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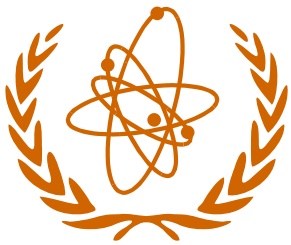

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section b — abstracts
1. general (including land use)
[See also **17**: no. 8387.]

8314 **Allsopp, R., Barrett, J., Cooper, J., Douthwaite, R., Grant, I., Hall, D., Harris, E. and Woodfine, A., 1993.** Tsetse control as an element of resource management. An overview of the expertise and experience of the Natural Resources Institute. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 221-222.
NRI, Central Avenue, Chatham Maritime, Chatham, Kent ME4 4TB, UK.
NRI's involvement with the technological, developmental, socioeconomic and environmental impact of tsetse control and resource management is summarised. Aerial spraying is capable of clearing tsetse from large areas in under 100 days if accurately applied. NRI can calibrate the aircraft to produce the correct application rate and drop size, monitor distribution in the spray block and advise on operational procedure. Odour-baited targets and traps are used to control and monitor fly populations. NRI chemists have analysed natural host odours and have used an electroantennograph to identify compounds that are attractive to tsetse. Various compounds can now be dispensed from plastic sachets at controlled rates. The toxicology of both new and established insecticides has been assessed in the laboratory and field, using a range of techniques including a wind tunnel and a method of applying extremely small drops of known size to simulate aerial spraying. The environmental impact of control operations based on aerial and ground spraying has been studied in both the short and longer term. Tsetse and trypanosomiasis control are elements in the management of resources within the planning process. NRI has multi-disciplinary expertise to advise on socioeconomics, land use planning and the use of computerised technologies such as GIS and remote sensing.

8315 **Douati, A., 1993.** Lutte contre les trypanosomiases animales en Côte d'Ivoire: revue des activités et perspectives. [Animal trypanosomiasis control in Côte d'Ivoire: a review of activities and perspectives.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p.103.
Projet de Lutte Antiglossine, B.P. 45, Korhogo, Côte d'Ivoire.
Climatic and phytomorphological conditions in Côte d'Ivoire offer favourable conditions for many tsetse

vectors of African animal trypanosomiasis, and tsetse control is imperative in livestock development programmes. This review targets activities according to three classic approaches: disease control by the use of trypanocides (the strategy varies according to region), rearing and promotion of trypanotolerant livestock, and vector control (methods, strategies and results are varied according to each ecological zone). Prospects for implementing and integrating these approaches were discussed and analysed.

8316 **Erdelen, W., Nagel, P., Müller, P. and Peveling, R., 1993.** Ecological impact of tsetse control in northern and central Ivory Coast: the conceptual framework of a three year project. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 216-217.

Institut für Biogeographie, Universität des Saarlandes, D-6600 Saarbrücken, Germany.

Comparative research was carried out in two regions of Côte d'Ivoire differing in their history of tsetse control. In the region of Korhogo, located in the northern Guinea savanna belt, tsetse flies have been effectively controlled since 1978. In the region of Bouaké, in the southern Guinea savanna, tsetse control is in its initial stage. Past changes in land use patterns and concomitant ecological impacts on savanna ecosystems at Korhogo (tsetse control induced) and Bouaké (independent of tsetse control) have been analysed. Moreover, future changes will be predicted and strategies for a sustainable use of natural resources will be defined for Bouaké. Analyses have been carried out at local, communal and regional levels. At a local level, the land use pattern and the structure of the vegetation have been studied; at a communal level, aerial photographs have been interpreted; at a regional level, satellite imagery has been used to document changes in settlement, land use and vegetational patterns.

8317 **Mahmoud, M.M., Ismaili, A.A., El Malik, K.H., Musa, M.M. and Rahman, A.H.A., 1993.** Animal trypanosomiasis: the Sudan situation. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 97.

University of Juba, P.O. Box 321/1, Khartoum Centre, Khartoum, Sudan; ibid.; Department of Preventive Veterinary Medicine, University of Khartoum, Khartoum, Sudan; Central Veterinary Research Laboratory, Soba, Khartoum, Sudan; ibid.

An update on the situation of animal trypanosomiasis in the Sudan and a brief history of the disease and its

epidemiology were given, with emphasis on the importance of the disease to the livestock industry, food security, human nutrition and health. Current national policies with regard to disease control and the existing supporting infrastructure were described. Potential trypanotolerant breeds of livestock and their distribution were considered and further studies were recommended to determine their productivity under tsetse challenge. Recommendations were also made regarding the improvement of trypanosomiasis management in the Sudan, the adoption of up-to-date and more sensitive diagnostic methods, the treatment of sheep and goats and the adoption of a better drug use strategy for disease control.

8318 **Meda, A.H. and Laveissière, C., 1993.** Connaissances, attitudes et pratiques concernant la maladie du sommeil dans le foyer de Vavoua. [Knowledge, attitudes and practices regarding sleeping sickness in the Vavoua focus.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 146-147.

OCCGE (Meda) and ORSTOM (Laveissière), IPR, 01 B.P. 1500, Bouaké 01, Côte d'Ivoire.

In the context of the control programme of human trypanosomiasis in the Vavoua focus, Côte d'Ivoire, a cluster sample survey was carried out by questionnaire addressed to 1861 farmers in the programme area and in control villages. The aims of the study were to evaluate the impact of the educational component of the programme and to identify knowledge, attitudes and practices (KAP) which could possibly affect the epidemiology and control of the disease. In the control area, the level of knowledge about sleeping sickness and control methods was significantly lower than in the programme area. The KAP differ according to socio-demographical features, such as ethnicity, religion and level of education. The study demonstrated that most villagers were aware of the principles of vector control and that they were able to put trapping into practice. However, in both areas, the study showed evidence of gaps in knowledge, wrong beliefs and other factors which may be linked with epidemiological aspects of the disease and vector control.

8319 **Mwangelwa, M.I., 1993.** Land use aspects with regard to the control of *Glossina morsitans centralis* (Machado) in western Zambia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 218.

Department of Veterinary and Tsetse Control Services, P.O. Box 920034, Senanga, Zambia.
The northward expansion of the tsetse belt in western Zambia since the 1950s and the need to stimulate livestock production in the same area led to the formation of a tsetse control project using odour-baited insecticide-impregnated targets. The project, which commenced in 1986, has the aim of reducing or eliminating the trypanosomiasis risk in 8000 km^2 of cattle grazing land. Related land use issues are: (i) risk of overgrazing and environmental degradation; (ii) priority areas for additional tsetse clearing; (iii) possibilities of reinforcing target barriers with other means based on land use development; and (iv) land use activities to be undertaken to promote a balanced use of tsetse cleared areas. The possibility of integrating these issues with tsetse control activities is being considered.

8320 **Ndyabahinduka, D.G.K., 1993.** Uganda country report. *In*: OAU/ STRC, 1993 (see **17**: no. 8321), pp. 100-102. Coordinating Office for the Control of Trypanosomiasis in Uganda, P.O. Box 16345, Kampala, Uganda.

The total area infested with tsetse flies in Uganda is about 98,500 km^2. This comprises two belts: 47,000 km^2 from south of Lake Edward northwards to the Uganda-Sudan border, and 51,500 km^2 from Lake Victoria on the Uganda-Tanzania border up through the Lake Kyoga basin to the Uganda-Sudan border in the north and north-east. Approximately 70% of Ugandan livestock are exposed to trypanosomiasis, with about 40% in high risk areas in the mid-west. The reduction of sleeping sickness cases in the Busoga region by 94% from 6674 in 1987 to 409 in 1990 reflects well-coordinated donor inputs and integrated field activities. However, the disease increased by 99% in the West Nile region (Arua and Moyo districts) from 1115 in 1989 to 2216 in 1990, and by 17% in Tororo district from 281 in 1989 to 328 in 1990. The West Nile increase was attributed to an influx of Ugandan returnees, Sudanese refugees and lack of funds, but concentrated control efforts had reduced the number of cases to 771 by 1991. The prevalence of animal trypanosomiasis varied from 4 to 48% in cattle and from 1 to 56% in pigs. The highest rates were recorded for *Trypanosoma brucei* in the districts of Jinja, Iganga, Kamuli, Tororo and Mukono, where isolates appear to be related to *T. b. rhodesiense* and infected animals may form reservoir hosts for *rhodesiense* sleeping sickness. Tsetse control is mainly by the use of impregnated pyramidal

traps, with some aerial and ground spraying and the introduction of deltamethrin application to livestock. A list of research and control projects is given.

8321 **Organization of African Unity/Scientific, Technical and Research Commission, 1993.** *Twenty-first Meeting of the International Scientific Council for Trypanosomiasis Research and Control, Yamoussoukro, Côte d'Ivoire, [21-25 October] 1991*. Nairobi; OAU/STRC. OAU/STRC Publication no. 116. 293 pp.
OAU/STRC, P.O. Box 30786, Nairobi, Kenya.
This volume contains the abstracts of papers presented at the twenty-first ISCTRC meeting, which are arranged under the following headings: review of current activities; protozoology, immunology and diagnosis; *Glossina* biology; human trypanosomiasis; animal trypanosomiasis; *Glossina* control. Abstracts of poster presentations are included separately under the same sequence of headings. An introductory section includes summaries of relevant work carried out by international organisations (OAU/IBAR, FAO, WHO, ILRAD, ILCA, IAEA, RTTCP, CRTA, ITC, OCEAC), reviews of the research presented under each of the main headings, and recommendations. There is also a report on the eighth Joint FAO/OAU/WHO Training Seminar on Trypanosomiasis Control, held at Yamoussoukro, Côte d'Ivoire, on 14-25 October 1991. Abstracts and/or bibliographic details of all the presentations in this report, most of which are published in both French and English, are included in this issue of *TTIQ*.

8322 **Simarro, P.P., Ona Sima, F., Mir, M., Mateo, M.J., Rodriguez, J.M., Moreno, C. and Ndong Asumu, P., 1993.** Programme de lutte contre la trypanosomiase humaine en Guinée Equatoriale: bilan de cinq ans d'activités (1985-1990). [Human trypanosomiasis control programme in Equatorial Guinea: report of five years of activities (1985-1990).] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 95-96.
Simarro: Centro de Control de la Tripanosomiasis, AECI, Apartado 560, Bata, Equatorial Guinea.
After an interval of 15 years, the human trypanosomiasis control programme in Equatorial Guinea began again in 1985 with the creation of the Centro de Control de la Tripanosomiasis, which was responsible for the adoption and application of a control method adapted to the epidemiological characteristics of sleeping sickness and the public health infrastructure in Equatorial Guinea. After 5 years the sleeping sickness situation in Equatorial Guinea is quite well known and is limited to the four historic foci: Luba,

Kogo, Mbini and Campo. The high number of cases observed in 1985 has been greatly reduced. Staff training in diagnosis and treatment has been carried out at the foci and a surveillance system based in the national health structure has been established. The development of epidemiological data at each focus during 5 years of control and the convenience and choice of different control methods were discussed.

2. tsetse biology
(a) REARING OF TSETSE FLIES
(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

8323 **Kabore, I., Merot, P. and Bauer, B., 1993.** Inhibition de la proline-oxydase chez *Glossina* spp. par la N-propargylglycine. [Inhibition of proline oxidase in *Glossina* spp. by N-propargylglycine.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 237.
CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso.
The inhibition of proline oxidase by N-propargylglycine was tested in *G. palpalis gambiensis, G. tachinoides and G. morsitans submorsitans*. The compound was added to the bloodmeal at doses varying from 0.25 to 10 mg/100 ml of blood. The flies were offered the bloodmeal for a maximum of two consecutive days. After 45 days fly performance was evaluated in terms of motility, mortality, fertility of the females and offspring size. In general, longevity was not markedly affected, whereas fertility was distinctly disturbed. N-propargylglycine induced total or almost total sterility in teneral flies and provoked a significant drop of fecundity in non-teneral flies. The mode of action and potential use of N-propargylglycine against *Glossina* spp. in tsetse campaigns are being evaluated.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

[See also **17**: nos. 8320, 8349.]

8324 **Gouteux, J.P., D'Amico, F., Kounda Gboumbi, J.C., Noutoua, L. and Bailly, C., 1993.** Le foyer de Nola-Bilolo en République Centrafricaine: implication de *Glossina fuscipes fuscipes* New. et *G. palpalis palpalis* (Rob.-Dev.) dans la transmission de la maladie du sommeil. [The focus of Nola-Bilolo in the Central African Republic: *G. f. fuscipes* and *G. p. palpalis* as vectors of sleeping sickness.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 235-236.
ORSTOM, Centre de Bangui, B.P. 893, Bangui, Central African Republic; ibid.; CIESPAC, B.P. 14513, Brazzaville, Congo; DMPGE, B.P. 783, Bangui, Central African Republic; ibid.

The historic sleeping sickness focus of Nola-Bilolo (Sangha-Mbaéré) is undergoing a resurgence: 110 new cases were notified in January 1991. This focus, lying in a dense and wet forest area along the road between Nola and the Cameroon frontier, is within the natural range of *G. f. fuscipes*. A relict population of *G. p. palpalis* has previously been described in the area around Nola. A survey using bipyramidal traps was carried out during February 1991. This confirmed the presence of both species: *G. f. fuscipes* is the vector in the western part of the focus and *G. p. palpalis* is the vector in the central and eastern parts. They are allopatric in two villages. Preliminary investigations revealed that their ecodistribution is different: *G. f. fuscipes* inhabits mainly open water sites while *G. p. palpalis* occurs mainly in coffee plantations near the village. Man/fly contact is therefore quite different in the two parts of this focus. These results show that a tsetse control strategy must be developed to take into account the distribution, ecology and population density of the two species involved.

8325 **Green, C.H., 1993.** Factors controlling the landing responses of tsetse to targets. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 131-132.

Tsetse Research Group, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Work on landing responses of *Glossina pallidipes* and *G. morsitans morsitans* to targets has been carried out in the field and in the laboratory. In the laboratory, a bioassay was developed which allowed the blind testing of odour substances. This work confirmed that landing responses were increased by the presence of carbon dioxide and ox breath, but not in ox breath with carbon dioxide removed. Field work in Zimbabwe and Kenya has revealed a number of other factors which affect landing. Increasing target size from 1 to 2 m^2 increased the proportion of tsetse landing from 36 to 70%. Landing was higher on targets reflecting ultraviolet wavelengths strongly. The effect of meteorological factors on landing was studied by hourly recording of catches between 15.15 and 18.15 h during the hot season in Zimbabwe. Alighting behaviour was strongest in the last hour of the afternoon, on the shady side of a target in sunlight, and (during the final hour of observation) on hotter days. Finally, flies with lower energy reserves showed a stronger tendency to alight directly on targets than those with higher reserves.

8326 **Späth, J, and Küpper, W., 1993.** The trap-orientated behaviour of *G. tachinoides* (Diptera: Glossinidae). (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 283.
Ökologische Station, Universität Würzburg, Fabrikschleichach, D-8602 Rauhenebrach, Germany; Vachendorfer Strasse 10, D-8227 Siegsdorf, Germany.
Trap efficiency and the number of *Glossina tachinoides* approaching a biconical trap were both increased by 70-100% when the phenolic fraction of cattle urine and 1-octen-3-ol were used as olfactory attractants. Odour-baited and unbaited traps attracted mainly females, whereas trap efficiency was greater for males. The trap-orientated behaviour of *G. tachinoides* is partly determined by age and nutritional status. Odour-baited traps tended to attract younger flies as well as flies with low dry weight and lipid reserves, compared with unbaited traps. The traps were selective in that only the hungrier flies attracted to them actually entered. For both sexes, trap efficiency decreased with increasing mean lipid reserves of the flies and tended to decrease with increasing mean age. *G. tachinoides* infected with trypanosomes did not differ from uninfected ones concerning nutritional status and trap-orientated behaviour.

8327 **Warnes, M.L., Malele, I.I., White, R.D. and Hall, D.R., 1993.** Probing responses of *G. m. morsitans* to ox sebum. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 133.
Warnes: IPMI Tsetse Project, c/o Tsetse Control Branch, Department of Veterinary Sciences, P.O. Box 8283, Causeway, Harare, Zimbabwe.
The probing responses of *Glossina morsitans morsitans* to ox sebum and fractions of ox sebum were recorded by exposing hungry flies to cloth that had been treated with either a test solution or a control of solvent alone. If the fly probed during a 30 s period a positive response was recorded. No increased probing responses were recorded from contact with cloth treated with the raw concentrated extract from cattle hair. However, significant responses were recorded when the extract was diluted; the optimum concentration was within the range 0.01-0.1% of the original extract. In a further course of experiments, the probing responses of male *G. m. morsitans* to acidic, phenolic and non-acidic fractions of sebum were recorded. Probing increased significantly in response to the non-acidic fraction ($P < 0.001$), but not the acidic or phenolic fractions.

The non-acidic fraction of sebum was further divided by boiling point distillation to give four fractions (15, 1, 0.01 mm pressure and a residue). The probing response to the residue and to the most volatile distillation fractions approached significance ($P < 0.10$).

3. tsetse control (including environmental side-effects)

[See also **17**: nos. 8314, 8316, 8318, 8319, 8320, 8323.]

8328 **Bauer, B., Clausen, P.H., Kabore, I. and Petrich-Bauer, J., 1993.** Laboratory tests and field trials against *Glossina* spp. using different formulations of various acaricides (pyrethroids). (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 200.
CRTA, 01 B.P. 286, Bobo-Dioulasso 01, Burkina Faso.
The effects of different formulations of pyrethroids against tsetse flies were evaluated under laboratory conditions. Exposure of flies to treated cattle took place either in fly cages or during releases in a fly-proof stable. The resulting mortality rates, degree of paralysis (knockdown effect) and duration were recorded. Knockdown was generally more marked than mortality. The duration of the effect of the different products was examined during exposure of the treated animals to sunlight and rain. Large-scale field trials were conducted in areas with high tsetse densities and with a high prevalence of animal trypano-somiasis, using acaricides as the sole means to combat tsetse. In general, a rapid decline in disease incidence was observed after three or four treatments of the cattle. A significant reduction of the mean age of tsetse was recorded before populations fell below detectable levels.

8329 **Djiteye, A., Boire, S., Coulibaly, E., Coulibaly, Z., Diarra, M., Traore, D. and Ouattara, I., 1993.** Lutte contre *Glossina palpalis gambiensis* à l'aide de pièges et d'écrans imprégnés d'insecticide (zone soudan-ienne, République du Mali). [Control of *G. p. gambiensis* using traps and screens impregnated with insecticide in the Sudan zone of Mali.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 198.
Laboratoire Central Vétérinaire, B.P. 2295, Bamako, Mali.
The use of traps and screens impregnated with deltamethrin along the riverine forest of the Niger River is a very efficient, simple and relatively cheap control method against *G. p. gambiensis* in the agro-pastoral zone of Tienfala-Baguineda, east of Bamako.

The highest reduction rate of the apparent population density (98.70%) was found after 3 months. The number of teneral flies increased dramatically from 3.7% before treatment to 47.05% after 1 week and 73.68% after 1 month. The percentage of nulliparous females increased from 19.14% before treatment to 87.50% after 1 month.

8330 **Feldmann, U., Barnor, H., Luger, D. and Vloedt, A. van der, 1993.** Sexually sterilized female tsetse flies as sentinel insects for monitoring of vector control operations: receptivity to mating and adult performance. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 213-214.

Entomology Unit, IAEA Agriculture Laboratory Seibersdorf, IAEA, P.O. Box 100, A-1400 Vienna, Austria; ibid.; ibid.; deceased.

The classical mark-release-recapture approach for population estimation could be extended by releasing laboratory-bred sterilised virgin female flies. Provided such females disperse normally and are receptive to mating, their recapture and information on mating/insemination status would reflect the wild population density. Such female fly releases could provide baseline data for the progress of control compaigns, particularly during the final stages of a control programme when the wild population is too low to be detected by conventional trapping. Experimental work was focused on several economically important *Glossina* spp. The impact of 40 Gy gamma radiation treatment of pupae at different developmental stages and 60 Gy treatment of adult females on the emergence rate, female receptivity to mating and remating and female performance has been investigated.

8331 **Flint, S., 1993.** The control of *Glossina morsitans centralis* (Machado) with odour baited targets in a 4,000 sq. km cattle grazing area in western Zambia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 199.

Department of Veterinary and Tsetse Control Services, P.O. Box 920034, Senanga, Zambia.

The successful eradication of *G. m. centralis* from a 500 km^2 block during 1987 and 1988 demonstrated the applicability of target technology to western Zambia. Continuing tsetse and trypanosomiasis monitoring has shown that the area has remained clear, although occasional disease cases have occurred along the boundaries. In a further area of 3000 km^2, targets were deployed at a reduced overall density of 1.4 per km^2 by erecting them only in the densest woodland.

Although a marked reduction in the tsetse population was observed, a few trypanosomiasis cases persisted and more targets were subsequently deployed. More recently, targets have been deployed more widely, resulting in a higher percentage of the overall area being covered, and in a higher target density (4 per km^2). Strategies for future operations were presented.

8332 **Fox, R.G.R., Mmbando, S.O. and Wilson, A., 1993.** The effect on herd health and productivity of controlling tsetse and trypanosomiasis by application of deltamethrin to cattle. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 205-206.

Fox: P.O. Box 117, Tanga, Tanzania.

Mkwaja Ranch is situated on the coast of Tanzania, 100 km south of Tanga. Trypanosomiasis in cattle has been controlled by regular treatment with chemoprophylactic drugs, latterly Samorin. In the 1960s 0.5 mg/kg every 3 months was effective but by 1988-89 the dose rate had risen to 1 mg/kg every 5 weeks and positive cases of trypanosomiasis were being confirmed 3 weeks after treatment. Although management was good, the general condition of the cattle was poor, productivity was low and there was serious mortality from trypano-somiasis and other causes including anaplasmosis. Control of tsetse by dipping all cattle in deltamethrin began in August 1989, resulting in the rapid reduction in the tsetse population. Since then mortality has decreased significantly and there has been a marked improvement in herd health and productivity. The calving percentage has increased from 58% to 77%, the average weaning weight of calves from 124.6 kg to 142.2 kg and steers are attaining a body weight at 30 months which they previously attained at 36 months.

8333 **Grundler, G.H.M. and Douati, A., 1993.** Méthode pluridisciplinaire de lutte antiglossinaire en Côte d'Ivoire. [A multidisciplinary approach to tsetse control in Côte d'Ivoire.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 207.

Service de Lutte Contre la Trypanosomiase Animale et les Vecteurs, B.P. 3301, Bouaké, Côte d'Ivoire.

Previous tsetse control projects have shown that operations limited to technical aspects do not achieve lasting success. Tsetse control in Côte d'Ivoire is now accompanied by ecological, sociological, economical and epidemiological studies. The tsetse campaign covers a 60,000 km^2 area, using monoconical traps impregnated with α-cypermethrin. After 1 year, the fly population had been reduced by 95-100%. At the

same time, direct and indirect impacts of tsetse control on the environment were monitored. The possible degradation of the savanna in tsetse-cleared areas was studied by satellite imagery, aerial surveys and field studies of vegetation. The sociological aspect consisted of demographic studies and the elaboration of methods to encourage the motivation, acceptance and participation of the local population in tsetse campaigns. Economic studies and epidemiological monitoring were also carried out.

8334 **Knols, B.G.J., 1993.** Economic considerations with regard to the target technology for the control of *Glossina morsitans centralis* (Machado) in western Zambia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 209-210.

Department of Veterinary and Tsetse Control Services, P.O. Box 920034, Senanga, Zambia.

An initial trial in 1987 with insecticide-impregnated odour-baited targets at an overall density of 3.8 per km^2 achieved eradication of *G. m. centralis* from a 500 km^2 block within 1 year. An annualised cost comparison with the existing prophylactic drug regime and a hypothetical aerial spraying operation showed it to be substantially cheaper than the latter yet more expensive than the former. The expansion of activities over a further 3500 km^2 involved trials to reduce costs by: (a) decreasing target densities; (b) change of target design; (c) altering operational logistics; (d) involving local communities; and (e) involvement of local contracting agencies. Decreasing target densities was not successful and more targets had to be erected at a later stage. All other methods or a combination thereof proved successful in a cost-benefit analysis to the extent where the cost of targets competed with that of prophylactic drug administration. The possibilities for reducing costs further are being considered.

8335 **Langley, P.A. and Mauchamp, B., 1993.** Formulation and stability of a juvenile hormone mimic, pyriproxyfen, for tsetse control. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 238-239.

Insect Investigations, Langford House, Langford, Bristol BS18 7DU, UK; INRA, Laboratoire de Physiologie de l'Insecte, 78000 Versailles, France.

Adult females of *Glossina morsitans morsitans* produce offspring which fail to metamorphose following topical dosing with 20 ng pyriproxyfen in acetone in the laboratory. Suppression of reproduction was achieved under field

conditions in Zimbabwe, when tsetse passed through traps and brushed against fabric surfaces treated with an oil formulation of pyriproxyfen. Pyriproxyfen is excreted and metabolised by adults but once it enters the larva it is apparently stable. An oil formulation on terylene netting was found to be very durable under field conditions. In tests the amount of pyriproxyfen present on treated netting was only 7-8% of the original after 12 months but no breakdown products were found. It is assumed that losses were physical. At the end of the tenth month, when 20% of the original dose was left, brief tarsal contact with this netting reduced the viability of offspring produced by treated females of *G. m. morsitans* to between 28% and 43% of control values. Pyriproxyfen is therefore an effective alternative to pyrethroids for the treatment of traps or targets used in tsetse control.

8336 **Mansinsa, D.M. and Milord, F., 1993.** Evolution de la maladie du sommeil au cours d'une campagne de lutte contre les glossines par piégeage à Nioki, Zaire. [Development of sleeping sickness during a campaign of *Glossina* control by traps in Nioki, Zaire.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 148-149.

Université de Kinshasa, Kinshasa, Zaire; Infectious Diseases Section, Centre Hospitalier Universitaire, 3001 12ème Avenue Nord, Sherbrooke, Quebec J1H 5N4, Canada and Zone de Santé Rurale de Nioki, Bandundu, Zaire.

A control compaign against *Glossina fuscipes quanzensis*, principal vector of sleeping sickness in Nioki, was conducted during 3 consecutive years in the Mfimi focus in the Nioki rural health zone, using Lancien-Gouteux mono-pyramidal traps. Among a population of 43,057 inhabitants living in the same ecoclimatic and socioeconomic conditions, 19,187 belonging to six different health areas benefited from trapping protection whereas 23,870 persons from other Nioki health areas did not benefit from trapping protection. After 3 years of control, 237 Lancien-Gouteux traps captured 59,770 *Glossina*. The apparent density of flies was greatly reduced at the beginning of the campaign and was stabilised at a very low level. The index of new contamination from the disease decreased from 0.47 during 1987 to 0.17 in 1990 for people who were protected by traps, with a reduction of human trypanosomiasis risk by 74%. In the other health areas the index of new contamination increased from 0.16 in

1987 to 0.20 in 1990, an increase in the risk of the disease of 20%.

8337 **Mulatu, W., Leak, S.G.A., Authié, E., d'Ieteren, G., Peregrine, A.S. and Rowlands, G.J., 1993.** Preliminary results of a tsetse control campaign using deltamethrin impregnated targets to alleviate a drug-resistance problem in bovine trypanosomiasis. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 203-204.

Mulatu: ILCA, P.O. Box 5689, Addis Ababa, Ethiopia; Leak, Authié, Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya; d'Ieteren, Rowlands: ILCA, P.O. Box 46847, Nairobi, Kenya.

In 1989 a serious problem of resistance to trypanocidal drugs was detected in cattle suffering from trypanosomiasis at Ghibe, in south-west Ethiopia. A tsetse control campaign using deltamethrin-impregnated targets was started in April 1990 to alleviate this situation. The relative density of the main vector, *Glossina pallidipes*, fell from a mean of 1.9 flies per trap per day in the 12 months prior to the introduction of tsetse control to a mean of 0.4 flies per trap per day in the 12 months after tsetse control was initiated. In the first quarter of 1991 fly density was constant at 0.09 flies per trap per day. The prevalence of *Trypanosoma congolense* fell from approximately 30% before tsetse control to a mean of approximately 5% during the first quarter of 1991. There also appears to have been a decrease in the rate of relapse in cattle after treatment with trypanocidal drugs.

8338 **Okoth, J.O., Kimura, E.K. and Kapaata, R., 1993.** A new approach to community participation in tsetse control in the Busoga sleeping sickness focus, Uganda. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 208.

Okoth, Kapaata: UTRO, P.O. Box 96, Tororo, Uganda; Kimura: Sociology Department, Makerere University, P.O. Box 7062, Kampala, Uganda.

Trapping technology has been transferred to a rural community which had been affected continuously by an epidemic of sleeping sickness for over a decade. Through a systematic health education programme, the people were actively involved in making and setting traps and learning about the general characteristics of the tsetse fly and the disease. A mono-screen trap which had been developed for community use was deployed. This was the first time that community participation had been attempted in tsetse control in Uganda. The study is relevant to the need for a

primary health care approach in the control of African trypanosomiasis.

8339 **Siziya, S. and Williams, B., 1993.** Barrier efficiency of a line of Nguruman traps. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 215.
TDRC, P.O. Box 71769, Ndola, Zambia; ICIPE, P.O. Box 30772, Nairobi, Kenya.
Nguruman traps spaced about 100 m apart in a line have been used as a barrier against both *Glossina pallidipes* and *G. longipennis* since 1987 at Nguruman, Kenya. Three mark-release-recapture experiments were conducted to evaluate the efficiency of this barrier. Apparent changes in population size were monitored every 3-4 days using 17 biconical traps. In the dry season, about nine in 1000 marked female *G. pallidipes* passed through the barrier. This rate was about four times that of males. Spatial distribution maps showed that fly density was higher in the dry than in the wet period. The number of recaptures was insufficient to show any movement of *G. longipennis* through the barrier. The barrier of traps at Nguruman does not eliminate the immigration of mainly female flies and it is suggested that studies be carried out on the optimal distribution of traps in a barrier.

8340 **Stevenson, P., Munga, L., Makumi, J., Baylis, M. and Alushula, H., 1993.** The control of tsetse and trypanosomiasis by deltamethrin treatment of ranch cattle in Kenya. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 201.
KETRI, P.O. Box 362, Kikuyu, Kenya.
Deltamethrin (Spoton) was applied every 2 weeks to approximately 1000 cattle grazing in an area of Galana Ranch known to have a high population of *Glossina pallidipes*. Another part of the ranch with similar tsetse fly numbers was used as a control area where cattle were not treated. Fly numbers decreased in both areas in the dry season but increased during the rains and in the control area reached the level recorded at the start of the trial. In the deltamethrin area, however, fly numbers also increased but did not reach the original level and soon dropped again to a low level. The incidence of trypanosome infection in deltamethrin-treated cattle was significantly lower than in untreated cattle. Only two prophylactic treatments with homidium were given to the deltamethrin-treated cattle during the rainy season, whereas control animals required eight treatments and showed a markedly lower growth rate.

8341 **Thakersi, H., 1993.** Umfurudzi large-scale target operation. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 104.
Tsetse Control Services, P.O. Box 8283, Causeway, Harare, Zimbabwe.
During 1986 a large-scale integrated tsetse control operation was carried out in the north-east of Zimbabwe, using selective ground spraying, odour-baited and insecticide-treated targets, and the treatment of cattle with a non-residual pesticide. This operation complemented a large-scale aerial spraying operation funded by the EEC. Deltamethrin-treated targets were deployed in 1500 km^2 of the Umfurudzi safari area and surrounding settlements at an average density of 4 per km^2. The operation resulted in the rapid decrease of the *Glossina morsitans morsitans* population, which was eradicated after 9 months. Targets also provided an effective barrier against the movement of flies out of or into the target area when distributed at 25 and 30 per km^2 along the border between this and the aerially-sprayed area.

8342 **Tiemoko, R., 1993.** Recherche d'un procédé susceptible d'améliorer la remanence des pyréthrinoïdes sur les supports (tissues bleus et noirs, tulles moustiquaires blancs et noirs) des systèmes attractifs toxiques (pièges, écrans): résultat d'une expérimentation aux ultra-violets comme facteur de résistance à la photodégradabilité. [Research on an effective process to improve the persistence of pyrethroids on the supports (blue and black cloth, white and black mosquito netting) of attractant toxic systems (traps, screens): result of an experiment with ultra-violet as a factor of resistance to photodegradability.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 202.
Projet Tsétsé (GTZ), Laboratoire d'Ecologie, B.P. 45, Korhogo, Côte d'Ivoire.
A major factor in the cost-effectiveness of traps and screens is the persistence of active material: the longer the persistence, the longer the interval between impregnations. A UV filter ($4H_2MS$) has been tested as an inhibitor of the photodegradation of pyrethroids, because of its ability to absorb the UV rays in sunlight. The synthetic pyrethroid α-cypermethrin CE 100 was used in experiments carried out at Korhogo from June to September 1989. Chromatographic analysis showed that the UV filter reacted positively in the presence of the colours blue and white. In contrast,

the wavelengths emitted by the colour black absorbed those emitted by the filter. The UV filter therefore effectively improved the persistence of α-cypermethrin when applied to white or blue supports. This test opens up new approaches to the improvement of traps and screens, such as research into adhesives capable of limiting the leaching out of active materials.

8343 **Vreysen, M.J.B., Mramba, F. and Khamis, I., 1993.** Trial release of sterile *G. austeni* males in the Jozani forest on Unguja (Zanzibar) Island. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 211-212.

Insect and Pest Control Section, Joint FAO/IAEA Division, IAEA, P.O. Box 100, A-1400 Vienna, Austria; TTRI, P.O. Box 1026, Tanga, Tanzania; Ministry of Agriculture, Department of Livestock Development, P.O. Box 159, Zanzibar, Tanzania.

A total of 220,699 sterile *Glossina austeni* males, treated with 120 Gy in air, was released in the northern part of the Jozani forest on Unguja Island from November 1990 to February 1991, with ten releases at three different release points. Daily monitoring with sticky panels in the experimental area of 1 km^2 revealed an average ratio of 3.5 sterile:1 sexually mature wild male during the observation period. The overall recapture rate of sterile males was 9.8% □ 4.2, 5.6% □ 4.5 and 4.7% □ 2.3 for the three release points respectively. The dispersal rate of the sterile males was good from the second day after release. Maximum recorded survival was on average 28.6 □ 6.8, 24.1 □ 11.5 and 23.8 □ 10.6 days for males released at the three different points. Marked changes in the reproductive physiology of caught wild females were observed, with the incidence of empty uteri (resulting from abortion) and eggs showing signs of embryonic arrest increasing from pre-release levels of 2.6-5.6% to around 20% 1 month after the start of sterile male releases.

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

[See also **17**: nos. 8324, 8353, 8360, 8368, 8427, 8429.]

8344 **Baylis, M., 1993.** The effect of infection by trypanosomes on the attractiveness of cattle to tsetse. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 135.

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

If the trypanosomes in infected vertebrate hosts were to make these hosts more attractive to tsetse flies

than clean hosts, those trypanosomes would be more successful at infecting tsetse and therefore of advancing to the next generation. One way that trypanosomes could make their hosts more attractive would be to increase the attractiveness of host urine, an established attractant of several species of tsetse. Experiments which test the hypothesis that the urine of cattle infected with *Trypanosoma congolense* and *T. vivax* is more attractive to *Glossina pallidipes* and *G. longipennis* than urine from uninfected cattle have been carried out.

8345 **Kageruka, P., Kazadi, J.M.L., Molisho, S.D. and Jochems, M., 1993.** Prévalence trypanosomienne et réservoir animal de *Trypanosoma (Trypanozoon) brucei gambiense* au Zaire. [Trypanosome prevalence and animal reservoir of *T. (T.) b. gambiense* in Zaire.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 169-170.

Kageruka, Kazadi, Jochems: Department of Animal Health and Production, Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp 1, Belgium; Molisho: Bureau Central de la Trypanosomiase, Kinshasa, Zaire.

Investigations were carried out in two regions of Zaire (Bas-Zaire, Bandundu) to identify species of trypanosomes in domesticated stock and to find out if these animals could harbour *T. b. gambiense* and act as reservoir hosts for human sleeping sickness. Parasitological (thick smear, buffy coat, mAECT, inoculation of laboratory animals) and serological (CATT, IFAT, VAT-specific immunolysis) methods were used. Stocks of *T. brucei* sspp. were present in forest zones with a high prevalence and in savanna areas with a low prevalence, despite the fly vectors and the host animals remaining the same. Pigs, sheep and goats harboured *T. b. gambiense*-type, comparable to human *T. b. gambiense* isolates. The extent of the human reservoir (asymptomatic or carrier forms) must be ascertained using highly sensitive and specific techniques. The role of animal reservoir hosts should then be critically evaluated, especially in situations where villagers live in close proximity to their livestock and in close contact with vectors (*Glossina palpalis palpalis* and *G. p. quanzensis*) as is the case in several foci in Zaire.

8346 **Makumi, J.N., Baylis, M. and Omuse, J.K., 1993.** The feeding habits of *Glossina longipennis* Corti (Diptera, Glossinidae) at Galana Ranch, south-eastern Kenya. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 134.

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

To determine the hosts of *G. longipennis*, engorged flies were captured from artificial refuges constructed at their resting sites, epsilon and F3 traps set at various sites, and stationary and mobile electric screens in a transect at the study site. From the total of 192 (101 male and 91 female) bloodmeal samples collected, 59.9% (*n* = 115) were not identified. Canidae provided 12.5% (*n* = 24), wild ruminants 11.9% (*n* = 23) and Suidae 5.21% (*n* = 10), respectively, of the identified blood samples. The 28,000 head of cattle on the ranch, representing approximately 65% of the total animal population, provided only 4.17% (*n* = 8) of the feeds. Although cattle can be an important host for *G. longipennis*, they were not proportional to the number of the feeds obtained from the identified bloodmeal samples on the ranch.

8347 **McNamara, J.J. and Ferris, V., 1993.** Mixed infections of *Trypanosoma vivax* and *T. grayi* in experimental tsetse. (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), p. 226.

Tsetse Research Group, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Laboratory-bred *Glossina palpalis gambiensis* and *G. morsitans morsitans* were fed with both *T. vivax* and *T. grayi*. Mixed infections, where the proboscis was infected with *T. vivax* and the midgut was infected with *T. grayi*, developed in individual flies of both species regardless of the order in which the trypanosomes were fed to the flies. Such mixed infections would be mistakenly classified by simple dissection in the field as *Nannomonas*, yet would effectively transmit *T. vivax*.

8348 **McNamara, J.J. and Snow, W.F., 1993.** The different *Nannomonas* populations in *Glossina morsitans submorsitans* and *G. palpalis palpalis* in The Gambia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 107.

Tsetse Research Group, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK; ITC, P.M.B. 14, Banjul, Gambia.

DNA probes specific for *Trypanosoma simiae*, a new species of *Nannomonas*, and each of the three types of *T. congolense* were used to identify infections in tsetse midguts. In The Gambia, about 80% of such infections were recognised in *G. m. submorsitans* and *G. p. palpalis*; this latter fly occupies small areas of relict forest in the savanna. Of *Nannomonas* infections, the Kilifi (Kenya coast) type of *T. congolense* was absent. The savanna

type, *T. simiae* and the new species of *Nannomonas* occurred only in *G. m. submorsitans*; *T. congolense* was less frequent than the other two species. The riverine-forest type of *T. congolense* was found only in *G. p. palpalis*.

8349 **Merot, P. and Filledier, J., 1993.** Attractifs olfactifs pour les glossines riveraines: bilan de cinq années de recherches. [Olfactory attractants for riverine *Glossina* species: summary of five years research.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 197.

CRTA, 01 B.P. 454, Bobo-Dioulasso 01, Burkina Faso.

Experiments have been carried out in Burkina Faso to identify olfactory attractants for riverine species of *Glossina*. Products identified in East Africa for *G. pallidipes* and *G. morsitans morsitans* gave no significant results with *G. palpalis gambiensis* and *G. tachinoides*. The results of research on *G. tachinoides* show that riverine species apparently do not detect odours from mammalian hosts as do savanna species. The most efficient attractant identified so far is metacresol: during some seasons of the year its effect is enhanced by adding octenol (this compound alone is not attractive). Large variations in the reactions of *Glossina* to different products and combinations of products are related to climatic factors and the type of trap used.

8350 **Moloo, S.K., 1993.** Vector competence of different *Glossina* species for *Trypanosoma vivax*, *T. congolense* and *T. b. brucei*. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 240-241.

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

Seven species of *Glossina* from laboratory colonies were allowed to feed simultaneously for 24 days on Boran cattle infected with *T. vivax* and on goats infected with *T. congolense* or for 34 days on goats infected with *T. brucei brucei* from East and West Africa. The flies were then dissected and infection rates were found to be as follows: 0-97.1% for *T. vivax*; 0.3-49.2% for *T. congolense* and 0-40.4% for *T. b. brucei*. Cyclical development of both Likoni and Galana *T. vivax* was best in *G. m. centralis* (61.1%, 36.2%) and *G. brevipalpis* (75.3%, 58.2%) but poor in *G. austeni* (1.8%, 5.0%) and four *palpalis* group tsetse (*G. p. palpalis*, *G. p. gambiensis*, *G. f. fuscipes*, *G. tachinoides*) (range, 0-4.9%). For Bamburi *T. vivax*, the infection rates were high in all seven tsetse species (range, 16.3-91.3%). For the two Nigerian *T. vivax* stocks, the infection rates were also high in all seven tsetse (range, 55.5-97.1%). Cyclical development of both Tanzanian and Nigerian *T. congolense* was best in *G. m. centralis* (35.3%, 49.2%) and poorest in *G. austeni* (2.0%, 3.0%) and the four *palpalis*

group tsetse (range, 0.3-6.0%). The infection rates of both Tanzanian and Nigerian *T. b. brucei* were high in *G. m. centralis* (40.4%, 6.8%) but low in the other tsetse species (range, 0-2.1%).

8351 **Okech, G., Mukiria, P.W., Mbwabi, D.L.L., Mgutu, S.P., Kwena, M., Kundu, P., Odhiambo, J., Lukhango, J., Nduta, J., Kiboy, M. and Njogu, A.R., 1993**. High incidence of *Trypanozoon* in village cattle during an outbreak of human African trypanosomiasis (HAT) in Busia District, Kenya (1990). (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 144-145.

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

Since 1987, Busia District has overtaken Lambwe Valley in South Nyanza as a focus for human trypanosomiasis, and several outbreaks were reported up to mid 1990. In the 1990 outbreak, a total of 71 patients was diagnosed and treated between March and June. In April, a parasitological survey to determine the possible role of domestic stock as reservoirs of infection was mounted: 425 cattle, 51 goats, 80 sheep, two dogs and two pigs were examined by HCT and trypanosomes were detected only in cattle. The overall infection rate in cattle was 6.8%, of which 4.7% was *Trypanozoon*, 1.4% *Duttonella* and 0.7% *Nannomonas*. An entomological survey revealed the presence of *Glossina fuscipes fuscipes*, although no trypanosomes were detected by dissection. The presence in cattle of trypanosomes of the subgenus *Trypanozoon* suggests that they may act as reservoirs of human African trypanosomiasis in this focus.

8352 **Steufmehl, K., Küpper, W. and Mehlitz, D., 1993.** Détermination des taux d'infection aux trypanosomes au niveau de *Glossina palpalis palpalis* par la culture *in vitro* et caractérisation du parasite cultivé. [Determination of the rate of trypanosome infection in *G. p. palpalis* by *in vitro* culture and characterisation of the cultured parasite.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 108-109.

Steufmehl, Mehlitz: Institüt für Parasitologie und Tropen-veterinärmedizin, Freie Universität, 1000 Berlin 37, Germany; Küpper: Projet Ivoiro-Allemand (GTZ), Service de Lutte contre la Trypanosomose Animale et les Vecteurs, Bouaké, Côte d'Ivoire.

The rate of trypanosome infection in the proboscis, midgut and salivary glands of *G. p. palpalis* was examined from April to October 1989 at Kouassi-Perita, 60 km west of Yamoussoukro in Côte d'Ivoire. It was impossible to differentiate between procyclic forms of the subgenera *Nannomonas* and *Trypanozoon* by dissection

alone. The rate of infection in the tsetse gut was determined by three methods: classic dissection (10%), homogenisation followed by microscopic examination (28.5%) and *in vitro* culture (46.4%). Trypanosomes from guts cultured *in vitro* could be identified to subspecies level by isoenzyme electrophoresis: threonine dehydrogenase distinguished between *Nannomonas* and *Trypanozoon* and alanine transferase distinguished *Trypanosoma (Trypanozoon) brucei brucei* from *T. (T.) b. gambiense*.

5. human trypanosomiasis
(a) SURVEILLANCE
[See also **17**: nos. 8320, 8367.]

8353 **Jannin, J., Ngampo, S. and Penchenier, L., 1993.** Situation épidémio-logique de la trypanosomiase humaine au Congo. [Epidemiological status of human trypanosomiasis in the Congo.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 141.
Programme National de Lutte contre la Trypanosomiase, B.P. 1066, Brazzaville, Congo; ibid.; Laboratoire d'Epidémiologie des Grandes Endémies, Centre ORSTOM, B.P. 181, Brazzaville, Congo.
The number of trypanosomiasis cases in the Congo has been increasing since 1968, with more than 600 cases treated each year. The number of patients continues to increase despite an on-going diagnosis programme, and the number of patients in the neurological stage is also increasing. The three most important foci are located in the Valley of Niari, Cuvette and Couloir. There has been an expansion within the last 2 years of foci along the major communication axis in the south alongside the focus in the Couloir. More than ten inhabitants are diagnosed annually in Brazzaville. Future control programmes will be geared towards active survey of the endemic foci, the establishment of diagnostic units and the progressive implementation of vector control projects.

8354 **Jannin, J., Penchenier, L. and Moulia-Pelat, J.-P., 1993.** Une nouvelle stratégie de dépistage immunologique de la trypanosomiase par l'utilisation en parallèle des CATT sur sang et sur sérum au Congo. [A new strategy for immunological diagnosis of trypanosomiasis using CATT on blood and on serum in the Congo.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 127.
Programme National de Lutte contre la Trypanosomiase, B.P. 1066, Brazzaville, Congo; Laboratoire d'Epidémiologie des Grandes Endémies, Centre ORSTOM,

B.P. 181, Brazzaville, Congo; Laboratoire National de Santé Publique, Brazzaville, Congo.
Evidence from the Congo shows numerous contradictions between CATT blood (Sg) and serum (Sr) diagnoses. A group of 2030 individuals, comprising 24 CATT Sg^+/Sr^-, 224 CATT Sg^-/Sr^+ and 1644 CATT Sg^-/Sr^- was studied. The CATT contradiction is considered to be a risk factor. The relative risk (RR) of becoming ill is calculated as the outcome of risk factors in exposed (FER_{pe}) and general (FER_{pg}) populations. The incidence is 2.5% in 6 months. The RR between CATT Sg^+/Sr^- and CATT Sg^-/Sr^- is $9.5 < 16.7 < 29.4$, and between CATT Sg^-/Sr^+ and CATT Sg^-/Sr^- it is $1.3 < 2.4 < 4.4$. Overall the contradicting CATT results show an FER_{pe} of 73% and an FER_{pg} of 27%. Increased detection attributable to the contradicting CATT factor is 27%, which justifies a modification of strategy towards early diagnosis.

8355 **Jannin, J., Penchenier, L., Moulia-Pelat, J.-P., Makuwa, M. and Louis, J.-P., 1993.** Infection rétrovirale à VIH et trypanosomiase humaine africaine au Congo. [HIV retroviral infection and African human trypanosomiasis in the Congo.] (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), p. 247.
Programme National de Lutte contre la Trypanosomiase, B.P. 1066, Brazzaville, Congo; Laboratoire d'Epidémiologie des Grandes Endémies, ORSTOM, Brazzaville, Congo; Laboratoire National de Santé Publique, Brazzaville, Congo; ibid.; Service d'Epidémiologie, OCEAC, Yaoundé, Cameroon.
Both *gambiense* sleeping sickness and HIV infection are strongly endemic in the Congo. A controlled study has been carried out, comprising 163 cases of trypanosomiasis from a systematic survey matched with 326 controls according to sex, age and village. The observed prevalence of human trypanosomiasis was 3.8%. The prevalence observed on Western Blot samples for HIV was 3.2%. The results recorded as 160 triplets showed an odds-ratio of $0.64 < 1.75 < 4.71$. The relationship was not significant. This study confirms bibliographic data on the absence of a relationship between HIV infection and trypanosomiasis. Data recorded in Cameroon and the Central African Republic also support these results.

8356 **Meda, H., Laveissière, C., Muynck, A. de and Doua, F., 1993.** Un score de risque pour le dépistage de la maladie du sommeil. [A risk score in the diagnosis of sleeping sickness.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 139.

OCCGE/IPR, B.P. 1500, Bouaké, Côte d'Ivoire; ibid.; Département d'Epidémiologie, Institut de Médecine Tropicale, Nationalestraat 155, B-2000 Antwerp 1, Belgium; PRCT, B.P. 1425, Daloa, Côte d'Ivoire.
A case study of the control of risk factors and the major symptoms of human trypanosomiasis was conducted on 111 patients and 111 controls grouped according to age, sex and place of residence. Analysis of the results revealed ten different clinical symptoms and seven different epidemiological symptoms highly associated with the disease. By giving each of these variances an equal weighting to the corresponding value of the `odd ratio', a risk score (RS) of 17 criteria was defined. For each individual, the RS was equal to the sum of 17 values. If an individual obtains an RS value higher than the fixed threshold, it is considered positive and highly indicative of trypanosomiasis. This score has an obvious discriminatory value. A field evaluation will be needed before it is recommended for general use in sleeping sickness diagnosis.

8357 **Molisho, S.D., Kageruka, P., Kazadi, J.M.L., Jochems, M. and Ekwanzala, M., 1993.** Utilisation de nouvelles techniques de diagnostic dans la lutte contre la trypanosomiase humaine africaine à *Trypanosoma (Trypanozoon) brucei gambiense* au Zaire. [Use of new diagnostic techniques for the control of African human trypanosomiasis due to *T. (T.) b. gambiense* in Zaire.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 122-123.

Molisho, Ekwanzala: Bureau Central de la Trypanosomiase, B.P. 7782, Kinshasa 1, Zaire; Kageruka, Kazadi, Jochems: Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp 1, Belgium.
In Zaire, the strategies for the control of sleeping sickness mainly consist of diagnosis and treatment. In the present study, classic methods of diagnosis were compared with some newer techniques carried out in the field by a mobile team of investigators. Cervical adenopathy indicates trypanosomiasis in endemic areas but diagnosis should be confirmed by the examination of lymph node fluid, wet blood film and sometimes thick stained blood smears. CATT was used as a serodiagnostic screening method, followed by mAECT for parasitological diagnosis. The results obtained on 3363 persons showed that diagnosis on the basis of adenopathy grossly overestimates the incidence of disease compared with CATT. The best results with CATT are obtained by using diluted plasma rather than whole

blood samples. The examination of lymph node fluid, wet blood film and thick stained blood smears leaves a higher proportion of undiagnosed cases when compared with mAECT. Highly sensitive and specific techniques increase the diagnosis rate in patients during the early stage of infection, enable the disease to be adequately monitored and will help reduce the overall cost of control.

8358 **Muynck, A. de, Henry, M.C., Mentens, H. and Nzaba, P., 1993.** Développement d'un outil de dépistage des trypanosomés à *T. b. gambiense* à l'aide d'un système de score basé sur des critères cliniques et épidémiologiques. [Development of a diagnostic tool for *T. b. gambiense* sleeping sickness patients using a scoring system based on clinical and epidemiological criteria.] (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), pp. 140 and 245-246.

Muynck, Mentens, Nzaba: Institut de Médecine Tropicale, Nationalestraat 155, B-2000 Antwerp 1, Belgium; Henry: AGCD, Kinshasa, Zaire.

The non-specificity of symptoms and signs of disease presented at health centres makes them difficult to identify. A diagnostic strategy has been developed using a scoring system based on clinical and epidemiological criteria. Data were collected from 2357 individuals at Kwamouth, Zaire, of whom 117 were *Trypanosoma brucei gambiense* trypanosomiasis patients. A statistical analysis was made for each criterion, and significant parameters were found to be: general health status of the patient, foot sole aching, pruritis, personality change, apathy, Winterbottom's sign and sleep problems. The significant factors were weighted according to the relative risk. A threshold of individual risk was determined to justify parasitological confirmation of the diagnosis. The determ-ination of the threshold took into consideration the sensitivity, specificity and foreseeable positive value. A detection form is proposed for health centre use.

8359 **Odiit, M., Komba, E. and Kalunda, M., 1993.** Field application of the antigen detection enzyme immunoassay for the diagnosis of sleeping sickness caused by *Trypanosoma brucei rhodesiense* in Tororo, Uganda. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 118-119.

Odiit, Kalunda: UTRO, P.O. Box 96, Tororo, Uganda; Komba: National Institute for Medical Research, P.O. Box 482, Tabora, Tanzania.

The ELISA test has been used for the diagnosis of sleeping sickness in Tororo, Uganda. Sera from 312 sleeping sickness suspects attending hospital and 276 suspects from an endemic area were used. Out of 109 parasitologically proven cases, 89 (81.7%) were positive by ELISA and the rest were negative. Eight cases missed by HCT and three by mAECT were detected by ELISA. The test was specific as it gave negative results with sera from patients with malaria, syphilis, AIDS, tuberculosis, filariasis, schistosomiasis and hookworm infections. Three months after completion of treatment, 66.7% of nine patients still had detectable antigenaemia in the serum but none in the CSF. This test is recommended as a complementary method for sleeping sickness diagnosis. However, further study to determine its usefulness in assessing treatment is required.

8360 **Penchenier, L. and Jannin, J., 1993.** Aspects epidémiologiques de la trypanosomiase humaine au Congo: étude de la persistance de l'endémie. [Epidemiological aspects of human trypanosomiasis in the Congo: study of the persistence of the endemic disease.] *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 142-143.

Laboratoire d'Epidémiologie des Grandes Endémies, Centre ORSTOM, B.P. 181, Brazzaville, Congo; Programme National de Lutte contre la Trypanosomiase, B.P. 1066, Brazzaville, Congo.

For 10 years human trypanosomiasis has been increasing in the Congo and control efforts have not managed to reduce it. Since 1988 more than 550 cases have been reported each year. In 1990, of the 580 cases detected in the Congo, 402 came from the main Boko-Songho focus. In 1983 five cases were reported at the second focus, at Mossaka in a flooded forest zone; 9 years later there were 171. The first survey here for over 20 years was carried out in 1987; a second survey 2 years later showed more than double the number of cases and extended the area of the focus. The movement of people by canoe within this focus increases their exposure to tsetse. The Boko-Songho focus is a savanna zone. Here contradicting results using CATT with blood and serum may have missed 25% of parasitologically positive cases. The absence of tsetse control combined with the persistence of a human reservoir ignored by CATT may help to explain the persistence of the disease here. It is hoped that the national control programme, with three-way diagnosis (ganglion palpation, blood CATT and serum CATT), systematic treatment of suspected cases

and tsetse control with community participation will clear trypanosomiasis from Boko-Songho.

(b) PATHOLOGY AND IMMUNOLOGY
(c) TREATMENT
[See also **17**: nos. 8419, 8421.]

8361 **Bronner, U., Doua, F., Ericsson, O., Gustafsson, L.L., Miézan, T.W., Rais, M. and Rombo, L., 1993.** Pharmacokinetics of pentamidine during treatment of *T. gambiense* infection in Côte d'Ivoire. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: 8321), pp. 250-251.
Bronner, Ericsson, Gustafsson, Rais, Rombo: Departments of Infectious Diseases and Clinical Pharmacology, Karolinska Institute, Stockholm, Sweden; Doua, Miézan: PRCT, Daloa, Côte d'Ivoire.
To obtain baseline information needed for the design of an appropriate dose schedule of pentamidine, 11 patients with early *Trypanosoma brucei gambiense* infection were studied at Daloa. Patients were treated with ten i.m. injections of 4 mg pentamidine base/kg bodyweight every second day. Blood samples were taken up to 48 h after the first and the last doses. CSF samples were obtained 6 h after injection of the first and last doses. An HPLC-method was used for analysis. Maximum plasma concentrations were usually reached within 1 h and varied widely: 420-13,420 nmol/l. The median half-life during the dose interval was 22.4 h after the first dose and 47.1 h after the last dose. The results indicate a much longer elimination half-life than previously reported and inter-individual differences in the pharmacokinetics of pentamidine. Very low concentrations were detected in all CSF samples. After the last dose, concentrations varied between 1.7 and 3.9 nmol/l corresponding to 0.5-0.8% of the plasma concentration, indicating that pentamidine to some extent crosses the blood-brain barrier. Pentamidine is probably distributed extremely rapidly into tissues after i.v. infusion, when the elimination half-life seems to be very long (days-weeks).

8362 **Hardenberg, J., Claverie, N. and Tell, G.P., 1993.** Traitement de 711 patients atteints de trypanosomiase africaine à *T. b. gambiense* avec l'eflornithine (Ornidyl$^{\varepsilon}$). [Treatment of 711 patients with *T. b. gambiense* trypanosomiasis with eflornithine (Ornidyl$^{\varepsilon}$).] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 158-159.
Marion Merrell Dow, Department of Clinical Research, 2 rue de Stockholm, F-67000 Strasbourg, France.

A total of 711 patients with *gambiense* trypanosomiasis (675 late-stage cases, 428 being arsenical resistant) were treated with eflornithine for several weeks, either i.v. (400 mg/kg/day), orally (300 mg/kg/day) or both i.v. and orally. Of 676 evaluable patients, 670 (99.1%) responded to therapy. Of 618 patients followed, 191 were cured (2 years follow-up without relapse) and 157 had at least 1 year follow-up without relapse. The relapse rate was 5.6% (38 patients): 20 were treated orally only; 15/38 (39.5%) relapsed within 6 months post-treatment and 28/38 (73.7%) within 1 year. In children (< 12 years) the relapse rate was higher than in adults. At present, the recommended treatment is 400 mg/kg/day i.v. four times a day for 2 weeks. Forty-nine patients died during/shortly after eflornithine therapy, due to concurrent infections, severe marasmus, cachexia, epilepsy or unknown reasons. Most common side-effects included anaemia (340 cases), diarrhoea (276), leucopenia (193) and hair loss (61), which were usually reversible upon stopping therapy. The i.v. regime produced fewer adverse events, particularly diarrhoea. Eflornithine represents an effective and well-tolerated treatment for *gambiense* trypanosomiasis, including cases refractory to arsenicals.

8363 **Jannin, J. and Ngampo, S., 1993.** Le traitement de la trypanosomiase humaine au Congo par le DFMO (alpha-difluoromethylornithine). [Treatment of human trypanosomiasis in the Congo using DFMO (alpha-difluoromethylornithine).] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 157.
Programme National de Lutte contre la Trypanosomiase, B.P. 1066, Brazzaville, Congo.

From May 1986 to October 1991, 152 patients were treated with DFMO in the Congo, including ten infants under 5 years of age. The first 20 patients received 100 mg/kg i.v. every 6 h for 11 days followed by an oral dose of 75 mg/kg every 6 h for 21 days. Twenty-five patients received 100 mg/kg i.v. every 6 h for 14 days and 97 patients were given 200 mg/kg i.v. every 12 h for 14 days. All the patients were in the neurological phase of the disease; 90 were followed for 6 months and 35 were lost to the study. One death, eight cases of convulsions and 12 cases of diarrhoea were noted. Three relapses were observed after 6 months. The regime of two daily i.v. doses was kept as it is less restricting, and DFMO treatment will be extended to two main treatment centres in the interior

of the country, with a view to abandoning the use of melarsoprol in the Congo.

8364 **Komba, E., 1993.** Clinical aspects of human African trypanosomiasis (HAT) with particular reference to reactive arsenical encephalopathy (RAE): a study from 28 cases of *T. rhodesiense* HAT treated in Kigoma, Tanzania. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: 8321), p. 154.

National Institute for Medical Research, P.O. Box 482, Tabora, Tanzania.

A retrospective study was conducted on 28 patients who developed encephalopathy during treatment of *Trypanosoma brucei rhodesiense* sleeping sickness with MelB in a rural hospital in Tanzania. Reactive arsenical encephalopathy occurred in 1.5% of patients treated with MelB. The reaction was fatal in 30% of those affected, and usually occurred several days after the first MelB injection. Risk of the complication was unrelated to dosage and therefore to toxicity or to administration schedule, and was therefore unpredictable. Treatment of encephalopathy with either dimercaprol (BAL, a chelating agent), adrenaline or prednisolone was considered beneficial in the prevention and treatment of toxic side effects and especially for the recovery of the patients.

8365 **Reincke, M., Arlt, W., Mbulamberi, D., Siekman, L., Winkelmann, W. and Allolio, B., 1993.** The effect of suramin on the adrenocortical function in patients with African sleeping sickness. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 150-151.

Reincke, Arlt, Siekman: University of Koln, Jos-Stelzmann Strasse 9, 5000 Koln 41, Germany; Mbulamberi: National Sleeping Sickness Control Programme, P.O. Box 1241, Jinja, Uganda; Allolio: Institut für Klinische Biochemie, University of Bonn, Bonn, Germany.

The effects of suramin on the adrenocortical function in patients with African sleeping sickness in Uganda were investigated. All the study subjects underwent an adrenocorticotrophin hormone (ACTH) stimulation test, using 250 μg ACTH (Synacthen) i.v. Blood was drawn for P-ACTH and S-suramin at 0 minutes, and for S-cortisol and S-aldosterone at 0 and 60 minutes. Levels of these hormones were measured using specific radioimmunoassay. S-suramin was determined using HPLC. Compared to the normal controls, patients with sleeping sickness (both early and late stage) showed initially a decreased cortisol response to exogenous ACTH. During treatment with suramin, the cortisol response to

stimulation with ACTH gradually increased. None of the patients had biochemical evidence of adrenocortical insufficiency. P-ACTH levels did not differ between patients and controls. No correlation was found between the cortisol increase and the S-suramin levels. Determination of S-aldosterone levels yielded similar results: the aldosterone response after exogenous ACTH was slightly diminished initially in patients with sleeping sickness, but was restored to normal during treatment.

6. animal trypanosomiasis
(a) SURVEY AND DISTRIBUTION
[See also **17**: no. 8320.]

8366 **Ahmed, M.I. and Agbede, R.I.S., 1993.** A three-year retrospective study of the prevalance of trypanosome infection in cattle, sheep and goats in Zaria, northern Nigeria. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 98-99.
Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.
The highest frequency of trypanosome infection was recorded in cattle, with a peak of 21.0% in 1987. In the same year, a frequency of 1.2% was recorded in goats and no infection was recorded in sheep. *Trypanosoma vivax* appeared to be the commonest species with a relative frequency of 49.5%, followed by *T. congolense* at 24.2% and non-pathogenic *T. theileri* at 14.1%. Twelve cases of infection in cattle could not be identified to species level. No *T. brucei* were identified. Most cases occurred between August and November. The infection appeared to increase proportionately with age in cattle, except in the age group of 3-4 years where there was a drop. Only two caprine cases were encountered and both animals were between 1 and 2 years of age. The infection rate in N'Dama cattle was 40.0%, followed by White Fulani at 11.0% and Sokoto Gudali at 8.3%. The two caprine cases were both Sokoto red goats which had a 0.7% infection rate.

8367 **Bajyana Songa, E., Bendahman, J., Wuyts, N., Chimfwembe, E., Camus, E., Sayer, P., Olaho-Mukuni and Hamers, R., 1993.** Evaluation du test RoTat 1.2 CATT dans le diagnostic des infections à *T. evansi* et *T. rhodesiense*. [Evaluation of the RoTat 1.2 CATT test in the diagnosis of *T. evansi* and *T.*

rhodesiense infections.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 115.
Bajyana Songa, Bendahman, Wuyts, Hamers: Instituut voor Moleculaire Biologie, Vrije Universiteit Brussel, Paardenstraat 65, B-1640 St-Genesius-Rode, Belgium; Camus: CIRAD-EMVT, Mission Antilles-Guyane, B.P. 1232, 97184 Pointe à Pitre Cedex, Guadeloupe; Sayer, Olaho-Mukuni: KETRI, P.O. Box 362, Kikuyu, Kenya; Chimfwembe: TDRC, P.O. Box 71769, Ndola, Zambia.
The RoTat 1.2 CATT test, based on an early variable antigen of *Trypanosoma evansi*, has been evaluated for the detection of *T. evansi* and *T. brucei rhodesiense* infections and compared with other diagnostic techniques. Samples were taken from domestic animals in Vietnam, Thailand, Morocco, Kenya, Colombia, Brazil and French Guiana, and sera were taken from patients at the Isoka and Chilonga hospitals in Zambia. A high proportion of animals tested (235/439 (53.8%) buffalo, 43/92 (46.5%) pigs, 64/120 (53.3%) camels, 7/13 (53.8%) llamas, 13/41 (31.7%) horses and 83/210 (39.5%) cattle) were positive to the CATT test. Antitrypanosome antibodies were detected in 28/200 (14%) of random samples of human sera. The CATT test applied to camels, buffalo and humans confirmed parasitological data (haematocrit, subinoculation in mice). Comparable results were obtained with CATT, IFAT and ELISA tests. The analysis of sera by the radio-immunoprecipitation of methionine-labelled (^{35}S) antigens showed the presence of several parasite-specific peptides in all the sera positive to CATT. The RoTat 1.2 CATT test is a simple, sensitive technique and is recommended for routine field diagnosis in conjunction with other diagnostic methods for trypanosome infections.

8368 **Okuna, N.M., Enyaru, J.C.K., Mayende, J.C.P. and Sserwadda, F.K., 1993.** Trypanosomiasis in pigs in south-eastern Uganda, a sleeping sickness endemic area, and its control by isometamidium chloride (Samorin). (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 184-185.
UTRO, P.O. Box 96, Tororo, Uganda; ibid.; Veterinary Department, Iganda, Uganda; May and Baker Ltd, Kampala, Uganda.
A total of 349 pigs was examined for trypanosomiasis by HCT and by ELISA. The prevalence of *Trypanosoma brucei* and *T. congolense* by HCT was 55 (15.8%) and 7 (2.0%) respectively, and by ELISA 316 (90.5%) and 325 (93.1%) respectively. By HCT, 2 (3.3%) of the 60 infected pigs had both *T. brucei* and *T. congolense* but ELISA showed that 57 (95.0%) of the pigs had mixed infections. The blood

incubation infectivity test showed that 11 (42.3%) of 26 *T. brucei* isolates were potentially infective to man. Isoenzyme analyses of five isolates were identical to *T. b. rhodesiense*. Ten pigs were treated with Samorin at 1 mg/kg body weight. All the pigs remained parasitologically free of infection for at least 96 days post-treatment. In south-east Uganda, pigs constitute a major reservoir of *rhodesiense* sleeping sickness. Block treatment of pigs in the area with Samorin could contribute to the control of sleeping sickness.

8369 **Rowlands, G.J., Mulatu, W., Authié, E., d'Ieteren, G.D.M., Leak, S.G.A., Nagda, S.M., Peregrine, A.S. and Rarieya, J.M., 1993.** A method for distinguishing new and recurrent trypanosome infections in a field survey of East African Zebu cattle in Ethiopia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 270.

Rowlands, d'Ieteren, Nagda, Rarieya: ILCA, P.O. Box 46847, Nairobi, Kenya; Mulatu: ILCA, P.O. Box 5689, Addis Ababa, Ethiopia; Authié, Leak, Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya.

During 4 years of monitoring cattle at Ghibe, south-west Ethiopia, many animals were found to be infected with *Trypanosoma congolense* despite regular treatment with diminazene aceturate at 3.5 mg/kg body weight whenever an animal was shown to be parasitaemic and had a PCV less than 26%. It was found that the proportion of blood samples in which trypanosomes were detected decreased as the PCV increased; when the PCV exceeded 26% fewer than 5% of blood samples were found to be infected. A blood sample with a PCV > 26% and without detectable trypanosomes was recorded as `negative'. It was postulated that the occurrence of an infection in an animal found to be `negative' the previous month was more likely to indicate a new rather than a recurrent infection, and that this likelihood would increase the longer an animal was recorded negative. This definition resulted in an average monthly incidence of new infections in cattle over 3 years of age of 15%, compared with a total monthly prevalence of 24%. The difference between these two figures demon-strated high levels of recurrent infection and showed that treatment was ineffective.

8370 **Turkson, P.K., 1993.** Seroprevalance survey of trypanosomiasis in cattle in coastal savanna zone of Ghana. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 255-256.

Department of Animal Science, School of Agriculture, University of Cape Coast, Cape Coast, Ghana.
Single serum samples from 340 cattle in four locations of the Winneba district, lying in the coastal savanna zone of Ghana, were screened for infections of *Trypanosoma vivax*, *T. congolense* and *T. brucei* using an ELISA modification. Trypanosomes were detected in 38.5 □ 2.6% of the cattle sera. *T. vivax* was the commonest species (50.4 □ 4.4%), followed by *T. brucei* (14.5 □ 3.1%) and *T. congolense* (3.1 □ 1.5%). The prevalence rate for mixed infections was 32 □ 4.1% (21% for two species and 11% for all three species). A high proportion (90%) of the mixed infections involved *T. brucei* and the continued use of Berenil at the normal dosage of 3.5 mg/kg is questioned, since *T. brucei* infections are more effectively treated at 5-7 mg/kg. The relatively high prevalence rates of *T. brucei* and/or mixed infections could limit effective diagnosis by common methods and suggest the need for a review of the chemotherapy of the disease in this area.

8371 **Waitumbi, J.N. and Nantulya, V.M., 1993.** Antigen detection ELISA in diagnosis of *T. evansi* infections in camels – how accurate? (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 120-121.
KETRI, P.O. Box 362, Kikuyu, Kenya; ILRAD, P.O. Box 30709, Nairobi, Kenya.
Whole blood and sera collected sequentially for a period of 18 months from two herds of camels living in two *Trypanosoma evansi* endemic areas were analysed for the presence of patent trypanosome infections by the buffy coat method and for the presence of circulating trypanosome antigens by the ELISA technique. Antigens were detected in 85% of the cases where parasitaemia was evident. It was concluded that the 15% of cases of patent parasitaemia without accompanying antigenaemia could have been early infections (less than 2 weeks) with trypanosomes detected before sufficient parasite destruction had occurred to give detectable levels of antigen. A few camels (7/120) were not parasitaemic despite the presence of antigens. That these antigens were due to trypanosome infections in these camels was confirmed by the presence of anti-trypanosome antibodies. Following chemotherapy, antigens disappeared within a period of 30 days in 80% of the cases but persisted in the rest, sometimes for more than 500 days. The persistence of antigens in treated animals may have been due to the failure of drugs to clear trypanosomes completely from cryptic foci.

(b) PATHOLOGY AND IMMUNOLOGY
[See also **17**: nos. 8384, 8386.]

8372 **Authié, E., Mbawa, Z., Muteti, D., Webster, P., Lonsdale-Eccles, J.D. and Williams, D.J.L., 1993.** Réponse anticorps contre une cystéine protéase parasitaire chez les bovins infectés par *Trypanosoma congolense*. [Antibody response against a parasite cysteine protease in cattle infected with *T. congolense*.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 113.

ILRAD, P.O. Box 30709, Nairobi, Kenya.
A *T. congolense* antigen has been identified as a cysteine protease (CP33). In a study of the immune response of 15 N'Dama (trypanotolerant) and 16 Boran (trypanosusceptible) cattle infected with *T. congolense*, class IgG1 anti-CP33 antibodies were detected in all the N'Dama but not in the Boran. Specific antibodies were also detected in buffalo, which are trypanotolerant. The antiprotease antibody response appears to be associated with resistance to the disease. It is possible that the antibodies directed against the *T. congolense* protease partly neutralise its biological activity and limit the pathogenic effects of trypanosomes.

8373 **Cloe, L.C., Thiombiano, D. and Chicoteau, P., 1993.** Influence d'une trypanosomose expérimentale sur la fonction sexuelle des Baoulé (*Bos taurus*). [The influence of an experimental trypanosomiasis infection on the sexual function of Baoulé bulls (*B. taurus*).] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 275-276.
CRTA, 01 B.P. 454, Bobo-Dioulasso 10, Burkina Faso; ibid.; CFPR, 27 avenue Franklin Roosevelt, 35408 St Malo, France.
This study reports the effects of an experimental infection with *Trypano-soma congolense* on the sexual function of Baoulé bulls. Six breeding bulls, aged 4-7 years and weighing on average 320 kg, were followed up for 7 months. The main conclusions were that the experimental infection, which was of a chronic nature, moderately altered the general health of the animals; and that the negative effect of the infection on the sexual function varied according to the individual, with the response of the bulls demonstrating a threshold effect. The servicing of these bulls would have been fertile although none of the ejaculate

obtained satisfied the parameters needed for use in artificial insemination.

8374 **Hecker, P.A., Coulibaly, L., Rowlands, G.J., Nagda, S.M. and d'Ieteren, G.D.M., 1993.** Effect of plane of nutrition on trypanosome prevalence in Djallonké sheep exposed to high tsetse challenge. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 259.

SODEPRA/GTZ/CIPEA, B.P. 143, Boundiali, Côte d'Ivoire; ibid.; ILCA, P.O. Box 46847, Nairobi, Kenya; ibid.; ibid.

Experiments in Boundiali, Côte d'Ivoire, were undertaken during 1989 and 1990 using 150 4-6 month old male sheep. Half the sheep were given a supplement of cotton seed and maize bran. Average trypanosome prevalence was 22% in 1989 and 17% in 1990 between weeks 12 and 43. Supplementation had a more marked effect on growth rate in 1990 with body weights of supplemented sheep 39% higher in week 43 (14% in 1989) than non-supplemented sheep. Onset of trypanosomiasis was delayed by a few weeks in supplemented sheep. By week 27 in 1990 55% of the supplemented sheep had become infected compared with 73% of the non-supplemented sheep; by week 43, however, similar numbers in both groups had become infected. Mortality was high in 1989 with 13 and 29 deaths associated with trypanosomiasis in supplemented and non-supplemented groups respectively. Trypanosome infections resulted in body weight losses which were significantly greater in non-supplemented than in supplemented sheep ($P < 0.05$). PCV was inversely related with frequency of parasitaemia in 1989, but not in 1990.

8375 **Katunguka-Rwakishaya, E., Murray, M. and Holmes, P.H., 1993.** Haematological, erythrokinetic and blood lipid changes in sheep infected with *Trypanosoma congolense*. (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), pp. 257-258.

Departments of Veterinary Physiology (Katunguka-Rwakishaya, Holmes) and Veterinary Medicine (Murray), University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK.

Experimental infection of Scottish Blackface sheep with *T. congolense* resulted in fluctuating parasitaemia, pyrexia, macrocytic normochromic anaemia and leucocytosis. The decline in PCV was associated with the first trypanolytic crisis and a significant correlation was observed between PCV and levels of parasitaemia. Erythrokinetic studies 75 days p.i. showed that infected sheep had significantly higher

mean blood volumes and plasma volumes ($P < 0.05$) but lower red cell volumes ($P < 0.05$) than uninfected controls. Observations indicate that anaemia was due to accelerated extravascular destruction of red blood cells and haemodilution; there was no evidence of dyshaemopoiesis. Biochemical assays for blood lipids showed that plasma cholesterol, serum phospholipids and total serum lipids decreased in infected sheep. The fall in plasma cholesterol and serum phospholipid concentrations was associated with rising parasitaemia, suggesting that trypanosomal uptake of these nutrients may be important in the development of hypolipidaemia observed in this study.

8376 **Katunguka-Rwakishaya, E., Parkins, J.J., Fishwick, G., Murray, M. and Holmes, P.H., 1993.** The influence of dietary protein on the pathophysiology of sheep infected with *Trypanosoma congolense*. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 173-174.

Department of Veterinary Physiology (Katunguka-Rwakishaya, Holmes), Veterinary Animal Husbandry (Parkins, Fishwick) and Veterinary Medicine (Murray), University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK.

The levels of parasitaemia, degree of anaemia and liveweight gains were measured in two groups of *T. congolense* infected sheep ($n = 6$) maintained on low (crude protein = 8.1%) and high (crude protein = 17.6%) protein diets and compared with non-infected controls ($n = 3$). Animals on a high protein (HP) diet developed higher parasitaemia than those on a low protein (LP) diet. Both groups of infected sheep developed a similar degree of anaemia but the erythropoietic activity was more enhanced in animals on a high protein diet. The animals on the HP diet also showed more rapid recovery from anaemia compared to those on the LP diet following treatment with isometamidium chloride 70 days p.i. The liveweight gain in the infected HP group was 88.7% of their controls and 65.8% in the infected LP group of animals between 0 and 70 days p.i. The level of protein intake can therefore play an important role in the pathogenesis of animal trypanosomiasis and also influence the rate of recovery following chemotherapy.

8377 **Leak, S.G.A., Kemp, S.J. and Teale, A.J., 1993.** Responses of N'Dama ∃ Boran crossbred cattle to experimental infection with *Trypanosoma congolense*. (Title only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 112.

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

8378 **Mwangi, D.M., Hopkins, J. and Luckins, A.G., 1993.** *Trypanosoma congolense* infection in sheep: parasite migration and early cellular responses in lymph draining local skin reactions. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 110-111.
Department of Veterinary Pathology and Microbiology, University of Nairobi, P.O. Box 29053, Nairobi, Kenya; Department of Veterinary Pathology, Royal (Dick) School of Veterinary Sciences, University of Edinburgh, Summerhall, Edinburgh, UK; CTVM, Easter Bush, Roslin, Midlothian EH25 9RG, UK.
Cellular responses in sheep during the development and dissemination of *Trypanosoma congolense* from the skin were examined by cannulation of lymphatic ducts of lymph nodes draining the local skin reactions. Trypanosomes appeared in afferent and efferent lymph 5-7 days p.i., reached peak numbers 7-10 days p.i. and persisted in low numbers thereafter as the skin reaction regressed. The cell output from both compartments increased, coinciding with the onset of parasitosis. Flow cytometric analysis of these cells revealed that the early afferent lymph response (5-10 days) was due to a proportional and absolute increase in $CD4^+$ T cells. As the local skin reaction regressed, lymphoblasts, SIg^+, $CD45R^+$ and MHC class II^+ cells increased in proportion. In contrast, efferent lymph response was predominantly due to a higher output of SIg^+, $CD45R^+$ and MHC class II^+ cells. Observations of afferent lymph by light and transmission electron microscopy showed that trypanosomes were phagocytosed by cells of macrophage/dendritic cell lineage. In addition, numerous lysed trypanosomes were evident in both afferent and efferent lymph. These cellular responses are ineffective in preventing the establishment of infection but are important in the subsequent induction of homologous immunity.

8379 **Ndung'u, J.M., 1993.** Mechanisms of cardiac damage in African trypanosomiasis. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 175.
KETRI, P.O. Box 362, Kikuyu, Kenya.
Ten beagle dogs infected with *Trypanosoma brucei* developed an acute disease syndrome, characterised by clinical signs of severe heart damage, including tachycardia, heart blocks, sinus arrest, accumulation of pericardial effusion and terminal bradycardia. Examination of the heart revealed progressively severe damage, with interstitial oedema, myocyte necrosis, and diffuse infiltration with trypanosomes and inflammatory cells.

Obstruction of lymphatic vessels, constriction of coronary arteries, and widespread deposition of lipids, fibrinogen, IgG, IgM and C3 was observed. It would appear that the severe cardiac damage is initiated by acute inflammatory reactions to the parasites. In addition, the severe anaemia and vascular obstruction causes tissue hypoxia and ischaemia. Lipid peroxidation in such tissue would interfere with electrolytes and tissue oxygenation.

8380 **Ogaa, J.S., Kamar, K.K., Gombe, S. and Njogu, A.R., 1993.** Abortion in goats following experimental infection with *Trypanosoma congolense*. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 176.

Ogaa: University of Zimbabwe, P.O. Box MP167, Mount Pleasant, Harare, Zimbabwe; Kamar, Njogu: KETRI, P.O. Box 362, Kikuyu, Kenya; Gombe: Reproductive Biology Unit, College of Biological and Physical Sciences, University of Nairobi, P.O. Box 30197, Nairobi, Kenya.

Fourteen East African goats aged between 2 and 3 years were infected by syringe inoculation with *T. congolense* (KETRI 2707 ex Transmara stabilate) during the middle and last third of pregnancy. Nine goats were infected at 64.88 □ 7.80 days and five goats at 107.4 □ 0.54 days of gestation. The goats became patent 5-8 days p.i. Seven developed acute disease and died 28.3 □ 4 days p.i. Abortion occurred in four of the nine goats infected during mid-pregnancy at 55 □ 19 days p.i. None of the five goats infected during the last third of pregnancy aborted, but one delivered a live kid prematurely at 136 days gestation. In six animals, the allantoic fluid was positive for trypanosomes on mouse inoculation. Foetal blood, spleen and brain homogenates were all negative. It was concluded that *T. congolense* can cross the placental barrier and cause abortion in goats.

8381 **Williams, D.J., Logan-Henfrey, L.L., Authié, E., Moloo, S.K., Kabata, J.M., McOdimba, F. and Opollo, M., 1993.** Infection expérimentale avec *Trypanosoma vivax* hémorragique chez les bovins N'Dama et Boran. [Experimental infection with haemorrhagic *T. vivax* in N'Dama and Boran cattle.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 114.

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

Four N'Dama bulls and four Boran bulls of various ages were tsetse-infected with a strain of *T. vivax* from Galana, Kenya. In Ayrshire cattle this strain causes a haemorrhagic syndrome. Parasitaemia and PCV were recorded each day for 5 weeks p.i. All eight animals

became parasitaemic 8-9 days p.i. There was no difference in the level of parasitaemia in N'Dama and Boran bulls. The PCV in all animals began to drop 7-14 days p.i. and reached a minimum on day 26. In two N'Damas the PCV fell below 15%; in the four Borans it stayed above 22%. The results show that N'Dama cattle, which are resistant to *T. congolense* and *T. vivax* in West Africa, are very susceptible to the strain of *T. vivax* which produces acute haemorrhagic disease.

8382 **Wissocq, N., Trail, J.C.M., Kakiese, O., d'Ieteren, G.D.M., Pelo, M. and Mulungo, M., 1993.** Importance of trypanosome species in relationship between infection, anaemia and reproductive performance in N'Dama cattle. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 278. Wissocq, Trail, d'Ieteren: ILCA, P.O. Box 46847, Nairobi, Kenya; Kakiese, Pelo, Mulungo: Compagnie J. Van Lancker, B.P. 199, Kinshasa, Zaire.

A link was detected between the number of trypanosome infections identified and average PCV, with an average reduction of 1.3% units of PCV per parasitaemia detected. When species of trypanosome was included in the analysis, it was shown that *Trypanosoma vivax* infections had significantly less effect on average PCV than either *T. congolense* or mixed infections. The average PCV for *T. vivax* was 31.8 □ 0.77%, for *T. congolense* it was 28.6 □ 0.47% and for a mixed infection it was 28.9 □ 0.93%. An effect of trypanosome infection on time to conception (reproductive performance) was only significant when two or more *T. congolense* infections were detected during the 8 month period from parturition to calf weaning. The times to conception were as follows: no infection, 156 □ 16.1 days; a *T. vivax* infection, 174 □ 26.5 days; one *T. congolense* infection, 172 □ 20.3 days; and two or more *T. congolense* infections, 214 □ 22.4 days. The relationship between average PCV and time to conception within groups of cows, classified according to the numbers and species of trypanosomes, showed that trypanosome effects on reconception operated through anaemia control. There was a significant reduction of 15.3 days in time to conception per unit increase in average PCV when cows were infected with *T. congolense* on two or more occasions during the 8 month post-partum period.

(c) TRYPANOTOLERANCE

[See also **17**: nos. 8372, 8381.]

8383 **Agyemang, K., Kaufmann, J., Dwinger, R.H., Bah, L. and Drammeh, B., 1993.** Impact of helminth infections on milk

production of trypano-tolerant cattle in an area of zero to low trypanosomiasis risk. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 279.
ILCA, P.O. Box 46847, Nairobi, Kenya; ITC, P.M.B. 14, Banjul, Gambia; ibid.; ibid.; ibid.
A total of 2639 records of daily milk production of N'Dama cows measured once a month from 1986 to 1988 in village herds were matched with data on trypanosome and helminth infections obtained concurrently from the same animals. Animals not infected with trypanosomes during the study period were classified as either positive for strongyles (eggs/g of faeces > 500) or negative (eggs/g of faeces < 500), based on faecal sampling each year from June to October (the peak period of strongyle egg output). Least squares analysis of monthly milk yields adjusted for year, herd, month and stage of lactation showed that milk production of 232 cows positive for strongyles was significantly lower ($P < 0.01$) than that of 44 cows negative for strongyles (900 *v*. 1040 ml/cow/day). Preliminary estimates indicated that the total loss in milk between June and November due to helminth infection amounted to about 30 l/lactating cow.

8384 **Agyemang, K., Little, D.A., Mattioli, R., Bah, M.L., Sonko, E. and Janneh, L., 1993.** Reproductive performance of N'Dama cows as influenced by trypanosome infection and postpartum liveweight change. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 171-172.
ILCA, P.O. Box 46847, Nairobi, Kenya; ibid.; ITC, P.M.B. 14, Banjul, Gambia; ibid.; ibid.; ibid.
Data on reproduction, liveweight and health aspects of N'Dama cattle raised under traditional husbandry systems in The Gambia were analysed to quantify the relative effects of post-partum liveweight performance and trypanosome infection on calving rate and calving interval. Two hundred and ninety-four calving records were classified firstly into cows having lost more or less than 5% of the first post-partum weight during the first 4 months post-partum and secondly into those infected or not with trypanosomes during this period. Least squares analyses adjusted for location, season of calving, calf viability and parity of cow showed that the proportions of cows that calved again within 21 months were: weight loss < 5%/uninfected group 62%; weight loss < 5%/infected group 40%; weight loss > 5%/uninfected group 34%; weight loss > 5%/infected group 25%. Corresponding mean calving intervals were 526, 592, 630 and 697 days respectively. These data

show that while post-partum body weight loss *per se* impairs reproductive performance, trypanosome infection does likewise, and that these effects may or may not act independently.

8385 **Duvallet, G., Clausen, P.-H., Bassinga, A., Queval, R., Maillard, J.C. and Gidel, R., 1993.** La trypanotolérance des taurins Baoulé. Caractérisation et mécanismes: revue des connaissances. [Trypano-tolerance in Baoulé cattle. Characterisation and mechanisms: review of knowledge.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 168.

CRTA, 01 B.P. 454, Bobo-Dioulasso 01, Burkina Faso.

It has been known since the beginning of this century that humpless African cattle suffer from trypanosome infections less than Zebus. The breeds of cattle in West Africa are able to survive in tsetse-infested areas, whereas Zebus die rapidly of trypanosomiasis. This ability, which is also found in wild animals, is called trypanotolerance. A growing interest in these animals is developing and significant progress has been made in the last decade in the characterisation of this phenomenon and the study of its mechanisms.

8386 **Ismail, A.A., Njogu, A.R., Musoke, A.J., Dolan, R.B. and Opiyo, E.A., 1993.** The susceptibility of the Orma Boran cattle to tsetse transmitted *Trypanosoma congolense* infections. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 166-167.

Ismail, Njogu, Dolan: KETRI, P.O. Box 362, Kikuyu, Kenya; Musoke: ILRAD, P.O. Box 30709, Nairobi, Kenya.

Groups of ten Galana and eight Orma steers were fly challenged with a clone of *T. congolense* known to be virulent to cattle. Their susceptibility to infection was compared on the basis of clinical responses, intensity of parasitaemia, severity of anaemia, trypanocidal drug requirements and ability to gain weight. Both groups developed febrile episodes, tachycardia and tachypnoea. The Orma were better able to reduce and control parasitaemia. The onset of anaemia was earlier and more severe in Galana than in Orma. Both groups developed leukopenia; Orma leukocyte counts had recovered by the end of the 10 week study period while the Galana remained leukopenic. Thrombo-cytopenia was evident in both groups but was more severe in the Galana. Galana had a net loss in body weight while the Orma had a net gain. Three out of eight Galana required treatment compared to one out of ten Orma animals. The results show that Orma Boran cattle have a degree of resistance to trypanosomiasis.

8387 **Minengu, M., Ngamuna, S., Winckel, F. van, d'Ieteren, G.D.M., Itty, P., Nagda, S.M., Rarieya, J.M., Rowlands, G.J. and Swallow, B.M., 1993.** Economic evaluation of productivity of N'Dama cattle introduced in a métayage system in Idiofa, Zaire. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 280.
Développement Progrès Populaire Idiofa, B.P. 8251, Kinshasa, Zaire; ibid.; ibid.; ILCA, P.O. Box 46847, Nairobi, Kenya; ibid.; ibid.; ibid.; ibid.
A programme of métayage, where the farmer pays rent in kind, has been used to introduce N'Dama cattle into villages in the Idiofa region of south-west Zaire, where the cattle population increased by 200% between 1972 and 1984. Seventeen herds were monitored between January 1986 and December 1989: compared to other sites in the African Trypanotolerant Livestock Network, fertility was found to be higher (annual calving rate of 65%) and mortality lower (14% of calves dying from birth to 1 year of age). Growth rates, however, were relatively lower and variable among herds. Trypanosomiasis was not a limiting factor. Analyses were conducted to quantify the benefits and costs of the herds to their owners and to the Zaire economy. Ratios of discounted net benefits to discounted investment (NKR) and internal rates of return (IRR) were used to evaluate the return to capital investments. Average economic returns were encouraging, with the average NKR 1.49 (range 0.88-2.45) and the average IRR 18.0% (range 7.4-31.5%).

8388 **Mwangi, E.K., Stevenson, P., Murray, M. and Gettinby, G., 1993.** Susceptibility of three cattle breeds to trypanosomiasis under natural tsetse challenge in Nguruman, south western Kenya. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 163-164.
KETRI, P.O. Box 362, Kikuyu, Kenya; ibid.; Department of Veterinary Medicine, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK; Department of Statistics and Modelling Science, University of Strathclyde, Livingstone Tower, Glasgow G1 1XH, UK.
Sixty-three steers, approximately 18 months old, consisting of 22 East African Zebu (Maasai), 22 Boran (Orma) and 19 Improved Boran (Galana), were introduced into an area of high tsetse challenge in September 1989. Matching groups of 21 Maasai Zebu and 21 Orma Boran were kept in an area of low tsetse challenge. The disease incidence, estimated by parasitaemia and anaemia (PCV), was measured weekly. Health and performance data were recorded fortnightly. The tsetse

challenge was monitored using biconical traps set in the two study areas. Results of the 8 months observation period showed that, in the high tsetse challenge area, the Maasai Zebu had the lowest disease incidence, maintained highest mean herd PCV and maintained good body condition. Susceptibility to trypanosomiasis increased in the order: Maasai Zebu, Orma Boran and Improved Galana Boran. In the low challenge areas, the disease incidence was similar in the Maasai Zebu and the Orma Boran, but the former maintained a higher mean herd PCV.

8389 **Ouattara, L., Ouedraogo, A., Clausen, P.H., Kaufmann, J. and Pfister, K., 1993.** Helminthoses gastro-intestinales chez les bovins trypano-tolérants (Baoulé) et trypanosensibles (Zébu) au Burkina Faso. [Gastrointestinal helminth infections in trypanotolerant (Baoulé) and trypanosusceptible (Zebu) cattle in Burkina Faso.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 260-261.

Ouattara, Kaufmann, Pfister: Département de Parasitologie Vétérinaire, Université de Berne, Länggass-Strasse 122, CH 3001 Berne, Switzerland; Ouedraogo, Clausen: CRTA, B.P. 753, Bobo-Dioulasso, Burkina Faso.

Gastrointestinal helminth infections have been studied in Baoulé and Zebu cattle kept under traditional herd management in Pays Lobi, an area affected by *Glossina palpalis gambiensis* and *G. tachinoides*. Parameters recorded included eggs per g faeces, PCV, parasitaemia and body weight for 377 animals. *Trypanosoma congolense* and *T. vivax* were the predominant trypanosome species, with prevalences varying from 14.8% to 71% in Baoulé and 14.9% to 42.4% in Zebu cattle. The prevalence of strongyle nematodes was 55.5% in June, 64.4% in October and 33.3% in December in Baoulé, compared to 74.88%, 80.83% and 64.57% in Zebu for the same periods. *Toxocara vitulorum* in calves between 0 and 6 months of age showed prevalences of 8.33% in Zebu and 2.89% in Baoulé. Even though the Zebu had superior management, they were more affected by helminthoses and trypanosomoses than the Baoulé.

8390 **Rahman, A.H.A., Abdel Karim, E.I. and Mohamed-Ahmed, M.M., 1993.** Studies on the natural resistance of some Sudanese Zebu cattle breeds. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 165.

Central Veterinary Research Administration, P.O. Box 8067, El-Amarat, Soba, Khartoum, Sudan; ibid.; ICIPE, P.O. Box 30772, Nairobi, Kenya.

Resistance to trypanosomiasis in Sudanese Zebu cattle was studied in herds of Western Baggara, a breed of cattle endogenous to the locality and seasonally exposed to tsetse flies, and Kinana and Butana breeds from the tsetse-free areas of eastern and central Sudan. The experimental herds, and a control herd kept under prophylaxis with Samorin, were exposed to natural tsetse challenge of an index that varied between 240 and 1750. While all untreated animals became infected with trypanosomes, the Western Baggara had a significantly longer prepatent period, lower parasitaemia and higher PCV values than the Kinana and Butana breeds, and 30% of Western Baggara animals survived the challenge and had the ability to control parasitaemia whereas all the Kinana and Butana animals died.

8391 **Sauveroche, B., Wagner, H.G. and Hoste, C.H., 1993.** Reproduction des bovins trypanotolérants et trypanosomose animale africaine. [Reproduction of trypanotolerant cattle and African animal trypanosomosis.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 262.
Projet PNUD/FAO, P.M.B. 10, Banjul, Gambia.
For improved productivity which also answers the needs of the people concerned, knowledge and control of reproductive parameters of trypanotolerant cattle are of prime importance. The objective is to accelerate the selection and distribution of improved breeding stock. It is of particular relevance to the effects of trypanosomiasis that the potential of trypanotolerant animals in their environment should be anticipated, managed and optimised.

(d) TREATMENT

[See also **17**: nos. 8368, 8369, 8370, 8421.]

8392 **Bealby, K.A., Chilenga, A.B., Silutongwe, J., Connor, R.J., Rowlands, G.J., Nagda, S.M., Chizyuka, H.B.G. and d'Ieteren, G.D.M., 1993.** Effect of trypanosomiasis control on reproduction of goats in Luangwa Valley, eastern Zambia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 277.
Bealby, Chilenga, Silutongwe: Department of Veterinary and Tsetse Control Services, P.O. Box 510016, Chipata, Zambia; Connor: RTTCP, P.O. Box A560, Avondale, Harare, Zimbabwe; Rowlands, Nagda, d'Ieteren: ILCA, P.O. Box 46847, Nairobi, Kenya; Chizyuka: Department of Veterinary and Tsetse Control Services, P.O. Box 50060, Lusaka, Zambia.

Ten female goats in 1989 and 16 in 1990 were treated prophylactically with 1 mg/kg isometamidium at 3-monthly intervals; 10 goats in 1989 and 25 in 1990 were not protected but were treated with 7 mg/kg diminazene when found to be parasitaemic and with reduced PCV. Treatments were withheld in 19 goats. A male goat was put in with the females between weeks 3 and 8 of 1989 and weeks 10 and 15 of 1990. In 1989, protected and unprotected groups had similar levels of fertility (9/10 protected dams produced live kids compared with 8/9 unprotected dams). Eight of the 19 goats from which treatment was withheld died due to trypanosomiasis. In 1990 parturition occurred at the start of peak tsetse catches and trypanosome prevalence; 14/16 protected dams kidded normally compared with only 16/25 unprotected dams. Protected goats also maintained higher body weights and PCVs during lactation. Six of the unprotected dams gave birth prematurely or aborted; parasitaemia occurred in each of these dams during the last 4 weeks of pregnancy. Of the 16 normal births, only two occurred in dams which had been parasitaemic during late pregnancy.

8393 **Codjia, V., Mulatu, W., Authié, E., Leak, S.G.A., Rowlands, J.R., d'Ieteren, G. and Peregrine, A.S., 1993.** Occurrence of multidrug-resistant *T. congolense* populations in Ghibe, Ethiopia. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 271-272.

Codjia, Authié, Leak, Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya; Mulatu: ILCA, P.O. Box 5689, Addis Ababa, Ethiopia; Rowlands, d'Ieteren: ILCA, P.O. Box 46847, Nairobi, Kenya.

Analyses of field data from Ghibe in early 1989 indicated a problem with drug resistance. Stabilates of blood were collected from parasitaemic cattle in July 1989 and stored in liquid nitrogen. Twelve isolates were subsequently inoculated into individual Boran calves and characterised for their sensitivity to diminazene aceturate (Berenil), isometamidium chloride (Samorin) and homidium chloride (Novidium) administered via the i.m. route. All 12 isolates resulted in *Trypanosoma congolense* infections and all were resistant to diminazene aceturate at 7.0 mg/kg. Eleven were also resistant to isometamidium chloride at 0.5 mg/kg and homidium chloride at 1.0 mg/kg. Five clones of one isolate expressed high levels of resistance in mice to all three trypanocides, suggesting that the expression of multidrug-resistance was by individual trypanosomes

and was not due to different trypanosomes being resistant to different trypanocides. This would indicate that chemotherapy *per se* would not control such an infection.

8394 **Coulibaly, L., Hecker, P.A., Rowlands, G.J., Küpper, W., d'Ieteren, G.D.M., Authié, E., Nagda, S.M. and Peregrine, A.S., 1993.** Efficiencies of trypanocidal drugs in N'Dama cattle under medium tsetse challenge in Côte d'Ivoire. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 273.

Coulibaly, Hecker, Küpper: SODEPRA/GTZ/CIPEA, B.P. 143, Boundiali, Côte d'Ivoire; Rowlands, d'Ieteren, Nagda: ILCA, P.O. Box 46847, Nairobi, Kenya; Authié, Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya.

Sixteen herds of 36 adult female cattle were randomised for individual treatment as follows: 1 mg/kg of homidium bromide, 0.5 mg/kg and 1 mg/kg of isometamidium chloride, and 3.5 mg/kg and 7 mg/kg of diminazene aceturate. Each herd was examined at 3-week intervals on 21 occasions from January 1990 to May 1991. Cows were treated with the appropriate drug and dosage when they were detected parasitaemic. Fewer than 5% of animals were reinfected within 9 weeks for homidium bromide, fewer than 5% within 12 and 21 weeks for isometamidium chloride at 0.5 and 1 mg/kg respectively, and fewer than 5% within 3 weeks for diminazene aceturate. These results gave no evidence of a serious drug resistance problem among trypanosomes infecting these cattle. However, these trials were conducted with a 3-weekly frequency of sampling and may therefore not have revealed drug resistant infections that these trypanotolerant cattle may have controlled themselves.

8395 **Eisler, M.C., Peregrine, A.S., Gault, E.A. and Holmes, P.H., 1993.** Validation of an ELISA for measurement of isometamidium in serum from African cattle. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 190-191.

Eisler, Gault, Holmes: Department of Veterinary Physiology, University of Glasgow Veterinary School, Bearsden Road, Glasgow G61 1QH, UK; Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya.

A modified ELISA test, with pre-dilution of serum samples and the use of a biotin-streptavidin system in place of the second antibody, was used to investigate the concentration of isometamidium in the serum of Kenyan Boran (*Bos indicus*) cattle treated i.m. with either 0.5 or 1.0 mg isometamidium chloride/kg body weight. The resulting drug profiles showed two distinct phases,

an initial rapid decline in serum drug concentration (days 1-6) followed by a more gradual decline in concentration with a half life of approximately 22 days, which were considered to correspond to drug distribution and drug elimination. This modified ELISA can accurately detect isometamidium levels for several months after treatment. Used in conjunction with diagnostics for trypanosome infections, it may have potential as a rapid test for drug resistance.

8396 **Gool, F. van, 1993.** Le Cymelarsan$^{\varepsilon}$: un nouveau traitement des trypanosomoses dues à *Trypanosoma evansi* chez le chameau. Resultats de deux essais cliniques effectués au Soudan (Musa M. Musa et al., 1990-91). [Cymelarsan$^{\varepsilon}$: a new treatment for *T. evansi* infections in camels. Results of two clinical trials carried out in Sudan.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 181-182.

Rhône Mérieux, 10 rue Rupunger, 69004 Lyon, France.

In the first trial, 40 parasitaemic camels infected with *T. evansi* were selected for treatment from a population of 265 naturally and chronically infected animals and maintained under natural field conditions. In the second trial, 20 parasitaemic animals collected from different herds and camel markets were kept under controlled (fly-proof) laboratory conditions for 90 days after treatment. Cymelarsan was found to be effective at doses of 0.25 and 0.50 mg/kg body weight, and 0.25 mg/kg administered i.m. is recommended as the optimum curative dose under natural field conditions. Under controlled laboratory conditions, it was demonstrated that Cymelarsan eliminated *T. evansi* in camels very rapidly and completely and that no relapse infections occurred.

8397 **Gool, F. van, 1993.** Etude de quelques paramètres pharmacocinétiques d'isométamidium chez les bovins. [Pharmacokinetic investigations of isometamidium in cattle.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 188-189.

Rhône Mérieux, 10 rue Rupunger, 69004 Lyon, France.

Isometamidium (Trypamidium) is very effective for the treatment and prevention of *Trypanosoma congolense* and *T. vivax* infections in cattle. As part of a safety evaluation, the pharmacokinetics of isometamidium in milk and muscles were studied. Three lactating Jersey cows received a single i.m. dose of 1 mg ^{14}C-isometamidium/kg body weight, administered as a 2% aqueous solution. The concentration of radioactivity in milk peaked at day 3 (C_{max} = 0.0044 μg/ml) and then

slowly declined from 0.0024 μg/ml at day 8 to 0.0022 μg/ml at day 31, showing that only very low quantities of isometamidium were excreted into milk. Concentrations of radioactivity in the skeletal muscles remote from the injection site were in the range of 0.012-0.017 μg/g at different sacrifice times (day 3, day 10 and day 30). These data show that no accumulation of isometamidium occurred in muscular tissue.

8398 **Gool, F. van, 1993.** Concentration plasmatique contre l'activité trypano-cide de l'isométamidium: résultats chez les bovins. [Plasma concen-tration *versus* trypanocidal activity of isometamidium: results in cattle.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 263-264.

Rhône Mérieux, 10 rue Rupunger, 69004 Lyon, France.

Three lactating Jersey cows each received a single i.m. dose of 1 mg ^{14}C-isometamidium (Trypamidium)/kg body weight administered as a 2% aqueous solution into the gluteal muscle. The plasma concentrations were then measured using a liquid scintillation counter. The concentration of radioactivity in the plasma peaked within 1 h of dosing at 0.94 μg/ml. The concentration then declined rapidly to 0.015 μg/ml at 12 h. Between 24 h and 31 days post-injection, the concentration decreased very slowly to 0.013 μg/ml. This study confirms a relatively long persistence of isometamidium in plasma in very low concentrations. These low levels are nevertheless sufficient in cattle to confer complete protection for between 2.5 and 7.5 months.

8399 **Maloo, S.H., Thorpe, W. and Nantulya, V.M., 1993.** Trypanosomiasis in dairy cattle under varying risk in coastal Kenya. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 228-229.

KARI/ILCA Project, P.O. Box 80147, Mombasa, Kenya; ibid.; ILRAD, P.O. Box 30709, Nairobi, Kenya.

Trypanosomiasis in dairy cattle was monitored at three sites within a 50 km radius with high, medium and low risk, using the dark ground buffy coat technique and ELISA. At the high risk site, small-holder dairy cattle, kept under isometamidium chloride (Samorin) chemoprophylaxis at 0.5 mg/kg bodyweight i.m. every 45 days, had a monthly trypanosome parasite prevalence of 61%. Trypanosomiasis risk was seasonal at the medium risk site, where half of a dairy herd was kept on chemoprophylaxis using Samorin at 0.5 mg/kg i.m. every 90 days. The other half was treated whenever detected parasitaemic with diminazene aceturate (Berenil) at 7.0

mg/kg bodyweight. No differences were observed between the two groups for the prevalence of trypanosome parasitaemia and antigenaemia. Trypanosome antigen prevalences of over 20% were detected even when there were no parasitaemias. At the low risk site, where mean monthly parasite prevalence was less than 1%, antigen prevalence at the start of the study was 32, 25 and 31% and declined to 11, 5 and 17% 8 weeks after 3.5 mg/kg Berenil treatment for dairy cattle in zero, semi-zero and free grazing systems respectively. The results indicate that Samorin in the high and medium risk sites was not effective in preventing trypanosomiasis.

8400 **Mamman, M., Aliu, Y.O. and Peregrine, A.S., 1993.** Pharmacokinetics of diminazene in Boran (*Bos indicus*) cattle. (Abstract only.) In: OAU/STRC, 1993 (see 17: no. 8321), pp. 268-269.

Mamman, Peregrine: ILRAD, P.O. Box 30709, Nairobi, Kenya; Aliu: Department of Veterinary Physiology and Pharmacology, Ahmadu Bello University, Zaria, Nigeria.

The disposition and absorption kinetics of diminazene were studied in five healthy, 11-14 month old, female Boran cattle. Single doses (3.5 mg/kg) of diminazene, as the diaceturate salt, were injected i.v. and i.m. and HPLC was used to determine the concentration of intact diminazene in plasma, whole blood and urine samples collected prior to, and at various intervals after, each drug administration. The disposition kinetics were best described by a three-compartment open model. Following the i.v. injection, plasma diminazene concentrations rapidly declined from 10.16 □ 2.02 μg/ml at 5 min to 2.34 □ 0.40 μg/ml at 1 h and 0.47 □ 0.10 μg/ml at 48 h. In three animals, plasma levels of 0.05 □ 0.02 μg/ml were detected at 4 weeks; the drug was not detected in plasma from any of the animals at 6 weeks. The absorption half-life of the i.m. dose was 8.6 □ 4.2 min. The C_{max}, 3.71 □ 0.56 μg/ml, was attained in 10-15 min and a systemic availability of 100.0 □ 2.0% was estimated. Although the plasma concentrations at 1 h (2.21 □ 0.26 μg/ml) and at 48 h (0.52 □ 0.06 μg/ml) were not significantly different from those present at the same time intervals after i.v. administration, 0.13 μg/ml was detected for up to 10 weeks in three animals. About 8.3 □ 0.8% of the i.m. dose was excreted intact in the urine within 24 h.

8401 **Silayo, R.S., 1993.** Studies on efficacy of repeat trypanocidal drug treatment against drug-resistant

Trypanosoma congolense infections. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 186.
Department of Veterinary Microbiology and Parasitology, Sokoine University of Agriculture, P.O. Box 3019, Morogoro, Tanzania.
Studies were carried out in goats and mice to determine the relative efficacies of two-dose as opposed to single-dose treatment with diminazene aceturate against known drug-resistant *Trypanosoma congolense* infections. In the first experiment, goats infected with a known drug-resistant clone (*T. congolense* IL 3274) were treated with 7.2 mg/kg i.m. single dose or two-dose at 19 days p.i. The treatment intervals for the two-dose treatment were 8 and 24 h. Within 7-12 days after treatment, all ten single-dose treated goats developed relapse parasitaemia, while at the end of the experiment (100 days after treatment) three out of ten animals which were two-dose treated were still aparasitaemic and were considered cured. In the second experiment, mice infected with a known drug resistant stock (*T. congolense* ADRI) were treated with diminazene aceturate at 56-70 mg/kg single dose or 21-42 mg/kg two-dose at 48 h intervals. It was shown that two-dose treatment had a cure rate of 80% compared to 6.5% for single dose treatment, a difference which was highly significant ($P < 0.001$). In a follow-up study using mice, it was shown that two-dose treatment at 8 h intervals was not efficacious at all while at 24-96 h intervals it was significantly more efficacious than single-dose treatment. The results also showed that two-dose treatment at 48 or 96 h intervals was significantly more efficacious than two-dose treatments at 24 or 72 h intervals ($P < 0.05$).

8402 **Yangari, G., Ordner, G., Dumont, P., Sauveroche, B., d'Ieteren, G.D.M., Rowlands, G.J., Nagda, S.M., Rarieya, J.M. and Trail, J.C.M., 1993.** Evaluation of the effect of strategic use of trypanocidal drugs on N'Dama cow fertility at OGAPROV Ranch, Gabon. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 274.

OGAPROV, B.P. 143, Moanda, Gabon; ibid.; ibid.; ibid.; ILCA, P.O. Box 46847, Nairobi, Kenya; ibid.; ibid.; ibid.; ibid.
Prophylactic treatment with 1 mg/kg body weight of isometamidium chloride improved calving rate from 0.50 to 0.66 ($P < 0.01$) among lactating N'Dama cows but had no effect on the calving rate of non-lactating cows. The difference in calving rate was brought about by a

low calving rate of 0.29 in untreated cows which became parasitaemic during the breeding season, particularly in cows which were treated with diminazene aceturate at 7 mg/kg when the PCV fell below 25% (calving rate, 0.13). Treatment also significantly improved calf weaning weight at 8 months from 97 to 102 kg ($P < 0.01$). Analysis of subsequent monthly trypanosome prevalence when cows were not treated prophylactically showed no significant difference in prevalence between previously treated and untreated cows. There was no evidence, therefore, of changes in subsequent susceptibility to trypanosomiasis. The impairment to fertility was greatest in cows apparently failing to control development of anaemia.

7. experimental trypanosomiasis

(a) DIAGNOSTICS

8403 **Hunter, C.A., Jennings, F.W., Murray, M. and Kennedy, P.G.E., 1993.** Detection of trypanosomes in drug treated mice using the polymerase chain reaction. [*T. brucei*.] (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), p. 124.

Murray: Department of Veterinary Medicine, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK.

(b) PATHOLOGY AND IMMUNOLOGY

8404 **Bajyana Songa, E., Lucas, R., Magez, S., Darji, A., Baetselier, P. de and Hamers, R., 1993.** Toxicité sanguine et tumor necrosis factor (TNF: facteur de nécrose tumorale) chez des animaux traités pour la trypanosomiase. [Blood toxicity and tumour necrosis factor (TNF) in animals treated for trypanosomiasis.] [*T. b. brucei*, *T. evansi*, *T. congolense*; mice.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 227.

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

8405 **Keku, T.O., Seed, J.R., Sechelski, J.B. and Balber, A., 1993.** *Trypanosoma brucei rhodesiense*: the inhibition of HL-60 cell growth by the African trypanosomes *in vitro*. *Experimental Parasitology*, **77** (3): 306-314.

Keku: Department of Epidemiology, School of Public Health, University of North Carolina at Chapel Hill, NC 27599-7400, USA.

8406 **Liu, E.-W., Otesile, E.B. and Tabel, H., 1993.** Immune lysis of *Trypanosoma congolense*: generation of a soluble covalent complex of variant surface glycoprotein and bovine complement component C3b. *Veterinary Immunology and Immunopathology*, **38** (1-2): 169-181.

Tabel: Department of Veterinary Microbiology, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada.

8407 **Magez, S., Lucas, R., Darji, A., Bajyana Songa, E., Hamers, R. and Baetselier, P. de, 1993.** Murine tumour necrosis factor plays a protective role during the initial phase of the experimental infection with *Trypanosoma brucei brucei*. *Parasite Immunology*, **15** (11): 635-641.

Magez: Unit of Cellular Immunology, Institute of Molecular Biology, Paardenstraat 65, B-1640 St-Genesius-Rode, Belgium.

8408 **Müller, N., Imboden, M., Detmer, E., Mansfield, J.M. and Seebeck, T., 1993.** Cytoskeleton-associated antigens from African trypanosomes are recognized by self-reactive antibodies of uninfected mice. [*T. b. rhodesiense*.] *Parasitology*, **107** (4): 411-417.

Seebeck: Institut für Allgemeine Mikrobiologie, University of Bern, Baltzerstrasse 4, CH-3012 Bern, Switzerland.

8409 **Rottenberg, M.E., Bakhiet, M., Olsson, T., Kristensson, K., Mak, T., Wigzell, H. and Örn, A., 1993.** Differential susceptibilities of mice genomically deleted of CD4 and CD8 to infections with *Trypanosoma cruzi* or *Trypanosoma brucei*. *Infection and Immunity*, **61** (12): 5129-5133.

Rottenberg: Department of Immunology, Karolinska Institute, S-10401 Stockholm, Sweden.

8410 **Schleifer, K.W. and Mansfield, J.M., 1993.** Suppressor macrophages in African trypanosomiasis inhibit T cell proliferative responses by nitric oxide and prostaglandins. [*T. b. rhodesiense*; mice.] *Journal of Immunology*, **151** (10): 5492-5503.

Mansfield: Laboratory of Immunology, Department of Animal Health and Biomedical Sciences, 1655 Linden Drive, University of Wisconsin-Madison, Madison, WI 53706, USA.

8411 **Uche, U.E. and Jones, T.W., 1993.** Pathways of complement (C3) activation in rabbits infected with *Trypanosoma evansi*. *APMIS*, **101** (5): 413-416.

Uche: Royal Veterinary College, Royal College Street, London NW1 0TU, UK.

8412 **Velthuysen, M.-L.F. van, Veninga, A., Bruijn, J.A., Heer, E. de and Fleuren, G.J., 1993.** Susceptibility for infection-related glomerulo-pathy depends on non-MHC genes. [*T. brucei*; mice.] *Kidney Inter-national*, **43** (3): 623-629.
Laboratory for Pathology, University of Leiden, P.O. Box 9603, 2300 RC Leiden, Netherlands.

(c) CHEMOTHERAPEUTICS

[See also **17**: nos. 8438, 8439.]

8413 **Chan, M.M.-Y., Grogl, M., Chen, C.-C., Bienen, E.J. and Fong, D., 1993.** Herbicides to curb human parasitic infections: *in vitro* and *in vivo* effects of trifluralin on the trypanosomatid protozoans. [Incl. *T. brucei in vitro*.] *Proceedings of the National Academy of Sciences of the United States of America*, **90** (12): 5657-5661.

Chan: Department of Biological Sciences and Bureau of Biological Research, Rutgers State University of New Jersey, Piscataway, NJ 08855-1059, USA.

8414 **Deken, R. de, Kageruka, P., Lootens, K., Schacht, E. and Geerts, S., 1993.** Efficacité des différents polymères contenant du bromure d'homidium à libération progressive dans la chimioprophylaxie des infections trypanosomiennes à *Trypanosoma (Nannomonas) congolense*. [Efficacy of different polymers containing homidium bromide as slow release devices for the chemoprophylaxis of *T. (N.) congolense* infection.] [Rabbits.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 179-180.

Deken, Kageruka, Geerts: Department of Animal Health and Production, Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp 1, Belgium; Lootens, Schacht: Department of Organic Chemistry, State University of Ghent, Krijgslaan 281, B-9000 Ghent, Belgium.

8415 **Gichuki, C.W., Nantulya, V.M. and Sayer, P.D., 1993.** Kinetics of trypanosome antigen clearance in *Trypanosoma brucei rhodesiense*-infected vervet monkeys following chemotherapy. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 116-117.

Gichuki, Sayer: KETRI, P.O. Box 362, Kikuyu, Kenya; Nantulya: ILRAD, P.O. Box 30709, Nairobi, Kenya.

Thirty-eight vervet monkeys (*Cercopithecus aethiopis*) with the meningoencephalitic stage of *Trypanosoma brucei rhodesiense* infection were treated with various trypanocidal drugs and observed for a period of more than 600 days; 33 of the treated monkeys were considered to have been cured. Analysis of serum and CSF samples for trypanosome antigens by ELISA revealed a gradual but progressive decline in antigen titres in the cured animals, with CSF antigen levels falling faster than serum levels. The rate of decline in antigen titres was estimated by calculating the percentage reduction in ELISA optical density (ROD) for samples taken at 2 week intervals following treatment. The reduction in serum and CSF ODs in animals treated

i.v. with melarsoprol and considered to have been cured reached the 50% mark (ROD_{50}) after 26-250 (mean 116.4) and 36-160 (mean 68.6) days, respectively, following treatment. The decline was sustained until eventual elimination. The five uncured animals did not show significant reductions in ODs, and parasitological relapses occurred within 214 days following treatment, indicating that persistence of antigens was a reflection of persisting infection. The animals treated using various experimental drug combinations, and considered to have been cured, displayed different patterns of antigen clearance. Some showed a persistence of antigens following treatment which may have been due to a failure of the drugs to clear the parasites from cryptic foci. Antigen ELISA may thus be a useful tool for evaluation of treatment success.

8416 **Gimbi, A.A. and Kinabo, L.D., 1992.** Influence of atropine on the acute toxicity of isometamidium. [Mice, goats.] *Veterinary and Human Toxicology*, **34** (5): 398-400.

Department of Veterinary Physiology, Biochemistry, Pharmacology and Toxicology, Faculty of Veterinary Medicine, Sokoine University of Agriculture, P.O. Box 3017, Morogoro, Tanzania.

8417 **Gool, F. van, 1993.** Toxicité du chlorure d'isométamidium chez le rat après administration réitérée par voie orale pendant 13 semaines. [Isometamidium chloride toxicity to rats after repeated oral administration for 13 weeks.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 265.

Rhône Mérieux, 10 rue Rupunger, 69004 Lyon, France.

8418 **Gool, F. van, 1993.** Le chlorure d'isométamidium: évaluation des potentialités mutagènes et tératogènes. [Isometamidium chloride: evaluation of its mutagenic and teratogenic potential.] [Rats.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 266-267.
Rhône Mérieux, 10 rue Rupunger, 69004 Lyon, France.

8419 **Jennings, F.W., 1993.** Combination chemotherapy in the treatment of experimental CNS-trypanosomiasis. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 155-156.
Department of Veterinary Parasitology, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK.
The successful treatment of late-stage trypanosomiasis depended on the arsenical drug melarsoprol until, in the case of *Trypanosoma brucei gambiense* infections, difluoromethylornithine (DFMO) was introduced. Some patients who relapsed after melarsoprol monotherapy (melarsoprol-resistance) have been treated with nifurtimox. Investigations have shown that using a combination treatment of DFMO and melaminyl arsenicals, cures can be achieved using low doses of arsenical. Thus it should be possible to both decrease the incidence of `reactive encephalopathies' and at the same time increase the efficacy of treatment, thereby reducing the number of relapses. The period required for this DFMO/arsenical treatment would be approximately 14 days. Recent work has demonstrated that the arsenicals can also be potentiated by certain nitroimid-azoles, resulting in cures of CNS-trypanosomiasis in experimentally infected mice using a 2 day treatment regimen. A universal treatment regimen for early- and late-stage trypanosomiasis is therefore possible. Furthermore, a 2 day treatment period means that it should be feasible to treat village livestock to eradicate their CNS-trypanosomes, thus eliminating this potential reservoir of infection.

8420 **Maathai, R.G., Masiga, R.C., Sayer, P.D., Ngure, R.M. and Ndung'u, J.M., 1993.** The role of propylene glycol in melarsoprol toxicity during treatment of *Trypanosoma rhodesiense* infected mice. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 152-153.
KETRI, P.O. Box 362, Kikuyu, Kenya.

8421 **Maes, L., Bajyana Songa, E. and Hamers, R., 1993.** Mise au point et évaluation d'un nouveau trypanocide. [Development and evaluation of a new trypanocide.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 177-178.

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

A new drug molecule (IMOL 881) has been synthesised and is showing interesting trypanocidal properties. Test results on animal models indicate good trypanocidal activity against several parasite species, including *Trypanosoma brucei rhodesiense, T. b. gambiense, T. evansi, T. equiperdum* and *T. b. brucei*. This, combined with a relatively low acute toxicity, results in a high therapeutic index and offers a wide safety margin for the treatment of chemoresistant parasite strains. The drug also seems to exhibit potential as a prophylactic, as evidenced by tests on drug-treated mice infected subsequently with *T. evansi*. The pre-liminary evaluation suggests that the new drug may be developed into an efficient and polyvalent trypanocide, for both human and animal trypanosomiases.

8422 **Murphy, N.B., Ndoutamia, G., Jamnadass, R. and Peregrine, A.S., 1993.** Towards understanding the molecular basis of drug resistance. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 192-193.

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

8423 **Mutugi, M.W., Boid, R. and Luckins, A.G., 1993.** The efficacy of suramin is dependent on parasite inoculum dose and timing of treatment. [Mice.] (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 183.

KETRI, P.O. Box 362, Kikuyu, Kenya; CTVM, Easter Bush, Roslin, Midlothian EH25 9RG, UK; ibid.

8424 **Nok, A.J., Esievo, K.A.N., Longdet, I., Arowosafe, S., Onyenekwe, P.C., Gimba, C.E. and Kagbu, J.A., 1993.** Trypanocidal potentials of *Azadirachta indica*: *in vivo* activity of leaf extract against *Trypanosoma brucei brucei*. [Mice, rats.] *Journal of Clinical Biochemistry and Nutrition*, **15** (2): 113-118.

Nok: Department of Biochemistry, Ahmadu Bello University, Zaria, Nigeria.

8425 **Sutherland, I.A., Mounsey, A. and Holmes, P.H., 1993.** The uptake of isometamidium chloride (Samorin) by *Trypanosoma congolense*. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), p. 187.

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

8426 **Yunmbam, M.K. and Roberts, J.F., 1993.** *In vivo* evaluation of reuterin and its combinations with suramin, melarsoprol, DL-α-difluoromethyl-ornithine and bleomycin in mice infected with *Trypanosoma brucei brucei*.

Comparative Biochemistry and Physiology (C), **105** (3): 521-524.
Roberts: Department of Zoology, North Carolina State University, Raleigh, NC 27695-7617, USA.

8. trypanosome research
(a) CULTIVATION OF TRYPANOSOMES
(b) TAXONOMY, CHARACTERISATION OF ISOLATES
[See also **17**: no. 8352.]

8427 **Enyaru, J.C.K., Gashumba, J.K., Odiit, M., Okuna, N.M., Nadide-Mudambi, M. and Sebikali, C., 1993.** Isoenzyme characterization of some *Trypanozoon* stocks from south-eastern Uganda. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 125-126.
UTRO, P.O. Box 96, Tororo, Uganda.
Forty-one *Trypanozoon* isolates (25 from humans, nine from cattle, two from pigs and five from *Glossina fuscipes fuscipes*) from Busoga and Tororo were compared and 13 trypanosome zymodeme groups were identified. Five groups were circulating in the human population, of which four had been previously identified from Busoga. Eleven *Trypanozoon* isolates from domestic animals belonged to six zymodeme groups. Two groups which had trypanosomes identical to those in man were found in cattle and a pig, implicating domestic animals as a reservoir of the human disease. Out of five trypanosome isolates from *G. f. fuscipes*, one had enzyme patterns similar to those of isolates from humans and cattle and belonged to zymodeme group 2; the remaining four belonged to different zymodeme groups.

8428 **Stevens, J.R., 1993.** Evaluation of species, subspecies and strain groups in trypanosomes by personal computer. (Abstract only.) *In*: OAU/ STRC, 1993 (see **17**: no. 8321), p. 225.
Tsetse Research Group, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

8429 **Truc, P., 1993.** Isoenzyme characterization of *Trypanosoma brucei* stocks isolated from Congo and Zaire: epidemiological significance. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 248-249.
UMR CNRS/ORSTOM 9926, ORSTOM, B.P. 5045, 34032 Mont-pellier Cedex 01, France.
A cellulose acetate electrophoresis isozyme study was carried out on 55 stocks of *T. brucei* isolated from man and animals in Congo and Zaire. Out of the 24 loci surveyed, 15 exhibited variability which made it possible to delimit 23 zymodemes divided into two groups. The first one could be equated to *T. b. gambiense*,

while the second corresponded to *T. b. brucei*. These results broadly agree with current taxonomy. Statistical analysis showed basically clonal reproduction of the trypanosomes in the area studied. The geographic distribution of the clones or zymodemes supports an endemo-epidemic pattern of human trypanosomiasis in Central Africa. The circulation of asymptomatic patients seems to disseminate sleeping sickness, and human and animal reservoirs contribute to maintaining the main historic foci in Congo and Zaire, which have a common origin.

8430 **Waihenya, R., Masake, R.A. and Kinoti, G.K., 1993.** Characterization of *Trypanosoma congolense* stocks using molecular karyotyping. (Abstract only.) *In*: OAU/STRC, 1993 (see **17**: no. 8321), pp. 230-231.
ILRAD, P.O. Box 30709, Nairobi, Kenya; ibid.; Department of Zoology, University of Nairobi, Nairobi, Kenya.

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

8431 **Affranchino, J.L., González, S.A. and Pays, E., 1993.** Isolation of a mitotic-like cyclin homologue from the protozoan *Trypanosoma brucei*. *Gene*, **132** (1): 75-82.
Affranchino: Centro de Virología Animal, Serrano 661 (1414), Buenos Aires, Argentina.

8432 **Aksoy, S., 1993.** A family of target site-specific retrotransposons interrupts spliced leader RNA genes in trypanosomatids. [Incl. *T. brucei*.] (Review.) *Journal of Parasitology*, **79** (5): 645-651.
Yale MacArthur Center for Molecular Parasitology, Department of Internal Medicine, Yale University School of Medicine, P.O. Box 3333, New Haven, CT 06510, USA.

8433 **Bayne, R.A.L., Kilbride, E.A., Lainson, F.A., Tetley, L. and Barry, J.D., 1993.** A major surface antigen of procyclic stage *Trypanosoma congolense*. *Molecular and Biochemical Parasitology*, **61** (2): 295-310.
Barry: Wellcome Unit of Molecular Parasitology and Institute of Genetics, University of Glasgow, Church Street, Glasgow G11 5JS, UK.

8434 **Beecroft, R.P., Roditi, I. and Pearson, T.W., 1993.** Identification and characterization of an acidic major surface glycoprotein from procyclic stage *Trypanosoma congolense*. *Molecular and Biochemical Parasit-ology*, **61** (2): 285-294.

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

8435 **Bienen, E.J., Maturi, R.K., Pollakis, G. and Clarkson, A.B., 1993.** Non-cytochrome mediated mitochondrial ATP production in bloodstream form *Trypanosoma brucei brucei*. *European Journal of Biochemistry*, **216** (1): 75-80.

Clarkson: Department of Medical and Molecular Parasitology, New York University School of Medicine, 550 First Avenue, New York, NY 10016, USA.

8436 **Burri, M., Schlimme, W., Betschart, B., Kämpfer, U., Schaller, J. and Hecker, H., 1993.** Biochemical and functional characterization of histone H1-like proteins in procyclic *Trypanosoma brucei brucei*. *Parasitology Research*, **79** (8): 649-659.

Hecker: Swiss Tropical Institute, Postfach, CH-4402 Basel, Switzerland.

8437 **Englund, P.T., 1993.** The structure and biosynthesis of glycosyl phosphatidylinositol protein anchors. (Review.) *Annual Review of Biochemistry*, **62**: 121-138.

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

8438 **Guo, J.Q., Wu, Y.Q., Farmer, W.L., Douglas, K.A., Woster, P.M., Garofalo, J. and Bacchi, C.J., 1993.** Restricted rotation analogs of *S*-adenosylmethionine: synthesis, evaluation as inhibitors of *S*-adenosylmethionine decarboxylase and potential use as selective antitrypanosomal agents. [*T. b. brucei*.] *Bioorganic and Medicinal Chemistry Letters*, **3** (2): 147-152.

Guo: Department of Pharmaceutical Sciences, Wayne State University, Detroit, MI 48202, USA.

8439 **Knowles, G., 1993.** The effects of arphamenine-A, an inhibitor of aminopeptidases, on *in-vitro* growth of *Trypanosoma brucei brucei*. (Letter.) *Journal of Antimicrobial Chemotherapy*, **32** (1): 172-174.

AFRC Institute of Animal Physiology and Genetic Research, Edinburgh Research Station, Roslin, Midlothian, UK.

8440 **Lodes, M.J., Smiley, B.L., Stadnyk, A.W., Bennett, J.L., Myler, P.J.**

and Stuart, K., 1993. Expression of a retroposon-like sequence upstream of the putative *Trypanosoma brucei* variant surface glycoprotein gene expression site promoter. *Molecular and Cellular Biology*, **13** (11): 7036-7044.
Stuart: Seattle Biomedical Research Institute, 4 Nickerson Street, Seattle, WA 98109-1651, USA.

8441 **Metzenberg, S., Joblet, C., Verspieren, P. and Agabian, N., 1993.** Ribosomal protein L25 from *Trypanosoma brucei*: phylogeny and molecular co-evolution of an rRNA-binding protein and its rRNA binding site. *Nucleic Acids Research,* **21** (21): 4936-4940.
Intercampus Program in Molecular Parasitology, University of California, San Francisco, CA 94143-1204, USA.

8442 **Michalon, P., Couturier, R., Bender, K., Hecker, H. and Marion, C., 1993.** Structural analysis of *Trypanosoma brucei brucei* chromatin by limited proteolysis: an electrical-birefringence study. *European Journal of Biochemistry*, **216** (2): 387-394.
Marion: Laboratoire de Biologie Structurale, Université Pierre et Marie Curie (Paris VI), 9 quai Saint Bernard, F-75252 Paris Cedex 05, France.

8443 **Phillips, C., Barrett, M.P., Gover, S., LePage, R.W.F. and Adams, M.J., 1993.** Preliminary crystallographic study of 6-phosphogluconate dehydrogenase from *Trypanosoma brucei*. *Journal of Molecular Biology*, **233** (2): 317-321.
Phillips: Laboratory of Molecular Biophysics, Oxford University, Rex Richards Building, South Parks Road, Oxford OX1 3QU, UK.

8444 **Ralton, J.E., Milne, K.G., Güther, M.L.S., Field, R.A. and Ferguson, M.A.J., 1993.** The mechanism of inhibition of glycosyl-phosphatidylinositol anchor biosynthesis in *Trypanosoma brucei* by mannosamine. *Journal of Biological Chemistry*, **268** (32): 24183-24189.
Ferguson: Department of Biochemistry, University of Dundee, Dundee DD1 4HN, UK.

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