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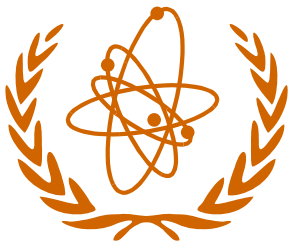

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SECTION A – NEWS

PROGRAMME AGAINST AFRICAN TRYPANOSOMIASIS

Fourth Meeting of the Advisory Group Co-ordinators

The Fourth PAAT Advisory Group Co-ordinators Meeting was held in Harare from 21 to 23 October 1998 and was attended by about 30 experts and PAAT Co-ordinators.

The meeting endorsed the PAAT Position Papers on 'Drug management and parasite resistance in bovine trypanosomiasis in Africa' and on 'The economic impacts of trypanosomiasis'. The former is subsequently being published as the first volume in a new series of publications entitled *PAAT Technical and Scientific Series*.

Much discussion focused on the further development of the five point action plan for control of animal trypanosomiasis based on priorities at both the regional and national levels. Criteria for the identification of priority areas were discussed and agreed in principle. With regard to the technologies to be applied, it was agreed that there is a need to consider the integration of existing tools available for the control of both the parasite and the vector. Some concern was expressed over the somewhat slow rate of achievement being recorded through current approaches to tsetse control based on the use of bait technologies applied at the community and farmer level. The Secretariat was requested to bring this concern to the attention of the Programme Committee and to consider options for a more sustainable and progressive attack against the vector based on the incorporation of sequential aerial spraying perhaps in combination with more modern techniques such as the sterile insect technique.

The full report of the meeting will be available on request to the FAO PAAT Secretariat by mid-December 1998.

CURRENT RESEARCH

Community participation in the control of tsetse (RTTCP)

There has been a growing appreciation worldwide that sustainable development requires the participation of the beneficiary communities. In many parts of West Africa, the community has been involved successfully in the small-scale control of tsetse. In Southern Africa, however, the tsetse problem involves predominantly the savanna species *Glossina morsitans* and *G. pallidipes*, which are highly mobile over large areas. A participatory approach has to be adjusted accordingly.

A trial to assess the feasibility of involving the community in controlling savanna species was initiated in 1995 by the Regional Tsetse and Trypanosomosis Control Programme (RTTCP) in collaboration with the Assistance to Veterinary Services of Zambia (ASVEZA) project and the Zambian Department of Animal Production and Health. The trial is conducted in 925 km^2 of the Msanzara area in Petauke and Katete Districts of the Eastern Province of Zambia. The tsetse species present is *G. morsitans morsitans*. The parasitological prevalence of bovine trypanosomosis was high (approximately 40%) and significantly reduced the reproductive performance of cattle.

The trial is being implemented with the assistance of two facilitators and nine technical staff. Between June and October 1995, a total of 3654 targets (a simpler version of the all black S-type target consisting of a piece of black cotton cloth, 1.5 × 1.0 m, tied to three bamboo poles using ribbons) were deployed. The community provided free labour. Deployment work was divided between 56 village groupings, each being responsible for an average of 65 targets. A total of 8836 villagers (or 14% of the total population in the area) assisted with target deployment. This level of participation provided sufficient labour for the target deployment exercise. Target maintenance started in August 1995 and is ongoing. During target maintenance, participation declined from 2.4 villagers per target during the deployment phase to, on average, 1.3 villagers per target a year later. Most of the partici-pants were cattle owners.

The apparent density of tsetse in the trial area declined drastically from, on average, 5 flies per fly round before, to 0.01 flies per fly round 10 months after target deployment. Trypanosomosis incidence declined from 39% to 8%.

The involvement of the community in target deployment and maintenance and the modifications in the target design significantly reduced the levels of theft. Over a period of 6 months the theft of target material in the community participation area was 6%, compared to 33% in an adjacent area where the community was not involved.

Recently, a sociological survey was conducted to establish the feasibility of handing over the full financial responsibility of the trial to the beneficiaries. Depending on the outcome of the survey, attempts will be made to get money from the communities to pay for the costs of target maintenance.

Joint FAO/IAEA Division Technical Co-operation Projects

Integrated tsetse control in Buvuma Island, Uganda (UGA/5/018)

Glossina fuscipes fuscipes is an important vector of both human and animal trypanosomosis on Buvuma Island, Lake Victoria. Recent mark-release-recapture experiments have shown that 70% of the flies are to be found along the shoreline of the island. Trapping activities are therefore concentrated around the shore. However, trapping alone is not reducing the fly population fast enough and also, once sterile fly releases start, the traps will also kill the released flies.

The project is therefore investigating the potential of autosterilisation using the insect growth regulator triflumuron with treatment devices (TD) mounted on conventional traps. Flies entering the trap pass up into the TD where they pick up a dose of the triflumuron before escaping from the open top. Triflumuron acts by disrupting the enzyme chitinase, so preventing the formation of new exoskeleton. As a result, insects either fail to moult at all or the newly emerged stage dies. The chemical is passed on from the treated female fly to her developing larva *in utero* which dies at the next moult. One dosing can render a female unable to produce viable pupae for life, and a dosed male can pass sufficient triflumuron to a female at mating to prevent pupal production for several cycles. Released sterile males are unharmed by the dosing. Trials are now under way in four peninsulas on Buvuma to compare the effects of conventional insecticide-treated traps with TD traps.

***Integrating SIT for tsetse eradication in Ethiopia* (ETH/5/012)**

Five field teams have been established to implement this tsetse eradication programme in the Southern Rift Valley (25,000 km^2) and training has now started in all aspects of the work. A recent workshop in Sodo, which was attended by the five team leaders and their technicians, covered: mapping techniques; vegetation and soil classification; plant sampling techniques; note-taking during field trips; tsetse morphology, reproduction, dissection techniques, physiological ageing of flies, wing fray, species determination, etc.; and a field guide has been prepared and distributed.

A meeting was held in April 1998 between project staff, researchers from Addis Ababa University and national research institutes, and various visiting experts with the purpose of establishing the baseline data that must be collected, or extracted from existing sources, for effective planning and implementation of the eradication programme and post-eradication land use. All the data collected will be integrated in a GIS to facilitate decision making and report preparation, as well as providing a model to assess the suitability of the area-wide intervention campaign integrated with SIT in specific circumstances. The data to be collected will include: tsetse species; seasonal tsetse density and trypanosome infection rate; livestock distribution; trypanosomosis prevalence and trypanosome species distribution; agricultural activities; agricultural potential; direct and indirect cost of trypanosomosis; environmental impact of trypanosomosis and tsetse eradication operations.

PUBLICATIONS

Forthcoming FAO publications

The PAAT has launched a new publication series entitled *PAAT Technical and Scientific Series*. The first one should be out in November and will be the first of the PAAT commissioned Position Papers on 'Drug management and parasite resistance in bovine trypanosomiasis in Africa' by S. Geerts and P.H. Holmes.

The FAO Manual 'Field guide for the diagnosis, treatment and prevention of African animal trypanosomiasis' by W.P. Boyt, first published some 20 years ago, has been revised and updated and is expected to be available early next year in English and French. Information on non-tsetse transmitted trypanosomes has been included to make it useful to a broader range of technical and field personnel.

Trypnews

Trypnews is a free quarterly scientific and technical bulletin devoted to information on haemoparasites affecting production animals in tropical and sub-tropical areas of America and of the whole world, and related haemoparasites in humans and wild animals.

The bulletin was originally developed by Dr Sandra Vokaty of the Interamerican Institute of Cooperation for Agriculture (IICA) and Dr Marc Desquesnes of CIRAD-EMVT during 1994-1996 as a forum for discussion and information on New World trypanosomes, after which publication lapsed. Dr Rita Tamasaukas of Rómulo Gallegos University, Venezuela, is now responsible for relaunching the bulletin.

Trypnews aims to publish scientific articles, reviews, reports of research projects, case studies, brief research notes, technical notices, letters, information on courses and conferences, etc. The languages for this bulletin are Spanish and English.

For further information, contact the Chief Editor, Dr Rita Tamasukas, Rómulo Gallegos University, LABIPRESAN, Avenida Universitaria, Sector El Castrero, San Juan de los Morros, estado Guárico, Venezuela (e-mail rtamasa@reacciun.ve; rtamasa@cantv.net; rtamasa@hotmail.com; 104551.315@compuserve.com; see also http://cbb.ivic.ve/simbio/rita.html).

MEETINGS

5th Biennial Conference of the Society for Tropical Veterinary Medicine (STVM'99)

This conference, entitled 'Tropical Diseases: Control and Prevention in the Context of 'The New World Order'', will take place from 12 to 16 June 1999 in Key West, Florida, USA. Further information is available at http://www.ifas.ufl.edu/~conferweb/stvm.htm or from Paul Gibbs, Conference Chair, e-mail bamt@gnv.ifas.ufl.edu or fax (352) 392-5685.

17th International Conference of the World Association for the Advancement of Veterinary Parasitology

This conference, entitled 'Parasites, Production and Environment', will be held at the Royal Veterinary and Agricultural University in Copenhagen, Denmark, from 15 to 19 August 1999. The scientific programme will cover a wide variety of disciplines within veterinary parasitology, the main themes being: economic impact of parasitic disease in production animals; epidemiology and control; chemotherapy/pharmacokinetics; immunity and pathology of parasite infection; integrated and biological parasite control in conventional and organic farming systems; nutrition-parasite interactions; implementation of research findings to the end user; molecular and biochemical parasitology; parasitic zoonoses; basic parasite biology; parasites in wildlife/Arctic parasitology; parasites in cultured and feral fish; parasites in poultry. The language of the conference is English.

For further information, see http://www.waavp99.kvl.dk, or contact the Conference Secretariat at: International Conference Services, P.O. Box 41, Strandvejen 171, DK-2900 Hellerup, Denmark (tel. +45 39 46 05 00; fax +45 39 46 05 15; e-mail WAAVP99@ ics.dk).

VIIIth European Multicolloquium of Parasitology (EMOP 2000)

The Multicolloquium will be held in Poznan, Poland, from 10 to 14 September 2000. It will be organised by Z. Pawlowski and K. Boczon. Further information can be obtained from: Prof. Krystyna Boczon, VIIIth European Multicolloquium of Parasitology, Depart-ment of Biology and Medical Parasitology, Karol Marcinkowski University of Medical Sciences, Fredry 10, 60-701 Poznan, Poland (tel. +48 61 85211 61; fax +48 61 85271 92).

SECTION B – ABSTRACTS

1. GENERAL (INCLUDING LAND USE)

10585 **Bouchet, B., Legros, D. and Lee, E., 1998.** Key indicators for the monitoring and evaluation of control programmes of human African trypanosomiasis due to *Trypanosoma brucei gambiense*. *Tropical Medicine and International Health*, **3** (6): 474-481.

Bouchet: 1203 Hollins Lane, Baltimore, MD 21209, USA.

Very little research has been devoted to the design of epidemiological tools for the monitoring and evaluation of national human African trypanosomiasis control programmes, and daily management decisions are made in the absence of accurate knowledge of the situation. This paper identifies key indicators necessary to make decisions in the field and constantly adjust control activities to changing situations. Examples are derived from the Médecins Sans Frontières HAT Control Programme in Adjumani, Uganda. Based on the principles of quality assurance, the focus is placed on process indicators. A conceptual framework derived from a system view/planning cycle perspective is also described for the construction of indicators. Finally, some specific challenging aspects of the epidemiology of HAT are presented and the limitations of the interpretation of the indicators are discussed.

10586 **Etame Ewane, 1997.** Evaluation sociologique des approches de contrôle de la trypanosomiase humaine africaine dans le Mbam. [Sociological evaluation of approaches to the control of human African trypanosomiasis in Mbam.] (Meeting abstract no. T3.1.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 87.

Faculté de Médecine et des Sciences Biomédicales, Université de Yaoundé I, Yaoundé, Cameroon.

Since 1967, when only one or two new cases of HAT per 10,000 persons examined were seen, HAT in Mbam focus, Cameroon, has once more attained the dramatic level seen in days gone by. The deterioration in the situation, despite many case-finding surveys and efforts at treatment, is attributed to three factors: the lack of qualified personnel, the lack of financial means, and the lack sometimes of methodology. A fourth reason can also be mentioned: the lack of a clear definition of the sociological determinants of HAT. Studies on all aspects of community life need to be undertaken using methods developed in different sciences (entomology, ethnology, sociology, geography, epidemiology, economics). Since the institution by WHO of a system of enquiry into communities' knowledge, attitudes, behaviour and practices, the sociological aspects of the problems of HAT are better defined, and formed the object of a study in Mbam in 1983-1984.

10587 **Jannin, J. and Cattand, P., 1997.** Evolution du principe de coordination des activités de lutte contre la trypanosomiase. [Evolution of the principle of coordinating trypanosomiasis control activities.] (Meeting abstract no. T2.1.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 79.

Jannin: Trypanosomiasis and Leishmaniasis Control Unit, Division of Control of Tropical Diseases (CTD), WHO, Geneva, Switzerland.

Faced with the recrudescence of human African trypanosomiasis in numerous countries, WHO/CTD created in 1984 a programme for the prevention of HAT and the control of this disease within the context of primary health care, its objective being to assure international coordination and facilitate collaboration between countries. In 1992, CTD proposed an Initiative for Central Africa after progression of the disease in that region. The concept of coordination continued, found financial support from several governments and drug producers, and resulted in 1995 in a programme for the coordination of control activities against HAT in Central and West Africa, funded by the French government: this consisted of support with human resources, the financing of coordination activities and the creation of funds for operational research and the development of pilot projects. Today Angola, Benin, Burkina Faso, Cameroon, Congo, Côte d'Ivoire, Gabon, Guinea, Equatorial Guinea, Togo, Mali, Uganda, the Central African Republic, Chad and Zaire actively participate in this programme, with OCEAC and OCCGE providing coordination at a regional level. Regular meetings are held by national representatives to exchange experiences, define common control tools, and harmonise methods and strategies. The concept of coordination has now enlarged to include many non-governmental organisations and institutions, and the European Union is funding a regional control programme in East Africa (Farming in tsetse controlled areas), including Uganda, Kenya, Ethiopia and Tanzania. The goal of a common approach and jointly defined priorities has been reinforced by the creation by FAO, WHO, IAEA and OAU/IBAR of PAAT which encompasses both human and animal trypanosomiasis in the context of rural development and food security.

10588 **Ngar-Ndigoum, K., 1997.** Etude anthropologique: femmes et THA à Tapol/ Moundou – Tchad. [Anthropological study: women and HAT at Tapol/ Moundou, Chad.] (Meeting abstract no. T3.4.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 89.

Ministère de la Santé Publique, Ndjaména, Chad.

An anthropological study was carried out in 1993 at the end of the rainy season in the eleven villages of the Tapol district. Its objective was to investigate the knowledge, behaviour and recourse to treatment regarding HAT by the women using a non- and semi-directive method of interview. The populations of these villages are more than 70 km from Moundou and situated at the edges of forest galleries where tsetse flies live. The women questioned were ignorant of the mode of transmission of sleeping sickness and believed it to be incurable and fatal. Anyone thought to be suffering from the disease is excluded from the community and straightaway completely isolated from his/her family. The body of the victim is denied a family or village burial and all his/her possessions are

burnt. In the past, marriage was refused with the children of victims. Certain traditional chiefs ban matrimonial unions with, and travel or visits of their populations to, villages at risk. Also the populations of non-affected villages treat those of affected villages with disdain, and expel from the village anyone recognised as ill. Sleeping sickness thus destroys the social structure of the community and nullifies the agro-economic activity of affected families.

10589 **Reid, R.S., Drummond, R. and Gardiner, A.J., 1997.** Impacts of land-use change on vegetative structure and plant biodiversity following tsetse control in the mid-Zambezi Valley, Zimbabwe. (Meeting abstract.) *Bulletin of the Ecological Society of America*, **78** (4 Suppl. 1): 300.

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

To quantify the influence of cropping and grazing expansion on vegetation following successful tsetse control, sites in wildlife conservation areas were compared with those in adjacent communal farmlands across mopane, miombo and alluvial vegetation types. Cropland supported less woody canopy cover than wildlife areas in miombo vegetation, but the same amount of cover in alluvial areas. Similarly, grazed land was less species rich than wildland in mopane vegetation, but more species rich in miombo. Each land-use type had a highly unique species composition. Although many wildland species would be lost on conversion to agriculture, farmers conserve some important species that are rare in wildlife areas. The differences in the type, direction and magnitude of land-use impacts shown in this study suggest that the opportunities for influencing system trajectories during agricultural conversion may be great.

10590 **Stanghellini, A., 1997.** Trypanosomiase – stratégies de lutte. [Trypanosomiasis: control strategies.] (Meeting abstract: overview.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 77-78.

Mission Française de Coopération, Luanda, Angola.

Human African trypanosomiasis continues to increase in extent in most of the countries subject to the disease. For many years alarm bells have been sounded by those in positions of responsibility without much effect. Nevertheless, some progress has been achieved in recent years, although it has proved difficult to start afresh implementing effective strategies and methods of control. The reasons for this include: duration of control activities against the disease (2-3 year projects undertaken by foreign partners doomed to failure); participation of populations (obligation in certain countries to present oneself for screening largely ignored, health education and training necessary but this inclined to lapse as prevalence of the disease diminishes, participation should include involvement in surveillance and vector control); participation of technicians (should be well trained, properly paid, with good working conditions and adequate supervision); political will (a clear declaration of national policy, nomination of a person responsible for the national control programme, a budget specifically for this purpose, appointment of personnel of sufficient quality and number); disorganisation of health services (regular screening in affected villages needed to facilitate early treatment and break the

transmission cycle); epidemiological surveillance (relatively demanding in manpower and materials, therefore too often neglected by those with responsibility who are therefore unprepared for the next outbreak).

10591 **Touko, A., Kemmegne, J. and Nguemen, F., 1997.** Etude de quelques facteurs humains relatifs à la trypanosomiase humaine africaine (THA) dans le foyer de Santchou. [Study of some human factors relating to HAT in the Santchou focus.] (Meeting abstract no. T3.2.) *Bulletin de Liaison et de Documentation de l'OCEAC,* **30** (3): 87-88.

Touko: Forum Camerounais de Psychologie, B.P. 8030, Yaoundé, Cameroon.

An investigation of the knowledge and practices of the people living in the Santchou focus, Cameroon, vis-à-vis HAT was undertaken in September and October 1996, using a questionnaire (quantitative aspects), and structured interviews with key informants and focus group discussions (qualitative aspects). Altogether 1392 people (54.4% male) aged between 15 and 96 from six villages were included in this study: their educational level was low, only 29% having received secondary education. More than half (59%) were unaware that it was possible to have the infection while appearing well. Regarding clinical signs, 31.1% could not name a single symptom of HAT, while others included symptoms of filariosis. Many (40.5%) did not know that tsetse flies are the vector of HAT and suggested other modes of transmission such as heredity, sexual relations or lack of hygiene. As to prevention, only 11.3% knew that it was by means of tsetse traps that HAT could be avoided. The level of knowledge increased with the level of education and was significantly higher in men. These populations are mainly occupied in growing coffee and food crops which obliges them to be regularly in plantations, thus increasing their exposure to tsetse. The populations are very mobile, sometimes moving near the neighbouring focus of Fontem which increases the risk of spreading the parasite. Some false ideas about mobile teams were revealed, such as the belief that blood samples taken during surveys were used for commercial purposes. These and other prejudices, together with their gaps in knowledge and their way of life, constitute obstacles to the success of control based on community participation.

10592 **Wang Sonne, 1997.** Approche historique des principales étapes de la survenue de la maladie du sommeil dans le Mbam, 1921-1968. [Historical approach to the principal stages in the occurrence of sleeping sickness in Mbam, 1921-1968.] (Meeting abstract no. T3.3.) *Bulletin de Liaison et de Documentation de l'OCEAC,* **30** (3): 88-89.

Département d'Histoire, Faculté des Arts, Lettres et Sciences Humaines, Université de Yaoundé I, Yaoundé, Cameroon.

At the end of the 1960s a revival was seen in certain historic sleeping sickness foci in Cameroon, such as Bafia in the Mbam region. Immediately doctors, entomologists and other biologists intervened with a view to reducing the infection. However, the question arises whether it is possible to contain and extinguish this type of 'historic' focus, without

knowing the precise circumstances (places and dates) in which the epidemic arose. Charting the history of HAT in Mbam, from the discovery of the first cases by Dr Jamot in 1921 to the warning of the recrudescence given by Dr Medou in September 1967, three stages are identified: the period of trial and error (1921-1926), the realisation of the gravity of the plague, and the efforts deployed to reduce it (1926-1931), and the concern for complete health cover of the area and the relaxation of epidemiological surveillance (1931-1967), after which the disease returned. The data being used in this study have been gathered from the archives of the Fathers of the Holy Spirit in Chevilly-La-Rue (near Paris), from the archives of the Pharo at Marseille, from the National Archives of Yaoundé, from OCEAC headquarters also in Yaoundé, and from numerous informants in the field.

2. TSETSE BIOLOGY

(a) REARING OF TSETSE FLIES

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

[See also **21**: no. 10600.]

10593 **Goes van Naters, W.M. van der, Otter, C.J. den and Maes, F.W., 1998.** Olfactory sensitivity in tsetse flies: a daily rhythm. *Chemical Senses*, **23** (3): 351-357.

Goes van Naters: Department of Animal Physiology, University of Groningen, P.O. Box 14, 9750 AA Haren, Netherlands.

The diurnal tsetse *Glossina morsitans morsitans* bites especially in early morning and late afternoon; around midday feeding is at a low. In laboratory apparatus that measures the amount of locomotion under constant conditions over the photophase, the flies display a similar patterning of activity levels. The profile of daily rhythms for *G. morsitans* reported in the literature includes a number of motor and sensory motor systems that fluctuate cophasically. Lacking is a study on the patterning of the senses' response levels. In this paper we present the first instance of a daily modulation in the sense of smell. We stimulated the antennae with concentration series of host-derived odours and measured the spiking rate of cells at different times during the photophase. The concentration-response curves suggest that the sensitivity of antennal olfactory cells flows in parallel with the other daily rhythms. This was also reflected in electroantennograms (EAGs). The electro-antennography was extended to *G. fuscipes fuscipes*, whose level of spontaneous locomotor activity, instead of following a U-shaped pattern, rises gradually over the photophase. Again, the EAGs appeared to parallel the species' locomotor activity. We believe that the organism tones down the sensitivity of its odour receptors during periods of anticipated inactivity for reasons of economy.

10594 **Kence, A., Otieno, L.H., Dargi, N. and Mahamat, H., 1995 [1997].** Genetic polymorphisms in natural populations of tsetse fly, *Glossina pallidipes* Austen in Kenya. *Insect Science and its Application*, **16** (3-4): 369-373.

Kence: Department of Biology, Middle East Technical University, 06513 Ankara, Turkey.

Genetic differentiations in natural populations of the tsetse fly, *G. pallidipes*, collected from three ecologically distinct regions of Kenya, namely Lambwe Valley, Shimba Hills and Nguruman, were analysed based on two enzymes, phosphoglucomutase (PGM) and phosphoglucose isomerase (GPI). The PGM gene frequencies of allele (a) of male and female flies from Lambwe Valley showed significant differences. A dendrogram of populations collected from different localities showed two clusters, one comprising Shimba Hills, Majimboni and Muhaka Forest, and the other comprising Gendo, Homa Hills and Nguruman. This suggests that different subpopulations of *G. pallidipes* have adapted to different habitats.

10595 **McIntyre, G.S. and Gooding, R.H., 1998.** Effect of maternal age on offspring quality in tsetse (Diptera: Glossinidae). *Journal of Medical Entomology*, **35** (3): 210-215.

McIntyre: Department of Biological Sciences, University of Alberta, Edmonton, AB, T6G 2E9, Canada.

The effects of maternal age on offspring quality were studied in one line of *Glossina palpalis palpalis*, one line of *G. p. gambiensis*, and three lines of *G. morsitans morsitans* by measuring offspring adult size and the duration of the puparial period. *G. p. gambiensis* males also were examined for effects of maternal age on fluctuating asymmetry of wing veins. The puparial period was shorter in offspring of old females (late offspring) than in offspring of young females (early offspring). The difference was small but was greater for male than for female offspring. Early male offspring were larger than late males. Wing vein fluctuating asymmetry was slightly greater in early than in late offspring in *G. p. gambiensis*. The differences between early and late offspring were very small, and we conclude that old females produce offspring of marginally lower quality than those produced by young females and that these differences are not biologically significant.

10596 **Voskamp, K.E., Otter, C.J. den and Noorman, N., 1998.** Electroantennogram responses of tsetse flies (*Glossina pallidipes*) to host odours in an open field and riverine woodland. *Physiological Entomology*, **23** (2): 176-183.

Otter: Sensory Physiology Group, Department of Animal Physiology, University of Groningen, P.O. Box 14, NL-9750 AA Haren, Netherlands.

The present study was initiated to gain insight into the way in which tsetse flies sense odours at different locations in odour plumes in both an open field and a wooded area. We recorded the antennal responses (EAGs) from stationary living female *G.*

pallidipes 15 m upwind and at various distances (60, 40, 20, 10, 5 and 1 m) downwind from a synthetic host odour source (containing 1-octen-3-ol, acetone and two phenols), in the natural habitat of the fly (Zimbabwe) using a portable electrophysiological device. Experiments were performed in a flat open area (an airstrip) and in riverine woodland. Differences between responses in different environments were determined by comparing various parameters of the EAGs (intermittency, frequency, amplitude, duration and rate of depolarisation). We found that a fly senses odours as puffs that, further downwind, contain less odour and pass less frequently. In an open field downwind from the source, tsetse perceive more olfactory information than upwind for only 10-20 m, whereas in woodland, olfactory responses remain higher and more frequent than upwind up to at least 60 m. In an open field, olfactory information rapidly increases when approaching the odour source from 20 m and in woodland from 5 m onwards. It is proposed that averaging odour information over time may be of minor importance in long-range location of odour sources. The results suggest that tsetse may smell odour-baited targets from at least 60 m downwind and that the number of flies responding to and being caught by these baits may be higher in woodland than in an open field.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

[See also **21**: nos. 10593, 10639, 10640.]

10597 **Dagnogo, M., Yapi, Y., Traore, G. and Kone, M., 1997.** Redistribution des glossines dans une zone forestière ivoirienne? [Shift in the distribution of tsetse in the forest area of Côte d'Ivoire?] *Médecine tropicale*, **57** (3): 265-268.

Dagnogo: CEMV 01, B.P. 2597, Bouaké 01, Côte d'Ivoire.

The region of Abengourou is a well known historical sleeping sickness focus in the forest zone of Côte d'Ivoire. However, data from epidemiological studies carried out since 1980 show that this area is currently disease-free. This finding warrants study of the tsetse vectors to clarify the epidemiology of the disease in this area. Entomological surveys were carried out over a period of one year. Traps were used to capture tsetse flies in ten types of habitat: villages with or without pigs, tracks, coffee and cocoa plantations, encampments, cultivated and fallow fields, forest margins, and wilderness. Findings showed that the zoophilic species *Glossina nigrofusca* and *G. pallicera*, which accounted for less than 0.5% of tsetse captured, had almost disappeared and were captured only during the rainy season. The apparent trap density (ATD) of *G. palpalis*, the main vector of trypanosomiasis, was low overall. However, ATD values tended to be higher in villages with pigs (ATD 2.07 flies/trap/day) and forest margins (ATD 2.63 flies/trap/day) than in other habitats where values were always lower than 1 fly/trap/day. These very reduced numbers of *G. palpalis* can be attributed mainly to deforestation in most of the habitats studied, which has resulted in reduced contact with man. The absence of contact between man and anthropophilic tsetse could explain the disappearance of sleeping sickness from the Abengourou region, unlike the situation in Daloa and Vavoua.

10598 **Mohamed-Ahmed, M.M., 1998.** Olfactory responses of *Glossina fuscipes fuscipes* (Diptera: Glossinidae) to the monitor lizard *Varanus niloticus niloticus*. *Bulletin of Entomological Research*, **88** (3): 311-317.

Tsetse Unit, Mbita Point Field Station, ICIPE, P.O. Box 30, Mbita Point, Homa Bay, Kenya.

Visual and olfactory responses of *G. f. fuscipes* to the monitor lizard *V. n. niloticus* were studied using various catching devices near Lake Victoria, Kenya. Electric nets baited with visible lizards caught more males (× 2.1) and significantly more females (× 2.0) than unbaited nets. Lizards concealed in electrified black PVC pipe models, simulating the shape and size of a monitor lizard, significantly increased the catches of tsetse (× 2.1). Fresh lizard urine dispensed at an evaporation rate of 500-1000 mg/h also increased significantly the catches of flies at biconical traps, electrified models and electric nets. Identification of chemical constituents of the odour could improve monitoring and control strategies for *G. f. fuscipes*, and possibly for other *palpalis* tsetse species.

10599 **Muhigwa, J.-B.B., Saini, R.K. and Hassanali, A., 1998.** Effects of fly abundance on catch index of traps for *Glossina fuscipes fuscipes* (Diptera: Glossinidae). *Journal of Medical Entomology*, **35** (2): 148-152.

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

The effect of fly abundance on the catch index of traps and that of rain as a source of variation in fly abundance were investigated for *G. f. fuscipes* around Lake Victoria, western Kenya, using odour-baited (cow urine, acetone) and colour-improved (peony purple instead of black) biconical traps. There was a significant inverse relationship between the catch index of experimental traps and abundance of flies, the catch index being the ratio of catch in the experimental trap to catch in a reference trap. At low tsetse abundance (< 10 flies/trap/day) there was a 3-fold increase of the catch of females in the experimental trap compared with the control. Rainfall alone explained 22-87% of the total variation in fly abundance. It is suggested that fly abundance should be considered in evaluating baits for *G. f. fuscipes* or when using traps for monitoring. The relative depression of the catch index at high abundance may be related to avoidance of conspecifics. Flies entered standard traps in an inverse proportion to the number observed at the trap. Females approached traps in greater numbers when fewer decoys (dead flies) were placed on traps.

10600 **Torr, S.J. and Hargrove, J.W., 1998.** Factors affecting the landing and feeding responses of the tsetse fly *Glossina pallidipes* to a stationary ox. *Medical and Veterinary Entomology*, **12** (2): 196-207.

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

In Zimbabwe, studies were made of the landing and feeding responses of *G. pallidipes* on an ox. Of the tsetse approaching an ox, ≈ 70% fed. Increasing densities of tsetse increased the grooming responses of the ox but had no significant effect on the percentage of tsetse that engorged. The landing site of tsetse on the ox varied with density, with ≈ 50% landing on the legs at low densities (< 20 flies per ox), compared to ≈ 80% at densities > 40 flies per ox. For male *G. pallidipes*, the mean bloodmeal size was 37 mg. The probability of feeding was negatively correlated with fat content, declining from 91% for flies with < 1 mg fat to < 50% for flies with > 4 mg fat. Bloodmeal size was also negatively correlated with fat content; the regression equation relating bloodmeal size and fat content indicated that the mean wet weight declined from 42 mg for flies with 1 mg of fat to 31 mg for flies with 5 mg of fat. For females, the probability of feeding was not significantly affected by age as determined by ovarian category but there was a paucity of young (ovarian category 0) flies attracted to the ox. Pregnancy status had no significant effect on the probability of feeding, but samples of flies attracted to the ox showed a relative dearth of females approaching larviposition and a preponderance just after.

3. TSETSE CONTROL (INCLUDING ENVIRONMENTAL SIDE EFFECTS)

[See also **21**: no. 10640.]

10601 **Bossche, P. van den, 1997.** The control of *Glossina morsitans morsitans* (Diptera: Glossinidae) in a settled area in Petauke District (Eastern Province, Zambia) using odour-baited targets. *Onderstepoort Journal of Veterinary Research*, **64** (4): 251-257.

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

A trial to control *G. m. morsitans* with the use of 980 odour-baited (acetone), insecticide-impregnated (0.1% deltamethrin) targets was conducted in a 300 km^2 area in the Eastern Province of Zambia between 1989 and 1991. The area is highly cultivated with a high cattle density of about 8 cattle/km^2. Targets were deployed along roads and tracks only in suitable tsetse habitat. The effect of the targets on the tsetse population and on the transmission of tsetse-transmitted trypanosomosis was monitored by means of man-walked fly rounds and sentinel herds, respectively. The apparent density of tsetse in the trial area and in adjacent areas declined rapidly after targets had been deployed. Trypanosomosis incidence in the trial area decreased significantly but did not completely disappear. Results from the trial show that odour-baited targets are effective in controlling *G. m. morsitans* in highly cultivated areas even when deployment is restricted to suitable tsetse habitat. It is concluded that tsetse control operations should be designed so that either the invasion pressure is low from adjacent areas, or the size of the area is big enough for a central challenge-free area to be created.

10602 **Maniania, N.K., 1998.** A device for infecting adult tsetse flies, *Glossina* spp., with an entomopathogenic fungus in the field. *Biological Control*, **11** (3): 248-254.

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

Various chamber designs for infecting natural populations of *Glossina pallidipes*, *G. longipennis* and *G. fuscipes fuscipes* with the entomopathogenic fungus *Metarhizium anisopliae* were tested in the field. All three species of tsetse flies entered the chambers and became infected with the fungus. Mortality attributed to infection by *M. anisopliae* ranged from 0 to 76% for *G. pallidipes*/*G. longipennis* and from 0 to 80% for *G. fuscipes*. One design proved to be more efficient than the others in permitting the passage of flies and contaminating them with fungal conidia. Dry conidia of *M. anisopliae* in the infection chamber retained their infectivity for more than 21 days in the field.

10603 **Myers, J.H., Savoie, A. and Randen, E. van, 1998.** Eradication and pest management. *Annual Review of Entomology*, **43**: 471-491.

Myers: Departments of Zoology and Plant Science, Centre for Biodiversity Research, University of British Columbia, Vancouver, BC, V6T 1Z4, Canada.

Eradication is the elimination of every single individual of a species from an area to which recolonisation is unlikely to occur. Cost-benefit analyses of eradication programmes involve biases that tend to underestimate the costs and overestimate the benefits. This review highlights limitations of current cost-benefit analyses, assesses eradication strategies from biological and sociological perspectives by discussing particular cases of successful and failed eradication efforts, and briefly contrasts eradication and ongoing area-wide control as pest management strategies. One of the successful eradication programmes discussed is that of tsetse fly in Nigeria (*Glossina palpalis palpalis*). Initially traps and insecticide-impregnated screens were used to reduce the tsetse population, then the sterile insect technique was used to complete eradication. In situations where it is difficult to prevent reinvasion of the pest, education and area-wide suppression are probably more realistic goals than eradication.

10604 **Obwoya, E.A., 1996.** Beneficial effects of residual acaricide applied on domestic animals in the control of tsetse flies. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 401-412.

Livestock Health Research Institute (LIRI), P.O. Box 96, Tororo, Uganda.

The biological or performance efficiencies of various formulations of the acaricides Supadip (chlorfenvinphos) and deltamethrin and the insecticide dieldrin were measured against teneral *Glossina morsitans morsitans*. Flies under 36 h old were fed on rabbit blood before being exposed for varying times to various formulations of the pesticides impregnated on Geigy cages and on cattle. Flies surviving exposure were maintained on rabbit blood for observations of any chemical effect on their reproductive biology, including successful mating, larval and puparial development and adult emergence. Average mortalities of 40, 80 and 90% were recorded for the various concentrations of chlorfenvinphos, dieldrin and deltamethrin, respectively, with no significant difference in

response between the sexes. After exposure to chlorfenvinphos and deltamethrin, the surviving flies mated successfully, with subsequent normal larval development period and 73% adult emergence. However, most of the flies which survived exposure to dieldrin were unable to mate successfully and showed varying degrees of weakness. The larval developmental period was also significantly longer with only 44% adult emergence from the resulting puparia. No repellency of the acaricide to the flies was observed. Analysis of cattle hair samples showed that the residual acaricide retained high levels of active ingredient for 5 days.

10605 **Wamunyokoli, F.W. and Osir, E.O., 1995 [1997].** Characterisation of *Bacillus thuringiensis* variety *israelensis* delta-endotoxin. *Insect Science and its Application*, **16** (3-4): 343-349.

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

Crystals of a local isolate of *B. thuringiensis* var. *israelensis* were isolated by centrifugation on a continuous sucrose gradient (40-70%). Analysis of the crystals by SDS-PAGE revealed three major protein subunits of M_r ~ 25,000, ~ 66,000 and ~ 140,000. The crystals were solubilised using high pH and reducing conditions. Analysis of the soluble (protoxin) and insoluble fractions by SDS-PAGE showed the presence of proteins of M_r ~ 21,000 and ~ 61,000, respectively. Proteolytic treatment of these fractions resulted in no apparent change in the molecular weights of the proteins. The crystals contained carbohydrate moieties as determined by periodic acid Schiff (PAS) and fluorescein isothiocyanate (FITC) Concanavalin A staining. In double radial immunodiffusion experiments, antisera raised against the M_r ~ 21,000 and ~ 66,000 subunits did not react with other *B. thuringiensis* protoxins known to be active against the tsetse fly, *Glossina morsitans morsitans*, and the stemborer, *Chilo partellus*.

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

[See also **21**: nos. 10585, 10586, 10592, 10597, 10598, 10600, 10620, 10628, 10633, 10635, 10655, 10676, 10677.]

10606 **Assonna, A., 1997.** Distribution spatiale des trypanosomés dans le foyer de THA de Bafia: 1978-1995. [Spatial distribution of trypanosome-infected cases in the Bafia HAT focus: 1978-1995.] (Meeting abstract no. T1.2.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 71-72.

Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Situated 120 km to the north-west of Yaoundé, the Bafia HAT focus comprises about a hundred villages and hamlets with an estimated population of around 95,000. Environmental, demographic and social factors of sleeping sickness transmission have been studied by mapping the distribution of cases. Two levels of analysis were used: the

regional, where the largest unit is the village, and the local, where the most important unit is the neighbourhood. Three villages were studied: Ombessa, Baningoang and Yambassa.

10607 **Clausen, P.-H., Adeyemi, I., Bauer, B., Breloeer, M., Salchow, F. and Staak, C., 1998.** Host preferences of tsetse (Diptera: Glossinidae) based on bloodmeal identifications. *Medical and Veterinary Entomology*, **12** (2): 169-180.

Clausen: Institute for Parasitology and Tropical Veterinary Medicine, Free University of Berlin, Königsweg 67, D-14163 Berlin, Germany.

An ELISA was developed to identify the origin of vertebrate blood in the guts of 29,245 wild-caught flies of eleven *Glossina* species from various ecological zones of East, Central and West Africa. Depending on the quality of the bloodmeal samples, 62.8% of the samples were identified and could be assigned to a host-group (e.g. ruminant), family (e.g. Bovidae) or species (e.g. *Bos* spp.). A total of 13,145 samples (44.9%) was identifiable up to the species level. With a few exceptions, the present results are in agreement with earlier published reports. *Glossina austeni* and *G. fuscipleuris* seemed to have a distinct feeding preference for Suidae (mainly bushpig). *G. morsitans* fed mainly on Suidae (mainly warthog), although local variations were observed and in some areas hippopotamus or ruminants replaced the warthog as the main host. Bushbuck seemed to be the principal food source for *G. longipalpis* and *G. fusca*. *G. pallidipes* fed mainly on ruminants (buffalo, bushbuck and cattle) but, depending on host availability and location, Suidae were also important hosts. Hippopotamus was identified as the main source of bloodmeals for *G. brevipalpis*. The main hosts for *G. longipennis* were Suidae (mainly bushpig) and not rhinoceros as had been reported 40 years earlier. The opportunistic feeding behaviour of the *palpalis* tsetse group (*G. palpalis*, *G. fuscipes* and *G. tachinoides*) was confirmed. The results showed that changes in environment, fauna and host availability may result in modification of tsetse feeding patterns.

10608 **Eouzan, J.P., Toto, J.C. and Assonna, A., 1997.** Le contact homme-glossines dans le foyer de THA du Mbam. Etude de trois terroirs en saison sèche. [Man-tsetse contact in the Mbam HAT focus. Study of three areas in the dry season.] (Meeting abstract no. T1.7.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 74.

Eouzan: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

The Mbam HAT focus extends 26 km north-south from Bafia to Yambassa and 28 km east-west from Bokito to Enanga. In spite of the apparent homogeneity of the landscape, dominated by cocoa plantations, the distribution and density of tsetse flies are very variable. An entomological study in the dry season (February to March) has clarified man/fly contact in three areas of the focus, and defined the potential transmission zones where control efforts should be made.

10609 **Hervouët, J.P., 1997.** SIG et détermination des zones à risques de THA en Côte d'Ivoire. [GIS and determination of areas at risk of HAT in Côte d'Ivoire.]

(Meeting abstract no. T1.1.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 71.

Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Using the numerous demographic data available in Côte d'Ivoire, a geographical information system has been set up to research the risk factors of HAT in an attempt to uncover predictive indicators of risk. It has been shown that the development of the disease in the second half of the 20th century is linked to diverse interwoven and interdependent demographic factors. On the one hand, the emergence of the disease corresponds to large population growth, due mainly to immigration; on the other hand, it is linked to the density of the population using the intermediate spaces. Below a threshold of around 20 inhabitants/km^2, no serious transmission takes place, while above another 'safety' threshold of 70 inhabitants/km^2 the transmission risk diminishes and even disappears. Nevertheless, for the transmission cycle to operate, it is necessary for a significant part of the population to reside in small encampments. It has also been shown that it is more the complexity of the network of habitats/camps than their number which generates the risk. Sleeping sickness is thus an excellent indicator of the degree of control of their environment by the user populations, and their management practices.

10610 **Kazadi, J.M., Kageruka, P., Losson, B., Torreele, G., Deken, R. de and Gnanvi, C., 1998.** Compétence vectorielle des mouches de *Glossina palpalis palpalis, G. p. gambiensis* et *Glossina morsitans morsitans* via-à-vis d'un clone de *Trypanosoma (Nannomonas) congolense* IL 1180. [The vectorial competence of *G. p. palpalis, G. p. gambiensis* and *G. m. morsitans* for a clone of *T. (N.) congolense* IL 1180.] *Parasite*, **5** (2): 159-165.

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

The authors report the results of experimental infections of teneral (age < 32 h) and non-teneral (age between 80 and 96 h) *G. p. palpalis*, *G. p. gambiensis* and *G. m. morsitans* with *T. congolense* IL 1180. Flies were fed once on a parasitaemic rat. Teneral flies of both sexes showed procyclic and metacyclic infection indices respectively of 0.0588 and 0.7272 for *G. p. palpalis*, 0.0525 and 0.0416 for *G. p. gambiensis*, and 0.6493 and 0.7300 for *G. m. morsitans*. Neither of the non-teneral *G. palpalis* subspecies had any vectorial competence, whereas *G. m. morsitans* had procyclic and metacyclic infection indices of 0.4541 and 0.7884. Statistical analysis showed no significant difference in metacyclic infection rate between teneral and non-teneral *G. m. morsitans*. Teneral flies of each subspecies transmitted the infection to host rats before the twentieth day. Concerning trypanosome development in the fly, procyclic and mesocyclic forms were observed simultaneously in all flies dissected 5 days after infection.

10611 **Maudlin, I., Welburn, S.C. and Milligan, P.J.M., 1998.** Trypanosome infections and survival in tsetse. *Parasitology*, **116** (Suppl.): S23-S28.

Maudlin: Tsetse Research Group, Division of Molecular Genetics, IBLS, University of Glasgow, Anderson College, 56 Dumbarton Road, Glasgow G11 6NU, UK.

The effect of trypanosome infection on vector survival was observed in a line of *Glossina morsitans morsitans* selected for susceptibility to trypanosome infection. The differential effects of midgut and salivary gland infections on survival were examined by exposing flies to infection with either *Trypanosoma congolense* which colonises midgut and mouthparts or *T. brucei rhodesiense* which colonises midgut and salivary glands. A comparison of the survival distributions of uninfected flies with those exposed to infection showed that salivary gland infection significantly reduced tsetse survival; midgut infection had little or no effect on the survival of tsetse. The significance of these findings is discussed in relation to the vectorial capacity of wild flies.

10612 **Moloo, S.K., Okumu, I.O. and Kuria, N.M., 1998.** Comparative susceptibility of *Glossina longipennis* and *G. brevipalpis* to pathogenic species of *Trypanosoma*. *Medical and Veterinary Entomology*, **12** (2): 211-214.

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

The susceptibility of two laboratory-reared *fusca* group tsetse flies, *G. longipennis* and *G. brevipalpis*, to various strains of *T. vivax*, *T. congolense* and *T. brucei brucei* was compared with the highly susceptible *morsitans* group species, *G. morsitans centralis*, which served as a control. Equal numbers of teneral male and female flies of each of the three tsetse species were allowed to feed on experimentally infected cattle (*T. vivax*) and goats (*T. vivax*, *T. congolense* and *T. b. brucei*) during the first parasitaemic wave. After maintenance on rabbits, tsetse were dissected on day 25 (*T. vivax*, *T. congolense*) or day 30 (*T. brucei*) and the relevant parts (midgut, labrum, hypopharynx, salivary glands) examined for the presence of trypanosomes. *G. longipennis* and *G. brevipalpis* were shown to have differing susceptibilities to the stocks of trypanosome species used. They were highly susceptible to *T. vivax* IL 2133 and IL Dat.1.9 but less so to IL 3091, *G. longipennis* being less susceptible than *G. brevipalpis*. For *T. congolense*, IL 3779 showed significantly lower mature infection prevalence in *G. longipennis* than in *G. brevipalpis*, while IL 2047 and IL 2281 failed to complete cyclical development except in one *G. brevipalpis*. *T. b. brucei* IL 3041, IL 923 and IL 3563 failed to complete cyclical development in either *G. longipennis* or *G. brevipalpis*. *G. m. centralis* showed considerably higher mature infection prevalences with most stocks of all three trypanosome species, being least susceptible to *T. vivax* IL 3091 and *T. brucei* IL 3563. Thus, the two *fusca* group tsetse appear to be poor vectors of pathogenic trypanosomes compared with the *morsitans* group tsetse flies, confirming previous field data.

10613 **Morlais, I., Grebaut, P., Bodo, J.M., Djoha, S. and Cuny, G., 1998.** Characterization of trypanosome infections by polymerase chain reaction (PCR) amplification in wild tsetse flies in Cameroon. *Parasitology*, **116** (6): 547-554.

Morlais: Laboratoire d'Epidémiologie des Maladies à Vecteurs, Centre ORSTOM, B.P. 5045, F-34032 Montpellier, France.

The PCR method was used to characterise trypanosome infections in tsetse flies from three sleeping sickness foci in Cameroon. The predominant tsetse species found was *Glossina palpalis palpalis*. An average infection rate of 12.1% was revealed by microscopical examination of 888 non-teneral tsetse flies. PCR amplification analyses for trypanosome identification were carried out on 467 flies, with primer sets specific for *Trypanosoma (Trypanozoon) brucei* s.l., *T. (Duttonella) vivax*, *T. (Nannomonas) simiae* and forest type *T. (Nannomonas) congolense*. Of 467 flies 93 were positive by microscopical analysis while PCR succeeded in identifying 89 positive flies. Of the PCR-positive flies, 34 (38.2%) were negative by microscopical examination. PCR amplification, when compared to the parasitological technique, gave a higher estimate of infection rate of trypanosomes in natural tsetse populations. The PCR technique, however, failed to identify 40.9% (38/93) of the parasitologically positive flies. The reasons for this failure are discussed. The overall prevalence of mixed infections, assessed by PCR, was 37.1%; the majority (72.7%) involved *T. brucei* and forest type *T. congolense*.

10614 **Morlais, I., Grebaut, P., Bodo, J.M., Djoha, S. and Herder, S., 1997.** Application de la PCR (polymerase chain reaction) à l'identification des trypanosomes circulant chez les glossines dans les foyers de trypanosomiase humaine au Cameroun. [Application of the PCR technique in the identification of trypanosomes circulating in tsetse flies in human trypanosomiasis foci in Cameroon.] (Meeting abstract no. T1.6.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 73.

Morlais: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

For abstract, see **21**: no. 10613.

10615 **Penchenier, L., Wang Sonne, Bureau, P., Assonna, A. and Eouzan, J.P., 1997.** Origine et évolution de la THA dans les pays de la zone OCEAC. [Origin and evolution of HAT in the OCEAC area.] (Meeting abstract no. T1.3.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 72.

Penchenier: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Since the 1970s, we have witnessed a general resurgence of human African trypanosomiasis. The recent epidemics have all developed at the sites of the historic foci of the dramatic pandemics of the end of the last century and of the 1930s. In trying to ascertain the causes of the revival of foci, and their maintenance, the OCEAC is studying their history and dynamics and in particular trying to discover their origin in order to determine whether they existed before colonisation (primary foci) or whether they are the consequence of population movements linked to colonial expansion.

10616 **Simarro, P., Franco, J.R., Ndongo, P., Nguema, E. and Ona, F., 1997.** Delimitacion de un foco de tripanosomiasis humana africana. Criterios administrativos, geograficos o epidemiologicos. El caso del foco de Mbini (Guinea Ecuatorial). [Delimitation of a human African trypanosomiasis focus. Administrative, geographical or epidemiological criteria. The case of the Mbini focus (Equatorial Guinea).] (Meeting abstract no. T1.5.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 73.

Simarro: Centro Control Tripanosomiasis, Fundacio CIDOB, Barcelona, Spain.

Human African trypanosomiasis is a disease with a focal distribution. Nevertheless, there are no clear criteria for defining a trypanosomiasis focus. After 12 years' experience of control activities in the Mbini focus, certain hypotheses can be put forward.

10617 **Truc, P., 1997.** Circulation chez l'homme, la glossine et le porc d'un même zymodème non *gambiense* en Côte d'Ivoire: conséquences en matière de contrôle de la THA. [Circulation in man, tsetse and pigs of the same non-*gambiense* zymodeme in Côte d'Ivoire: consequences for the control of HAT.] (Meeting abstract no. T1.8.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 74.

OCCGE/IPR, B.P. 1500, Bouaké 01, Côte d'Ivoire.

In Côte d'Ivoire, the agent of HAT is classically named *Trypanosoma brucei gambiense*. This name is based solely on the extrinsic characters of the parasite. The use of isoenzymes as markers of the parasite genome has largely called into question this classification. In addition, the classic clinical form of this type of HAT was chronic. Since 1995, an acute form of HAT has been suspected in Côte d'Ivoire, correlated with a non-*gambiense* type of trypanosome. Similarly, recent work has shown the existence of a man/tsetse/pig transmission cycle of a trypanosome which, on an isoenzyme basis, is a non-*gambiense* line of *T. brucei*. This form would be non-pathogenic in man. To investigate this, a study has been carried out in an area of high transmission in Côte d'Ivoire, and the clinical and serological data obtained from patients have prompted a reconsideration of the therapeutic approach and of the priorities in terms of control and operational research.

5. HUMAN TRYPANOSOMIASIS

(a) SURVEILLANCE

[See also **21**: nos. 10585, 10632, 10675.]

10618 **Ancelle, T., Paugam, A., Bourlioux, F., Merad, A. and Vigier, J.-P., 1997.** Détection des trypanosomes dans le sang par la technique du quantitative buffy coat (QBC): évaluation expérimentale. [Detection of trypanosomes in the blood using the quantitative buffy coat technique: laboratory evaluation.] *Médecine tropicale*, **57** (3): 245-248.

Ancelle: Laboratoire de Parasitologie, Hôpital Cochin, 27 rue du Faubourg Saint-Jacques, 75014 Paris, France.

Microhaematocrit centrifugation (Woo test) and miniature anion exchange are the most widely used techniques for routine detection of *Trypanosoma brucei gambiense* sleeping sickness in the field. The quantitative buffy coat (QBC) technique, developed for diagnosis of malaria, has been successfully used for detection of trypanosomes in blood. This laboratory study aimed to evaluate the end-point sensitivity of the QBC test in comparison with the Woo test. Decreasing concentrations from 15×10^5 to 15 trypanosomes/ml of human blood were tested using the two techniques. Sensitivity was calculated as a function of reading time at each concentration. Results showed that the sensitivity of the QBC test was 95% down to a concentration of 450 trypanosomes/ml. In comparision, 95% sensitivity of the Woo test was observed only down to 7500 trypanosomes/ml and reading time was 2 × longer. These findings were reproducible for 2 h after sample preparation but deterioration was rapid thereafter. Given its simplicity and sensitivity, the QBC test would appear to be a suitable technique for trypanosomiasis screening programmes in the field.

10619 **Bengi-Moko, H., Behrend, M., Vanda Löa, S. and Stich, A.H.R., 1997.** Intervention du projet Angotrip/Caritas de lutte contre la THA sur quatre foyers du nord de l'Angola. [Operation of the Angotrip/Caritas project for the control of HAT in four foci in northern Angola.] (Meeting abstract no. T2.2.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 80.

Bengi-Moko: c/o OCEAC, B.P. 288, Yaoundé, Cameroon.

The recrudescence of sleeping sickness in northern Angola following the civil war, resulting from the arrest of health programmes and population migration, has prompted Caritas of Angola to set up small diagnostic and treatment units at Uige, Quitexe, Lucala and Mbanza Kongo, four foci in northern Angola. Starting in January 1996, CATT was used for initial diagnosis: only cases confirmed parasitologically were treated, those in the early stage with pentamidine and those with neurological involvement with melarsoprol. Between January and December 1996, 14,011 persons were screened, 2266 new cases were diagnosed, 2013 were treated, and 87 died under treatment. The current prevalence

of HAT suggests that Angola may be the worst affected country in Africa, and that there is a need for training, vector control and active case finding.

10620 **Berg, I. van den, Ebo'o Eyenga, V., Grebaut, P., Bureau, P., Morlais, I., Bodo, J.M., Assonna, A., Herder, S., Eouzan, J.P. and Penchenier, L., 1997.** Le recueil des données du dépistage de la THA: cas du foyer de Fontem au Cameroun. [Collection of case-finding data on HAT: the case of the Fontem focus in Cameroon.] (Meeting abstract no. T1.4.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 72.

Penchenier: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

The data from the Fontem focus are difficult to interpret. Besides geographical confusion between Fontem and Manfé, statistics come either from incomplete surveys, or from patients diagnosed in Manfé or Dschang, or from patients at the Mary Health of Africa hospital at Fontem. At the start of the 1980s, differences of the order of 1 to 10 are seen, according to source (64 to 700 patients in 1983). The 1980s upsurge is indisputable but the significance of the number of patients diagnosed is difficult to understand even if there is variation in the definition of cases (clinical cases, immunological suspects, patients with trypanosomes). In 1987 surveys stopped, resulting in a spectacular drop in the number of cases recorded (below 10 from 1992): these figures need to be handled with extreme care. Thus a focus can appear to be either at the height of an outbreak or practically extinct according to how one interprets the figures.

10621 **Bureau, P., Demaille, H., Morlais, I., Ebo'o Eyenga, V., Matip, E., Binzouli, J.J., Ndzinga Obono, L.M. and Assonna, A., 1997.** Surveillance épidémiologique qualitative de la trypanosomiase humaine africaine. Mise en place du réseau OCEAC: premiers résultats. [Qualitative epidemiological surveillance of human African trypanosomiasis. Establishment of the OCEAC network: first results.] (Meeting abstract no. T2.9.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 83-84.

Bureau: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

A system of epidemiological surveillance of foci should be integrated into HAT control in order to deal with fluctuations in time and space and the lack of total survey coverage. After a first stage of mapping the areas at risk with a view to setting up a geographic information system (GIS), qualitative epidemiological data are collected by a system easy to implement and standardised for all the countries concerned. Its principle is the detection of antitrypanosome antibodies by microCATT, a method derived from the CATT, undertaken by means of veinous blood samples collected on filter paper. We describe the principle of the elaboration of this GIS, its advantages and disadvantages, as well as the first results obtained in the OCEAC area for Cameroon, Gabon and Chad.

10622 **Djoha, S., Herder, S., Bodo, J.M., Grebaut, P., Morlais, I., Bureau, P., Eouzan, J.P. and Penchenier, L., 1997.** Apport de la PCR sur sang dans le diagnostic des trypanosomoses. [Usefulness of the PCR technique on blood in the diagnosis of trypanosomiasis.] (Meeting abstract no. T2.6.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 82.

Djoha: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Detection of trypanosomes in blood is difficult. Compared to classic parasitological techniques, PCR is more sensitive and often more specific, but direct amplification in the blood is inhibited by haemoglobin derivatives. We have removed this inhibition by the development of a simple and efficacious method of blood preparation which makes possible the collection of blood samples in the field. We have tested it in Cameroon on pigs living in natural conditions in villages with and without *Trypanosoma brucei gambiense* HAT. The results of the PCR agree with parasitological results. Moreover, the PCR brings an important benefit compared to the classic parasitological techniques in that it is more sensitive and specific. This technique, which is usable in field conditions, can greatly facilitate epidemiological studies.

10623 **Doua, F., 1997.** Evolution de la prise en charge des cas en 15 années au PRCT de Daloa en Côte d'Ivoire. [Developments in the care of patients during 15 years at PRCT in Daloa, Côte d'Ivoire.] (Meeting abstract: overview.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 86.

PRCT, B.P. 1425, Daloa, Côte d'Ivoire.

A review of clinical signs observed in hospital patients at PRCT during the last 15 years shows that the principal symptoms of HAT are adenopathies, headaches and problems of vigilance or sleep. Primitive brainstem reflexes, whose frequency reaches 85%, are a strong presumptive indicator of CNS involvement. Lack of qualified personnel means that such signs are not always recognised, especially in foci considered extinct. Because of the toxicity of melarsoprol, pentamidine has been proposed for the treatment of cases with early CNS involvement and has given a success rate of 89.6% after 24 months. Trials of 7 day treatments with DFMO have shown an efficacity of 84% at 12 months. If these results were confirmed at 24 months, this would halve the cost of treatment with this drug and make it accessible to far more patients.

10624 **Laveissière, C., Doua, F. and Sane, B., 1997.** Dépistage de la maladie du sommeil: agents de santé *vs* équipes mobiles. [Screening for sleeping sickness: health agents versus mobile teams.] (Meeting abstract no. T2.7.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 82.

Laveissière: IPR/OCCGE, B.P. 1500, Bouaké 01, Côte d'Ivoire.

Effective diagnostic tests have been available for several years but results of medical surveys have been mediocre, mainly because of the attitude of mind of the human

populations. The rare mobile teams achieve poor coverage of the total population affected. For example, teams from IPR and PCRT in Côte d'Ivoire, on a typical 10 days survey, visited only 9311 people, 42% of a population estimated at 22,300. Conversely, in the same focus, community health agents, specially trained in sleeping sickness and the collection of blood samples on filter papers, visited nearly 15,600 people (73% of the population) in less than 2 months. The choice of strategy for sleeping sickness control in the future is limited: either the classic mobile teams which can be rapidly mobilised (if trained and available) but which cannot carry out an exhaustive survey; or the integration of screening into primary health care, entrusting surveillance to community health agents who, although with minimal training, are permanent sentinels at the heart of village communities. The cost of surveillance per person amounts to 0.55 US$ using mobile teams, compared with 0.10 US$ using community health agents. Integration of sleeping sickness screening into primary health care is thus an effective and economic solution provided the community health agents receive sufficient training and encouragement.

10625 **Lejon, V., Büscher, P., Magnus, E. and Meirvenne, N. van, 1997.** A field test for IgM quantification in cerebrospinal fluid of sleeping sickness patients. (Meeting abstract no. T2.A1.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 84.

Lejon: Department of Parasitology, Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium.

Diagnostic differentiation between the early and late stages of infection with *Trypanosoma brucei gambiense* is essential to select an optimal treatment and is currently performed by examining the CSF for cell number, protein concentration and presence of trypanosomes. It is well known that second stage trypanosomiasis is also accompanied by the occurrence of IgM in the CSF. IgM measurement, however, is difficult to realise under field conditions due to the lack of suitable tests and stable reagents. To enable IgM to be measured in the field, a card agglutination test 'Latex/IgM' has been developed. The reagent consists of IgM-specific antibodies covalently coupled to latex particles. In its freeze-dried form, it remains stable for at least 6 months, even at 45°C. The test is performed on serial dilutions of CSF and takes only 10 min. Using this test, the IgM concentration in CSF samples of sleeping sickness patients and controls was determined. Results were comparable to those obtained by nephelometry.

10626 **Ngar-Ndigoum, K., 1997.** Intégrer les activités de lutte contre la trypanosomiase humaine africaine (THA) dans les centres de santé primaires au Tchad. [Integration of control activities against HAT in primary health care centres in Chad.] (Meeting abstract no. T2.8.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 83.

Ministère de la Santé Publique, Ndjaména, Chad.

There are five HAT foci in Chad, with 70,000 people living in the villages at risk. Mobile teams using CATT to find serological suspects, which are then confirmed in a health centre using lymph aspiration and thick blood film, provide insufficient coverage,

confirmation of cases is difficult and vector control by trapping is ineffective. To resolve these problems it is recommended that use be made of community health agents who should be trained to use the mini-CATT based on filter papers for surveillance, and the more sensitive techniques of mHCT and mAEC for confirmation of suspects. This approach is the cheapest and most effective method of permanent surveillance of the population at risk, and only parasitologically confirmed cases need to be evacuated to the nearest health centre for treatment.

(b) PATHOLOGY AND IMMUNOLOGY

10627 **Ayed, Z., Bouteille, B., Bisser, S., Stanghellini, A., Doua, F., Meirvenne, N. van, Dumas, M. and Jauberteau, M.O., 1997.** Autoanticorps spécifiques de constituants neuronaux au cours de la trypanosomose humaine africaine. Détection et corrélation avec le stade de la maladie. [Autoantibodies specific to constituants of the nervous system during human African trypanosomiasis. Detection and correlation with the stage of the disease.] (Meeting abstract no. T3.6.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 90-91.

Bouteille: Institut d'Epidémiologie Neurologique et de Neurologie Tropicale, Faculté de Médecine, F-87025, Limoges, France.

The antibodies studied are directed against two protein subunits (160 and 200 kDA) of neurofilaments (NF). An investigation into the presence of anti-NF antibodies has been carried out by Dot blot on the serum of 50 stage 2 trypanosomiasis patients and 50 control subjects living in the same endemic region (Daloa, Côte d'Ivoire), as well as on the CSF of 25 stage 2 (Daloa) and 40 stage 1 patients (Pool, Bouenza and Plateaux, Congo). Anti-NF antibodies were detected more frequently in the serum of stage 2 patients than in control subjects (86% v. 24%). They belonged essentially to the IgM class (86% v. 4% for IgG). In the CSF, anti-NF antibodies were absent in stage 1 patients but were detected in most of the stage 2 patients where IgM similarly predominated (88% v. 32% for IgG). Detection of these antibodies in the CSF could form the basis of a serological test which could allow more precise diagnosis of stage 2 disease and thence a better therapeutic choice.

10628 **Frezil, J.L., 1997.** De l'infection à trypanosomes à la maladie du sommeil. [From trypanosome infection to sleeping sickness.] (Meeting abstract: overview.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 70.

Laboratoire d'Epidémiologie des Maladies à Vecteurs, ORSTOM, B.P. 5045, 34032 Montpellier Cedex 01, France.

From observations and from data in the literature, the author speculates on the natural history of sleeping sickness and ways of controlling it. Is the disease inescapable after inoculation of the parasite? What is its evolution as a function of the natural immunity of the populations exposed? Can one speak of human trypanotolerance? How does the patient see his illness? What is an epidemic, and how is it triggered off? In relation to the preceding, can one envisage effective control of sleeping sickness?

10629 **Okomo Assoumou, M.C., Daulouède, S., Ndumbe, P., Büscher, P., Lemesre, J.L. and Vincendeau, P., 1997.** Présence d'anticorps anti-tryptophane-like dans le sérum de malades atteints de trypanosomose humaine africaine. [Presence of anti-tryptophan-like antibodies in the serum of patients with human African trypanosomiasis.] (Meeting abstract no. T3.7.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 91.

Okomo Assoumou: Faculté de Médecine et des Sciences Biomédicales, Université de Yaoundé I, Yaoundé, Cameroon.

The immune system dysfunction which accompanies trypanosomiasis is seen notably in the production of auto-antibodies against a variety of antigens. Since amino acids (tryptophan, tyrosine) are implicated in the physiology of normal sleep, one of the principal metabolites of tryptophan, serotonin, being essential to slow wave sleep, we looked for antibodies directed against small molecules of the metabolic pathways of tryptophan and tyrosine. Using an immunoenzymatic test, we detected significant levels of anti-tryptophan-like antibodies (exclusively of isotype M) in the serum of HAT patients. These were present from the start of stage 1 and their level increased with the severity of the disease. These antibodies were also present in the serum of certain control subjects from the same endemic area but were not detected in other pathologies tested for (Parkinsonism, multiple sclerosis, Chagas disease, HIV/AIDS). These results led us to see whether these antibodies could be induced by a parasite antigen. By immunoprinting, a tryptophan-like epitope was shown on the major protein (VSG) of trypanosomes both pathogenic and non-pathogenic to man.

(c) TREATMENT

[See also **21**: nos. 10619, 10623, 10671.]

10630 **Ben Fai-Lai, 1997.** The disease trypanosomiase and you, as seen by a tradi-practitioner. (Meeting abstract no. T3.A1.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 92-93.

c/o OCEAC, B.P. 288, Yaoundé, Cameroon.

Cooperation between modern and traditional practitioners is recommended in research projects to discover possibly valuable plants in the forests which could be used as medicines. The patient with trypanosomiasis should consult a doctor or traditional healer without delay as early treatment is vital. Traditional practitioners can both diagnose and treat the disease, but patients are often advised to go for a blood test, after which they can choose either modern or traditional treatment. They are also advised to buy and install tsetse traps in their environment.

10631 **Dumas, M., 1997.** Prise en charge des patients atteints de trypanosomose humaine africaine. [Care of patients suffering from human African trypanosomiasis.] (Meeting abstract: overview.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 86.

Institut de Neurologie Tropicale, Faculté de Médecine, 2 rue du Dr Marcland, 87025 Limoges Cedex, France.

Care of HAT patients in 1997 raises many questions: whether care is given in the rural environment or in hospital; the frequent difficulty of determining the stage of the disease; the consequent difficulty of choosing the best treatment; the difficulty of follow-up of patients; and ethno-cultural considerations.

10632 **Laouabdia, K., Barboza, P., Mbulamberi, D. and Legros, D., 1997.** Bilan de 5 années de lutte contre la maladie du sommeil en Ouganda, Adjumani, 1991-1996. [Account of five years of sleeping sickness control at Adjumani, Uganda, 1991-1996.] (Meeting abstract no. T3.5.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 89-90.

Legros: c/o OCEAC, B.P. 288, Yaoundé, Cameroon.

Since 1986, Medecins Sans Frontières (MSF) and the National Sleeping Sickness Control Programme have been conducting a control programme based on active case-finding using CATT. Once the diagnosis has been confirmed, patients are treated with pentamidine or melarsoprol according to stage. Data collected between 1991 and 1996 by the treatment centre at Adjumani and by the mobile teams have been analysed. During this period, 4954 cases of HAT were treated at Adjumani hospital, a mean of 80 cases per month: 20% were Sudanese refugees and 65% showed CNS involvement. A peak was seen in the 20-39 year age group. Among the treated cases, there were 193 deaths (0.9% in stage 1, 5.7% in stage 2, overall 4%); 137 deaths were attributable to melarsoprol treatment (4.5% of those treated with this product). These results show once again the effectiveness of control strategies based on active case-finding. Nevertheless, the massive resurgence of the disease in Central Africa needs to be tackled on two fronts: the putting in place of control programmes in the worst affected areas, and encouragement for research into the development of new control tools, particularly therapeutic drugs.

6. ANIMAL TRYPANOSOMIASIS

(a) SURVEY AND DISTRIBUTION

10633 **Asonganyi, T., 1996.** Trypanosomes in domestic animals in Cameroon. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 99-106.

Faculté de Médecine et des Sciences Biomédicales, Université de Yaoundé I, Yaoundé, Cameroon.

Trypanosome infections in domestic animals in the two main sleeping sickness foci in Cameroon (Fontem and Mbam) were investigated using parasitological and serological tests. Altogether 799 animals were screened: 300 goats, 324 sheep, 131 dogs and 44 pigs. The only subgenus detected was *Trypanosoma (Nannomonas)* with a prevalence of 29%. CATT gave a positivity rate of 43%. The absence of *T. (Trypanozoon)* antigens suggests

that human African trypanosomiasis is not a zoonosis in these sleeping sickness foci. However, when an antigen-detection ELISA based on a MAb was used, antigens specific for *Trypanozoon* were detected in sera from dogs (1 of 40), goats (35 of 125), sheep (15 of 207) and pigs (1 of 3) in the Fontem focus. This test also allowed the detection of *T. vivax* antigens.

10634 **Böhning, D. and Greiner, M., 1998.** Prevalence estimation under heterogeneity in the example of bovine trypanosomosis in Uganda. *Preventive Veterinary Medicine,* **36** (1): 11-23.

Greiner: Institute of Parasitology and Tropical Veterinary Medicine, Department of Tropical Veterinary Medicine and Epidemiology, Freie Universität Berlin, Königsweg 67, D-14163 Berlin, Germany.

We examined variance estimators of a binomial parameter established under cluster sampling using data from a cross-sectional study of bovine trypanosomosis in Mukono County, Uganda. Fifty farms (referred to as clusters) were sampled with a total sample size of 487 cattle. Trypanosomes were found in 17.9% of the total sample. The cluster-level (CL) prevalences were not homogeneously distributed. According to maximum-likelihood parameters established by mixture-distribution analysis, 18% of the clusters had 0% prevalence whereas 48% and 34% of the clusters could be allocated to subpopulations of clusters with mean prevalences of 11.6% and 31.9%, respectively. We show that this form of heterogeneity invalidates the applicability of the Beta distribution as a model for the distribution of CL prevalences. Furthermore, we provide empirical evidence for a variance inflation due to heterogeneity (inflation factor 2.07) that exceeds the design-based variance inflation due to clustering alone (inflation factor 1.82). The variance inflation due to heterogeneity is given in a closed form so that the approach can be conveniently applied to survey data that involve cluster sampling under heterogeneity.

10635 **Burudi, E.M.E., 1996.** Polymerase chain reaction: a field diagnostic tool for African trypanosomiasis in wildlife in Kenya. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 107-110.

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

Plans to adapt the PCR for field use are described. It is hoped to use this modified PCR to investigate the role of wildlife in the epidemiology of African trypanosomiasis in the Ruma National Park in Kenya.

10636 **Demaille, H., Ebo'o Eyenga, V., Mahamat Saleh, O., Manthelot, C., Nangouma, A., Ndongo Asumu, P. and Penchenier, L., 1997.** Situation de la trypanosomiase humaine dans les 6 états de l'OCEAC: 1965-1996. [Human trypanosomiasis situation in the six member states of the OCEAC: 1965-1996.] (Meeting abstract no. T1.A1.) *Bulletin de Liaison et de Documentation de l'OCEAC,* **30** (3): 74-75.

Penchenier: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Data from OCEAC member states show that human trypanosomiasis, which had been reduced to extremely low prevalences in the early 1960s, has since 1965 progressed everywhere in the historic foci of the disease. This recrudescence, a consequence of the abandonment of systematic case finding and of vector control, has resulted in serious epidemic outbreaks in the six states. It is vital that national programmes be reinforced and sustained. It is equally important that epidemiological surveillance be extended to all the areas at risk.

10637 **Desquesnes, M., 1997.** Standardisations internationale et régionale des épreuves immuno-enzymatiques: méthodes, interêts et limites. [International and regional standardisation of immuno-enzyme tests: methods, advantages and limitations.] *Revue scientifique et technique de l'Office International des Epizooties*, **16** (3): 809-823.

CIRAD-EMVT, c/o CIRDES, B.P. 454, Bobo Dioulasso 01, Burkina Faso.

In the light of a model indirect ELISA for detecting antibodies against *Trypanosoma vivax* in cattle, the author proposes the international standardisation of reagents, test protocol, and the expression of ELISA results using international reference samples. For local standardisation, the following proposals are made: sampling of representative local populations; establishment of the distribution patterns of infected and uninfected local populations; selection of representative controls from local populations (secondary reference samples); expression of test results in comparison with these controls; establishment of internal quality control based on the response of controls; determination of a positive threshold, in accordance with the requirements of the user; adaptation of the positive threshold according to the prevalence observed in the geographical sector under study. These measures will make it possible to determine sensitivity and specificity of the test in the population studied and, when the prevalence of infection is known, to calculate the predictive values of the test.

10638 **Dia, M.L., Diop, D., Aminetou, M., Thiam, A., Jacquiet, P. and El-Mabrouk, A., 1996.** Epidémiologie de la trypanosomose caméline en Mauritanie, facteurs de variations. [Epidemiology of camel trypanosomosis in Mauritania, variation factors.] *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 87-97.

Dia: CNERV, B.P. 167, Nouakchott, Mauritania.

The epidemiology of *Trypanosoma evansi* trypanosomosis was investigated in 2070 camels (*Camelus dromedarius*) of various ages in four provinces of Mauritania (Trarza, Gorgol, Adrar, Hodh El Chargui) with different climatic and ecological characteristics. Blood smears were examined and serological tests (CATT, IFAT) were carried out. The overall prevalence was 1.3% by blood smear, 16.1% by CATT and 25.7% by IFAT. Trarza was the most severely affected province. Within provinces, infection levels

differed significantly, depending on the herd management strategy. Seroprevalence was highest in the 5-10 year age group. Of 339 tabanids identified in southern Trarza, 50% were *Tabanus taeniola*, 15% were *T. sufis* and 35% were *Atylotus agrestis*. Stomoxyinae (*Haematobia irritans*) were also present. In Hodh, only hippoboscids were found.

10639 **Kalu, A.U., Uzoukwu, M. and Ikeme, M., 1996.** Prevalence of tsetse fly and ruminant trypanosomosis in Katsina-Ala Local Government Area, Nigeria. *Romanian Archives of Microbiology and Immunology*, **55** (4): 341-352.

Department of Veterinary Pathology, Microbiology and Epidemiology, University of Nigeria, Nsukka, Nigeria.

The prevalence of ruminant trypanosomosis and tsetse flies was investigated in Katsina-Ala Local Government Area, a sleeping sickness endemic area in Central Nigeria. Analysis of 320 blood samples showed that among semi-nomadic animals, 21.3% of cattle and 38.0% of sheep carried mature trypanosome infections. Significantly lower ($P < 0.05$) values (12.5%) were recorded among peri-domestic West African × Red Sokoto goats. The most prevalent species encountered was *Trypanosoma vivax* which was diagnosed in 10.3% of the ruminant population and was responsible for 42.8% of the infections in all animals. Corresponding figures for *T. congolense* were 5.9% and 24.6%. *T. brucei* infections were low in cattle (1.8%) and absent in goats. Lower infection rates were seen in males and young stock but the difference was not significant ($P > 0.05$) except between ages in cattle. *Glossina tachinoides* was the only tsetse species encountered and responded to acetone odour attractant in biconical traps.

10640 **Maikaje, D.B., 1998.** *Some aspects of the epidemiology and drug sensitivity of bovine trypanosomosis in Kaura Local Government Area of Kaduna State*. Ph.D. thesis, Ahmadu Bello University, Zaria, Nigeria. 147 pp.

Department of Biological Sciences, Nigerian Defence Academy, P.M.B. 2109, Kaduna, Nigeria.

Reports of tsetse fly infestation and bovine trypanosomosis outbreaks in Kaura Local Government Area (LGA) of Kaduna State, leading to high cattle mortality and mass exodus of settled Fulani pastoralists from the area, were recently investigated. Using the biconical and NiTse tsetse traps, *Glossina palpalis palpalis* and *G. tachinoides* were caught only along the banks of River Kajim in Kaura LGA. *Stomoxys calcitrans*, *Haematopota* spp. and *Tabanus* spp. were detected in every part of the LGA using the same traps. Results of parasitological surveys conducted in this LGA revealed dry and rainy season bovine trypanosomosis prevalence rates of 17.26% and 53.04% respectively. The antigen capture enzyme-linked immunosorbent assay (ELISA) revealed bovine trypanosomosis prevalence rates of 49.40% and 63.48% respectively during the two seasons. The principal etiological agents of bovine trypanosomosis detected during these investigations were *Trypanosoma brucei*, followed by *T. congolense* and *T. vivax* and mixed infections with the three trypanosome species. Drug sensitivity tests conducted in red Sokoto goats revealed complete sensitivity of the *T. brucei* isolate to diminazene diaceturate (Berenil) and isometamidium chloride (Samorin), at doses of 7 mg/kg and 0.5

mg/kg body weight, respectively. On the other hand, the *T. congolense* isolate in one of three experimentally infected goats relapsed to diminazene at 7 mg/kg body weight 3 weeks post treatment. The remaining two, and three others from another group, infected with the same trypanosome isolate were cured with 7.0 mg/kg diminazene and 0.5 mg/kg isometamidium, respectively. It was concluded that there were outbreaks of bovine trypanosomosis and its vectors which could hamper cattle breeding in Kaura LGA. The seemingly efficient trapping of the bovine trypanosomosis vectors using biconical and NiTse tsetse traps observed during this study suggests that the large-scale use of this locally fabricated equipment might effectively control these flies in Kaura LGA. Similarly, in spite of the rampant misuse of trypanocidal drugs in this LGA, many trypanosome isolates are still apparently sensitive to the therapeutic doses of the commonly used trypanocides diminazene diaceturate and isometamidium chloride. The chemotherapeutic/chemoprophylactic treatment of cattle may provide another viable option for the control of bovine trypanosomosis in Kaura LGA.

10641 **Masiga, D.K., 1996.** Studies of trypanosomiasis in small ruminants in Kenya. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 79-85.

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

A project which aims to use the PCR to evaluate the prevalence of trypanosomiasis in sheep and goats on two ranches in Kenya under different management systems is described. The importance of chemoprophylaxis in the control of trypanosomiasis in small ruminants will also be investigated.

(b) PATHOLOGY AND IMMUNOLOGY

10642 **Akinbamijo, O.O., Bennison, J.J., Jaitner, J. and Dempfle, L., 1998.** Haematological changes in N'Dama and Gobra Zebu bulls during *Trypanosoma congolense* infection maintained under a controlled feeding regimen. *Acta Tropica*, **69** (3): 181-192.

Akinbamijo: ITC, P.M.B. 14, Banjul, Gambia.

Haematological changes were monitored in Gobra Zebu and N'Dama bulls following infection with *T. congolense*. The cattle were offered a diet which provided levels of protein and energy above maintenance requirement and a pair feeding regimen was used in order to eliminate the confounding anorexic effects of trypanosomosis on the traits studied. PCV, red blood cells (RBC) and haemoglobin (Hb) were monitored weekly. Mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), and mean corpuscular volume (MCV) were derived by computation. Significant breed differences ($P < 0.001$) were observed in the baseline data collected, with N'Dama bulls having higher ($P < 0.001$) values for RBC and Hb. PCV levels were similar in both breeds pre-infection. Post-infection, there was a significant ($P < 0.001$) infection effect on the RBC, Hb and PCV in both breeds. The pathogenic effects were more severe in the Gobra Zebu bulls where three out of ten bulls compared with only one out of eight infected N'Dama bulls attained the low PCV threshold, were treated and

withdrawn from the study along with their pair mates. Throughout the infection in N'Dama cattle and during the first 6 weeks of infection in the Gobra Zebu bulls, the infection presented a normochromic normocytic anaemia. However, in the chronic phase, the Gobra Zebu bulls became macrocytic. The infection reduced total dry matter intake in both breeds although this persisted longer in the Gobra Zebus. However, their pair-fed controls showed no haematological changes, indicating that the anorexia was not compounding the effects of the infection. The severity and type of anaemia in N'Dama correlates with their innate ability to resist the effects of trypanosome infection compared to the Gobra Zebu bulls.

10643 **Boly, H., 1996.** Incidence de *Trypanosoma congolense* sur la formule sanguine et la fonction de reproduction des taurins 'Baoulé'. [Effect of *T. congolense* on the haematology and reproductive function of Baoulé bulls.] *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 111-123.

Institut du Developpement Rural (IDR), Université de Ouagadougou, B.P. 7021, Ouagadougou 03, Burkina Faso.

The effects of natural infection with *T. congolense* on haematology and testicular function were assessed in a herd of 53 Baoulé bulls. Parasitological examination of the blood showed that 8 bulls were infected. Trypanosome infection did not cause any significant differences in haematological values except for PCV (non-infected bulls 35.5 ± 4.0%; infected bulls 28.0 ± 9.4%), confirming the trypanoresistance of this breed. Average values for daily spermatozoa production, and for spermatozoa in the epididymis head, corpus and cauda, tended to be about 30% lower in infected bulls but there was great individual variation. Morphometric analysis of the testicle showed that infection caused a significant reduction in the total volume of the Leydig cells, and the daily production of round spermatids was significantly reduced. It is concluded that infection alters both the interstitial tissue and the meiotic division of the germinal cells.

10644 **Dia, M.L., Aminetou, M., Diop, C., Thiam, A., Jacquiet, P. and El-Mabrouk, A., 1996.** Est-il possible de se debarrasser de son infection trypanosomienne sans aucune intervention therapeutique? [Is it possible to get rid of trypanosome infection without therapeutic intervention?] *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 391-400.

Dia: CNERV, B.P. 167, Nouakchott, Mauritania.

An 18-month-old camel calf was experimentally infected with a Mauritanian strain of *Trypanosoma evansi*. Five white mice also inoculated with this stabilate were used to prepare antigens for the IFAT. Parasites were first detected in the camel's peripheral blood on day 6 p.i., and serological tests were positive on days 11 by IFAT and 15 by CATT. The parasitaemia remained almost constant until day 94. From days 94 to 170 it fluctuated, but inoculation of blood into mice indicated that the infection was still present. From day 170 until slaughter on day 575, all attempts to infect normal or immunosuppressed mice by blood inoculation proved negative. Four months before slaughter, the camel was immunosuppressed by means of two Endoxan injections, but its

blood, and inoculations into mice, remained negative. At post mortem the only lesion observed was thickening of the bladder. No parasites were found during examination of homogenised organs, blood and CSF, and their inoculation into mice proved negative. These results suggest that an animal can overcome a trypanosome infection without treatment. Throughout the infection period, serological tests were positive, but the positivity of sera 2 months before slaughter did not exceed 1:160 in the IFAT.

10645 **Gray, G.D. and Uilenberg, G. (eds), 1996.** *Parasitology research in Africa* (Proceedings of an IFS Workshop, Bobo-Dioulasso, Burkina Faso, 6-10 November 1995). Stockholm, Sweden; International Foundation for Science (IFS). (ISBN 91 85798 45 2.)

For papers on tsetse and trypanosomiasis, see **21**: nos. 10604, 10633, 10635, 10638, 10641, 10643, 10644, 10646, 10652, 10655.]

10646 **Katunguka-Rwakishaya, E., 1996.** The influence of plane of nutrition on weight gains, degree of anaemia and ferrokinetics in animals infected with trypanosomes. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 143-152.

Department of Veterinary Medicine, Makerere University, P.O. Box 7062, Kampala, Uganda.

The influence of plane of nutrition on body weight gains, degree of anaemia and erythropoietic responses was investigated in groups of four sheep given either a high (116 g digestible crude protein (DCP) per day) or a low (51.5 g DCP per day) protein diet following infection with *Trypanosoma congolense*. Dietary protein had no effect on the prepatent period and subsequent intensities of parasitaemia or on the rate of development and degree of anaemia that followed infection. However, it affected growth rates: whereas infected and control animals on the high protein diet grew at similar rates, infected animals on the low protein diet experienced marked growth retardation compared to their uninfected controls. Ferrokinetic measurements indicated that infected animals had lower ^{59}Fe half-lives and estimated red cell lifespans but higher values for plasma iron turnover rates (PITR), ^{59}Fe utilisation and erythrocyte ^{59}Fe-incorporation rates than control animals. PITR and ^{59}Fe incorporation rates were higher in the high protein infected group than in the low protein infected group, although the differences were not significant. It is concluded that erythropoietic activity was greater in infected animals than in controls and that infected animals on a high protein diet showed greater enhancement of erythropoietic activity than infected animals on a low protein diet.

10647 **Katunguka-Rwakishaya, E., Murray, M. and Holmes, P.H., 1998.** Influence of supplementation with cotton seed cake on body weight, parasitaemia, degree of anaemia and response to diminazene aceturate of goats infected with *Trypanosoma congolense*. *Small Ruminant Research*, **29** (3): 283-288.

Katunguka-Rwakishaya: Department of Veterinary Medicine, Makerere University, P.O. Box 7062, Kampala, Uganda.

The present study investigated the changes in levels of parasitaemia, live body weight, degree of anaemia and response to treatment with diminazene aceturate in Small East African goats infected with *T. congolense*, fed either a basal ration of 500 g of fresh Napier grass only, or supplemented with 300 g of cotton seed cake per day. It was observed that the infected supplemented group had longer prepatent periods than the infected unsupplemented group and grew at a similar rate to that of the uninfected controls. The infected unsupplemented group experienced reduction in weight gain ($P < 0.001$) compared to their respective controls. Infection caused reduction in mean PCV values in both groups ($P < 0.001$) initially; however, the infected supplemented group showed an improvement in PCV between 35 and 56 days p.i. unlike the infected unsupplemented group. Following treatment at 56 days p.i., the infected supplemented group showed greater improvement in PCV than the infected unsupplemented group, and by 4 weeks after treatment the values in the infected supplemented and control supplemented groups were similar. It is concluded that the plane of nutrition plays an important role in the rate of live weight gain and in the rate of recovery from anaemia produced by trypanosome infection. Lack of adequate nutrition that occurs under field conditions may have an important influence on the pathogenic impact of trypanosomiasis in the Small East African breed of goats.

10648 **Onah, D.N., Hopkins, J. and Luckins, A.G., 1998.** Increase in $CD5^+$ B cells and depression of immune responses in sheep infected with *Trypanosoma evansi*. *Veterinary Immunology and Immunopathology*, **63** (3): 209-222.

Onah: Department of Veterinary Parasitology and Entomology, University of Nigeria, P.M.B. 011, Nsukka, Enugu State, Nigeria.

The effects of *T. evansi* on the cellular and humoral immune responses of sheep to *Pasteurella haemolytica* vaccine were studied. Peripheral blood lymphocytes (PBLs) from the sheep were analysed using single and double-colour indirect immunofluorescence staining and flow cytometry to monitor changes in circulating B and T cell subsets. Serum antibody responses were assayed using the ELISA, in addition to measuring local skin reactions at the site of vaccine administration. Results showed significant increases in circulating B cells in all sheep after the primary ($P < 0.01$) and secondary ($P < 0.001$) vaccinations although the increases were much more dramatic in the *T. evansi*-infected sheep. In addition, infection induced significant increases ($P < 0.004$) in both proportions and numbers of $CD5^+$ B cells, with more than 70% of circulating B cells expressing the CD5 antigen, and showed significant differences ($P < 0.01$) from those of control sheep in which vaccination alone failed to induce similar increases. Also, infection resulted in significant decreases in $CD5^+$ ($P < 0.003$), $CD4^+$ ($P < 0.03$) and $CD8^+$ ($P < 0.03$) T cell subsets in contrast to their increases in all control animals after vaccination. Moreover, there was significant suppression of both local skin reaction ($P < 0.005$) and serum Ig and IgG_1 ($P < 0.001$) antibody responses to the vaccine antigen.

10649 **Osaer, S., Goossens, B., Jeffcoate, I., Jaitner, J., Kora, S. and Holmes, P., 1998.** Effects of *Trypanosoma congolense* and nutritional supplements on

establishment and outcome of pregnancy in trypanotolerant Djallonké ewes. *Animal Reproduction Science*, **51** (2): 97-109.

Osaer: ITC, P.M.B. 14, Banjul, Gambia.

Interactions between *T. congolense* and nutritional status were studied in 42 ewes, bred at the peak of parasitaemia after synchronisation of oestrus. As experimental design, a randomised block design was used with four treatment combinations (2 × 2 factors), of which two were on a restricted diet (L), the remainder on an unrestricted diet (H) and half of each nutritional group infected with *T. congolense* (LI, HI), the remainder serving as controls (LC, HC). Severity of parasitaemia was not influenced by supplementation, and mortality rates were higher in the HI and LC groups, but these differences were not significant. Progesterone levels during the synchronised cycle were significantly lower in the infected groups. Levels of pregnant specific protein B (PSPB) in pregnant sheep at days 21 and 26 were not significantly affected by nutrition or infection, despite the tendency of a decrease in infected groups. *T. congolense* clearly affected establishment of pregnancy, as shown by lower rates of pregnancy and extended intervals between breeding and confirmation of pregnancy, nor was there any benefit of nutritional supplementation. Mean progesterone concentration during pregnancy, in those ewes which lambed, was not different between groups. The effect of the *T. congolense* infection on the outcome of pregnancy was not clear, with the LI and HC performing well and poor pregnancy outcomes in groups HI and LC, although differences in litter size might explain these anomalies. It is concluded that the most pronounced effect of *T. congolense* was a negative influence on establishment of pregnancy, with nutritional supplementation unable to overcome this effect but having a beneficial influence on maintenance and successful outcome of pregnancy. However, individual exceptions indicate that some ewes cope better with the negative effects of infection and poor nutrition.

10650 **Singla, L.D., Juyal, P.D. and Ahuja, S.P., 1998.** Blood brain barrier status in experimental *Trypanosoma evansi* infected and levamisole treated cow-calves. *Indian Veterinary Journal*, **75** (2): 109-112.

Singla: Punjab Agricultural University, Ludhiana 141004, Punjab, India.

Groups of five Jersey calves were infected with *T. evansi* and given levamisole at 2.5 mg/kg body weight s.c. at weekly intervals or infected and given levamisole treatment starting at day 79 p.i. Two animals were kept as uninfected, untreated controls. Changes in albumins and immunoglobulins in CSF and blood plasma samples indicated that levamisole improved the immune status of infected calves. The implications of these findings on the impairment of the blood-brain barrier with trypanosome infection are discussed briefly.

10651 **Umar, I.A., Omage, J.J., Shugaba, A., Igbokwe, I.O., Ibrahim, N.D.G., Kadima, K.B., Ameh, D.A., Kwanashie, H.O., Agbede, R.I.S., Saror, D.I. and Esievo, K.A.N., 1998.** Effects of acute bovine trypanosomosis (*Trypanosoma vivax*) on plasma kinetics of intravenously administered lactose. *Veterinary Parasitology*, **74** (2-4): 173-178.

Esievo: Department of Veterinary Patholology and Microbiology, Ahmadu Bello University, Zaria, Nigeria.

Four calves infected with *T. vivax* and four uninfected control calves were each injected i.v. with repeated doses of 0.5 g lactose/kg body weight, thrice daily at intervals of 4 h. Plasma samples were collected at specified time intervals and analysed for lactose. Pharmacokinetic parameters were calculated from the data. *T. vivax* infection delayed excretion of lactose from the body, thus leading to significantly ($P < 0.001$) increased biological half life ($t1/2$) and a significantly ($P < 0.001$) reduced elimination rate constant for lactose in the body. The apparent volume of distribution and total clearance of lactose were not affected by the infection. *T. vivax* infection also appeared to cause accumulation of lactose in the plasma after repeated i.v. administration.

(c) TRYPANOTOLERANCE

10652 **Mwangi, E.K., 1996.** Are *Bos indicus* cattle breeds that possess a degree of trypanotolerance resistant to tick infestations and their consequences? *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), pp. 133-141.

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

Two trypanotolerant cattle breeds, the Orma Boran and the Maasai Zebu, were investigated for their susceptibility to tick infestation in comparison with the trypanosusceptible Galana Boran breed and the exotic Friesian breed which has known susceptibility to ticks. Observations over a 3 month period indicated that differences in tick infestations and their consequences, namely anaemia and incidence of tick-borne diseases, exist among the breeds. The major tick species were *Rhipicephalus appendiculatus, R. evertsi* and *Boophilus* spp. and the mean weekly tick counts were 28.2, 39.3, 46.8 and 50.5 ticks per host for Maasai Zebu, Orma Boran, Galana Boran and Friesian, respectively. The counts in Maasai Zebu were significantly lower than in Galana Boran and Friesian. Following tick infestations, the degree of anaemia developed by Friesian steers was significantly lower than in Orma Boran and Galana Boran, but not lower than in Maasai Zebu. The major disease encountered was East Coast fever (*Theileria parva*) and its incidence was significantly higher in the Maasai Zebu than in the other breeds. The implications of these findings for planning alternative tick (and trypanosomiasis) control strategies are discussed.

10653 **Spooner, R.L., 1997.** Genetics of disease resistance and the potential of genome mapping. *Tropical Animal Health and Production*, **29** (4 Suppl.): 95S-97S.

CTVM, Easter Bush, Roslin, Midlothian EH25 9RG, UK.

This general paper mentions breeding experiments at ILRI to identify genes responsible for trypanotolerance by crossing trypanotolerant N'Dama cattle with trypanosusceptible Boran cattle.

(d) TREATMENT

[See also **21**: nos. 10640, 10641.]

10654 **Diarra, B., Diall, O., Geerts, S., Kageruka, P., Lemmouchi, Y., Schacht, E., Eisler, M.C. and Holmes, P., 1998.** Field evaluation of the prophylactic effect of an isometamidium sustained-release device against trypanosomiasis in cattle. *Antimicrobial Agents and Chemotherapy*, **42** (5): 1012-1014.

Geerts: Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium.

In order to compare the prophylactic effect provided by a poly(D,L-lactide) sustained-release device (SRD) containing isometamidium (ISMM) with that provided by the classical intramuscular injection of the drug, a field trial was carried out at the Madina Diassa Ranch in Mali. One- to 3-year-old N'Dama cattle were randomly divided into three groups. The first group (n = 42) was treated with ISMM at a dose of 1 mg/kg of body weight, the second group (n = 44) received the same dose of the drug via an SRD, which was subcutaneously implanted in the shoulder region, and the third group (n = 36) was kept as an untreated control group. All animals were treated with diminazene aceturate (7 mg/ kg of body weight) 2 weeks before the start of the experiment and were tested monthly by the buffy coat technique for a period of 8 months. *Glossina morsitans submorsitans* was the most important tsetse species, with apparent densities (number of catches/trap/day) varying between 11.9 and 38.7 over the experimental period. Eight months after treatment the cumulative infection rates (with *Trypanosoma vivax* and *T. congolense*) were 27.7, 58.5 and 77.4% in the group with the SRD implant, the group receiving the i.m. injection and the control group, respectively. Statistical analysis showed that the incidence of trypanosomiasis was significantly lower (P = 0.006) in the group which received ISMM via the SRD than in the one which was treated with ISMM i.m.

10655 **Nyeko, J.H.P.M., 1996.** Chemotherapy of vector forms of *Trypanosoma congolense*. *In*: Gray, G.D. and Uilenberg, G. (eds), 1996 (see **21**: no. 10645), p. 125.

African Pest and Environment Management Foundation, P.O. Box 40289, Kampala, Uganda.

Glossina morsitans morsitans infected with a drug-sensitive strain of *T. congolense* were fed on animals treated with isometamidium chloride (Samorin). While the dose used could cure the infections in the mammalian hosts, it did not kill all the parasites in the tsetse flies, although the drug did cause serious morphological damage in many of them. The degree of parasite damage was more pronounced in the flies fed a blood meal containing Samorin using an artificial membrane. It was thought that the drug might exert this effect by preventing the establishment of trypanosome infection in tsetse flies as it does in livestock. When tsetse were fed on blood meals containing Samorin before being infected, there was no significant difference in the fly infectivity following the

prophylactic blood meal. In another investigation, when flies with immature infections were maintained on rabbits that were regularly treated with Samorin, the drug had no significant effect on the maturation of infections in the flies.

7. EXPERIMENTAL TRYPANOSOMIASIS

(a) DIAGNOSTICS

10656 **Ijaz, M.K., Nur-E-Kamal, M.S.A., Mohamed, A.I.A. and Dar, F.K., 1998.** Comparative studies on the sensitivity of polymerase chain reaction and microscopic examination for the detection of *Trypanosoma evansi* in experimentally infected mice. *Comparative Immunology Microbiology and Infectious Diseases*, **21** (3): 215-223.

Dar: Department of Medical Microbiology, Faculty of Medicine and Health Sciences, UAE University, P.O. Box 17666, Al Ain, United Arab Emirates.

10657 **Mbah, H. and Büscher, P., 1997.** Purification and diagnostic evaluation of a common antigen of *T. brucei* in antibody detection ELISA for gambian and rhodesian sleeping sickness. (Meeting abstract no. T2.3.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 80-81.

Mbah: Star Comm & Extension, B.P. 395, Bamenda, Cameroon.

Aiming at the preparation of invariable surface glycoproteins (ISG) 65 and 75 from bloodstream form trypanosomes for serodiagnostic purposes, a putative glycoprotein of about 62 kDa was partially purified by detergent extraction and ConA chromatography from *Trypanosoma brucei gambiense* clone VAT LiTat 1.5. A polyclonal rabbit antiserum was raised against this protein preparation. A cross reactivity with ISG 75 was observed as well as the presence of antibodies against this protein in sera of *T. b gambiense* and *T. b. rhodesiense* infected human patients. The diagnostic potential of this antigen was evaluated in an antibody detection ELISA with sera of 76 *T. b. gambiense*, 62 *T. b. rhodesiense* and 124 *Plasmodium* infected patients. At an OD cut-off value of 0.25 the sensitivity of the test was 100% and 87% with *T. b. gambiense* and *T. b. rhodesiense* sera respectively, while the specificity was 94.4%.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **21**: no. 10702.]

10658 **Bouteille, B., Millet, P., Enanga, B., Ndong, J.M.M., Keita, M., Jauberteau, M.O., Georges, A. and Dumas, M., 1998.** La trypanosomose humaine africaine, apport des modèles expérimentaux. [Experimental models of human African trypanosomiasis.] *Bulletin de la Société de Pathologie exotique*, **91** (2): 127-132.

Bouteille: Institut d'Epidémiologie Neurologique et de Neurologie Tropicale, 2 rue du Dr Marcland, 87025 Limoges Cedex, France.

Experimental animal models of late-stage HAT are needed to study the pathology and pathogenesis of the disease, as well as for therapeutic trials of potentially effective new drugs or combinations. We have developed acute and chronic murine and sheep experimental animal models of HAT infection by *T. b. brucei*. Meningoencephalitis and neurological signs are relatively difficult to obtain in murine models and require artificial means, such as suramin treatment on day 21 p.i. The sheep model develops a disease with CNS complications, and CSF can be collected for experimental use. However, studies of new therapeutic compounds, which could be proposed for human use, have to be carried out on a primate model infected with *T. b. gambiense*, and we have recently developed such a model in *Cercopithecus aethiops*, the vervet monkey.

10659 **El Sawalhy, A., Seed, J.R., Hall, J.E. and El Attar, H., 1998.** Increased excretion of aromatic amino acid catabolites in animals infected with *Trypanosoma brucei evansi*. [Mice, dogs, donkeys.] *Journal of Parasitology*, **84** (3): 469-473.

Seed: Department of Epidemiology, School of Public Health, University of North Carolina, Chapel Hill, NC 27599, USA.

10660 **Igbokwe, I.O., 1998.** Glycaemic state in acute trypanosomiasis in relation to adrenal gland response. *Tropical Veterinarian*, **16** (1-2): 89.

Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria.

This note comments on the article by E.A. Iyayi (1996) on 'Response of adrenal gland, plasma cortisol and glucose to *T. congolense* infection in rabbits' in *Tropical Veterinarian*, **14** (1-2): 31-38. See also *TTIQ*, no. 10668.

10661 **Igbokwe, I.O., Lafon, J.Y., Umar, I.A. and Hamidu, L.J., 1998.** Erythrocyte and hepatic glutathione concentrations in acute *Trypanosoma brucei* infection of rats. *Tropical Veterinarian*, **16** (1-2): 81-83.

Igbokwe: Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria.

10662 **Igbokwe, I.O., Mohammed, C. and Shugaba, A., 1998.** Fasting hyperglycaemia and impaired oral glucose tolerance in acute *Trypanosoma brucei* infection of rats. *Journal of Comparative Pathology*, **118** (1): 57-63.

Igbokwe: Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria.

10663 **Inoue, N., Narumi, D., Mbati, P.A., Hirumi, K., Situakibanza, N.-T.H. and Hirumi, H., 1998.** Susceptibility of severe combined immuno-deficient (SCID) mice to *Trypanosoma brucei gambiense* and *T. b. rhodesiense*. *Tropical Medicine and International Health*, **3** (5): 408-412.

Inoue: Research Centre for Protozoan Molecular Immunology, Obihiro University of Agriculture and Veterinary Medicine, Inada-cho, Obihiro, Hokkaido 080-0834, Japan.

10664 **Mezui-Me-Ndong, J., Millet, P., Dubreuil, G., Bouteille, B., Dumas, M. and Georges, A.J., 1997.** Etablissement d'un modèle expérimental de la trypanosomose à *Trypanosoma brucei gambiense* chez le singe vervet, *C. aethiops*. [Establishment of an experimental model of *T. b. gambiense* trypanosomiasis in the vervet monkey, *C. aethiops*.] (Meeting abstract no. T3.8.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 92.

Mezui-Me-Ndong: Centre International de Recherches de Franceville, B.P. 769, Franceville, Gabon.

The vervet monkey, *Cercopithecus aethiops*, infected with *T. b. rhodesiense*, remains the primate model best adapted for the study of *T. b. rhodesiense* HAT but a primate model of this type has not yet been established for *T. b. gambiense* HAT. A female vervet monkey was infected with *T. b. gambiense* and biological parameters, clinical signs and behaviour were recorded for this animal and a control animal. Parasites were first seen in the blood on the 7th day p.i. and irregular waves of parasitaemia culminated in a peak on the day of death 190 days p.i. Parasites were seen in the CSF from day 170 p.i. at which time hypercytorachia was also seen. Blood biochemical parameters and the clinical picture were typical of HAT, suggesting that the vervet monkey could be a suitable primate model for *T. b. gambiense* HAT.

10665 **Sarmah, P.C., Bhattacharyulu, Y. and Joshi, V.B., 1997.** Effect of *Trypanosoma evansi* infection on the antibody response in guinea pigs vaccinated with haemorrhagic septicaemia oil adjuvant vaccine. *Journal of Veterinary Parasitology*, **11** (2): 161-164.

Sarmah: Department of Parasitology, College of Veterinary Science, Assam Agricultural University, Guwahati 781022, India.

10666 **Sternberg, J.M., 1998.** Immunobiology of African trypanosomiasis. (Review.) *Chemical Immunology*, **70** (*Immunology of Intracellular Parasitism*): 186-199.

Department of Zoology, University of Aberdeen, Aberdeen AB24 2TZ, UK.

10667 **Sutmuller, M., Madaio, M.P., Baelde, J.J., Heer, E. de and Bruijn, J.A., 1997.** Idiotype usage by polyclonally activated B cells in experimental autoimmunity and infection. [*T. brucei*; mice.] (Meeting abstract no. A2168.) *Journal of the American Society of Nephrology*, **8** (Program and Abstracts issue): 466A-467A.

Sutmuller: Department of Pathology, University of Leiden, P.O. Box 9600, 2300 RC Leiden, Netherlands.

10668 **Taiwo, V.O., 1998.** Anaemia and cachexia during trypanosomiasis: putting the facts right. *Tropical Veterinarian*, **16** (1-2): 85-87.

Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria.

This note comments on the article by E.A. Iyayi (1996) on 'Response of adrenal gland, plasma cortisol and glucose to *T. congolense* infection in rabbits' in *Tropical Veterinarian*, **14** (1-2): 31-38. See also *TTIQ*, no. 10661.

(c) CHEMOTHERAPEUTICS

[See also **21**: nos. 10658, 10687, 10689.]

10669 **Busch, J., Grether, Y., Ochs, D. and Séquin, U., 1998.** Total synthesis and biological activities of (+)- and (–)-boscialin and their 1′-epimers. [*T. b. rhodesiense*; *Boscia salicifolia.*] *Journal of Natural Products*, **61** (5): 591-597.

Séquin: Institut für Organische Chemie, Universität Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland.

10670 **Calenbergh, S. van and Herdewijn, P., 1997.** Rational development of new sleeping sickness drugs. (Review.) *Current Medicinal Chemistry*, **4** (6): 359-384.

Calenbergh: Laboratory of Medicinal Chemistry, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.

10671 **Enyaru, J.C.K., Matovu, E., Lubega, G.W. and Kaminsky, R., 1998.** Response of a *T. b. rhodesiense* stock with reduced drug susceptibility *in vitro* to treatment in mice and cattle. *Acta Tropica*, **69** (3): 261-269.

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

In vivo drug susceptibility tests involving treatment of infected mice and cattle were performed on a *Trypanosoma brucei rhodesiense* stock isolated in south-eastern Uganda, which had expressed reduced susceptibility to diminazene aceturate and isometamidium chloride *in vitro*. Diminazene aceturate at 14 mg/kg and isometamidium chloride at 2.0 mg/kg were not sufficient to cure all mice but 7 mg/kg diminazene aceturate cured the infection in cattle. The reduced susceptibility of this *T. b. rhodesiense* stock, which was demonstrated in mice as well as in culture, may indicate the existing potential for the evolution of resistance in south-eastern Uganda.

10672 **Freiburghaus, F., Steck, A., Pfander, H. and Brun, R., 1998.** Bioassay-guided isolation of a diastereoisomer of kolavenol from *Entada abyssinica* active on *Trypanosoma brucei rhodesiense. Journal of Ethnopharmacology*, **61** (3): 179-183.

Pfander: Department of Chemistry and Biochemistry, University of Bern, Freiestrasse 3, CH-3012 Bern, Switzerland.

Bioassay-guided fractionation of the dichloromethane rootbark extract of *E. abyssinica* (Leguminosae), a plant used by traditional healers in Uganda for the treatment of sleeping sickness, led to the isolation of a diastereoisomer of the clerodane type diterpene kolavenol. This is the first report on this compound. It showed a trypanocidal activity with an IC_{50} value of 2.5 μg/ml (8.6 μM) against *T. b. rhodesiense*.

10673 **Kioy, D.W., Murilla, G., Kofi-Tsekpo, M.W., Mukhongo, M. and Okwara, J., 1998.** Anti-trypanosomal effects of some compounds isolated from the extracts of *Warburgia ugandensis*. *African Journal of Health Sciences*, **5** (1): 35-37.

Kioy: Faculty of Pharmacy, University of Nairobi, P.O. Box 19676, Nairobi, Kenya.

The crude total aqueous stem bark extract of *W. ugandensis*, a common plant used traditionally to treat many disease conditions, and two purified compounds (Mukaadial and Cinnamolide) were tested against *Trypanosoma congolense, T. evansi* and *T. brucei*. *In vitro* tests using the tissue culture method indicated that the purified compounds were more active than the crude extract. *In vivo* tests using mice indicated that the total extract was not effective, whereas one of the pure compounds was too toxic and the other showed activity. The two purified compounds were basically of the same structural type with a slight difference in the functional groups.

10674 **Yang, Y.-S., Ou, Y.-C., Ruan, C.-M., Chen, Y.-G. and Zhang, F.-Q., 1995.** Trypanocidal value of liposomal diminazene in experimental *Trypanosoma evansi* infection in mice. *Annual Anthology of University of Agriculture and Animal Sciences, PLA*, **1994**: 35-38.

Laboratory of Pharmacology, Military Veterinary Institute, University of Agriculture and Animal Sciences, Changchun 130062, China.

8. TRYPANOSOME RESEARCH

(a) CULTIVATION OF TRYPANOSOMES

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

10675 **Grebaut, P., Truc, P., Penchenier, L., Bureau, P. and Herder, S., 1997.** Le KIVI (kit for *in vitro* isolation), un outil indispensable à la recherche sur les trypanosomoses à *T. brucei* s.l. [KIVI, an indispensible tool for research on *T.*

brucei s.l. infections.] (Meeting abstract no. T2.4.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 81.

Grebaut: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Up to 1989, characterisation of *Trypanosoma brucei* group trypanosomes was difficult because it was necessary to isolate, then amplify the parasites in rodents in order to obtain sufficient biological material for carrying out the necessary biochemical analyses. In addition, passage through rodents submitted strains to selection. The KIVI is an advance in the isolation of trypanosomes. Numerous field studies have confirmed its ease of handling and its efficacy in the mass production of trypanosomes. It has proved its worth in genetic studies of populations of African trypanosomes and as a diagnostic tool.

10676 **Herder, S., Grebaut, P., Eouzan, J.P. and Cuny, G., 1997.** De nouveaux marqueurs moléculaires pour l'étude de la variabilité génétique de *T. brucei* s.l. [New molecular markers for the study of the genetic variability of *T. brucei* s.l.] (Meeting abstract no. T2.5.) *Bulletin de Liaison et de Documentation de l'OCEAC*, **30** (3): 81.

Herder: Laboratoire de Recherches sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

Markers capable of distinguishing between *Trypanosoma brucei brucei* and *T. b. gambiense* are of fundamental importance to an understanding of the current resurgence of HAT foci. Use of currently available genetic markers (isoenzymes, RAPD, RFLP, kDNA probes) involve onerous procedures (mass cultivation of trypanosomes, radioactive marking, extraction of kDNA). OCEAC's trypanosomiasis research laboratory has identified some new markers capable of discriminating the subspecies of the *T. brucei* s.l. complex. They have been developed from microsatellite DNA sequences extracted from the *T. brucei* genome. These markers, based on PCR amplification of the sequences, are easy to use and easily adaptable to laboratories in endemic countries.

10677 **Hide, G., Angus, S.D., Holmes, P.H., Maudlin, I. and Welburn, S.C., 1998.** *Trypanosoma brucei*: comparison of circulating strains in an endemic and an epidemic area of a sleeping sickness focus. *Experimental Parasitology*, **89** (1): 21-29.

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

Human sleeping sickness in East Africa is characterised by periods of long-term endemicity interspersed with short-term epidemics. The factors generating these huge changes are largely uncharacterised but probably reflect complex interactions among socioeconomic factors, ecological factors, and the movement and diversity of trypanosome strains. To investigate the role of trypanosome strains in the generation of these epidemics, we addressed two important questions: (i) Are the trypanosome strains

circulating within a focus the same during times of endemicity and during an epidemic? (ii) How stable are trypanosome strains within a single animal reservoir host? Using restriction fragment length polymorphism analysis of repetitive DNA, we have examined the relationship between *T. brucei* isolates taken from the Busoga focus of human sleeping sickness during an endemic period (Busia, Kenya, 1993-1994) and during an epidemic period (Tororo, Uganda, 1988-1990). We show that similar strains, including human infective strains, are circulating in domestic cattle (the most significant animal reservoir) in both epidemic and endemic areas of the Busoga focus. Furthermore, we show the important finding that individual animals harbour the same genotype of *T. brucei* for a period of time and may be clonal for a given parasite strain.

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

10678 **Al-Qahtani, A., Teilhet, M. and Mensa-Wilmot, K., 1998.** Species-specificity in endoplasmic reticulum signal peptide utilization revealed by proteins from *Trypanosoma brucei* and *Leishmania*. *Biochemical Journal*, **331** (2): 521-529.

Mensa-Wilmot: Department of Cellular Biology, University of Georgia, 724 BioSciences, Athens, GA 30602, USA.

10679 **Anderson, S.A., Carter, V. and Parsons, M., 1998.** *Trypanosoma brucei*: molecular cloning and stage-regulated expression of a malate dehydrogenase localized to the mitochondrion. *Experimental Parasitology*, **89** (1): 63-70.

Parsons: Seattle Biomedical Research Institute, 4 Nickerson Street, Seattle, WA 98109, USA.

10680 **Aphasizhev, R., Karmarkar, U. and Simpson, L., 1998.** Are tRNAs imported into the mitochondria of kinetoplastid protozoa as 5′-extended precursors? [*T. brucei*.] *Molecular and Biochemical Parasitology*, **93** (1): 73-80.

Howard Hughes Medical Institute, UCLA, 6780 MacDonald Building, Los Angeles, CA 90095-1662, USA.

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Beg: Molecular Biology Core Facility, Division of Biomedical Sciences, Meharry Medical College, 1005 D.B. Todd Boulevard, Nashville, TN 37208, USA.

10682 **Bernstein, B.E. and Hol, W.G.J., 1998.** Crystal structures of substrates and products bound to the phosphoglycerate kinase active site reveal the catalytic mechanism. [*T. brucei*.] *Biochemistry*, **37** (13): 4429-4436.

Department of Biological Structure, Howard Hughes Medical Institute, Biomolecular Structure Center, University of Washington, Box 357742, Seattle, WA 98195, USA.

10683 **Bernstein, B.E., Williams, D.M., Bressi, J.C., Kuhn, P., Gelb, M.H., Blackburn, G.M. and Hol, W.G.J., 1998.** A bisubstrate analog induces unexpected conformational changes in phosphoglycerate kinase from *Trypanosoma brucei*. *Journal of Molecular Biology*, **279** (5): 1137-1148.

Hol: Department of Biological Structure, Howard Hughes Medical Institute, University of Washington, Box 357742, Seattle, WA 98195. USA.

10684 **Blundell, P.A., Leeuwen, F. van, Brun, R. and Borst, P., 1998.** Changes in expression site control and DNA modification in *Trypanosoma brucei* during differentiation of the bloodstream form to the procyclic form. *Molecular and Biochemical Parasitology*, **93** (1): 115-130.

Borst: Division of Molecular Biology, Netherlands Cancer Institute, Plesmanlaan 121, NL-1066 CX Amsterdam, Netherlands.

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Bringaud: Laboratoire de Parasitologie Moléculaire, Université Victor Ségalène de Bordeaux II, Unité Propre de Recherche de l'Enseignement Supérieur Associé au CNRS 5016, 146 rue Léo Saignat, F-33076 Bordeaux Cedex, France.

10686 **Ernest, I., Callens, M., Uttaro, A.D., Chevalier, N., Opperdoes, F.R., Muirhead, H. and Michels, P.A.M., 1998.** Pyruvate kinase of *Trypanosoma brucei*: overexpression, purification, and functional characterization of wild-type and mutated enzyme. *Protein Expression and Purification*, **13** (3): 373-382.

Michels: ICP-TROP, 74.39, Avenue Hippocrate 74, B-1200 Brussels, Belgium.

10687 **Gao, X.-G., Garza-Ramos, G., Saavedra-Lira, E., Cabrera, N., Gómez-Puyou, M.T. de, Perez-Montfort, R. and Gómez-Puyou, A., 1998.** Reactivation of triosephosphate isomerase from three trypanosomatids and human: effect of Suramin. [*T. brucei*, *T. cruzi*, *Leishmania mexicana*.] *Biochemical Journal*, **332** (1): 91-96.

A. Gómez-Puyou: Departamento de Bioquímica, Instituto de Fisiología Celular, Universidad Nacional Autónoma de México, Apartado Postal 70243, Mexico City 04510, DF, Mexico.

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Garza-Ramos: Departamento de Bioquímica, Instituto de Fisiología Celular, Universidad Nacional Autónoma de México, Apartado Postal 70242, Mexico City 04510, DF, Mexico.

10689 **Goldberg, B., Rattendi, D., Lloyd, D., Sufrin, J.R. and Bacchi, C.J., 1998.** Effects of intermediates of methionine metabolism and nucleoside analogs on *S*-adenosylmethionine transport by *Trypanosoma brucei brucei* and a drug-resistant *Trypanosoma brucei rhodesiense*. *Biochemical Pharmacology*, **56** (1): 95-103.

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Department of Biochemistry and Molecular Biology A-10, Albany Medical College, 47 New Scotland Avenue, Albany, NY 12208, USA.

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Ullu: Department of Internal Medicine, Yale University School of Medicine, P.O. Box 208022, 333 Cedar Street, New Haven, CT 06520, USA.

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Ferguson: Department of Biochemistry, University of Dundee, Dundee DD1 4HN, UK.

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Ching: Department of Pharmaceutical Chemistry, University of California, San Francisco, CA 94143-0446, USA.

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Hajduk: Department of Biochemistry and Molecular Genetics, University of Alabama School of Medicine, Birmingham, AL 35294, USA.

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Ullman: Department of Biochemistry and Molecular Biology, Oregon Health Sciences University, Portland, OR 97201-3098, USA.

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Tschudi: Department of Internal Medicine, Yale University School of Medicine, 333 Cedar Street, New Haven, CT 06520-8022, USA.

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