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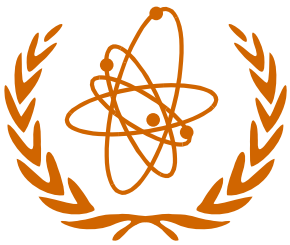

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SECTION A – NEWS

25TH MEETING AND GOLDEN JUBILEE OF INTERNATIONAL SCIENTIFIC COUNCIL FOR TRYPANOSOMIASIS RESEARCH AND CONTROL

Meeting report

The 25th meeting of ISCTRC, celebrating the 50th Anniversary of ISCTRC, was successfully held in Mombasa, Kenya, from 27 September to 1 October 1999. About 400 participants attended from various parts of Africa, Europe, Asia and USA.

About 200 oral and poster scientific presentations were made, divided into seven main categories: human African trypanosomiasis (diagnosis, treatment and control); animal trypanosomiasis (diagnosis, treatment, control, including chemotherapy, chemoprophylaxis and vaccine development); the tsetse vector (entomological aspects, mass rearing for SIT as a control strategy, other management measures and genetic studies); trypanotolerance; socio-economic aspects and the environmental impact of tsetse control; community participation in the control of tsetse and trypanosomiasis; and molecular aspects of research on the disease (human and animal) and the vector.

After all the deliberations, and considering all the evidence from the presentations, the conference concluded that the sleeping sickness situation in Africa is gloomy. About 60 million people are at risk, and more than 10 million km^2 of fertile land is infested by tsetse. The infection rate in humans is back to where it was in the 1930s.

The only way to bring food security and decrease poverty in Africa is by reclaiming the fertile land infested by tsetse. It was revealed that it will cost Africa about US$ 20 million to control tsetse and trypanosomiasis over a period of 20 years. The rate of economic return after such control is calculated to be US$ 50 billion, resulting in a cost benefit analysis of 2:1. Donor countries are requested to cancel the debt of ten poorest countries in Africa and to divert the fund towards tsetse control.

The ***general recommendations*** of the meeting were as follows:

The council: noting that the incidence of sleeping sickness and the animal disease is on the increase, with human disease estimated at 350,000 cases; realising that *c*. 60 million people are at risk; aware that a third of sub-Saharan Africa is still under tsetse infestation; cognisant that only a limited number of drugs for both human and animal diseases is available, and that the manufacture of some of them has ceased and that drug resistance is on the increase:

(i) warns member states that this is an emergency situation which warrants immediate attention;

(ii) recommends that member states rank African trypanosomiasis control high in priority in their development programmes;

(iii) recommends that urgent and particular attention be given to: surveillance; intervention in epidemic areas; and drug availability and resistance;

(iv) recommends that a West and Central Africa regional programme be developed similar to the FITCA programme in East Africa.

It is expected that a specific progress report will be provided by the ISCTRC secretariat on these recommendations.

It is proposed to hold the 26th ISCTRC Meeting in Burkina Faso in October 2001.

Solomon Haile Mariam, ISCTRC Secretary, OAU/IBAR

Jubilee awards

To mark the ISCTRC's Golden Jubilee, awards were made during the meeting to some of the personalities who have made significant contributions to advances in the understanding and control of the African trypanosomes and their vectors.

Gold medals were awarded to Dr Glyn A. Vale, Dr Anthony M. Jordan, Dr Peter de Raadt, Prof. Max Murrary and Dr Saydil M. Toure.

Silver medals were awarded to Dr Adriel R. Njogu, Prof. Thomas R. Odhiambo, Dr John Hargrove, Dr Rajinder K. Saini, Dr Guy d'Ieteren, Prof. Peter Holmes, Dr Albert Challier, Dr Dominic Cuisance, Dr Burkhard Bauer, Mr Brian Hursey, Mr Pierre Cattand, Dr Vinand Nantulya, Mr Udo Feldmann, Dr Nestor van Meirvenne and Dr Jean-Louis Frezil.

Two *special awards* were presented to Dr Walter N. Masiga and Mr Kenneth M. Katondo and five *posthumous awards* were presented to Mr Janick Lancien, Dr G. L. Kazyumba, Prof. E. Bursell, Dr E. Freidheim and Dr A. van der Vloedt.

PROGRAMME AGAINST AFRICAN TRYPANOSOMIASIS

PAAT Chairman's Report

Many members of the PAAT community have just returned from a very enjoyable and successful series of meetings in Mombasa. On the 23-24 September a meeting of the PAAT Advisory Group Co-ordinators was held (see report below). This was followed by the Jubilee ISCTRC Conference. The latter was a very special occasion and we would like to offer our congratulations to the organisers for arranging a very successful conference. The PAAT meeting and conference provided an opportunity to review recent PAAT achievements and also to look at future plans.

PAAT has undoubtedly made a contribution to the international debate on tsetse and trypanosomiasis control through PAAT-L, the co-ordinator network and meetings and through the PAAT newsletter. As a result there is a greater understanding of the disease impact. Through workshops and discussion there is also a growing harmonisation of policies, planning and strategies and effective moves towards the standardisation of technologies, e.g. in diagnostics and tests for chemoresistance. This emerging consensus is best reflected in the PAAT Position Papers and it is hoped to publish more of these in the coming year. All these are contributing to PAAT's mission of concerted international action and improved disease management.

Over the coming year it is hoped to carry forward these activities in a number of ways. These include the transfer of the Policy, Planning and Implementation Module to IBAR in Nairobi, greater support to regional and national programmes through the provision of advice, technical backstopping and assistance with capacity building. These activities will be promoted by the formation of a number of working groups and a PAAT Support Group. Finally, it is recognised that the whole PAAT community must be more active in awareness raising if the problem of trypanosomiasis in people and their livestock is to achieve the level of international recognition and funding needed for its effective control.

Peter Holmes, Chairman PAAT

Report on the Fifth PAAT Advisory Group Co-ordinators Meeting

This meeting took place from 23-24 September 1999 in Mombasa in conjunction with the ISCTRC meeting. Reports were presented by the members of the PAAT secretariat, FAO, IAEA, OAU/IBAR and WHO, by the co-ordinators for socio-economic aspects of trypanosomiasis and for bait technology, and the meeting was updated on FITCA (Dr R. Dransfield now in post as Technical Adviser for Uganda project), RTTCP (which will complete its activities in Zambia, Malawi and Mozambique in December 1999), PAAT-IS and ICPTV. A report instigated by DFID on an economic analysis of inter-national tsetse and trypanosomiasis research and development was presented and discussed. The meeting also considered the recommendations of the FAO Liaison Officers' Meeting (see below) and was briefed on a workshop on policy harmonisation and project cycle management which Animal Resources Directors of 14 different countries had just been attending (this included a topic on 'mechanisms of ensuring that different livestock programmes receive the support of PAAT').

PAAT Plan of Action: Two different approaches to tsetse and trypanosomosis control had previously been discussed in detail during previous PAAT meetings. However, it was now felt that there is a considerable overlap between area-wide and small-scale and that it was not helpful to make a restrictive distinction between the two terms. Similarly, distinctions could be made between top-down and bottom-up approaches or isolated and non-isolated areas. After a long debate it was agreed to stress the range of activities and techniques that are available (see recommendation 14).

PAAT-IS: Further development of the PAAT information system (PAAT-IS) comprises a predictive capability showing expected livestock increases following tsetse clearance. Although still relatively basic, the predictions support the priority accorded to Ethiopia and show the potential in other countries such as Tanzania. High quality data on tsetse and disease distributions are now urgently needed. A CD-ROM containing all the information will be produced before March 2000. (See also below.)

WHO: Major programme structure changes within WHO have imposed a review of the objectives of the WHO sleeping sickness programme. Five new objectives have been identified: (i) ensure sustainability of field surveillance and control activities; (ii) strengthen inter-agency collaboration through the PAAT; (iii) enhance epidemiological surveillance systems; (iv) develop a treatment and drug resistance network; and (v) develop an information system. Achievements towards objectives (ii) and (iv) were noted. A regional surveillance office will be opened in Yaoundé in November.

PAAT Support Group: The retirement of key personnel has resulted in an increased workload for the secretariat. The development of a Support Group to facilitate the uptake of PAAT recommendations and assist the secretariat was endorsed by the meeting: this will consist of three senior-level, part-time advisers, one for policy development, one for field programme support and one to prepare publications and promote communication.

The ***recommendations*** arising from the meeting are as follows:

1. PAAT endorses IBAR's initiative in taking forward the new discussions on proposed West and Central African regional programmes and recommends that the expertise within PAAT be fully utilised in formulating these programmes.
2. PAAT to pursue the development of the Support Group.

3. PAAT to strengthen and redefine the responsibilities of the PPI module, facilitate the transfer of these responsibilities to IBAR in Nairobi, assist with the development of new terms of reference and advise on the resource implications.
4. PAAT to initiate working groups on animal trypanocidal drug quality (see FAO Liaison Officers' Meeting, below) and on training.
5. Experiences gained through project formulation and implementation, as well as technologies developed, must be passed on and not lost.
6. PAAT-IS should include information on the distribution of disease risk and drug resistance.
7. WHO treatment and drug resistance network to become a technical advisory group of PAAT.
8. The data collected by the regional surveillance office based in Yaoundé to become integrated with PAAT-IS.
9. The PAAT to draw more attention to the sleeping sickness situation and to the worsening epidemiological status of the disease.
10. The development of diagnostic tools for individual animal diagnosis should take into account their practical utility at the field level.
11. Further dialogue should be promoted through PAAT and the EU Concerted Action to provide practical advice on drug delivery and resistance.
12. The PAAT secretariat should initiate further discussions on the production of recommendations for action that may be proposed from the economic and financial analysis of the DFID International Research Programme.
13. PAAT, through OAU/IBAR and member organisations, should ensure that the FITCA programme considers the research priorities identified by the Advisory Group on socio-economic aspects.
14. It was recommended that the concept of area-wide versus farmer-based control schemes as previously adopted should no longer be maintained because of the likely confusion the terminology could generate. However, under the PAAT Plan of Action, the Programme will continue to encourage the improvement of, and provide guidance on, a range of applications of concepts and techniques for tsetse/trypanosomiasis control and/or eradication programmes. These could range from small-scale, farmer-based schemes to large-scale interventions.
15. There is a need for PAAT to be more effective in the advocacy of its programmes.
16. Position papers awaiting publication should be scrutinised and edited by an editorial group in order to ensure publication without further delay.
17. There is a need for a position paper on issues pertaining to human sleeping sickness (WHO to submit draft).

PAAT-IS Resource Inventory

Tsetse and trypanosomiasis information for 37 African countries (22 complete, 15 partial) can now be accessed by visiting http://www.fao.org/paat/html/ri.htm.

The categories presented have evolved over the last 12 months through consultation with key users and feedback from various meetings. This is a tentative start to provide a focal point for country level tsetse and trypanosomiasis information which will be updated on an annual basis. As much grey literature material as possible has been included (with the assistance of text recognition software), as well as maps, tables and figures from hard

copy reports. Quantitative and graphical outputs from the PAAT Geographical Information System (GIS) contribute to assessing the economic impact of trypanosomiasis.

For those without internet access, this information will be included in the PAAT-IS CD-ROM which should be available by March 2000.

Suggestions, corrections and/or additional material that would add value to any of these country reports would be gratefully received.

For further information, please contact: Chris Jenner, PAAT-IS, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy (tel. +39 06 570 52032; fax. +39 06 570 55749; e-mail chris.jenner@fao.org; http://www.fao.org/paat).

Report on FAO Liaison Officers' Meeting

The FAO Liaison Officers' meeting on African trypanosomiasis in Central and West Africa was held at Mombasa on 21-22 September 1999. Several recommendations were formulated during the meeting:

1. The liaison officers strongly recommend that a programme similar to FITCA in East Africa, which has been proposed for West and Central Africa, is urgently activated by OAU/IBAR in conjunction with PAAT.
2. The liaison officers recommend: that national governments should strive to organise measures minimising the development of drug resistance; that FAO, WHO, IAEA, OAU/IBAR, PAAT and pharmaceutical companies work together in the quality control of trypanocidal drugs; that FAO and OAU/IBAR should consult with OIE, ECOWAS and OCEAC on the possibility of their involvement in quality control and drug marketing.
3. The liaison officers emphasise the need for integrated control of trypanosomiasis, and note with pleasure the involvement of PAAT in achieving this objective.

These recommendations were considered by the fifth PAAT Advisory Group Co-ordinators Meeting (see above).

NEW TRYPANOSOMIASIS REFERENCE CENTRE IN VIANA, ANGOLA

The Trypanosomiasis Reference Centre of the Programa Nacional da Tripanossomíase (PNT) in Viana, Angola, has been completely renovated and was inaugurated on 16 April 1999. It is located on the outskirts of Luanda, 17 km from the city centre.

The project was financed by FAC (Fonds d'Aide et Cooperation), France, and NORAD (Norwegian Cooperation) and was technically supported by the Swiss Tropical Institute. The mission of the centre, which consists of a clinical and a laboratory division, is to provide training facilities for national trypanosomiasis staff, diagnosis, treatment and surveillance of sleeping sickness, and research opportunities for applied and operational research. The clinical division, dedicated to treatment of human African trypanosomiasis, is equipped with 42 beds in seven rooms and is currently permanently fully occupied.

The laboratory division allows the sterile handling and cryopreservation of samples (N_2), but not yet the cultivation of trypanosomes, and basic biochemical analysis (basis Reflotron®). Currently a large-scale pharmacokinetic study is being conducted in collaboration with the Swiss Tropical Institute; this involves detailed clinical anamnesis,

sampling and biochemical analysis. The centre has sufficient qualified and motivated staff.

The political situation in Angola currently does not allow field work to be conducted in most areas but Luanda, the capital, can be considered acceptably safe. The new centre sees patients from all over the country due to the migration forced by the armed conflicts and provides opportunities to perform collection of samples and simple research projects at a remarkably good quality level. To maintain the standard achieved and to expand the knowledge of the staff involved, the scientific community is invited to consider Viana as a basis for future projects of any scale.

Further information may be obtained from: Dr Christian Burri, Swiss Tropical Institute, Socinstrasse 57, P.O. Box, CH-4002 Basel, Switzerland (tel. +41 61 284 82 47; fax +41 61 271 86 54); or from Prof. T. Josenando (Head of the PNT), Dr M. Kiassekioka (Acting Director, PNT) or Dr F. Manuel (Director, Reference Centre Viana), Programa Nacional da Tripanossomíase, 168 Rua Cmdt. Kuenha, CP 2657 – C, Bairro Ingombota, Luanda, Angola (tel +244 2 39 96 10 (administration); fax +244 2 33 51 29).

REGIONAL INFORMATION TECHNOLOGY TRAINING CENTRE

SATELLIFE (USA) and SATELLIFE HEALTHNET KENYA are pleased to announce the opening of the Regional Information Technology Training Centre (RITTC) in Nairobi, Kenya. The RITTC will provide training in the use of basic information technology, including e-mail, CD-ROM and World Wide Web/Internet technology, to health professionals, with special emphasis on their particular information needs.

An initial round of courses for nationals from Eritrea, Ethiopia, Kenya, Tanzania and Uganda working in any aspect of medicine or public health is being conducted as a pilot project during the 1999-2000 academic year. Two 3-day courses will be offered: (i) Information Technology (IT) Basics Course, and (ii) Information Technology (IT) Trainers Course.

To request further information on dates of courses, tuition fees and eligibility, and to receive a Word version of the application via e-mail, or to receive a copy of the application via fax or regular mail, please contact: SATELLIFE HEALTHNET KENYA, Director, infoDev Project, Kenyatta National Hospital Training Centre, Hospital Road, Off Ngong Road, P.O. Box 29750, Nairobi, Kenya (tel: +254-2-724543 or 714757; fax: +254-2-724590; e-mail RITTC@healthnet.or.ke).

MEETING

Oxford 2000: New challenges in tropical medicine and parasitology

This joint meeting of the British Society for Parasitology, the Royal Society of Tropi-cal Medicine and Hygiene and the American Society of Tropical Medicine and Hygiene will be held in Oxford, UK, from 18 to 22 September 2000, and will review past achievements and focus on areas for future developments. Although human diseases will be a primary focus, all aspects of human and animal parasitology will be covered. Representatives of the major international agencies will be invited to present their vision of tropical medicine and parasitology in the third millennium.

For further information, contact: tel. +44 (0)1625 624091; fax +44 (0)1625 430544; e-mail ccs@cmc.co.uk; http://www.oxford2000.org.uk.

SECTION B – ABSTRACTS

1. GENERAL (INCLUDING LAND USE)

11086 **Barrett, M.P., 1999.** The fall and rise of sleeping sickness. *Lancet*, **353** (9159): 1113-1114.

Division of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ, UK. [m.barrett@bio.gla.ac.uk]

This editorial commentary was prompted by the message of the international meeting at the Institute of Tropical Medicine, Antwerp, in December 1998: sleeping sickness is back. Surveillance has waned and tsetse populations have returned as a result of wars which have obliterated national health programmes and displaced infected individuals. Co-ordinated efforts of NGOs and WHO have helped in the worst situations, e.g. in the Sudan, but, in endemic rural areas, few patients seek early medical assistance. Up to 20% of late-stage patients in current epidemics are not responding to melarsoprol and there are licensing and cost problems over the use of eflornithine. Even for suramin and pentamidine, for the early-stage disease, WHO has had to intervene with the manufacturers to ensure continued supply at a reasonable price. In view of pharmaceutical companies' reluctance to develop new agents against sleeping sickness, bold decisions need to be taken on trials of potentially useful drugs. Several of the most promising for late-stage disease are Ames-test positive and considered inappropriate for clinical trials but this constraint seems bizarre in view of the fact that many cancer drugs are licensed in the west despite serious problems with toxicity and mutagenicity. It is recommended that a Pan-African drug-licensing agency be set up within the infrastructure offered by OAU which could play a key part in promoting trials, authorising use of drugs, and licensing drugs for diseases of special importance to Africa; it might also spawn an African pharmaceutical industry focusing on the development of new drugs of local importance at a fraction of the cost quoted by western companies.

11087 **Brinn, P., 1997.** Land use, tsetse, participation and privatisation in Zambia. *Land (Chatham)*, **1** (3): 183-195.

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

Limited success in the implementation of land use plans in the communal sector following tsetse control is attributed to too great an emphasis on technical aspects and too little on demonstrating the benefits of planning and involving communities in the process. This paper reviews the approach and experience of the Land Use Component of RTTCP in the Chiawa area of Zambia, illustrating how local initiatives were incorporated into the early stages of the planning process. The process had four phases: rapid socio-economic and environmental appraisal; nano-projects; detailed planning; and implementation. By

implementing selected nano-projects before the land use planning exercise, community confidence was increased and a constructive relationship established between the community and the planners. Coordination by a gender-balanced team was based on the following principles: projects to be identified by the community, managed by coordinators from the community and implemented by the community, with external inputs confined to technical advice. Thirty nano-projects were established over an 18 month period. Detailed planning was subsequently undertaken using two different mechanisms. The first involved Government staff funded under an EDF agreement, while the second involved selection through competitive tendering. The two methods produced results of comparable technical quality. The commercial outputs were more timely than those of the Government but were produced at higher cost.

11088 **Dumas, M., Bouteille, B. and Buguet, A. (eds), 1999.** *Progress in human African trypanosomiasis, sleeping sickness.* Paris, France; Springer-Verlag France. ISBN 2-287-59655-0. xiii + 344 pp.

Although there has been no revolutionary breakthrough in trypanosomiasis research and control at the end of the twentieth century, some significant scientific advances have been made. These recent developments are reviewed in 19 chapters written by experienced specialists in their respective fields: Trypanosomiasis exists when it is searched for... (J.L. Frézil); Identification of trypanosomes: from morphology to molecular biology (W. Gibson, J. Stevens and P. Truc); Antigenic variation in African trypanosomes (E. Pays); Carbohydrate metabolism (F.R. Opperdoes); Polyamine metabolism (J.C. Breton and B. Bouteille); Cytokines and the blood-brain barrier in human and experimental African trypanosomiasis (V.W. Pentreath); Cytokines in the pathogenesis of human African trypanosomiasis: antagonistic roles of TNF-α and IL-10 (S.G. Rhind and P.N. Shek); Immunology of African trypanosomiasis (P. Vincendeau, M.O. Jauberteau-Marchan, S. Daulouède and Z. Ayed); Pathology of African trypanosomiasis (K. Kristensson and M. Bentivoglio); Hormones in human African trypanosomiasis (M.W. Radomski and G. Brandenberger); Sleeping sickness: a disease of the clock with nitric oxide involvement (A. Buguet and R. Cespuglio); Electroencephalographic features and evoked potentials in human African trypanosomiasis (F. Tabaraud and P. Tapie); Clinical aspects of human African trypanosomiasis (M. Dumas and S. Bisser); Biological diagnosis of human African trypanosomiasis (N. van Meirvenne); Present strategies in the treatment of human African trypanosomiasis (S. van Nieuwenhove); The nitroimidazoles and human African trypano-somiasis (G. Chauvière and J. Périé); Experimental models for new chemotherapeutic approaches to human African trypanosomiasis (B. Bouteille, M. Keita, B. Enanga and J. Mezui Me Ndong); Prophylactic strategies in human African trypanosomiasis (A. Stanghellini); International co-operation: past and present (P. de Raadt and J. Jannin). Each chapter has its own reference list and a subject index is provided.

11089 **Gibson, W., 1998.** African trypanosomosis. *Zoonoses*, **1998**: 501-512.

School of Biological Sciences, University of Bristol, Bristol BS8 1UG, UK.

This general account of human African trypanosomosis covers the history (discovery of the disease and of the causative organisms; pathogenesis; epidemiology; control), the agent (taxonomy; molecular biology; disease mechanisms; growth and survival requirements), the hosts (general; incubation period; symptoms and signs; diagnosis; pathology; treatment; prognosis), epidemiology (occurrence: incidence, prevalence, epidemics, risk groups, geography; sources; transmission; communicability), and prevention and control (prevention; control strategies; methods and programmes: control of the parasite, tsetse control; evaluation; legislation). Although emphasis is on the human disease, animal trypanosomosis caused particularly by *Trypanosoma brucei brucei* is also briefly discussed.

11090 **Kristjanson, P.M., Swallow, B.M., Rowlands, G.J., Kruska, R.L. and Leeuw, P.N. de, 1999.** Measuring the costs of African animal trypanosomosis, the potential benefits of control and returns to research. *Agricultural Systems*, **59** (1): 79-98.

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

This paper addresses issues surrounding measurement of the potential productivity gains from new livestock technologies and the returns to international livestock research. The approach, applicable to many livestock production constraints and technologies, used geographic information systems (GIS) to spatially link a biophysical herd simulation model with an economic surplus model. The particular problem examined was trypanosomosis in cattle in Africa, and the potential research product was a multi-component vaccine. The results indicated that the potential benefits of improved trypanosomosis control, in terms of meat and milk productivity alone, were US$ 700 million per year in Africa. The disease currently costs livestock producers and consumers an estimated US$ 1340 million annually, without including indirect livestock benefits such as manure and traction. Given an adoption period of 12 years, a maximum adoption rate of 30%, a discount rate of 5%, and a 30% probability of the research being successful within 10 years, the net present value of the vaccine research is estimated to be at least US$ 288 million, with an internal rate of return of 33%, and a benefit/cost ratio of 34:1.

11091 **Pearson, R.A., Zerbini, E. and Lawrence, P.R., 1999.** Recent advances in research on draught ruminants. *Animal Science*, **68** (1): 1-17.

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

Four areas of recent research on draught ruminants which are important to future development of animal power – a feeding system, draught cows, disease/work interactions and animal power introduction in a farming system – are reviewed. A new feeding system for draught animals is described which enables food requirements and the effects of work on live weight and milk production to be calculated. Recent data on the energy cost of walking are appraised. Research on working cows, mainly in Ethiopia, has shown that undernutrition has a greater effect on milk yield than work, which has a transient effect. The length of the post-partum anoestrous period increases with decrease in body condition. Body-weight loss increases with increasing work load. It is suggested that

dairy cows delay conception by 1 day for every day of work done. Work has little effect on food intake or digestive parameters. Although it is associated with an overall increase in food intake of cows, even of unsupplemented forage diets, the increase is not sufficient to meet all the extra energy needs for work. Food intake of both working and non-working cows increases during lactation. Disease limits the working capacity of draught animals and work can exacerbate disease. These effects were investigated using *Trypanosoma evansi* in Indonesia and *T. congolense* in The Gambia. In both studies, infected animals were able to do much less work than non-infected ones and the severity of the effect depended greatly on the strain of trypanosome used. In general, increasing the plane of nutrition did not ameliorate the effects of the disease, nor in the Gambian study did it prevent loss of appetite in infected animals. The technical and agronomic innovations necessary for the introduction of animal power into an inland valley region of central Nigeria are described and some of the sociological implications discussed.

11092 **Robinson, T., 1998.** Practical applications of geographic information systems in tsetse and trypanosomiasis control. *In*: *Towards livestock disease diagnosis and control in the 21st century* (Proceedings of an International Symposium on Diagnosis and Control of Livestock Diseases using Nuclear and Related Techniques, Vienna, 7-11 April 1997), pp. 421-437. Vienna, Austria; IAEA. ISBN 92-0-102498-3.

ILRI, P.O. Box 30709, Nairobi, Kenya. [t.robinson@cgiar.org]

Three aspects of geographic information systems (GISs) in tsetse and trypanosomiasis control are addressed: (1) their use in planning and managing control operations, (2) the use of appropriate data management systems to capture data from the field and process them in a format that facilitates their geographical analysis, and (3) the use of GISs to predict some of the data layers required for planning tsetse and trypanosomiasis control activities. In planning and managing trypanosomiasis interventions, GISs are applied at a range of levels. At the policy level, they can be used to integrate data such as tsetse and trypanosomiasis distributions, livestock densities and percentage cultivation to assist in allocating resources to tsetse and trypanosomiasis control. At the management level, they can be used to combine the same sorts of data in decision support models to help prioritise areas for control. At the operational level, they can be used to help plan, manage and monitor field operations. Much of the data required for these applications comes directly from the field, particularly the distributions of livestock, vector and disease. The use of bespoke software such as the disease and vector integrated database (DAVID) greatly facilitates entry, display and analysis of field data, and their integration with other data within GISs. Collecting field data relevant to planning and managing tsetse and trypanosomiasis control operations is often very expensive and time consuming, therefore preventing exhaustive ground coverage. The use of GISs to combine environmental predictor variables, using multivariate statistical models, and to predict the distribution and abundance of tsetse, trypanosomiasis, cultivation and livestock is reviewed. Finally, opportunities are discussed for developing these applications in the future. It is recommended that stronger links be forged between the research workers and those in operational programmes.

11093 **Robinson, T.P. and Hopkins, J.S., 1999.** Managing livestock disease data: the Disease And Vector Integrated Database (DAVID). *In*: Goodall, E.A. and Thrusfield, M.V. (eds), *Proceedings of a meeting of the Society for Veterinary Epidemiology and Preventive Medicine, University of Bristol, UK, 24-26 March 1999*, pp. 62-67. Roslin, UK; Society for Veterinary Epidemiology and Preventive Medicine. ISBN 0-948073-39-X.

ILRI, P.O. Box 30709, Nairobi, Kenya. [t.robinson@cgiar.org]

The Disease And Vector Integrated Database (DAVID) is a GIS for managing field data on tsetse, trypanosomiasis and livestock. The programme is supplemented by a field guide, which provides sample data recording sheets that can be modified to meet individual requirements. Where possible, the programme uses established coding systems (e.g. those adopted by OIE). The DAVID programme is used to enter these data in a computer, to verify the data, to query the data and to produce output reports. A key feature is that all data are temporally and geographically registered, enabling data from tsetse, trypano-somiasis and livestock surveys to be integrated. For a particular country the programme is customised by providing administrative overlays, national veterinary area overlays, and lists of livestock inspection sites, diagnostic methods used, tsetse sampling sites, tsetse sampling methods used, and tsetse and trypanosome species present. These details are then used to provide checks for data entry, and filtering options for data output. Data output is in the form of tables, graphs or maps. Tabular output (e.g. details of drug use and tabular census data) may be presented in reports and analysed further in spreadsheets or statistical packages. Typical graph output includes PCV histograms, monthly trypanosomiasis incidence, or monthly tsetse catches. Typical map output includes livestock distributions, mean PCV maps, trypanosomiasis prevalence maps, and tsetse distribution maps. The DAVID project has been supported, both financially and institutionally, by many national and international organisations and is currently being tested operationally in at least sixteen institutions in nine African countries.

11094 **Uilenberg, G., 1998.** *A field guide for the diagnosis, treatment and prevention of African animal trypanosomosis*. (Adapted from the original edition by W.P. Boyt.) Rome, Italy; FAO. ISBN 92-5-104238-1. 158 pp. [A French translation of this guide will be published in due course.]

'A Surgente', Route du Port, F-20130 Cargèse, Corsica, France.

This new edition adheres as much as possible to the original style and, in particular, to the intention of the original author in that it is essentially meant to be a guide for field control personnel. Its scope has been extended somewhat to include trypanosomes of African origin which have spread to the Americas and Asia, but the main emphasis remains on Africa. More attention is also given to methods of disease control other than chemotherapy and chemoprophylaxis, such as vector control, within an integrated multi-disciplinary and flexible approach. The five chapters cover: (1) African animal trypanosomes: life cycles, morphology, taxonomy and nomenclature, epidemiology, distribution; (2) African animal trypanosomosis: clinical aspects, post-mortem findings, pathogenesis, economic aspects; (3) Diagnosis: laboratory methods; (4) Control: control of the

trypanosome, vector control, innate resistance to trypanosomosis, integrated control; (5) Non tsetse-transmitted trypanosomoses. The guide also contains practical tips for field personnel (collecting blood and lymph, making blood smears, staining trypanosomes, making brain smears), sample size considerations (compiled by J. Otte), and a further reading list.

2. TSETSE BIOLOGY

(a) REARING OF TSETSE FLIES

11095 **Malele, I.I. and Parker, A.G., 1999.** Mating age of *Glossina austeni* Newstead. *Acta Tropica*, **72** (3): 319-324.

Malele: School of Biological Sciences, University of Wales, Memorial Building, Deniol Road, Bangor LL57 2UW, UK. [bsp418@bangor.ac.uk]

Before removal from the emergence cage, 12.8% of 141 newly emerged females of *G. austeni* < 24 h old were found on dissection to have been inseminated. Likewise, dissection of a sample of sterilised females destined for release showed that 5.43% of 2487 females had already been inseminated while still in the emergence cages. It was decided therefore to put female and male flies together in production cages from the day of emergence at a ratio of 1 male to 5 females and leave them to mature and mate in the cages. The females produced viable pupae of acceptable mean weight and desired quality with the proportion of A-class pupae less than 10%. The number of pupae per initial female did not differ from pupae produced by pre-aged parent flies. It is now clear that there is no need to age female and male flies of *G. austeni* before mating. Parent flies of < 1 day old put together in production cages from the day of emergence have been used for mass rearing *G. austeni* in the Tsetse and Trypanosomosis Research Institute (TTRI) colony to produce males for the eradication programme in Zanzibar, Tanzania, since December 1995. This has substantially reduced the labour of fly production by removing the need to age flies and the need to chill and separate flies after mating.

11096 **Moloo, S.K., Karia, F.W. and Okumu, I.O., 1999.** Membrane feeding *Glossina morsitans centralis* on livestock blood and its effect on the tsetse susceptibility to pathogenic trypanosome infections. *Medical and Veterinary Entomology*, **13** (1): 110-113.

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

The survival and reproductive performance of mated female *G. m. centralis* when fed *in vitro* through silicone membranes on various bovine and porcine blood diets were compared with flies maintained *in vivo* on rabbits. Fresh defibrinated bovine blood, with or without the addition of the phagostimulant ATP, was found to be the best diet for *in vitro* feeding of *G. m. centralis* and compared favourably with *in vivo* feeding on rabbits apart from lower mean puparial weight. Defibrinated bovine blood stored at 4°C or frozen was unsatisfactory for this tsetse species, but frozen porcine blood either alone or mixed

with frozen bovine blood augmented with ATP was satisfactory. The effect of membrane feeding on tsetse susceptibility to pathogenic trypanosome infection was also investigated. Feeding the tsetse *in vitro* on fresh defibrinated bovine blood after a trypanosome-infected blood meal on a goat had some adverse effect on the establishment as well as cyclical development of *Trypanosoma vivax*, *T. congolense* or *T. brucei brucei* in the flies compared to maintenance on rabbits. However, when flies with mature infections of these trypanosomes were fed *in vitro* on fresh defibrinated bovine blood, no effect was seen.

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

11097 **Beard, C.B., Durvasula, R.V. and Richards, F.F., 1998.** Bacterial symbiosis in arthropods and the control of disease transmission. *Emerging Infectious Diseases*, **4** (4): 581-591.

Beard: Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop F12, Atlanta, GA 30333, USA. [cbb0@cdc.gov]

Bacterial symbionts may be used as vehicles for expressing foreign genes in arthropods. Expression of selected genes can render an arthropod incapable of transmitting a second microorganism that is pathogenic for humans and is an alternative approach to the control of arthropod-borne diseases. The authors discuss the rationale for this alternative approach and its potential applications, including genetically transformed tsetse S-symbionts for the control of tsetse transmission of trypanosomes, its limitations, and the regulatory concerns that may arise from its use in interrupting disease transmission in humans and animals.

11098 **Carlson, D.A., Bernier, U.R. and Sutton, B.D., 1998.** Elution patterns from capillary GC for methyl-branched alkanes. *Journal of Chemical Ecology*, **24** (11): 1845-1865.

Carlson: USDA-ARS, Medical and Veterinary Entomology Research Laboratory, Gainesville, FL 32604, USA.

Relative gas chromatography (GC) retention times are presented for typical mono-, di-, tri- and tetramethylalkanes comprising most of the commonly appearing series of homologous methyl-branched alkanes up to 53 carbons that are found in insect cuticular hydrocarbons. Typical insect-derived methylalkanes with backbones of 33 carbons were characterised by Kovats indices (KI). A protocol is described for identification of methyl-branched hydrocarbons eluted from nonpolar polysiloxane DB-1 capillary GC columns. In this protocol, retention indices (KI values) are assigned to peaks, then the patterns in GC peaks that probably contain homologues are marked to assist subsequent GC-mass spectrometric (GC-MS) interpretation. Use of the KI allows assignment of likely structures and the elimination of others, with demonstrative consistency, as there are no known exceptions. Interpretation of electron ionisation mass spectra can then proceed within narrowed structural possibilities without the necessity of chemical ionisation GC-MS analysis. Specific examples of insect hydrocarbons assembled from the literature are

given, including the dimethylalkanes from *Glossina morsitans morsitans, G. austeni, G. pallidipes, G. tachinoides* and *G. brevipalpis*, and the trimethylalkanes from *G. m. centralis, G. m. submorsitans* and *G. tachinoides*.

11099 **Cheng, Q. and Aksoy, S., 1999.** Tissue tropism, transmission and expression of foreign genes *in vivo* in midgut symbionts of tsetse flies. *Insect Molecular Biology*, **8** (1): 125-132.

Aksoy: Section of Vector Biology, Department of Epidemiology and Public Health, Yale University School of Medicine, 60 College Street, New Haven, CT 06510, USA.

Tsetse flies harbour three different symbiotic organisms in addition to the pathogenic African trypanosomes they transmit. The two gut-associated symbionts (primary, P; secondary, S) are enteric and are nutritionally required, whereas the third microorganism *Wolbachia* (family Rickettsiaceae) affects the reproductive biology of the insects it infects. The bacteriome-associated P-symbiont (*Wigglesworthia glossinidia*) displays a concordant phylogeny with its host tsetse species, whereas midgut S-symbionts characterised from distant tsetse have identical 16S rDNA sequences and therefore may either represent recent independent acquisitions or horizontal transfer between species. The S-symbionts have been cultured *in vitro* and a genetic transformation system has been developed. Here we report on their density and tissue tropism in different species (*Glossina morsitans morsitans, G. palpalis palpalis, G. austeni* and *G. brevipalpis*) and on their maternal route of transmission to tsetse progeny. Using a bacterium-specific PCR-assay, the S-symbionts were found primarily in the midgut, haemolymph, milk gland and in *G. palpalis* also in salivary glands of teneral flies. In older flies these infections were found to spread to other tissues including muscle, testes and fat body. The S-symbionts were transformed to express the marker gene product, Green Fluorescent Protein (GFP), *in vitro*. When the recombinant symbionts were introduced into the haemocoel of fertile female flies via intrathoracic micro-injection, they were detected in the intra-uterine progeny, indicating that haemolymph may provide a possible route for their transmission. The implications of these results for symbiont-host interactions and for transgenic strategies in tsetse are discussed.

11100 **Dobson, S.L., Bourtzis, K., Braig, H.R., Jones, B.F., Zhou, W.-G., Rousset, F. and O'Neill, S.L., 1999.** *Wolbachia* infections are distributed throughout insect somatic and germ line tissues. *Insect Biochemistry and Molecular Biology*, **29** (2): 153-160.

O'Neill: Section of Vector Biology, Department of Epidemiology and Public Health, Yale University School of Medicine, 333 Cedar Street, New Haven, CT 06520, USA. [scott.oneill@yale.edu]

Wolbachia are intracellular microorganisms that form maternally-inherited infections within numerous arthropod species. *Wolbachia* tissue tropism was examined in a number of representative insect hosts by western blot, dot blot hybridisation and diagnostic PCR. These studies indicated that *Wolbachia* spp. are much more widely

distributed in host tissues than previously appreciated. Some *Wolbachia*/host associations showed *Wolbachia* spp. disseminated throughout most tissues while others appeared to be much more restricted, being predominantly limited to the reproductive tissues. In *Glossina morsitans morsitans* females, *Wolbachia* was detected only in the ovaries; however, in males weak levels of *Wolbachia* were detected in the head, thorax and abdomen. The relevance of these infection patterns to the evolution of *Wolbachia*/host symbioses and to potential applied uses of *Wolbachia* spp. is discussed.

11101 **Lambert, J.D. and Moran, N.A., 1998.** Deleterious mutations destabilize ribosomal RNA in endosymbiotic bacteria. *Proceedings of the National Academy of Sciences of the United States of America*, **95** (8): 4458-4462.

Moran: Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA. [nmoran@u.arizona.edu]

The authors show that several independently derived insect endosymbionts (including *Wigglesworthia glossinidia* of *Glossina tachinoides*), each with a long history of maternal transmission, have accumulated destabilising base substitutions in the highly conserved 16S rRNA. Stabilities of Domain I of this subunit are 15-25% lower in endosymbionts than in closely related free-living bacteria.

11102 **Voskamp, K.E., Noorman, N., Mastebroek, H.A.K., Schoot, N.E.G. van and Otter, C.J. den, 1998.** Neural coding in antennal olfactory cells of tsetse flies (*Glossina* spp.). *Chemical Senses*, **23** (5): 521-530.

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

Spike trains from individual antennal olfactory cells of tsetse flies obtained during steady-state conditions (spontaneous as well as during stimulation with 1-octen-3-ol) (*G. pallidipes*) and dynamic stimulation with repetitive pulses of 1-octen-3-ol (*G. morsitans morsitans*) were investigated by studying the spike frequency and the temporal structure of the trains. In general, stimulation changes the intensity of the spike activity but leaves the underlying stochastic structure unaffected. This structure turns out to be a renewal process. The only independently varying parameter in this process is the mean interspike interval length, suggesting that olfactory cells of tsetse flies may transmit information via a frequency coding. In spike records with high firing rates, however, the stationary records had significant negative first-order serial correlation coefficients and were non-renewal. Some cells in this study were capable of precisely encoding the onset of the odour pulses at frequencies up to at least 3 Hz. Cells with a rapid return to pre-stimulus activity at the end of stimulation responded more adequately to pulsed stimuli than cells with a long increased spike frequency. While short-firing cells process information via a frequency code, long-firing cells responded with two distinctive phases: a phasic, non-renewal response and a tonic, renewal response which may function as a memory of previous stimulations.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

11103 **Gibson, G. and Torr, S.J., 1999.** Visual and olfactory responses of haematophagous Diptera to host stimuli. *Medical and Veterinary Entomology*, **13** (1): 2-23.

Gibson: NRI, University of Greenwich, Central Avenue, Chatham, Kent ME4 4TB, UK.

Key biotic and environmental constraints on the host-orientated behaviour of haematophagous Diptera are summarised. For each major group of biting Diptera, including Glossinidae, responses to host stimuli are reviewed: these include activation and ranging behaviour, long-range and short-range olfactory responses and visual responses. Limitations to the comparison of results between groups of species, and the practical problems of experimental method and equipment are discussed.

11104 **Gouteux, J.-P. and Jarry, M., 1998.** Tsetse flies, biodiversity and the control of sleeping sickness. Structure of a *Glossina* guild in southwest Côte d'Ivoire. *Acta Oecologica*, **19** (5): 453-471.

Gouteux: Laboratoire d'Ecologie Moléculaire, ORSTOM, UPRES-A CNRS 5053, IBEAS-UPPA, avenue de l'Université, F-64000 Pau, France.

Tsetse fly guilds usually comprise two or three species. However, the presence of only one species often indicates that anthropic modifications have occurred in the habitat. On the other hand, more than three species are seldom observed in the same zone and the presence of five is extremely rare. Previous detailed studies have always focused on a single species, without taking into account interactions between species. The authors present the results of observations carried out in Côte d'Ivoire on a guild consisting of *Glossina palpalis*, *G. pallicera*, *G. nigrofusca*, *G. longipalpis* and *G. fusca*. *Glossina* have unusual physiological characteristics: both sexes feed exclusively on blood, they have a highly developed larviparity associated with a slow rhythm of reproduction (one larva about every 10 days) and a long life expectancy (up to 9 months). The authors report on the size of the flies, the hosts, feeding habits, ecodistribution, resting places, flying heights, circadian activity and seasonal dynamics of tsetse fly populations in order to understand the organisation of this guild. Each species feeds indiscriminately on a wide spectrum of hosts without a particular preference. Different species share habitat (ecodistribution) and time (circadian and annual cycles). Thus, during an annual cycle, there is always a slight time-lag between the density peaks of *G. palpalis* and *G. pallicera*, the peak of the dominant species immediately preceding that of the dominated species. In a village area, 77% of the variations in density of *G. pallicera* were accounted for by the previous variations in density of the dominant species, *G. palpalis*. Experiments showed that *G. pallicera* and *G. nigrofusca* immediately invade anthropic areas from which *G. palpalis* has been partially removed by trapping. These species thus appear to confront each other in a global dynamic equilibrium. This suggests that there is a 'conflicting coexistence' between the cohabiting species. Whereas the reason for such a process is quite obvious, how it occurs still remains to be explained. Other observations may provide a clue. For example, the sex ratios of both the main species fluctuate in opposite phases during the annual cycle. This strongly suggests that interspecific interactions occur

through sexual mediation. Finally, the authors discuss the consequences of dynamic cohabitation on disease systems (trypanosomes, tsetse flies, hosts) and on control possibilities.

11105 **Kappmeier, K., Nevill, E.M. and Bagnall, R.J., 1998.** Review of tsetse flies and trypanosomosis in South Africa. *Onderstepoort Journal of Veterinary Research*, **65** (3): 195-203.

Kappmeier: ARC-Onderstepoort Veterinary Institute, Private Bag X5, ZA-0110 Onderstepoort, South Africa.

The history of tsetse flies and nagana (trypanosomosis) in South Africa, and especially in Zululand, is reviewed. Four valid tsetse fly species have been recorded from South Africa. *Glossina morsitans morsitans* disappeared from the most northerly parts of South Africa during the rinderpest epizootic between 1896 and 1897. Of the three remaining species that occurred in Zululand, now part of KwaZulu-Natal Province, *G. pallidipes* was the most common vector of nagana in cattle, but was eradicated from this area in 1954. *G. brevipalpis* and *G. austeni* remained but were responsible for only a few sporadic cases of nagana up until 1990. A widespread outbreak occurred in 1990 where cattle served by 61 diptanks were found infected with *Trypanosoma congolense* and *T. vivax*. Dipping of cattle in a pyrethroid plus the therapeutic treatment of infected animals brought the disease under control. The outbreak also led to a trial to control *G. brevipalpis* from the most northerly parts of the Hluhluwe/Umfolozi Game Reserve making use of target technology as for savanna species. The results were not satisfactory and the trial was discontinued until further research could provide a more appropriate system for the control of this species. A Tsetse Research Station was established at Hellsgate near St Lucia Lake where research on *G. brevipalpis* and *G. austeni* is conducted into ways and means of monitoring and controlling these species.

11106 **Rogers, D.J., 1998.** Satellite imagery and the prediction of tsetse distributions in East Africa. *In*: *Towards livestock disease diagnosis and control in the 21st century* (Proceedings of an International Symposium on Diagnosis and Control of Livestock Diseases using Nuclear and Related Techniques, Vienna, 7-11 April 1997), pp. 397-420. Vienna, Austria; IAEA. ISBN 92-0-102498-3.

Trypanosomiasis and Land-use in Africa (TALA) Research Group, Department of Zoology, University of Oxford, Oxford OX1 3PS, UK.

The debate over whether the aim of tsetse suppression is eradication or control is briefly reviewed, and it is concluded that control is the only viable solution for many areas of Africa. This approach requires a fuller understanding of the natural dynamics of tsetse populations and the environmental limits to their distribution than does eradication. Various types of remotely sensed satellite data are correlated with the meteorological records that have in the past been used to interpret tsetse distribution and abundance patterns, and have the advantage over such records of complete spatial coverage at acceptable resolution for country, regional or continental studies. The paper describes both the temporal Fourier processing of such data from the NOAA and Meteosat series of

meteorological satellites and the application of these processed data to describing the distribution of five species of tsetse in East Africa, *Glossina morsitans s.l.*, *G. pallidipes*, *G. austeni*, *G. longipennis* and *G. fuscipes fuscipes*. Observed distributions are described with accuracies of between 85 and 97% (*G. morsitans* and *G. austeni*, respectively) when, within non-linear discriminant analysis, variables are selected on the basis of maximising the minimum multivariate distance between alternative categories of presence and absence training set data. Inaccuracies in the predicted maps arise for several reasons: the distribution maps used to define tsetse and non-tsetse areas are now rather out of date; some of the areas for which predictions are made are very different from any of the training set areas, although the analysis may be forced to assign such areas to one or other category; and, finally, non-tsetse areas may indeed be climatically suitable for flies, but not inhabited by them for a variety of reasons. Examples are given of each for the case of *G. longipennis*, a species unrecorded from relatively large areas of Kenya which appear to be suitable for it. The conclusion highlights the need to test many of the ideas presented in the paper using contemporary tsetse and satellite data, to establish a real time monitoring system for the changes that lie ahead.

3. TSETSE CONTROL (INCLUDING ENVIRONMENTAL SIDE-EFFECTS)

[See also **22**: nos. 11095, 11097, 11105.]

11107 **Allsopp, R., 1998.** Geographic information system (GIS) and remote sensing aid tsetse control in Botswana. *Pesticide Outlook*, **9** (4): 9-12.

NRI, University of Greenwich, Chatham Maritime, Chatham, Kent ME4 4TB, UK.

Because of difficulty of access, which made ground spraying unworkable, aerial spraying became the primary tsetse control method from 1972 to 1991 in the 20,000 km^2 Okavango delta, Botswana. Although no case of human or animal trypanosomiasis has been recorded there since 1985, the objective of tsetse eradication has not been achieved. Following environmental concern about the use of endosulfan, deltamethrin- or α-cypermethrin-impregnated, odour-baited targets have been used since 1992. This method has the same drawback as ground-spraying, i.e. difficulty of access, although changed flood dynamics and the use of helicopters have helped to reduce this problem. However, maintenance and vigilance for wind, fire or elephant damage are essential. A recent development has been the use of global positioning systems (GPS) which have transformed the ability to navigate around the delta and, together with good maps or satellite imagery, have made it possible to pinpoint an exact location, and plot roads and rivers. Since 1995, four field teams have recorded the locations of every target deployed or re-serviced (20,000 in all). The target locations are entered as themes (data layers) into a GIS so that they are geographically registered and can be used as an overlay on a map or satellite image. Satellite imagery is also very useful for identifying potential tsetse habitat which can then be pinpointed using the GIS and located on the ground using the GPS. The method's advantages and pitfalls, and its use in managing and monitoring private sector involvement in tsetse control, are discussed.

11108 **Bauer, B., Slingenbergh, J. and Hendrickx, G., 1999.** A trial to control tsetse at Galana Ranch: examining the issues. (Letter.) *Parasitology Today*, **15** (2): 82.

Bauer: CIRDES, Vector Control Unit, 01 B.P. 454, Bobo Dioulasso 01, Burkina Faso.

The authors comment on the article by Baylis and Stevenson (see *TTIQ*, **22** (1): no. 10734) on 'Trypanosomiasis and tsetse control with insecticidal pour-ons – fact or fiction?'. They consider that the trial carried out at Galana Ranch, Kenya, covered too small an area to have had a quantifiable effect on overall tsetse populations and to merit the conclusions drawn from it. In particular they disagree with two of Baylis and Stevenson's hypotheses: (i) that repellency is of no importance in explaining the observed effects of deltamethrin pour-on, and (ii) that deltamethrin would result in a reduction in tick burden, leading to a general improvement in animal health and thereby improved resistance to trypanosomiasis. [See also **22** : no. 11109.]

11109 **Baylis, M. and Stevenson, P., 1999.** A trial to control tsetse at Galana Ranch: examining the issues – Reply. (Letter.) *Parasitology Today*, **15** (2): 82-83.

Baylis: AFRC, Institute for Animal Health, Ash Road, Pirbright, Surrey GU24 0NF, UK.

[See also **22**: no. 11108.] The original authors comment on the issues raised by Bauer, Slingenbergh and Hendrickx. They dispute that the pour-on trial at Galana Ranch was 'small', stating that the scale of the trial (area and number of cattle) was typical of semi-arid tsetse-infested land in East Africa and therefore appropriate for the majority of stock-holders in the region. As to tick control, lower tick numbers were seen on cattle treated with deltamethrin than on those treated with organophosphate acaricides; deltamethrin therefore might well have benefited herd health. They deny concluding that repellency of tsetse by pour-ons is of no importance; indeed they stress that this is an issue meriting more field investigation. While sustainability is easer to achieve with pour-ons, the data suggest that this method is less effective than targets under certain conditions. Application of pour-ons reduced the incidence of animal trypanosomiasis at all times, not just seasonally when tsetse were scarce; the question is: why?

11110 **Bossche, P. van den and Duchateau, L., 1998.** The effect of deltamethrin pour-on applied to cattle on the transmission of bovine trypanosomosis. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (2): 123-126.

Bossche: RTTCP, P.O. Box A560, Avondale, Harare, Zimbabwe. [petervdb@rttcp.icon.co.zw]

A trial to evaluate the effect of monthly deltamethrin pour-on treatments on the feeding response of *Glossina morsitans morsitans* and, consequently, on the incidence of tsetse-transmitted trypanosomosis in treated and untreated cattle was conducted in Katete District in the Eastern Province of Zambia, an area of high trypanosomosis prevalence. During a period of 14 consecutive weeks between August and December 1992, the

2-weekly trypanosomosis incidence and PCV were monitored in treated (n = 12) and untreated (n = 15) Ngoni cattle, herded in the same area. No significant differences were found. It is concluded that the reported effects of deltamethrin treatments on trypanosomosis incidence are a result of reduced tsetse challenge due to a decline in tsetse density in surrounding areas and not of the direct effect of deltamethrin treatments on the tsetse's feeding response. This control method will therefore be most effective in those areas where the tsetse population density can be sufficiently reduced to affect disease transmission significantly.

11111 **Chalvet-Monfray, K., Artzrouni, M., Gouteux, J.-P., Auger, P. and Sabatier, P., 1998.** A two-patch model of Gambian sleeping sickness: application to vector control strategies in a village and plantations. *Acta Biotheoretica*, **46** (3): 207-222.

Chalvet-Monfray: Ecole Nationale Vétérinaire de Lyon, Unité Bio-Informatique, 1 avenue Bourgelat, B.P. 83, F-69280 Marcy l'Etoile, France.

A compartmental model is described for the spread of Gambian sleeping sickness in a spatially heterogeneous environment in which vector and human populations migrate between two 'patches': the village and the plantations. The number of equilibrium points depends on two 'summary parameters': g_r, the proportion removed among human infectives, and R_0, the basic reproduction number. The origin is stable for $R_0 < 1$ and unstable for $R_0 > 1$. Control strategies are assessed by studying the mix of vector control between the two patches that brings R_0 below 1. The results demonstrate the importance of vector control in the plantations. For example, if 20% of flies are in the village and the blood meal rate in the village is 10%, then a 20% added vector mortality in the village must be combined with a 9% added mortality in the plantations in order to bring R_0 below 1. The results are quite insensitive to the blood meal rate in the village. Optimal strategies (that minimise the total number of flies trapped in both patches) are briefly discussed.

11112 **Djiteye, A., Moloo, S.K., Foua Bi, K., Coulibaly, E., Diarra, M., Ouattara, I., Traoré, D., Coulibaly, Z. and Diarra, A., 1998.** Essai de lutte contre *Glossina palpalis gambiensis* (Vanderplank, 1949) à l'aide de pièges et d'écrans imprégnés de deltaméthrine en zone soudanienne au Mali. [Control trial on *G. p. gambiensis* in the sudanese zone of Mali using deltamethrin-impregnated traps and screens.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (1): 37-45.

Djiteye: Laboratoire Central Vétérinaire, B.P. 2295, Bamako, Mali.

A control trial using biconical traps and black/blue/black screens impregnated with deltamethrin, deployed in various combinations, was undertaken along the riverine forests of the Niger River in the agropastoral zone of Tienfala-Baguinéda, east of Bamako. The apparent density of the *G. p. gambiensis* population on the left bank of the river (Tienfala) was reduced by 98.70% after 3 months (maximum reduction on right bank (Baguinéda) 77.50% after 1 month). The percentage of teneral flies increased dramatically from 3.75%

before control to 47.05% 1 week and 73.68% 1 month after the start of the trial. Nulliparous females increased from 19.14% before control to 87.50% 1 month after the trial started. This control strategy proved to be simple, inexpensive and very efficient in controlling the tsetse population in this area.

11113 **Gouteux, J.-P., 1998.** Un nouveau dispositif expérimental pour la mise au point de pièges à tsétsé. Premier essai sur *Glossina fuscipes fuscipes* en République centrafricaine. [A new experimental design for refining tsetse traps. First trials against *G. f. fuscipes* in the Central African Republic.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (4): 317-319.

Laboratoire d'Ecologie Moléculaire, IBEAS, Université de Pau (UPPA), avenue de l'Université, 64000 Pau, France. [jean-paul.gouteux@wanadoo.fr]

A new protocol combining the Latin square and two competing opposite traps within the same experiment was tested against *G. f. fuscipes* in the Central African Republic. Analysis of variance was carried out for three independent Latin squares, while paired catches of double traps forming a mobile were tested for random distribution between the two traps by a simple χ^2 test. The fact of having traps in competition in the same place at the same time avoids all the site-day interactions which can invalidate Latin squares.

11114 **Langley, P.A., 1998.** Target technologies for insect pest control. *Pesticide Outlook*, **9** (2): 6-12.

Insect Investigations Ltd, School of Pure and Applied Biology, University of Wales, Cardiff, P.O. Box 915, Cardiff CF1 3TL, UK.

This article discusses the use of traps and targets to monitor and control insect pests, and the new technologies that are being developed to optimise chemical control techniques. The tsetse model is used to illustrate the concept of catching out a pest population, increasing efficiency through knowledge of the influence of visual and olfactory stimuli on the insect's behaviour. Sterilisation may be more efficient than killing the target insect and chemosterilants may be used in traps as an alternative to the expensive method of releasing mass-produced radiation-sterilised insects. Insect growth inhibitors which either mimic hormones or interfere with a specific metabolic process may also be used in traps and targets, avoiding environmental contamination by insecticides. Examples are given of insect control by juvenile hormone mimics and chitin synthesis inhibitors, and the use of entomopathogenic fungi for tsetse control is also mentioned briefly. Prediction of pest outbreaks from meteorological data, with or without the assistance of computers or electronic devices, will also help to optimise target deployment.

11115 **Magona, J.W., Okuna, N.M., Katabazi, B.K., Omollo, P., Okoth, J.O., Mayende, J.S.P. and Drabile, D.C., 1998.** Control of tsetse and animal trypanosomosis using a combination of tsetse-trapping, pour-on and chemo-therapy along the Uganda-Kenya border. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (4): 311-315.

Magona: LIRI, P.O. Box 96, Tororo, Uganda.

A joint tsetse and trypanosomosis control programme has been carried out along the Uganda-Kenya border since July 1991. A combination of tsetse trapping (deltamethrin-impregnated pyramidal traps), deltamethrin pour-on and chemotherapy has been used. Different combinations of control strategies were tried in the project area, which was divided into three zones. In zone A, large-scale applications of pour-on, tsetse trapping (8-10 traps/km^2) and chemotherapy were used. In zone B, only tsetse trapping (8-10 traps/km^2) and chemotherapy were used. In zone C, block treatment of cattle in the entire area with diminazene aceturate (7.0 mg/kg) was carried out, followed by less intensive tsetse trapping (4-5 traps/km^2). During monitoring, 400 cattle in each zone were screened every 3 months and the apparent tsetse density was determined every month. Between July 1991 and March 1997, reductions in the prevalence of trypanosomosis and apparent tsetse density of 94 and 99.5% in zone A, 89 and 99.5% in zone B and 79 and 95% in zone C, respectively, were achieved and maintained. The predominant trypanosome species found in cattle during the control period were: *Trypanosoma vivax* in zone A; *T. vivax* and *T. congolense* in zone B; and *T. vivax*, *T. congolense* and *T. brucei* in zone C. *Glossina fuscipes fuscipes* was the only tsetse fly species caught. The most effective control strategy was an initial large-scale application of pour-on, followed by trapping and regular chemotherapy. However, control effectiveness seemed to be influenced by the level of trypanosome challenge, speed of initial reduction in tsetse density and sustainability of tsetse and trypanosomosis control inputs during the campaign.

11116 **Muzari, M.O., 1999.** Odour-baited targets as invasion barriers for tsetse flies (Diptera: Glossinidae): a field trial in Zimbabwe. *Bulletin of Entomological Research*, **89** (1): 73-77.

Muzari: Tsetse and Trypanosomiasis Control Branch, P.O. Box CY52, Causeway, Harare, Zimbabwe.

In Zimbabwe, targets baited with synthetic odours (acetone, octenol, 3-*N*-propyl-phenol, 4-methylphenol) and impregnated with deltamethrin were deployed at 4 per km^2 in a 9 km-wide band as an invasion barrier against dense populations of *Glossina morsitans morsitans* and *G. pallidipes*. Tsetse populations across the barrier were monitored by a line of traps. Invasion pressure was estimated by the catches from two additional traps about 6 km into the invasion source. After 14 months all traps more than 7 km from the invasion source recorded zero catches for 12 consecutive months, indicating that the barrier was effective in preventing re-invasion, and that the 9 km-wide barrier gave a good margin of safety.

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

[See also **22**: nos. 11103, 11111, 11127, 11143, 11147, 11164.]

11117 **Asonganyi, T., 1998.** The effect of the presence of pigs on the frequency of blood components from man and domestic animals in the bloodmeals of tsetse flies from the Fontem sleeping sickness focus, Cameroon. *Bulletin de Liaison et de Documentation de l'OCEAC*, **31** (4): 20-25.

Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, B.P. 1365, Yaoundé, Cameroon.

Inhabitants of sleeping sickness zones keep a variety of domestic animals like pigs, goats and sheep to satisfy their food and ceremonial needs. Pigs have been reported to be the preferred source of tsetse bloodmeals. Some investigators believe that pigs perpetuate the transmission of sleeping sickness while others think that their presence protects man from contact with tsetse flies by diverting the flies and reducing man-fly contact. In this study, tsetse flies were caught from 50 compounds with pigs and 50 compounds without pigs and their bloodmeals were analysed by ELISA to determine their source. When there were pigs in the compound, the probability of human blood being present in the tsetse bloodmeal was found to be 1.74 (0.97-3.13) times higher than when there were no pigs present. Thus 47.3% of flies that had pig blood also had human blood; 34% of flies that had no pig blood had human blood. This difference is significant by the χ^2 test of Mantel and Haentzel ($P = 0.046$) but not significant by the corrected χ^2 test of Yates ($P = 0.06$). The results suggest that pigs do not protect man from tsetse flies. However, there was no significant difference in the chance of having pig blood in flies from compounds where there were pigs and those from compounds where there were no pigs ($\chi^2 = 0.23$; $P = 0.635$), which implies that pig blood in tsetse was not necessarily taken from the compounds in which the pigs were found but from pigs roaming outside the village. The effect of the presence of pigs on the frequency of bloodmeals from sheep and goats was also analysed.

11118 **Asonganyi, T. and Moloo, S.K., 1998.** Saliva of tsetse flies has components that are antigenic in man and domestic animals. *Bulletin de Liaison et de Documentation de l'OCEAC*, **31** (4): 26-32.

Asonganyi: Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, B.P. 1365, Yaoundé, Cameroon.

ELISA and immunoblot analyses of sera revealed that domestic animals (sheep, goats, pigs and dogs) and man exposed to feeding tsetse flies develop antibodies to antigens in tsetse saliva. High levels of anti-saliva IgG were shown in sheep, goats, pigs and dogs; IgE and IgM were not studied since anti-IgE and IgM were not commercially available for these animals. In man, anti-saliva antibodies included IgG, IgM and IgE isotypes. Overall, CATT-positive serum samples had significantly higher anti-saliva antibody levels than CATT-negative samples. The presence of the IgE isotype suggests that some saliva antigens are allergenic. Antibodies in sera of people exposed to black flies cross-reacted with tsetse saliva, indicating that salivas of these two insect vectors have cross-reacting antigens.

11119 **Kazadi, J.M., Geerts, S., Kageruka, P., Losson, B. and Torreele, G., 1998.** Interactions entre le vecteur et le trypanosome dans la détermination de la compétence vectorielle des glossines. [Interactions between vector and trypanosome in determining the vectorial competence of tsetse flies.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (4): 297-304.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium. [v_kazadi@itg.be]

The interactions between tsetse flies and trypanosomes and their impact on metacyclogenesis were studied in 5257 teneral flies of both sexes originating from three laboratory strains: *Glossina palpalis gambiensis* (Maisons-Alfort), *G. p. palpalis* (Mongo-Bemba) and *G. morsitans morsitans* (Mall). The flies were fed once on rats infected with *Trypanosoma brucei gambiense* (Mba and Phanzu strains), *T. b. brucei* (EATRO 1125 strain) or *T. congolense* (IL 1180 clone and Agriumbe stock). Both *G. palpalis* strains had no or very low vectorial competence (VC) for all trypanosomes tested, except for the *T. congolense* clone and stock. *G. m. morsitans* had no VC for either *T. b. gambiense* strain, but had a relatively high VC (32%) for *T. b. brucei* EATRO 1125. *G. m. morsitans* had a higher VC for the IL 1180 clone (95.45%) than the Agriumbe stock (48.40%) of *T. congolense*. These results indicated a strong interaction between *G. m. morsitans* (Mall) and *T. congolense* clone IL 1180.

11120 **Kazadi, J.-M., Kageruka, P., Losson, B. and Hees, J. van, 1998.** Compétence vectorielle des *Glossina tachinoides* Westwood et *Glossina palpalis gambiensis* Vanderplank infectées simultanément par *Trypanosoma brucei brucei* EATRO 1125. [Vectorial competence of *G. tachinoides* and *G. p. gambiensis* infected by *T. b. brucei* EATRO 1125.] *Veterinary Research*, **29** (6): 511-518.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium.

The vectorial competence (VC) of teneral (< 32 h) *G. tachinoides* (N'Djamena) and *G. p. gambiensis* (Bobo-Dioulasso), fed simultaneously on a guinea-pig infected with *T. b. brucei* EATRO 1125, was assessed. Statistical analysis of the experimental results revealed that female *G. tachinoides* had a significantly higher midgut infection rate than males, but no such sex-related difference was observed in *G. p. gambiensis*. When the species were compared, male *G. p. gambiensis* had higher midgut infection rates than male *G. tachinoides*. The metacyclic index did not differ significantly between the species, although *G. p. gambiensis* showed relatively more metacyclic infections than *G. tachinoides*. An overall VC of 0.0242 and 0.0483 was found for *G. tachinoides* and *G. p. gambiensis*, respectively. VC did not differ significantly either between sexes or between the two species. However, *G. tachinoides* more rapidly infected the guinea-pig than *G. p. gambiensis*. In all infected flies, the procyclic index value was superior to the metacyclic index value, suggesting that cyclic infection is established by ascending origin. Both broad and slender parts of the salivary glands were invariably infected. Unequal

longitudinal divisions of the trypomastigotes were observed in the digestive tract of the flies.

11121 **Kazadi, J.M., Kageruka, P., Losson, B. and Hees, J. van, 1998.** Compétence vectorielle des lignées Bobo-Dioulasso et Maisons-Alfort de *Glossina palpalis gambiensis* Vanderplank 1949 infectées simultanément par *Trypanosoma brucei brucei* EATRO 1125. [Vectorial competence of Bobo-Dioulasso and Maisons-Alfort lines of *G. p. gambiensis* infected simultaneously with *T. b. brucei* EATRO 1125.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (4): 305-310.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium. [v_kazadi@itg.be]

The vectorial competence (VC) of 1257 teneral tsetse flies of two parental lines of *G. p. gambiensis*, Bobo-Dioulasso (BD) and Maisons-Alfort (MA), was assessed. Flies from both lines were fed once and simultaneously on a guineapig infected with *T. b. brucei* EATRO 1125. Prior to dissection they were kept for 33 days on healthy guineapigs. Statistical analysis of the results showed no significant difference in the procyclic index between males and females of the BD line. On the other hand, the index was more pronounced in males than in females of the MA line. The procyclic index of males was higher in the MA line than in the BD line. The metacyclic index did not differ significantly between the males or the females of the two lines. However, the VC of the MA line flies was higher than that of the BD line flies. The male VC of the BD line did not differ significantly from that of the females, whereas the male VC of the MA line was higher than that of the females.

11122 **Kazadi, J.M., Kageruka, P., Losson, B. and Mamboundou, B.M., 1999.** Influence de l'intensité de la parasitémie de l'hôte sur la compétence vectorielle de *Glossina morsitans morsitans* Westwood, 1850 (Mall) infectée par *Trypanosoma (Nannomonas) congolense* IL 1180. [Influence of the intensity of host parasitaemia on the vectorial competence of *G. m. morsitans* infected with *T. (N.) congolense* IL 1180.] *Parasite*, **6** (1): 57-62.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium.

Two groups of teneral *G. m. morsitans* (aged < 32 h) were fed separately on two rats that had been infected with *T. congolense* IL 1180, one of which had a low parasitaemia (antilog 5.4-5.7) and the other a high parasitaemia (antilog 7.8-8.1). Following the two levels of parasitaemia, variations in the procyclic indices were found between males and females. In both sexes, it was found that the intestinal infection rate was relatively higher in the flies that were fed on the rat with a low parasitaemia than in those fed on the rat with a high parasitaemia. Although no significant differences in metacyclic indices were observed between the sexes, the mature infection rate was most pronounced in the flies that were fed on the rat with high parasitaemia. In both sexes, the vectorial competence

(VC) reached 0.5532 and 0.5521 in the flies that had been fed on the rats with low and high parasitaemia, respectively. No significant difference in VC was detected between the two types of infectious feeding. However, when considering the antilog 5.4-5.7 parasitaemia , the VC was relatively higher in the females than in the males. No significant difference in VC was detected between sexes when considering the antilog 7.8-8.1 parasitaemia. A discrepancy was found in the way the metacyclic infection and the VC evolve compared with the procyclic infection, suggesting that the intensity of the parasitaemia of the blood meal influences only the intestinal stage of development of the parasite in the fly.

11123 **Kazadi, J.M., Losson, B. and Kageruka, P., 1998.** Développement biologique de *Trypanosoma (Nannomonas) congolense* IL 1180 chez *Glossina morsitans morsitans* Westwood 1851 (Diptera: Glossinidae). [Biological development of *T. (N.) congolense* IL 1180 in *G. m. morsitans*.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (3): 219-224.

Kazadi: Département de Santé Animale, Institut de Médecine Tropicale Prince Léopold, Nationalestraat 155, B-2000 Antwerp 1, Belgium.

Teneral *G. m. morsitans* (Mall) infected with *T. congolense* IL 1180 were examined for trypanosomes from days 3 to 15 (D_3-D_{15}) at 72 h intervals. Microscopic examination of the digestive tract showed that, on D_3, 75% of the flies were infected in the midgut only. On D_6, procyclic, mesocyclic and metacyclic forms were observed in 82, 74 and 26% of the flies, respectively. The finding of metacyclic forms on D_6 revealed the precocity of the parasite biological cycle. From D_9, all midgut-infected flies also harboured trypomastigotes in the proventriculus and oesophagus. Occasionally, mesocyclic forms were observed in the proboscis of flies with mature infections. Moreover, epimastigote and metacyclic forms were clustered in several 'rosettes' fixed to the labial walls. In both sexes, the procyclic index showed variations between different periods of the cycle. The metacyclic infection rate showed a progressive increase between D_6 and D_{15}, as did the vectorial competence except for the period D_9-D_{12}. Overall values of vectorial competence calculated from D_6 were 0.5381 for males and 0.5194 for females. These values showed no significant difference between the sexes.

11124 **Njagu, Z., Mihok, S., Kokwaro, E. and Verloo, D., 1999.** Isolation of *Trypanosoma brucei* from the monitor lizard (*Varanus niloticus*) in an endemic focus of rhodesian sleeping sickness in Kenya. *Acta Tropica*, **72** (2): 137-148.

Njagu: Department of Zoology, Kenyatta University, P.O. Box 43844, Nairobi, Kenya.

Monitor lizards were sampled along the shores of Lake Victoria, Kenya, to detect natural infections of potentially human-infective trypanosomes. In an area with endemic rhodesian sleeping sickness (Busia), one of 19 lizards was infected. Six of 10 lizards also showed indirect evidence of infection with *T. brucei* (antibody ELISA). In an area with no recent history of human disease (Rusinga Island), no parasites were found and no antibodies to *T. brucei* were detected. The isolate was identified as *T. brucei* through

xenodiagnosis (completion of the life cycle in the salivary glands of tsetse), and through molecular techniques (positive reactions with a PCR primer and a microsatellite DNA probe characteristic of the subgenus *Trypanozoon*). Experimental infections of monitor lizards were also attempted with a variety of parasites and tsetse species. It was possible to infect monitor lizards with *T. brucei* but not with forest or savanna genotypes of *T. congolense*. Parasites reached low levels of parasitaemia for a short period without generating any pathology; they also remained infective to tsetse and laboratory rats. The implications of these findings are discussed in relation to the endemicity of sleeping sickness.

5. HUMAN TRYPANOSOMIASIS

(a) SURVEILLANCE

11125 **Laveissière, C., Meda, A.H., Doua, F. and Sane, B., 1998.** Dépistage de la maladie du sommeil: efficacité comparée des équipes mobiles et des agents de santé communautaires. [Detecting sleeping sickness: a comparison between the efficacy of mobile teams and community health workers.] *Bulletin of the World Health Organization*, **76** (6): 559-564.

Laveissière: OCEAC, B.P. 288, Yaoundé, Cameroon. [oceac@camnet.cm]

The solution to the problem of human African trypanosomiasis (HAT) first of all requires improved case detection. Effective tests have been available for a number of years but the results of medical surveys are still mediocre, mainly because the populations are poorly mobilised. Those few mobile teams still visiting villages obtain very low presentation rates. In spite of major information campaigns among villagers in Côte d'Ivoire, IPR and PRCT teams examined only 42% (9311) of the 22,300 inhabitants of a disease focus during a conventional 10 day survey. In the same focus, community health workers specially trained in sleeping sickness and in the collection of blood samples on filter-paper examined 73% of the population (15,000 individuals) in less than 2 months. Implementation of a sleeping sickness control strategy is restricted to two types of intervention: either conventional mobile teams which are on hand, competent and rapidly operational but which fail to carry out exhaustive case detection, or integration of case detection into primary health care by entrusting surveillance to the community health workers. The latter approach requires a minimum of training but ensures that sentinels are permanently present in the village communities. By using the community health workers rather than mobile teams it should be possible to achieve comprehensive monitoring. In operational terms, the cost of surveillance per person is US$ 0.55 for the mobile teams compared with US$ 0.10 for the community health workers. Integration of HAT case detection into primary health care is therefore an effective and economical solution, provided the community health workers are properly supervised and above all motivated.

11126 **Lejon, V., Büscher, P., Sema, N.H., Magnus, E. and Meirvenne, N. van, 1998.** Human African trypanosomiasis: a latex agglutination field test for quantifying IgM in cerebrospinal fluid. *Bulletin of the World Health Organization*, **76** (6): 553-558.

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

Differential diagnosis of early and late stages of human African trypanosomiasis is currently by examination of CSF for cell number, protein concentration and the presence of trypanosomes. The late stage is also characterised by the presence of IgM in the CSF but this is difficult to test for in the field. LATEX/IgM, a rapid and sensitive agglutination test for the semi-quantitative detection of IgM in CSF, is described. The test has been designed for field use and the freeze-dried reagent remains stable at 45°C for at least a year. The test was evaluated on CSF samples from 34 untreated patients with parasitologically confirmed *Trypanosoma brucei gambiense* infection and four non-infected controls, in comparison with a commercial latex agglutination test, radial immunodiffusion and nephelometry. All test systems yielded similar results.

11127 **Penchenier, L., Grébaut, P., Bodo, J.M., Ebo'o Eyenga, V., Njiokou, F., Simo, S.G., Nkinin, S., Ndong Asumu, P., Simarro, P., Herder, S. and Soula, G., 1998.** Le foyer de trypanosomiase humaine de Campo (Cameroun) en 1998. Aspects épidémiologiques, état de l'endémie et comparaison des CATT 1.3 et CATT Latex dans le dépistage de masse. [The Campo focus of human trypanosomiasis, Cameroon, in 1998. Epidemiological aspects, endemic state and comparison of CATT 1.3 and Latex CATT in mass screening.] *Bulletin de Liaison et de Documentation de l'OCEAC*, **31** (4): 8-19.

Penchenier: OCEAC, B.P. 288, Yaoundé, Cameroon.

The human trypanosomiasis focus of Campo, on the border between Cameroon and Equatorial Guinea, was surveyed in June 1998 for the first time since 1985. Screening was carried out jointly on both sides of the border. The opportunity was taken to compare the CATT using antigen type LiTat 1.3, which has usually been used in surveys, with the Latex CATT, which consists of a lyophilised suspension of latex covered with variable surface antigens of bloodstream forms of *Trypanosoma brucei gambiense* of antigen types LiTat 1.3, 1.5 and 1.6. We also looked for the existence of serological cross reactions between trypanosomes and *Plasmodium* and microfilariae. The results showed that the Cameroonian village of Ipono is the centre of the Campo focus and has a low prevalence (0.3%). The persistence of endemicity may be related to the presence of a pig reservoir in Ipono but this needs confirmation. The Latex CATT gave, at a dilution of 1/4, a higher specificity (76.5%) than that of CATT 1.3 at a threshold of 1+ (42.8%). At 1/8 dilution, the specificity of the Latex CATT was 93.8%. Sensitivity of the two CATTs was 100%. The use of the Latex CATT in place of the CATT 1.3 would therefore, at a 1/8 dilution, reduce the workload by about 8 times and the cost by 3 times. No cross reactions were seen with *Plasmodium* and microfilariae. The detection threshold needs to be confirmed and validated in a high prevalence focus.

11128 **Simo, G., Grebaut, P., Herder, S., Nkinin, S.W. and Penchenier, L., 1999.** Intérêt de la PCR dans le diagnostic de la trypanosomiase humaine africaine.

[The significance of PCR in the diagnosis of human African trypanosomiasis.] *Bulletin de Liaison et de Documentation de l'OCEAC*, **32** (1): 17-21.

Simo: Laboratoire de Recherche sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

In order to demonstrate the significance of PCR performed on blood in the diagnosis of human African trypanosomiasis, blood samples were collected in EDTA coated tubes from 1663 individuals, 1614 of whom were from three active sleeping sickness foci (Bipindi, Campo and Fontem) in Cameroon and 49 from individuals not exposed to the disease (Europeans). A total of 62 sleeping sickness patients were revealed by a combination of parasitological examination and *in vitro* culture (KIVI). KIVI added 4 more cases to the 58 detected parasitologically, whereas PCR was positive for 61 of these patients. The percentage positivity rate for all PCR positive individuals from among sleeping sickness patients, serological suspects (CATT positive) and negative controls (7%, 117/1663) was twice that for parasitological examination (3.5%, 58/1663). This technique can be used to detect trypanosomes in serological suspects where parasitological examination proves ineffective.

(b) PATHOLOGY AND IMMUNOLOGY

11129 **Claustrat, B., Buguet, A., Geoffriau, M., Bogui, P., Mouanga, G., Stanghellini, A. and Dumas, M., 1998.** Plasma melatonin rhythm is maintained in human African trypanosomiasis. *Neuroendocrinology*, **68** (1): 64-70.

Claustrat: Service de Radiopharmacie et Radioanalyse, Centre de Médecine Nucléaire, Hôpital Neuro-Cardiologique, B.P. Lyon Montchat, F-69394 Lyon Cedex 03, France.

In human African trypanosomiasis, sleep and wake episodes are sporadically distributed throughout the day and night. Plasma melatonin, sleep-wakefulness and rectal temperature rhythms were studied in nine Congolese patients suffering from *Trypanosoma brucei gambiense* sleeping sickness compared to six healthy controls submitted to the same light/dark regime. The circadian distribution of the sleep-wake cycle was disturbed in relation to the severity of the disease. As in controls, patients maintained a very distinct plasma melatonin nyctohemeral rhythm which displayed a significant phase advance (1:08 ± 0:43 and 2:34 ± 0:31 (h:min, mean ± SD), in patients and controls respectively; $P < 0.01$, U test), as well as a persistent rectal temperature rhythm (mesor 36.67 ± 0.29 and 36.74 ± 0.13 °C, amplitude 0.29 ± 0.16 and 0.32 ± 0.13 °C, acrophase 13:53 ± 2:47 and 15:32 ± 0:36 for patients and controls respectively). No alteration of these rhythms was observed after treatment with melarsoprol and corticotherapy. Plasma melatonin characteristics were similar in African and European controls, especially for the onset and duration of the secretion and the stability of the rhythm, despite a different light/dark regime. The dissociation observed between the three rhythms (melatonin, temperature and sleep-wake cycle) is discussed, taking into consideration a functional compartmentalisation of the suprachiasmatic nuclei, or more likely a disruption of the neural pathway between the circadian clock and structures involved in the regulation of

the sleep-wake cycle, related to the activity of compounds released by the parasites or host cells.

11130 **Iborra, C., Danis, M., Bricaire, F. and Caumes, E., 1999.** A traveler returning from central Africa with fever and a skin lesion. *Clinical Infectious Diseases*, **28** (3): 679-680.

Caumes: Département des Maladies Infectieuses et Tropicales, Hôpital Pitié-Salpêtrière, 47 boulevard de l'Hôpital, 75013 Paris, France.

A 45-year-old French man living in Libreville, Gabon, was evacuated to France with a febrile illness and an erythematous plaque on the right ankle. Examination of a peripheral blood smear showed trypanosomes, and the haemolymphatic stage of *Trypanosoma brucei gambiense* trypanosomiasis was diagnosed. The patient was successfully treated with 5 doses of i.v. pentamidine isethionate (4 mg/kg) over 10 days. Such skin lesions (chancres) are rare in *T. b. gambiense* infection.

11131 **Kakou, A., Assemian, P., Eholie, S., Bissagnene, E., Coulibaly, M., Aoussi, E. and Kadio, A., 1999.** Aspects cliniques et thérapeutiques de la méningo-encéphalite à *Trypanosoma gambiense* en milieu hospitalier. [Clinical and therapeutic aspects of meningo-encephalitis due to *T. b. gambiense* in the hospital environment.] *Médecine d'Afrique Noire*, **46** (3): 147-152.

Clinique des Maladies Infectieuses, CHU, Treichville, Abidjan, Côte d'Ivoire.

Based on a study of 33 cases of trypanosomiasis over a period of 10 years, the authors report their experience of the hospital management of meningo-encephalitis due to *T. b. gambiense*. Clinical features were dominated by sleeping abnormalities (79%), with diverse other neurological signs being observed, in particular sensory-motor and psychological problems. Fever was found in 24% and adenopathy in 88%. Diagnosis was based on isolation of parasites (73%) and serological tests. The most commonly used drug was melarsoprol which had an efficacy rate of 79%. Two cases of arsenical encephalopathy were noted. The introduction of DFMO for hospital use is recommended and the importance of early diagnosis is stressed.

(c) TREATMENT

[See **22**: nos. 11086, 11131.]

6. ANIMAL TRYPANOSOMIASIS

(a) SURVEY AND DISTRIBUTION

[See also **22**: nos. 11105, 11145.]

11132 **Bengaly, Z., Ganaba, R., Sidibe, I. and Duvallet, G., 1998.** Infections trypanosomiennes chez des bovins dans la zone Sud-soudanienne du Burkina Faso. [Trypanosome infections in cattle in the south Sudanese area of Burkina Faso.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (3): 225-229.

Bengaly: CIRDES, 01 B.P. 454, Bobo-Dioulasso 01, Burkina Faso.

In order to assess the apparent prevalence of trypanosome infections and some variation factors in cattle in five provinces of the south Sudanese area of Burkina Faso, 1796 cattle were sampled between 1994 and 1995 for the presence of trypanosomes using the buffy coat technique and Giemsa stained blood smears. In four provinces which were surveyed during the rainy season (July-August), the apparent prevalence varied between 7.6 and 12.2% (4.9-11.3% and 8.9-16.3% confidence intervals, respectively). In the only province investigated during the dry season (March), the prevalence was 4.9% (2.7-8.4 CI). Of the studied variation factors (province, livestock area, animal phenotype and age group), only the livestock area and age group had a significant effect on the infection prevalence in the animals. In particular, a decrease in *Trypanosoma vivax* prevalence was associated with age, while the opposite was observed for *T. congolense*. *T. vivax* was the most common species (64% of total infections), followed by *T. congolense* (46.6%) and *T. brucei* (2.5%). There were 13% mixed infections and *T. vivax* and *T. congolense* infections were positively correlated.

11133 **Hopkins, J.S., Chitambo, H., Machila, N., Luckins, A.G., Rae, P.F., Bossche, P. van den and Eisler, M.C., 1998.** Adaptation and validation of antibody-ELISA using dried blood spots on filter paper for epidemiological surveys of tsetse-transmitted trypanosomosis in cattle. *Preventive Veterinary Medicine*, **37** (1-4): 91-99.

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

The indirect ELISA for the detection of anti-trypanosomal antibodies in bovine serum was adapted for use with dried blood spots on filter paper. Absorbance (450 nm) results for samples were expressed as percent positivity, i.e. percentage of the median absorbance result of four replicates of the strong positive control serum. The antibody-ELISA was evaluated in Zambia for use in epidemiological surveys of the prevalence of tsetse-transmitted bovine trypanosomosis. Known negative samples (sera, n = 209; blood spots, n = 466) were obtained from cattle from closed herds in tsetse-free areas close to Lusaka. Known positive samples (sera, n = 367; blood spots, n = 278) were obtained from cattle in Zambia's Central, Lusaka and Eastern Provinces, diagnosed as being infected with *Trypanosoma brucei*, *T. congolense* or *T. vivax* using the phase-contrast buffy-coat technique or Giemsa-stained thick and thin blood smears. For sera (at a cut-off value of 23.0% positivity) sensitivity and specificity were 86.1 and 95.2%, respectively. For bloodspots (at a cut-off value of 18.8% positivity) sensitivity and specificity were 96.8 and 95.7%, respectively. The implications of persistence of antibodies following treatment or self-cure are discussed.

11134 **Masupu, K.V. and Majok, A.A., 1998.** Apparent prevalence of equine dourine in Kgalagadi district of Botswana. *Zimbabwe Veterinary Journal*, **29** (4): 113-116.

Majok: FAO, House no. 8a and b, Street 30, F-7/1, GPO 2713, Islamabad, Pakistan.

A survey of dourine (*Trypanosoma equiperdum* infection) among the equine population of Kgalagadi district of Botswana was conducted using serum samples from 372 animals (214 donkeys, 146 horses and 12 mules). Using the complement fixation test, 26 horses and 11 donkeys and mules were positive, giving an apparent prevalence of *c*. 10%. It is recommended that horses and donkeys in Zimbabwe should be regularly tested for *T. equiperdum* infection and that imported animals should be certified negative for dourine.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **22**: nos. 11091, 11093, 11144.]

11135 **Magona, J.W., Katabazi, W., Olaho-Mukani, W., Mayende, J.S.P. and Walubengo, J., 1997.** Haemorrhagic *Trypanosoma vivax* outbreak in cattle in Mbale and Tororo districts in eastern Uganda. *Journal of Protozoology Research*, **7** (2): 48-53.

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

Surveys were carried out between March and May 1997 in the Mbale and Tororo districts of Uganda to investigate reports of an outbreak of an unusual disease which was causing considerable mortality of cattle. Clinical signs were anaemia, bleeding through the skin and ears before death, and petechial haemorrhages on the tongue and enlarged spleen observed at post-mortem. Altogether 808 cattle were examined by the buffy coat technique for trypanosomiasis, and tsetse trapping was carried out in five subcounties in the two districts. Trypanosomiasis was found to be prevalent in 8.7-26.5% of the cattle in Mbale district and in 27.8-34.8% of the cattle in Tororo district. Infections were mostly due to *T. vivax*. Infected cattle had a lower mean PCV (23.6 ± 0.64) than uninfected cattle (26.9 ± 0.25). Of the cattle examined, 43% had a PCV ≤ 24. The clinical signs and high mortality indicated that the outbreak was due to haemorrhagic *T. vivax* infection. This is the first time haemorrhagic *T. vivax* has been reported in Uganda. Trapped tsetse flies were predominantly *Glossina fuscipes fuscipes* but a few were *G. pallidipes*. The immediate implementation of an integrated control programme using pour-on applications, chemotherapy and insecticide-impregnated traps was recommended.

11136 **Osaer, S., Goossens, B., Jeffcoate, I. and Holmes, P., 1998.** Effects of *Trypanosoma congolense* and nutritional supplements in Djallonké ewes on live weight during pregnancy, post partum weight, haematology parameters and lamb performance. *Research in Veterinary Science*, **65** (1): 65-69.

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

The effects of *T. congolense* infection and nutritional supplements on live weight changes during pregnancy, haematology traits and offspring performance were studied in 42 Djallonké ewes. A randomised block design was used to allocate ewes to four treatment combinations, of which two were on a restricted diet (L) and the remainder on an unrestricted diet (H). Half of each nutritional group were infected with *T. congolense* (LI, HI), the remainder serving as controls (LC, HC). The degree of anaemia following infection was similar in both infection groups ($P < 0.001$), but the erythropoietic activity, as judged by the increase in mean corpuscular volume, was significantly greater in the HI group ($P < 0.01$). Live weight gains during pregnancy attributable to higher supplements were significantly depressed by infection ($P < 0.01$). Post partum weight was lower in the LI group as compared with the LC control. Diet interacted significantly with infection ($P < 0.01$) and resulted in the lowest lamb growth rates in the LI group. It was concluded that dietary supplementation of trypanosome-infected Djallonké ewes during pregnancy and lactation improves productivity in terms of ewe live weight and improved lamb growth rates to weaning.

11137 **Patel, N.B., Ng'wena, A.G.M. and Wango, E.O., 1998.** Absence of LH surge in *Trypanosoma congolense* infected female goats. (Meeting abstract). *European Journal of Neuroscience*, **10** (Suppl.): 315.

Patel: Department of Medical Physiology, University of Nairobi, P.O. Box 30197, Nairobi, Kenya.

11138 **Pathak, K.M.L. and Kapoor, M., 1999.** Transplacental transmission of *Trypanosoma evansi* in a donkey. *Indian Veterinary Journal*, **76** (2): 179.

Department of Veterinary Parasitology, College of Veterinary and Animal Science, Bikaner 334 001, India.

T. evansi was detected in blood samples from an aborted donkey foetus, demonstrating that congenital transmission had occurred.

11139 **Sayed, A.S., 1998.** Clinical, haematological and some trace elements status in healthy and emaciated camels in Assiut and New Valley governorates. *Assiut Veterinary Medical Journal*, **39** (77): 154-168.

Department of Animal Medicine, Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt.

In a study of 71 dromedary camels in Assiut and New Valley governorates, Egypt, only 24 were healthy. Of the remaining 47 emaciated camels, 20 were suffering from trypanosomiasis (*Trypanosoma evansi*) and 9 from trypanosomiasis and mange mite. The rest had chronic diarrhoea, emaciation and weakness. A significant decrease in blood serum levels of copper was found in all emaciated camels, while blood serum levels of iron, zinc and manganese depended on region and soils. A decrease in total erythrocytes,

haemoglobin, PCV and MCHC, and a significant increase in leucocytes, were seen, i.e. the camels were suffering from normocytic hypochromic anaemia.

11140 **Varshney, J.P., Varshney, V.P. and Dwivedi, S.K., 1998.** Clinico-endocrinological findings in clinical trypanosomosis in dog. *Journal of Veterinary Parasitology*, **12** (2): 143-144.

Division of Medicine, Indian Veterinary Research Institute, Izatnagar 243 122, India.

Asymptomatic hypothyroidism, high concentration of cortisol and low level of insulin and blood glucose were recorded in a clinical case of *Trypanosoma evansi* infection in a dog which had swelling of the throat, hoarse voice and bilateral loss of vision. Trypanosomes were detected in lachrymal secretions as well as in the blood. The dog was successfully treated with diminazene aceturate and supportive therapy, vision being restored in 45 days post-treatment.

(c) TRYPANOTOLERANCE

11141 **Black, S.J., Wang, Q., Makadzange, T., Li, Y.-L., Praagh, A. van, Loomis, M. and Seed, J.R., 1999.** Anti-*Trypanosoma brucei* activity of nonprimate zoo sera. *Journal of Parasitology*, **85** (1): 48-53.

Black: Department of Veterinary and Animal Sciences, Paige Laboratory, University of Massachusetts, Amherst, MA 01003, USA.

Constitutive anti-*T. b. brucei* S 427 clones 1 and 22 activities were evaluated in sera from 22 species of nonprimate mammals. The sera fell into five categories. Sera from Cape buffalo, giraffe and greater kudu showed a concentration-dependent inhibition of replication of the two clones, which was dependent on the presence of xanthine oxidase. Sera from warthog and springbok also severely limited trypanosome replication but lacked xanthine oxidase. Their antitrypanosome activity was inactivated by heating at 56°C for 30 min but not affected by absorbing with trypanosomes at 4°C. Sera from lion and leopard showed a concentration-dependent inhibition of the growth of *T. brucei* S 427 clone 1, but not clone 22. These sera lacked xanthine oxidase. Their anti-*T. brucei* S 427 clone 1 activity was inactivated by heating at 56°C for 30 min but not removed by absorbing with trypanosomes. Serum from Grant's gazelle prevented replication of both *T. brucei* clones, lacked xanthine oxidase, and was not affected by heating at 56°C. Sera from waterbuck, Thompson's gazelle, sitatunga, Cape hartebeeste, gerenuk, Grant's zebra, cow, serval cat, cougar, bobcat and domestic cat were fully supportive of trypanosome replication irrespective of concentration tested up to a maximum of 48% v/v in culture medium. Sera from different individuals of the same mammal species had similar effects on trypanosomes, and samples collected from the same individual at different times also had similar activities, indicating species-specific stable expression, or lack thereof, of constitutive serum antitrypanosome components.

(d) TREATMENT

[See also **22**: nos. 11115, 11157.]

11142 **Clausen, P.H., Waiswa, C., Katunguka-Rwakishaya, E., Schares, G., Steuber, S. and Mehlitz, D., 1999.** Polymerase chain reaction and DNA probe hybridization to assess the efficacy of diminazene treatment in *Trypanosoma brucei*-infected cattle. *Parasitology Research*, **85** (3): 206-211.

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

Four of eight Ankole longhorn cattle experimentally infected with *T. brucei* were treated with 7 mg/kg diminazene aceturate at day 71 p.i. The trypanocidal activity was monitored using PCR and DNA probe hybridisation. When extracted parasite DNA (without host DNA) was used, as little as 1 fg per reaction (equivalent to *c.* 1-10% of the DNA in a single trypanosome) produced a specific product that was visible as a 177-bp band in an agarose gel. In infected cattle, specific PCR products could be amplified as early as 1 day p.i. PCR signals remained positive during infection, except in one sample, although aparasitaemic phases occurred. In cases where treatment resulted in a significant clinical improvement, PCR signals disappeared at 3-4 days after the administration of the drug. By contrast, in cattle that showed clinical signs of CNS involvement after treatment, although aparasitaemic, and died before the termination of the experiment, specific products could be amplified on several occasions following treatment. The PCR signals generated after treatment could be further enhanced by subsequent slot-blot hybridisation with a *T. brucei*-specific DNA probe. It is concluded that PCR coupled with DNA probe hybridisation provides a highly sensitive tool for the assessment of therapeutic efficiency and disease progression in trypanosome infections, especially in chronic infections when the level of parasitaemia is low or when trypanosomes are sequestered at cryptic sites.

11143 **Diack, A., Moloo, S.K. and Peregrine, A.S., 1998.** Effect of multiple treatment of cattle with diminazene aceturate on the infectivity and transmissibility of drug-resistant *Trypanosoma congolense* for *Glossina morsitans centralis*. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (3): 211-218.

Peregrine: Department of Pathobiology, Ontario Veterinary College, University of Guelph, Guelph, ON N1G 2W1, Canada. [aperegrine@ovcnet.uoguelph.ca]

Six Boran cattle were infected with the drug-resistant *T. congolense* IL 3338. At the first peak of parasitaemia different groups of 200 teneral *G. m. centralis* were fed once on each animal, just prior to treatment with diminazene aceturate at a dose of 3.5 mg/kg body weight. Thereafter, all animals were monitored three times a week and retreated with the same drug dosage whenever the PCV declined in three consecutive samples from one or more of the animals. After eight treatments at approximately 2-week intervals, the mean duration when parasites were not detected after each treatment did not increase, but

remained at 7.8 ± 1.1 days. The mean PCV declined from 33.2 ± 0.6% at the time of the first treatment to a mean inter-treatment value of 23.7 ± 2.6% between the eighth and ninth treatment. Therefore, subsequent to the eighth treatment diminazene was administered as before but at a dose of 7.0 mg/kg. After treatment with this higher dosage, the mean inter-treatment PCV increased from 25.4 ± 2.4% following the first treatment to 32.9 ± 1.7% for the 2-month period following the fifth treatment. At least 14 days after treatments with diminazene at 3.5 mg/kg, and 30 days after treatments at 7.0 mg/kg, similar numbers of flies as used for the first feed were fed on one occasion on each animal. Thereafter, 10 flies with mature infections from each group were fed individually on mice to determine the transmissibility index. In general, the midgut and hypopharynx infection rates in flies of all groups were not significantly lower than that of the control group. However, while tsetse groups that fed following the second and third treatments with diminazene at 7.0 mg/kg picked up infections from all six cattle, flies fed following the fourth treatment became infected from only two of the six animals. Thus, repeated treatment with diminazene at a dose of 7.0 mg/kg resulted in the apparent complete elimination of infection in four out of six animals. In contrast, the transmissibility index of *T. congolense* IL 3338 was not affected by multiple treatment with diminazene.

11144 **Umar, I.A., Ameh, D.A. and Esievo, K.A.N., 1998.** Normal plasma lactose concentrations and kinetics of intravenously infused lactose in cattle. *Research in Veterinary Science*, **65** (1): 1-4.

Esievo: Department of Veterinary Pathology, Ahmadu Bello University, Zaria, Nigeria.

The chemotherapeutic usefulness of lactose as a base to a trypanocidal agent to inhibit erythrophagocytosis during bovine trypanosomiasis was investigated. Thirty-seven adult Zebu cattle and 20 Zebu calves were used to establish normal lactose concentrations. A range of 0.061 to 0.55 mM with a mean of 0.208 ± 0.128 mM, observed in adult cattle, was significantly lower than corresponding values in recently weaned calves: 0.429 to 1.496 mM (0.972 ± 0.318 mM). Semi-logarithmic plots from calves given a single dose (0.5 g lactose per kg bodyweight as a solution in normal saline, infused at a rate of 18 ml/min) showed a biexponential pattern of regression lines. Decrease in plasma concentrations was biphasic and lactose was rapidly distributed into the extravascular space after administration. The biological half-life of the infused lactose ranged from 4.10 to 6.00 h (5.01 ± 0.81 h); its mean elimination rate constant was 0.14 ± 0.02 per h, mean apparent volume of distribution was 168.09 ± 56.65 ml/kg, while its mean total clearance was 23.54 ± 8.31 ml/kg/h. A single dose rapidly reached a peak and gradually fell below the pre-infusion level while repeated doses did not cause accumulation of the lactose in the plasma as each infusion fell back to normal relatively rapidly. These results suggest that i.v. administered lactose may be able to reduce the rate of sequestration of desialylated erythro-cytes during *Trypanosoma vivax* infection of cattle, thus decreasing the rate of develop-ment of anaemia.

7. EXPERIMENTAL TRYPANOSOMIASIS

(a) DIAGNOSTICS

11145 **El Sawalhy, A. and Seed, J.R., 1998.** Diagnosis of trypanosomiasis in experimental mice and field-infected camels by detection of antibody to trypanosome tyrosine aminotransferase. *Journal of Parasitology*, **84** (6): 1245-1249.

El Sawalhy: Department of Animal Medicine, Faculty of Veterinary Medicine, Mansoura University, Mansoura, Egypt.

Sera from animals with acute and chronic *Trypanosoma evansi* infections were examined directly for trypanosome tyrosine aminotransferase activity and indirectly for their ability to inhibit tyrosine aminotransferase activity. It was shown that sera from acutely infected mice and camels with high parasitaemias contained significant levels of trypano-some tyrosine aminotransferase activity. In contrast, the sera from chronically infected mice and camels did not contain significant tyrosine aminotransferase activity, but they were able to neutralise the enzyme activity in trypanosome homogenates. The sera from camels with other pathological conditions did not neutralise this enzyme activity. It is suggested that the inhibitory factor in the chronic sera is antibody. The potential use of the direct enzyme assay and the indirect neutralisation assay as diagnostic tools is discussed. Finally, the use of these assays to distinguish between early (acute) and late (chronic) infections is also suggested.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **22**: no. 11182.]

11146 **Buguet, A., Burlet, S., Banzet, S., Bouteille, B., Gobert, A., Vincendeau. P., Tapie, P., Debilly, G., Doua, F. and Cespuglio, R., 1998.** The NO story in African trypanosomiasis. [*T. b. brucei*.] (Meeting abstract.) *Journal of Sleep Research*, **7** (Suppl. 2): 33.

Buguet: CRSSA, B.P. 87, 38702 La Tronche, France.

11147 **Diaite, A., Gueye, A., Thiongane, Y., Lo, M., Dieye, T.N. and Vassiliades, G., 1998.** Observation dans les Niayes du Sénégal d'une souche de *Trypanosoma (Duttonella) vivax* transmissible d'un bovin à des souris par la seringue. [A strain of *T. vivax* from the Niayes of Senegal transmissible by syringe from cattle to mice.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **51** (2): 127-129.

Diaite: ISRA-LNERV, Service de Parasitologie, B.P. 2057, Dakar Hann, Senegal.

A strain of *T. vivax* isolated from a zebu cow in the Niayes region of Senegal in 1997 was successfully transmitted to laboratory mice (Balb/c). Parasitaemia was monitored in one mouse at first appearance for more than 100 days. *T. vivax* may thus be spontaneously transmissible to rodents. The possible epidemiological implications are discussed.

11148 **Hertz, C.J. and Mansfield, J.M., 1999.** IFN-γ-dependent nitric oxide production is not linked to resistance in experimental African trypanosomiasis. [*T. b. rhodesiense*; mice.] *Cellular Immunology*, **192** (1): 24-32.

Mansfield: Department of Bacteriology, University of Wisconsin, 1925 Willow Drive, FMT Building, Madison, WI 53706, USA.

11149 **Kaushik, R.S., Uzonna, J.E., Radzioch, D., Gordon, J.R. and Tabel, H., 1999.** Innate resistance to experimental *Trypanosoma congolense* infection: differences in IL-10 synthesis by macrophage cell lines from resistant and susceptible inbred mice. *Parasite Immunology*, **21** (3): 119-131.

Tabel: Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, 52 Campus Drive, Saskatoon, SK S7N 5B4, Canada.

11150 **Liu, Y.-J., Li, Z.-L. and Bakhiet, M., 1999.** Upregulation of the chemokines Rantes, MCP-1, MIP-1a and MIP-2 in early infection with *Trypanosoma brucei brucei* and inhibition by sympathetic denervation of the spleen. [Rats.] *Tropical Medicine and International Health*, **4** (2): 85-92.

Bakhiet: Division of Neurology, Karolinska Institute, Huddinge University Hospital, S-14186 Huddinge, Sweden.

11151 **Raper, J., Fung, R., Ghiso, J., Nussenzweig, V. and Tomlinson, S., 1999.** Characterization of a novel trypanosome lytic factor from human serum. *Infection and Immunity*, **67** (4): 1910-1916.

Raper: Department of Medical and Molecular Parasitology, New York University School of Medicine, 341 E. 25th Street, New York, NY 10010, USA.

A new immunoaffinity-based purification procedure for TLF2 and TLF1, as well as further characterisation of the components of each purified TLF, is reported. Immuno-affinity-purified TLF1 has a specific activity 10-fold higher than that of TLF1 purified by previously described methods. Moreover, TLF1 is a lipoprotein particle that contains mainly apoA-I and Hpr, trace amounts of paraoxonase, apoA-II and haptoglobin, but no detectable haemoglobin. Characterisation of TLF2 revealed that it is a 1000-kDa protein complex containing mainly IgM, apoA-I and Hpr but less than 1% detectable lipid.

11152 **Uzonna, J.E., Kaushik, R.S., Gordon, J.R. and Tabel, H., 1999.** Cytokines and antibody responses during *Trypanosoma congolense* infections in two inbred mouse strains that differ in resistance. *Parasite Immunology*, **21** (2): 57-71.

Tabel: Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, 52 Campus Drive, Saskatoon, SK S7N 5B4, Canada.

11153 **Uzonna, J.E., Kaushik, R.S., Zhang, Y., Gordon, J.R. and Tabel, H., 1998.** Experimental murine *Trypanosoma congolense* infections. II. Role of splenic adherent $CD3^+$ $Thy1.2^+$ TCR-$\alpha\beta^-$ $\gamma\delta^-$ $CD4^+8^-$ and $CD3^+$ $Thy1.2^+$ TCR-$\alpha\beta^-$ $\gamma\delta^-$ $CD4^-8^-$ cells in the production of IL-4, IL-10, and IFN-γ and in trypanosome-elicited immunosuppression. *Journal of Immunology*, **161** (11): 6189-6197.

Tabel: Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK S7N 5B4, Canada.

(c) CHEMOTHERAPEUTICS

[See also **22**: nos. 11166, 11168, 11172, 11176, 11177.]

11154 **Aronov, A.M., Suresh, S., Buckner, F.S., Voorhis, W.C. van, Verlinde, C.L.M.J., Opperdoes, F.R., Hol, W.G.J. and Gelb, M.H., 1999.** Structure-based design of submicromolar, biologically active inhibitors of trypanosomatid glyceraldehyde-3-phosphate dehydrogenase. [Incl. *T. brucei*.] *Proceedings of the National Academy of Sciences of the United States of America*, **96** (8): 4273-4278.

Gelb: Department of Chemistry, University of Washington, Seattle, WA 98195, USA.

11155 **Denise, H., Matthews, K., Lindergård, G., Croft, S. and Barrett, M.P., 1999.** Trypanosomiasis and leishmaniasis: between the idea and the reality of control. (Report on International Symposium on Trypanosomiasis and Leishmaniasis, Arcachone, France, April 1998.) *Parasitology Today*, **15** (2): 43-45.

Barrett: Division of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ, UK.

11156 **Kelly, J.M., Miles, M.A. and Skinner, A.C., 1999.** The anti-influenza virus drug rimantadine has trypanocidal activity. [*T. brucei*.] *Antimicrobial Agents and Chemotherapy*, **43** (4): 985-987.

Kelly: Department of Infectious and Tropical Diseases, LSHTM, Keppel Street, London WC1E 7HT, UK.

11157 **Lemmouchi, Y., Schacht, E., Kageruka, P., Deken, R. de, Diarra, B., Diall, O. and Geerts, S., 1998.** Biodegradable polyesters for controlled release of trypanocidal drugs: *in vitro* and *in vivo* studies. [Isometamidium chloride, ethidium bromide; rabbits, cattle.] *Biomaterials*, **19** (20): 1827-1837.

Schacht: Polymer Materials Research Group, Institute of Biomedical Technologies, State University of Ghent, Krijgslaan 281, B-9000 Ghent, Belgium.

11158 **Lowe, G., Droz, A.S., Vilaivan, T., Weaver, G.W., Tweedale, L., Pratt, J.M., Rock, P., Yardley, V. and Croft, S.L., 1999.** Cytotoxicity of (2,2′:6′,2″-terpyridine)platinum(II) complexes to *Leishmania donovani*, *Trypanosoma cruzi*, and *Trypanosoma brucei*. *Journal of Medicinal Chemistry*, **42** (6): 999-1006.

Lowe: Dyson Perrins Laboratory, Oxford University, South Parks Road, Oxford OX1 3QY, UK.

11159 **Scory, S., Caffrey, C.R., Stierhof, Y.-D., Ruppel, A. and Steverding, D., 1999.** *Trypanosoma brucei*: killing of bloodstream forms *in vitro* and *in vivo* by the cysteine proteinase inhibitor Z-Phe-Ala-CHN_2. [Mice.] *Experimental Parasitology*, **91** (4): 327-333.

Steverding: Abteilung Parasitologie, Hygiene-Institut der Ruprecht-Karls-Universität, Im Neuenheimer Feld 324, D-69120 Heidelberg, Germany. [Dietmar_Steverding@med.uni-heidelberg.de]

11160 **Siafaka-Kapadai, A., Svetlov, S., Hanahan, D.J. and Javors, M.A., 1998.** Effects of suramin on human platelet aggregation and Ca^{2+} mobilization induced by thrombin and other agonists. *Life Sciences*, **63** (20): 1769-1777.

Javors: Departments of Psychiatry and Pharmacology, Texas Health Science Center, San Antonio, TX 78284-7760, USA.

11161 **Troeberg, L., Morty, R.E., Pike, R.N., Lonsdale-Eccles, J.D., Palmer, J.T., McKerrow, J.H. and Coetzer, T.H.T., 1999.** Cysteine proteinase inhibitors kill cultured bloodstream forms of *Trypanosoma brucei brucei*. *Experimental Parasitology*, **91** (4): 349-355.

Coetzer: Department of Biochemistry, University of Natal (Pietermaritzburg), Private Bag X01, 3209 Scottsville, South Africa.

11162 **Waechter, A.-I., Cavé, A., Hocquemiller, R., Bories, C., Muñoz, V. and Fournet, A., 1999.** Antiprotozoal activity of aporphine alkaloids isolated from *Unonopsis buchtienii* (Annonaceae). [Incl. *T. brucei*.] *Phytotherapy Research*, **13** (2): 175-177.

Fournet: ORSTOM, CP 9214, La Paz, Bolivia.

8. TRYPANOSOME RESEARCH

(a) CULTIVATION OF TRYPANOSOMES

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

11163 **Clayton, C. *et al*., 1998.** Genetic nomenclature for *Trypanosoma* and *Leishmania*. *Molecular and Biochemical Parasitology*, **97** (1-2): 221-224.

Clayton: Zentrum für Molekulare Biologie, Im Neuenheimer Feld 282, D-69120 Heidelberg, Germany. [cclayton@sun0.urz.uni-heidelberg.de]

11164 **Nkinin, S.W., Njiokou, F., Grebaut, P., Penchenier, L., Bureau, P., Simo, G. and Herder, S., 1999.** Isoenzyme characterization of *Trypanosoma brucei s.l.* stocks from different foci in the Central African Region. *Bulletin de Liaison et de Documentation de l'OCEAC*, **32** (1): 9-16.

Nkinin: Laboratoire de Recherche sur les Trypanosomiases, OCEAC, B.P. 288, Yaoundé, Cameroon.

In this study, 33 newly isolated stocks from the central African region, and 7 reference stocks previously identified as either *T. b. gambiense* or *T. b. brucei*, were characterised by isoenzyme electrophoresis with the aid of 14 enzyme systems on cellulose acetate gels. A total of 18 zymodemes were defined, with the majority of stocks belonging to zymodeme 1 which was associated with *T. b. gambiense* group 1 responsible for the chronic form of trypanosomiasis in West and Central Africa. An animal stock from a domestic pig in Campo (Cameroon) was considered to be *T. b. gambiense* on the basis of its superoxide dismutase (SOD) phenotype, though it had a unique aspartate aminotrans-ferase (ASAT) pattern. Our results also show that the use of KIVI is cumbersome, very expensive and hence not advisable for large-scale diagnostic campaigns.

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

11165 **Armah, D.A. and Mensa-Wilmot, K., 1999.** *S*-myristoylation of a glycosyl-phosphatidylinositol-specific phospholipase C in *Trypanosoma brucei*. *Journal of Biological Chemistry*, **274** (9): 5931-5938.

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

11166 **Barrett, M.P. and Fairlamb, A.H., 1999.** The biochemical basis of arsenical-diamidine crossresistance in African trypanosomes. [*T. b. brucei*, *T. b gambiense*, *T. b. rhodesiense*.] (Review.) *Parasitology Today*, **15** (4): 136-140.

Barrett: Division of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ, UK. [m.barrett@bio.gla.ac.uk]

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