriuki, C.W., Muthiani, A.M., Grab, D.J. and Lonsdale-Eccles, J.D., 1989.** Disulfide bond involvement in the maintenance of the cryptic nature of the cross-reacting determinant of metacyclic forms of *Trypanosoma congolense*. *Biochemistry*, **28** (13): 5415-5421.

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

5896 **Game, S., 1988.** *Sugar transport in* Trypanosoma brucei. Ph.D. thesis, University of Bath, UK. 208 pp.

Department of Biochemistry, University of Bath, Bath BA2 7AY, Avon, UK.

5897 **Giffin, B.F. and McCann, P.P., 1989.** Physiological activation of the mitochondrion and the transformation capacity of DFMO induced intermediate and short stumpy bloodstream form trypanosomes. [*T. b. brucei.*] *American Journal of Tropical Medicine and Hygiene*, **40** (5): 487-493.

Department of Biology, University of Dayton, 300 College Park, Dayton, OH 45469, USA; Merrell Dow Research Institute, 2110 E. Galbraith Road, Cincinnati, OH 45215, USA.

5898 **Gray, A., 1987.** *Uptake and metabolism of purine nucleotide and pyridoxal phosphate precursors in* Trypanosoma brucei brucei. Ph.D. thesis, University of Edinburgh, UK. 224 pp.

5899 **Hajduk, S.L., Moore, D.R., Vasudevacharya, J., Siqueira, H., Torri, A.F., Tytler, E.M. and Esko, J.D., 1989**. Lysis of *Trypanosoma brucei* by a toxic subspecies of human high density lipoprotein. *Journal of Biological Chemistry*, **264** (9): 5210-5217.

Department of Biochemistry, Schools of Medicine and Dentistry, University of Alabama, Birmingham, AL 35294, USA.

5900 **Homans, S.W., Edge, C.J., Ferguson, M.A.J., Dwek, R.A. and Rademacher, T.W., 1989**. Solution structure of the glycosyl-phosphatidylinositol membrane anchor glycan of *Trypanosoma brucei* variant surface glycoprotein. *Biochemistry*, **28** (7): 2881-2887.

Homans, Ferguson: Department of Biochemistry, Medical Sciences Institute, University of Dundee, Dundee DD1 4HN, UK; Edge, Dwek, Rademacher: Oxford Glycobiology Unit, Department of Biochemistry, Oxford University, South Parks Road, Oxford OX1 3QU, UK. (Correspondence to Dwek.)

5901 **Hublart, M., Mendonça-Previato, L., Boutignon, F., Huet-Duvillier, G. and Degand, P., 1989**. Evidence of myristylated disulfide-linked dimer of variant surface glycoprotein of *Trypanosoma brucei brucei*. *Comparative Biochemistry and Physiology (B)*, **92** (4): 705-710.

Unité INSERM no. 16, Place de Verdun, 59045 Lille Cédex, France. (Correspondence to Degand.)

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