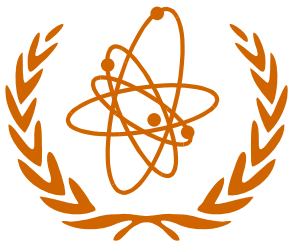
ISSN 0142-193X

TSETSE AND TRYPANOSOMIASIS INFORMATION QUARTERLY

Volume 24
Part 4, 2001
Numbers 12047–12133



DFID

CIRAD
Cirad-emvt

SECTION A - NEWS

FOOD AND AGRICULTURE ORGANISATION

FAO: Strategic Planning for RTTCP – Phase II: Project Findings and Recommendations

FAO has issued under the FAO/Government Cooperation Programme, the paper "Strategic Planning for the Regional Tsetse and Trypanosomiasis Control Programme – Phase II: Project Findings and Recommendations" (AG:GCP/RAF/336/EC). The paper could usefully be read in conjunction with other longer publications, such as those abstracted in Section B, entries 12047-12049. Of particular interest is the section Recommendations, and these recommendations are summarized here.

It is argued that to ensure the sustainability of technical interventions in a rural development context, it is important to give adequate consideration to socio-economic, institutional and environmental (SITE) factors. Animal disease programmes should be examined and tested in the field, and base line information is needed for this. The issues of how control techniques may be transferred to the farmers themselves for implementation, and the question of whether these techniques can be sustained, have to be fully examined. The emphasis is therefore on the farmers' needs and capabilities, rather than on the application of a particular control technique.

For Malawi, it is suggested that while maintenance of target operations in Kasungu and Nkhotakota would seem to be a logical strategy to keep cattle disease and human sleeping sickness under control, local and donor support for a continuation of these operations seems to be lacking. The only alternative left is for farmers to use trypanocides to control the cattle disease. In other areas of Malawi, the strategy should be to allow farmers to continue to manage trypanosomiasis by using trypanocides. Government resources should be directed to monitoring the disease (esp. in Kasungu and Nkhotakota), monitoring drug sales (by both government and private agents) and monitoring for the development of trypanosome resistance (for example, by following shifts in the frequency of treatments). Research efforts are called for to see if prophylactic drugs could help pre-pregnant and pregnant cattle achieve better calf survival in medium-challenge areas.

Mozambique should continue to rely on trypanocides, and large-scale vector control operations are not justified. Subsidies to trypanocides should be discontinued, to help longer-term sustainability. Drug sales and disease management practices should be monitored with special attention given to areas having high cattle densities and local risk of trypanosomiasis. Plans to establish an antibody-ELISA laboratory in Chimoio in Manica Province should be pursued. Privatisation of drug sales and the delivery of veterinary services should be encouraged. Such policy changes will involve overhaul in related areas, such as improvement of access to credit, removal of existing subsidies, legislation, extension and training.

In Zambia, ongoing tsetse control operations in Msanzara, Eastern Province, cannot be justified. Studies have suggested that target control operations will not bring benefits at the herd level significantly better than would the use of trypanocides, and it is unlikely that cattle owners will have the motivation to maintain the target operation. Drug use should be monitored nationally to give warning of possible drug resistance. Privatisation of veterinary services at national level is already Government policy, and drugs are already supplied at unsubsidised prices. Reducing calf mortality by the use of prophylactic drugs should be tried out in places such as Chipangali.

For Zimbabwe, past gains resulting from tsetse control operations should be maintained by servicing the existing re-invasion barrier on a long-term basis. Attempts should be made to privatise the maintenance of target barriers, and placing this work to competitive international tender should be considered. Decisions regarding the clearance of tsetse from Matusadonna National Park are required. The effectiveness of existing target barriers generally should be monitored, paying attention to nearby human settlements, which might in time reduce the need to maintain some sections. The government should progressively withdraw from operational activities in tsetse control, and concentrate on setting standards for private contractors, planning and monitoring the activities of private contractors, monitoring the status of the disease and evaluating the benefits of control.

For the four countries, Malawi, Mozambique, Zambia and Zimbabwe, the need for training in strategic planning, socio-economics and environmental monitoring is emphasized. This is an area where donors could give help. Research is needed into trypanosome resistance to the drugs used in southern Africa, with special attention to effective monitoring as to drug quality and use. Socio-economic and sociological research about the transferability and sustainability of community-based control operations (targets and insecticide-treated cattle) is also justified, though costly and time-consuming.

The unique and valuable data base accumulated by the RTTCP, one of the most comprehensive and up-to-date sources of information about tsetse and trypanosomiasis control in Africa, should be stored at the Tsetse and Trypanosomiasis Control Branch offices in Harare, perhaps in a special Regional Centre to be established.

FAO: "Assessment of Priority Areas for Typanosomiasis Control Actions by Satellite Data and Fuzzy Logic"

FAO has issued an informative six-page leaflet in colour, "Assessment of Priority Areas for Trypanosomiasis Control Actions by Satellite Data and Fuzzy Logic." This is No. 20 in the series *Remote Sensing for Decision Makers*, and is available in English and French versions. The FAO Environment and Natural Resources Service produced the series, and the pamphlet is based on a study by the Laboratory for Forest Management and Spatial Information Techniques, University of Ghent, Belgium, in collaboration with the Prince Leopold Institute for Tropical Medicine, Antwerp, Belgium, and the FAO Regional Project for Trypanosomiasis Control, Togo and Burkina Faso (GCP/RAF/ 347/BEL), and draws upon examples from Togo. It is targeted at decision-makers such as

heads and division directors of national and international organizations and administrators, project managers, planners, and policy-makers of development institutions. It promotes the use of remote sensing and geographical information system techniques to aid planning for and management of renewable natural resources in agriculture, forestry and fisheries. This issue No. 20 is specifically intended for such managers who are concerned with the control of vector-borne diseases and the management of rangeland resources. It is explained that opportunities exist, using satellite imagery and fuzzy logic, to detect areas of land where trypanosomiasis control might result in a sustainable increase of animal production, avoiding the risk of increasing cattle density above the carrying capacity of the land. Fuzzy logic is described as a mathematical process allowing entities to have a partial membership of a class, rather than falling into the yes/no categorization used in classical binary logic, and the process has advantages when one is dealing with data coming from the environment and land use.

The leaflet has several colour images, for example a Landsat Thematic Mapper colour composite image superimposed on a digital terrain model, showing the Oti Plains, the Savanes plateau and the gallery forests of the River Oti. Another colour image deals with land cover of a particular area, with twelve distinct land cover classes mapped out, and the location of villages, roads and canton boundaries shown. A section of the text deals with costs and delivery times of the components of the whole operation, which could be helpful to planners and economists.

Further information is available from the Environment and Natural Resources Service, Sustainable Development Department, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy; e-mail: Changchui.He@fao.org.

CIRDES, ILRI, ITC: COLLABORATIVE RESEARCH PROGRAMME

Collaborative Research Programme on Trypanosomosis and Trypanotolerant Livestock in West Africa

The document "Collaborative Research Programme on Trypanosomosis and Trypanotolerant Livestock in West Africa: Joint Report of Accomplishments and Results (1993-1999)" (227 pp.), was published in December 2000 by Centre international de Recherche-Développment sur l'Elevage en Zone subhumide (CIRDES), International Livestock Research Institute (ILRI) and International Trypanotolerance Centre (ITC). The work was funded by the Commission of the European Communities (under EDFVII-REG 6061/002). Technical details and results, and activities in the areas of tick and worm control, may be obtained from the original document. Salient points of the Executive Summary are given below, with emphasis on programme design, trypanosomosis and the policy implications of the study results.

Aims and objectives

The purpose of the Programme was to improve livestock productivity in the sub-humid and semi-arid regions of West Africa by raising the productivity of trypanotolerant

livestock and reducing disease constraints in crop-livestock systems. The specific objectives were (1) to assess the disease resistance and productivity of livestock (cattle and sheep) at village level; (2) to reduce the constraints imposed by pathogenic parasitic diseases, particularly trypanosomosis, with community participation; (3) to identify factors affecting livestock owners' portfolio choices, breed preferences and adoption of improved livestock production and disease control techniques; (4) to evaluate the costs, benefits, organisational needs and constraints of alternative techniques for improving the productivity of trypanotolerant/non-tolerant livestock; and (5) to strengthen collaboration between international/regional research organisations and national systems of agricultural research.

Mode of operation

The Communauté Economique du Bétail et de la Viande (CEBV), based in Ouagadougou, Burkina Faso, acted as the Regional Authorising Officer of the EDF. The three collaborating research centres were: CIRDES, Bobo-Dioulasso, Burkina Faso, ILRI Nairobi, Kenya, and ITC, Banjul, The Gambia. CIRDES and ITC were responsible for veterinary and genetic components, while ILRI was responsible for the socio-economic components. Collaborative arrangements were established with national systems of agricultural research and livestock development in a number of West African countries, notably Benin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Senegal, Sierra Leone and Togo, and with a number of European research institutes. The programme lasted from mid-1993 to mid-1997, with extension to December 1999. Field station were used in Burkina Faso and The Gambia; village communities were studied in Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger and Senegal. The budget amounted to ECU 7,100,000 adjusted to 8,505,000 to cover the extension.

Research Programme

The collaborative research programme covered twelve countries in West Africa, having 20 million cattle and 41 million sheep and goats. Two thirds of the cattle are raised under trypanosomosis risk. Certain areas within the medium rainfall areas were selected for special study: four areas of Burkina Faso were selected to represent different production systems; three areas of The Gambia in Central River Division were selected to represent different levels of trypanosomosis risk.

Policy Implications

(i) Public agencies have rôles to support farmer integration of different strategies, for the control of animal diseases. They also need to understand how farmers' location and their choice of species and breeds, condition the choices they make with medium and short-term consequences. (ii) The use of trypanocidal drugs could be reduced if people were provided with more information about tsetse, trypanosomosis and when

trypanocidal drugs are best used. (iii) Development and extension services in Burkina Faso should focus on the rational use of local feed resources and ways to reduce calf mortality. (iv) Better management, e.g. housing and better nutrition, would improve the productivity of small ruminants and have particularly positive impacts on women. (v) Tsetse control may seldom be justified where trypanotolerant livestock predominate. (vi) The site-specific studies of livestock production, vector dynamics and disease incidence need to be extended across the region using the tools of rapid appraisal and geographic information systems. (vii) Disease and vector control programmes should be designed to facilitate people to contribute in the manner they deem most suitable to their needs and constraints; in many ways money contributions are preferable to labour contributions, as money is fungible and labour is not. (viii) Zebu breeds should not be widely promoted in areas of high or moderate trypanosomosis risk or of risk of cowdriosis. (ix) Breed improvements programmes in Burkina Faso should concentrate on improvements to fitness to traction, disease resistance and reproductive performance.

SECTION B – ABSTRACTS

1. GENERAL (INCLUDING LAND USE)

12047 **Bossche, P. van den and Vale, G.A., 2000.** *Bovine Trypanosomosis in Southern Africa, Volume 2. Tsetse and trypanosomosis in southern Africa.* Pp. 140. Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

Van den Bossche: Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

The achievements and recommendations of the technical work performed by or in association with the Regional Tsetse and Trypanosomosis Control Programme for Malawi, Mozambique, Zambia and Zimbabwe, which ran from 1986 to 2000, are reviewed. Aerial spraying with non-residual insecticide was confirmed as effective in the rapid eradication of *Glossina morsitans morsitans* in flat terrain, but was less effective in mountainous areas; *G. pallidipes* was more difficult to eradicate in any terrain. Artificial baits treated with pyrethroids and odour attractants were developed into useful tools for the eradication of both species from a variety of terrains. Odour-baited traps were developed as efficient devices for surveying for *G. pallidipes* and *G. brevipalpis*, but were less effective for *G. m. morsitans* and *G. austeni*. Both aerial spraying and baits were shown to have no long-term, irreversible impact on the environment, but there is need to clarify the effect that the insecticide treatment of cattle has on the dung fauna. Methods of diagnosing trypanosomosis were improved, and a highly sensitive antibody detection test was introduced to complement the more traditional methods. The Common Fly-belt was surveyed, with the exception of large parts of Mozambique, due to strife. Natural barriers to tsetse infestation, including large water bodies, treeless zones, and areas in which the mean temperature is less than 16^{o}C for at least three months of the year, were identified. Large scale testing of the blood in cattle showed that about 90% of the *Trypanosoma* infections were due to *T. congolense*, with local variations of prevalence. In Zimbabwe, a combination of aerial spraying and the use of bait technology, reclaimed all the land lost to tsetse in the war of the 1970's. In the 1990's, barriers of baits prevented the reinvasion of these areas. In Zambia, baits have removed flies from the Gwembe Valley and nearby areas, and from settlements in the Eastern Plateau. In Malawi, baits dealt effectively with the human and animal trypanosomosis associated with the Kasungu National Park and the Nkhotakota Game Reserve. In future, trypanocidal drugs are the most likely method of control, with perhaps some control by the bait technique, mainly using insecticide-treated cattle. Research areas relevant to these requirements are identified.

12048 **Doran, M., 2000.** *Bovine Trypanosomosis in Southern Africa, Volume 3. Socio-economics of trypanosomosis: Implications for control strategies within the Common Fly-belt of Malawi, Mozambique, Zambia and Zimbabwe.* Pp. 156. Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

Doran: Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

The objectives of the RTTCP switched in 1995 from eradication towards locally based control operations based on the principles of transferability and sustainability. The technical database needed in respect of socio-economic and environmental impacts of control was not properly understood at that time. In 1997 the RTTCP embarked on a series of studies to improve the information base required for the purposes of strategy formulation. The main objective was to determine the direct and indirect effects of trypanosomosis on agricultural and livestock production in the different epidemiological situations found within the Common Fly-belt, with particular emphasis given to assessing the effects of the disease on herd performance and the disease management practices adopted by farmers. Epidemiological studies have sampled over 20,000 cattle. Large parts of the Common Fly-belt are unaffected by the disease, but where trypanosomosis is found, a distinction can be made between areas in which farmers live within tsetse-infested zones, and areas where farmers live on the fringes of tsetse infested zones. By comparing the different epidemiological situations, the direct and indirect effects of the disease can be examined, giving a more reliable basis for strategy formulation. Direct effects (calving rates, weaning rates, herd mortality rates) are easier to measure, and the data suggest that calving rates but not cattle mortality rates may be affected when animals are subjected to high to medium disease challenge. In the study areas, use of trypanocides masked the effect on cattle mortality; calving rates appeared to be affected by the level of challenge as well as the herd disease tolerance. Indirect effects on variables such as crop and livestock management practices, herd sizes and ownership levels, herd structures, offtake and sales rates, and human and livestock influx, are more difficult to measure. Generalizations about the farming system and disease impact should be avoided. However, it has been found that disease management practices by farmers are of over-riding importance; control strategies recommended for Malawi, Mozambique and Zambia would logically be based on the continued use of trypanocides. Zimbabwe has great areas recently cleared of tsetse, so that both communal and commercial farmers have been protected from the direct and indirect effects of trypanosomosis. The strategy here will be to maintain the target (treated cloth screen) barrier, which protects the country from reinvasion by tsetse from Mozambique and the Zambezi Valley. The role of the Government should change towards monitoring the status of the disease, and monitoring the performance of private contractors maintaining this barrier.

12049 **Doran M. and Bossche, P. van den, 2000.** *Bovine Trypanosomosis in Southern Africa. Volume 1. SITE Analysis: An approach to strategy formulation for*

tsetse and trypanosomosis control. Pp. 74. Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

Doran: Regional Tsetse and Trypanosomosis Control Programme for southern Africa, PO Box A560, Avondale, Harare, Zimbabwe.

The Regional Tsetse and Trypanosomiasis Programme (RTTCP) was started in 1986, with EDF funding. The original strategy was to eradicate the tsetse from the Common Fly-belt, an area within the countries of Malawi, Mozambique, Zambia and Zimbabwe, covering 322,000km^2 of tsetse-infested land devoted to a variety of land uses. The Programme commenced its second phase in 1992, and the emphasis shifted to the design of a comprehensive Regional Strategic Plan in which rural development and environmental considerations were taken more into account. In 1995 a mid-term evaluation led to a redefinition of the project goal as "Integrated strategic tsetse and trypanosomosis control to support rural development", involving a swing away from eradication and towards sustainable and economically viable control operations in priority areas. Identification of such priority areas required account to be taken of socio-economic, institutional, technical and environmental (SITE) aspects, and the required planning work was to be completed by multi-disciplinary National Strategic Planning Task Force units. The more precise information required by these Task Force units indicated large gaps in the existing data base. Consequently, the RTTCP has used farming-system surveys to identify constraints and pathways to improvements at the farmer level; information was obtained on calving rates, mortality rates, and livestock disease prevalence, often gathered at the household level. Institutional changes included the drive towards privatization of veterinary services, and cost recovery. As participating governments faced staff and budget constraints, there was a move towards community-managed operations, although it was found that such local groups had difficulties in achieving vector control by deliberate intervention. It is likely that farmers will continue to manage the disease by the use of trypanocides. On the technical side, greater emphasis needs to be paid to the issues of suitability of given control techniques in the particular local circumstances, the transferability of the technique at the farmer level, and the sustainability of the technique in respect of the farmers' willingness to commit the required input over a long period. The continued availability of the insecticides and other material used, and the possible longer-term side effects of the intervention, need attention. Concerns about the environmental impact of tsetse and trypanosomosis control operations are widespread and sometimes justified. Environmental concerns should be addressed at the planning stage. Environmental impact studies should take note of direct effects of control measures, and of the complex issue of longer-term effects of human settlement.

12050 **La Rocque, S., Michel, J.F., Cuisance, D., De Wispelaere, G., Solano, P., Augusseau, X., Arnaud, M. and Guillobez, S., 2001.** *Trypanosomiasis risk: global approach for a local decision.* [*Le risque trypanosomien: une*

approche globale pour une décision locale] Pp. 151. Centre de coopération internationale en recherche agronomique pour le développement.

La Rocque: CIRAD, Campus international de Baillarguet, TA 30/F, 34398 Montpellier Cedex 5, France.

Based on 1300km^2 of an agro-pastoral zone in Burkina Faso, infested with tsetse (*Glossina tachinoides*, *G. palpalis gambiensis*), this study set out to explain how the parasite system (trypanosomes/tsetse/hosts) functioned relative to the environment, in order to identify high risk areas. Georeferenced information on parasitic, agro-ecological and socio-economic systems was examined with a GIS. A very detailed entomological survey covering 120 km of gallery forest was used to produce a map of the current tsetse distribution, which could be compared with the fly distribution obtained 14 years previously. The genetic structure of the tsetse populations was identified from microsatellite molecular markers. An exhaustive ground based survey of the cattle herd was carried out. Dissections of flies, with molecular studies, were used to produce a map on which flies were categorised by species, sex, age, and degree and type of trypanosome infection. Serological and parasitological surveys of cattle confirmed the enzootic situation of trypanosomosis. Longitudinal monitoring of sentinel herds suggested great variations in tsetse/cattle interaction, depending on the manner of animal husbandry. The riverine tsetse habitat was studied in detail by describing it through seventy parameters recorded from the ground every 100 metres. Likewise, the land use pattern was delineated in detail from the ground. Existing satellite images were used to demonstrate historical changes in agricultural land use and land management. Two hundred and fifty livestock watering places were analysed as to type and frequency of use. The human population was categorized according to length of stay in the area, cattle ownership, and agricultural impact. Questionnaire-based studies of the animal production systems showed a wide range of herd size; a map of the categories was produced.

Collation of all the information gathered was achieved using GIS methods. A detailed map of the tsetse distribution identified the most favourable habitats and the key factors involved. The distance between the crops and the gallery forest was positively correlated with tsetse density. A close relationship was found between high crop densities and high cattle densities. Identified high-risk zones, where cattle/tsetse encounters were most favourable to disease transmission, were validated by comparison with trypanosome prevalence. Simple, accessible indicators were drawn up to assist in the identification of "danger zones" for treatment, enabling targeted control. Evaluating the risk of disease transmission requires an overall conspectus of the epidemiological process, and the need to look beyond the traditional bio-ecological context, to an eco-socio-pathogen system, which can be examined at different scales and using a range of investigative tools, both traditional and modern.

12051 **Maurice, J., 2001.** Continent-wide attack launched on African trypanosomiasis. (News item) *Bulletin of the World Health Organisation*, **79** (11): 1087.

12052 **Service, M.W., (ed.), 2001.** *The Encyclopedia of Arthropod-transmitted Infections of Man and Domesticated Animals*. Pp. 579. CABI Publishing, Wallingford, UK, and New York, USA.

Service: Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK.

Within this encyclopaedia, an article (pp. 13-23) on *African trypanosomiasis, human*, by P. Cattand, covers the elucidation of the main features of human African trypanosomiasis in the early part of the 20th century, the considerable successes of campaigns to suppress the disease achieved in the 1950s and 1960s, and the relative failure of control measures in the last decade of the century. The impact of the disease and its present-day distribution in sub-Saharan Africa are described. The causative organisms, *Trypanosoma* spp., are referred to, with emphasis on their biochemical and molecular characterization, and the essentials of antigenic variation. Clinical symptoms are described; clinical diagnosis, indirect diagnosis, detection of parasites and determination of the stage of the disease, and the vector role of the tsetse fly, are dealt with. Treatment of the disease by available drugs, and the different treatment regimes followed in different countries, are described. Control measures, including surveillance, case finding and treatment, as well as vector control, are also covered. An article (pp. 33-46) on the subject *Animal Trypanosomiasis* by T.W.Jones covers the main trypanosome species pathogenic to domestic animals, and their morphological features and pathogenicity. The account of clinical signs and diagnosis of animal trypanosomiasis deals with the variety of tests available. The section on control of the disease covers vector reduction methods and drug treatment of livestock. There are useful figures to show a stained preparation of trypanosomes in the blood, sick cattle, trypanotolerant N'Dama cattle, and vector control measures. A short article (pp. 533-534) on *Tsetse-flies (Glossinidae)* by M.W. Service, outlines the biology of the fly, the diseases transmitted and aspects of control.

2. TSETSE BIOLOGY

(a) REARING OF TSETSE FLIES

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

12053 **Nirmala, X., Hypša, V. and Žurovec, M., 2001.** Molecular phylogeny of Calyptratae (Diptera: Brachycera): the evolution of 18S and 16S ribosomal rDNAs in higher dipterans and their use in phylogenetic inference. *Insect Molecular Biology*, **10** (5): 475-485.

Hypša: Institute of Parasitology, Academy of Sciences of the Czech Republic, Branišovská 31, 37005 České Budějovice, Czech Republic. [vacatko@parv.cas.cz]

Sequences for nearly complete 18S rRNA and partial 16S rRNA genes were determined for sixteen species representing twelve calyptrate families. Two unique insertions are present in expansion regions of the 18S rDNA in nycteribiids. Alignments containing other dipteran rRNA genes provided good resolution at higher taxonomic level: monophyly of Calyptratae is well supported. While both 16S and 18S rDNA matrices produce unstable topologies within Calyptratae when analysed separately, their combination results in a tree with several robust and well supported nodes. Of three superfamilies recognized in recent classifications, the Hippoboscoidea is well supported by 16S rDNA and by combined matrices. The representatives of Muscoidea, *Musca* sp. and *Antipoda* sp., display a tendency to cluster within Oestroidea. The comparison of secondary structures of two variable regions indicates that Sarcophagidae are related to Calliphoridae rather than to Tachinidae.

12054 **Opiyo, E., 2001.** Survival and reproductive potential of gamma irradiated male *Glossina pallidipes* Austen. [Short communication]. *Entomologia Experimentalis et Applicata*, **99** (3): 397-400.

Opiyo: Entomology Unit, FAO/IAEA Agriculture and Biotechnology Laboratory, A-2444 Seibersdorf, Austria.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

12055 **Hargrove, J.W., 2001.** Factors affecting density-independent survival of an island population of tsetse flies in Zimbabwe. *Entomologia Experimentalis et Applicata*, **100** (2): 151-164.

Hargrove: Tsetse Control, Box CY52, Causeway, Zimbabwe.

Analysis is presented of the factors affecting survival probability in populations of tsetse flies *Glossina morsitans morsitans* and *G. pallidipes* on Antelope Island, Lake Kariba, Zimbabwe. For mature male and female adult *G. m. morsitans* mean temperature (T_{bar}) accounted for 70% and 50%, respectively, of the variance in mark-recapture estimates of survival when the flies were not subjected to trapping. Saturation deficit (SD) only accounted for 36% and 33%, respectively. Maximum temperature (T_{max}) and SD accounted for 36-42% of the variance in male and female *G. pallidipes*. For the corresponding Moran curve estimates of the survival over all developmental stages, SD lagged by three weeks accounted for 61% and 41% of the variance for male and female *G. m. morsitans*, respectively, and 64% and 56% for *G. pallidipes*. The corresponding figures for plots against T_{max} were 44%, 23%, 23%, and 21%, respectively. The same patterns were seen in the whole data set once allowance was made for the effect of

trapping of survival and for an effect of season, correlated with an index of photosynthetic activity. For male *G. m. morsitans* there was a significant effect of saturation deficit, but not temperature, on immature survival. Decreased adult survival at high temperatures results from the need to feed more frequently and hence to take more risks per unit time. High saturation deficits result directly in reduced emergence of healthy flies from pupae.

12056 **Vreysen, M.J.B. and Saleh, K.M., 2001.** Long-term sampling of gamma sterilised male *Glossina austeni* (Diptera : Glossinidae) with sticky panels on Unguja Island. *Acta Tropica*, **80** (1): 29-37.

Vreysen: IAEA P.O.Box 100, Vienna, Austria [m.vreysen @worldonline.be]

Daily catches of gamma sterilised male *Glossina austeni* with experimental sticky panels were analysed from March 1996 to July 1997. The flies were released weekly by light aircraft over primary and secondary forest ecosystems of Unguja Island, Zanzibar. In the primary forest, the cross-shaped royal blue XT panel (two interlocking panels of each 70 x 60 cm) trapped significantly more flies than the royal blue-white leg panel (panel with a body of 65 x 30 cm and two legs of each 15 x 15 cm) in all months, except in July 1996 and July 1997. In the same habitat, the cross-shaped royal blue-white leg panel (two interlocking leg panels) trapped from 1.7 (not significant) to 3.0 times (highly significant) as many flies as the standard leg panel depending on the season. Significantly more flies were trapped with the cross-shaped XT panel than with the leg panel in the secondary forest compared to the primary forest. Catches of the cross-shaped XT panel on each of a series of days, correlated well with those of the leg panel on the same day, except for panels deployed in the primary forest during the hot-dry and the beginning of the cold-dry season. Catches of the cross-shaped leg panel correlated less well with the catches of the standard leg panel in the primary forest. The data presented indicate that the behavioural responses in time and space of sterile male *G. austeni* are influenced by the type of trapping device used.

3. TSETSE CONTROL (INCLUDING ENVIRONMENTAL SIDE EFFECTS)

12057 **Anon., 2001.** *Strategic planning for the Regional Tsetse and Trypanosomiasis Control Programme – Phase II. Project findings and recommendations*. Pp. 26.

Food and Agricultural Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy.

12058 **Brightwell, B., Dransfield, B., Maudlin I., Stevenson P. and Shaw, A., 2001.** Reality vs. rhetoric – a survey and evaluation of tsetse control in East Africa. *Agriculture and Human Values*, **18**: 219-233.

Brightwell: 5 the Square Cottages, Burwash, East Sussex TN19 7EF, U.K. [thebobs@mistral.co.uk]

Odour baited methods of controlling tsetse have received considerable attention as ecologically friendly ways for African farmers to reduce their levels of livestock trypanosomosis. Over the last decade, a number of tsetse control projects have been set up in East Africa using these methods. Although much has been written, few hard data are available regarding their ongoing success, problems and sustainability. To evaluate the situation on the ground, the authors conducted a series of site visits to a number of such tsetse control projects in Kenya. A comparison of these projects with others across the region identified the possible constraints to a wider uptake of these methods. Poor information, coupled with inappropriate research and development policies, were found to be the key restraints. These could be overcome with a farmer-based approach to control, with a better application of existing techniques, and with a greater role for veterinarians. Tsetse control needs to become demand- rather than supply-driven, if it is to be an important component of livestock disease control in Africa.

12059 **De Garine-Wichatitsky, M., Cheke, R.A. and Lazaro, D., 2001.** Effects of tsetse targets on mammals and birds in Kasungu National Park, Malawi. *Biodiversity and Conservation*, **10** (6): 869-891.

Cheke: NRI, University of Greenwich, Central Avenue, Chatham Maritime, Chatham, Kent ME4 4TB, U.K. [r.a.cheke@greenwich.ac.uk]

Possible effects on wildlife of targets baited with an attractive odour (acetone), impregnated with deltamethrin and used to control tsetse flies (*Glossina morsitans morsitans*), were investigated in the Kasungu National Park, Malawi. Mammals and birds were censused simultaneously along transects in miombo woodland or dambo grassland/mixed woodland, with and without targets. Mammals were also monitored by surveys of their spoor on experimentally cleared plots (5m in diameter) and a target relocation experiment was conducted when the targets were removed from the test transects and transferred to the controls. Significantly fewer small antelopes (e.g. common duiker *Sylvicapra grimmia*) were detected in plots along transects with targets (tests) than along control transects. The presence of targets affected the frequency of occurrence of antelopes, suids and large herbivores in the experimental plots, but small carnivores, monkeys, rodents and hares were unaffected. A conclusion of the relocation experiment was that the deltamethrin-impregnated cloth was responsible for the observed effects and not the acetone. A total number of 23 species of birds meeting a criterion for their abundance in the areas surveyed were selected for detailed analyses. Lower indices in the test areas than in the controls were recorded for 15 of these 23 species in the

dambos and for 10 of 21 species in the miombo woodland. Matched paired comparisons revealed significantly lower numbers in the test areas than in the controls in both habitats only for black-headed oriole *Oriolus larvatus*, but in the dambo habitat only, for the grey lourie *Corythaixoides concolor*, little bee-eater *Merops pusillus*, fork-tailed drongo *Dicrurus adsimilis* and combined data on three species of sunbirds. The black-eyed bulbul *Pycnonotus barbatus* had significantly lower numbers in the tests than in the controls in miombo woodland. The numbers of three species of dove were higher in the tests than in the controls in both habitats, significantly so for the Cape turtle dove *Streptopelia capicola*, and numbers of the flappet lark *Mirafra rufocinnamomea* were significantly higher in the tests than in the controls in dambos. The results are discussed in the light of previous studies on environmental effects of tsetse control, including effects of tsetse targets on pollinators especially non-target horseflies.

12060 **Ferriman, A., 2001.** Fake cows help to reduce sleeping sickness and use of insecticides. (News item). *British Medical Journal*, **323** (7315): 711.

12061 **Hendrickx, G., Napala, A., Slingenbergh, J.H.W., De Deken, R. and Rogers, D.J., 2001.** A contribution towards simplifying area-wide tsetse surveys using medium resolution meteorological satellite data. *Bulletin of Entomological Research*, **91** (5): 333-346.

Hendrickx: Avia-GIS, Elsbos 24, 2640 Edegem, Belgium. [ghendrickx@pandora.be]

A raster or grid-based Geographic Information System with data on tsetse, trypanosomiasis, animal production, agriculture and land use has recently been developed in Togo. The area-wide sampling of tsetse fly, aided by satellite imagery, is the subject of two separate papers. This paper follows on a first paper, published in Bulletin of Entomological Research, describing the generation of digital tsetse distribution and abundance maps and how these accord with the local climatic and agro-ecological setting. Such maps when combined with data on the disease, the hosts and their owners, should contribute to the knowledge of the spatial epidemiology of trypanosomiasis and assist planning of integrated control operations. Here we address the problem of generating tsetse distribution and abundance maps from remotely sensed data, using a restricted amount of field data. Different discriminant analysis models have been applied using contemporary tsetse data and remotely sensed, low resolution data acquired from the National Oceanographic and Atmospheric Administration (NOAA) and Meteosat platforms. The results confirm the potential of satellite data application and multivariate analysis for the prediction of the tsetse distribution and abundance. This opens up new avenues because satellite predictions and field data may be combined to strengthen and/or substitute one another. The analysis shows how the strategic incorporation of satellite imagery may minimize field collection of data. Field surveys may be modified and conducted in two stages, first concentrating on the expected fly distribution limits and thereafter on fly abundance. The study also shows that when applying satellite data, care

should be taken in selecting the optimal number of predictor variables because this number varies with the amount of training data for predicting abundance and with the homogeneity of the distribution limits for predicting fly presence. Finally, it is suggested that in addition to the use of contemporary training data and predictor variables, training and predicted data sets should refer to the same eco-geographic zone.

12062 **Joja, L.L. and Okoli, U.A., 2001.** Trapping the vector: Community action to curb sleeping sickness in southern Sudan. *American Journal of Public Health*, **91** (10): 1583-1585.

Joja: CARE International, South Sudan, Nairobi, Kenya.

South Sudan experienced a resurgence of trypanosomiasis (sleeping sickness) in the 1990s. In 1997 in Tambura County, public health officials combined standard mass screening and treatment techniques for infected persons with an additional component - trapping the vectors of the disease. The intent of this integrated approach was to lower the number and concentration of the tsetse flies that spread the disease while reducing the level of infection in the human population to make the likelihood of transmission extremely low. Because the trapping project depends on village participation (making, setting, and maintaining the traps), village volunteers and their neighbours learned more about the causes and prevention of sleeping sickness and became much more willing to participate in serosurveys and to seek treatment.

12063 **Kamuanga, M., Swallow, B.M., Sigue, H. and Bauer, B., 2001.** Evaluating contingent and actual contributions to a local public good: Tsetse control in the Yale agro-pastoral zone, Burkina Faso. *Ecological Economics*, **39** (1): 115-130.

Kamuanga: ILRI, POB 30709, Nairobi, Kenya

In this case study of the Yale agro-pastoral zone in southern Burkina Faso, the sustainability of tsetse control as a local public good was shown to depend upon farmers' contributions to establish and maintain the traps and targets that attract and kill tsetse flies. Contingent valuation (CV) techniques were used to generate estimates of farmers' willingness to pay for tsetse control in money, labour, or both forms of payment. Of the 261 households that participated in the CV survey, these proportions were 23, 37 and 40% respectively, indicating differentiation among the population and an overall preference for labour contribution. A comparison of predicted versus actual contribution of labour indicated that only 56% of households that said they would contribute actually contributed; 3% of households that said they would not contribute, actually contributed. Major factors affecting contingent contributions of labour in discrete choice models were identified as well as those to account for in any successful scheme for actual labour contribution. These factors include the age of household head, offtake of cattle, involvement in secondary activities, membership in rural organizations, current

expenditure on drug therapy, and cash-on-hand. The results also indicate that full cost-recovery of the investment in targets - about US$8000 - could not be achieved in the short run with the proposed contribution of US$0.90-1.00 per month per household. Contingent contributions of money were interpreted as maximum donations to expect of beneficiaries as part of the total cost of providing tsetse control.

4 EPIDEMIOLOGY: VECTOR-HOST AND VECTOR PARASITE INTERACTIONS

12064 **Hao, Z., Kasumba, I., Lehane, M.J., Gibson, W.C., Kwon, J. and Aksoy, S., 2001.** Tsetse immune responses and trypanosome transmission: Implications for the development of tsetse-based strategies to reduce trypanosomiasis. *Proceedings of the National Academy of Sciences of the United States of America*, **98** (22): 12649-12653.

Aksoy: Department of Epidemiology and Public Health, Section of Vector Biology, Yale University School of Medicine, 60 College Street, New Haven, CT 06510, USA. [serap.aksoy@yale.edu]

Tsetse flies are the medically and agriculturally important vectors of African trypanosomes. Information on the molecular and biochemical nature of the tsetse/trypanosome interaction is lacking. Here we describe three antimicrobial peptide genes, attacin, defensin, and diptericin, from tsetse fat body tissue obtained by subtractive cloning after immune stimulation with *Escherichia coli* and trypanosomes. Differential regulation of these genes shows the tsetse immune system can discriminate not only between molecular signals specific for bacteria and trypanosome infections but also between different life stages of trypanosomes. The presence of trypanosomes either in the hemolymph or in the gut early in the infection process does not induce transcription of attacin and defensin significantly. After parasite establishment in the gut, however, both antimicrobial genes are expressed at high levels in the fat body, apparently not affecting the viability of parasites in the midgut. Unlike other insect immune systems, the antimicrobial peptide gene diptericin is constitutively expressed in both fat body and gut tissue of normal and immune stimulated flies, possibly reflecting tsetse immune responses to the multiple Gram-negative symbionts it naturally harbors. When flies were immune stimulated with bacteria before receiving a trypanosome containing bloodmeal, their ability to establish infections was severely blocked, indicating that up-regulation of some immune responsive genes early in infection can act to block parasite transmission. The results are discussed in relation to transgenic approaches proposed for modulating vector competence in tsetse.

12065 **MacLeod, A., Tait, A. and Turner, C.M.R. 2001.** The population genetics of *Trypanosoma brucei* and the origin of human infectivity. *Philosophical*

Transactions of the Royal Society of London, Series B – Biological Sciences, **356** (1411): 1035-1044.

Turner: Division of Infection and Immunity, Institute of Biomedical and Life Sciences, Joseph Black Building, University of Glasgow, Glasgow G12 8QQ, UK. [m.turner@bio.gla.ac.uk]

The African trypanosome, *Trypanosoma brucei*, is a zoonotic parasite transmitted by tsetse flies. Two of the three subspecies, *T. brucei gambiense* and *T. b. rhodesiense*, cause sleeping sickness in humans whereas the third subspecies, *T. b. brucei*, is not infective to humans. We propose that the key to understanding genetic relationships within this species is the analysis of gene flow to determine the importance of genetic exchange within populations and the relatedness of populations. *Trypanosoma brucei* parasites undergo genetic exchange when present in infections of mixed genotypes in tsetse flies in the laboratory although this is not an obligatory process. Infections of mixed genotype are surprisingly common in field isolates from tsetse flies such that there is opportunity for genetic exchange to occur. Population genetic analyses, taking into account geographical and host species of origin, show that genetic exchange occurs sufficiently frequently in the field to be an important determinant of genetic diversity, except where particular clones have acquired the ability to infect humans. Thus, *T. brucei* populations have an 'epidemic' genetic structure, but the better-characterized human-infective populations have a 'clonal' structure. Remarkably, the ability to infect humans appears to have arisen on multiple occasions in different geographical locations in sub-Saharan Africa. Our data indicate that the classical subspecies terminology for *T. brucei* is genetically inappropriate. It is an implicit assumption in most infectious disease biology that when a zoonotic pathogen acquires the capability to infect humans, it does so once and then spreads through the human population from that single-source event. For at least one major pathogen in tropical medicine, *T. brucei*, this assumption is invalid.

12066 **Muller, G., 2001.** Multi-agent model for the simulation of trypanosomiasis. [Modèle multi-agent pour la simulation de la trypanosomiase]. Unpublished thesis. Université Pierre et Marie Curie, Paris; Institut de recherche pour le developpement.

12067 **Tyler, K.M., Higgs, P.G., Matthews, K.R. and Gull, K., 2001.** Limitation of *Trypanosoma brucei* parasitaemia results from density-dependent parasite differentiation and parasite killing by the host immune response. *Proceedings of the Royal Society of London, Series B – Biological Sciences*, **268** (1482): 2235-2243.

Tyler: Department of Pathology, northwestern University Medical School, 303E. Chicago Avenue, Chicago, IL60611, USA. [k-tyler@northwestern.edu]

In the bloodstream of its mammalian host, the 'slender' form of *Trypanosoma brucei* replicates extracellularly producing a parasitaemia. At high density, the level of parasitaemia is limited at a sublethal level by differentiation to the non-replicative 'stumpy' form and by the host immune response. Here, we derive continuous time equations to model the time-course, cell types and level of trypanosome parasitaemia, and compare the best fits with experimental data. The best fits that were obtained favour a model in which both density-dependent trypanosome differentiation and host immune response have a role in limiting the increase of parasites, much poorer fits being obtained when differentiation and immune response are considered independently of one another. Best fits also favour a model in which the slender-to-stumpy differentiation progresses in a manner that is essentially independent of the cell cycle. Finally, these models also make the prediction that the density-dependent trypanosome differentiation mechanism can give rise to oscillations in parasitaemia level. These oscillations are independent of the immune system and are not due to antigenic variation.

5. HUMAN TRYPANOSOMIASIS

(a) SURVEILLANCE

12068 **Welburn, S.C., Picozzi, K., F⬟vre, E.M., Coleman, P.G., Odiit, M., Carrington, M. and Maudlin, I., 2001.** Identification of human-infective trypanosomes in animal reservoir of sleeping sickness in Uganda by means of serum-resistance-associated (*SAR*) gene. *Lancet*, **358** (9298): 2017-2019.

Welburn: CTVM, Royal (Dick) School of Veterinary Studies, University of Edinburgh, Roslin, Midlothian, EH25 9RG UK. [sue.welburn@ed.ac.uk]

The expansion of sleeping sickness caused by *Trypanosoma brucei rhodesiense* beyond its traditional focus in southeast Uganda has been linked with large-scale livestock restocking. To assess the risk presented to the human population by domestic livestock, human-infective *T. b. rhodesiense* must be distinguished from non-human-infective *T. brucei brucei*, since both parasites can be present in cattle. We investigated the use of a simple genetic marker to characterise parasites collected from cattle in villages within the new sleeping sickness focus in Soroti District, Uganda. Seventy *T. brucei sl* samples of known human infectivity status collected from human beings and cattle in Tororo District, Uganda, from 1989 to 1991 were screened for the presence of the human-serum-resistance-associated (*SRA*) gene by conventional PCR. In 2000-01, blood samples from 200 randomly selected cattle in six villages and two markets in Soroti District were screened for *T. brucei sl* parasites (i.e. both *T. b. brucei* and *T. b. rhodesiense*) by PCR; positive samples were screened for the presence of the *SRA* gene. The *SRA* gene was present in all 29 samples from patients with sleeping sickness in Tororo District. Of the 41 samples collected from cattle at the same time, the *SRA* gene was present in the eight samples that tested resistant to human serum *in vitro*, whereas it

was absent from all 33 isolates that were sensitive to human serum *in vitro*. Of the 200 cattle sampled in Soroti District, we estimated that up to 18% (95% CI 12-23) were infected with *T. b. rhodesiense*. Detection of the *SRA* gene could provide the basis for a simple diagnostic test to enable targeted control of *T. b. rhodesiense* in the domestic livestock reservoir, thereby reducing the public-health burden of sleeping sickness in east Africa.

(b) PATHOLOGY AND IMMUNOLOGY

12069 **MacLean, L., Odiit, M. and Sternberg, J.M., 2001.** Nitric oxide and cytokine synthesis in human African trypanosomiasis. *Journal of Infectious Diseases*, **184** (8): 1086-1090.

Sternberg: Department of Zoology, University of Aberdeen, Aberdeen AB24 2TZ, UK. [j.sternberg@abdn.ac.uk]

Plasma and cerebrospinal fluid (CSF) concentrations of nitrate and the cytokines interferon (IFN)-γ, tumor necrosis factor (TNF)-α, interleukin (IL)-10, and IL-4 were measured in 91 African trypanosomiasis patients before and after treatment. Nitrate levels overall were not significantly elevated over those for control persons, but a marginal increase in plasma nitrate was detected in patients reporting illness of <40 days' duration. Plasma IFN-γ and total TNF-concentrations increased during infection, but free TNF-α levels were low in all patients. The most dramatic cytokine response was for IL-10, which was significantly elevated in both plasma and CSF during infection but returned to control levels after treatment. The results indicate that human African trypanosomiasis leads to the development of a strong anti-inflammatory cytokine response.

(c) TREATMENT

12070 **Brun, R., Schumacher, R., Schmid, C., Kunz, C. and Burri, C., 2001.** The phenomenon of treatment failures in Human African Trypanosomiasis. *Tropical Medicine and International Health*, **6** (11): 906-914.

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

Treatment of human African trypanosomiasis relies on a few drugs which are old, toxic and expensive. The most important drug for the treatment of second stage infection is melarsoprol. During the last 50 years treatment failures with melarsoprol were not a major problem in *Trypanosoma brucei gambiense* patients. Commonly a relapse rate of 5-8% was reported, but in recent years it has increased dramatically in some important foci of *T. b. gambiense* sleeping sickness. Treatment failures for *T. b. rhodesiense* are much less of a problem apart from some reports between 1960 and 1985 of refractoriness

in *T. b. rhodesiense* patients in East Africa. Analysis of those isolates revealed that their *in vitro* sensitivity to melarsoprol was one-tenth that of sensitive isolates, and complete failure to cure the infection in the acute mouse model with melarsoprol levels comparable with those in human patients. There was very little indication of resistance in *T. b. gambiense* isolates from Côte d'Ivoire and NW Uganda. The *in vitro* melarsoprol sensitivities for populations from relapsing and from curable patients were in the same range. Melarsoprol concentrations in the plasma and cerebrospinal fluid of patients 24 h after treatment did not show any difference between patients who relapsed and those who could be cured. The reason for relapses in the recent *T. b. gambiense* epidemics are not known. Other parasite-related factors might be involved, e.g. affinity to extravascular sites other than the CNS, which are less accessible to the drug. In conclusion, a combination of factors rather than a single one may be responsible for the phenomenon of melarsoprol treatment failures in *T. b. gambiense* patients.

12071 **Etchegorry, M.G., Helenport, J.P., Pecoul, B., Jannin, J. and Legros, D., 2001.** Availability and affordability of treatment for Human African Trypanosomiasis. *Tropical Medicine and International Health*, **6** (11): 957-959.

Jannin: Department of Communicable Diseases, Surveillance and Response, WHO, 1211 Geneva 27, Switzerland. [janninj@who.ch]

Human African trypanosomiasis is a re-emerging disease whose usual treatments are becoming less efficient because of the increasing parasite resistance. Availability of HAT drugs is poor and their production in danger because of technical, ecological and economic constraints. In view of this dramatic situation, a network involving experts from NGOs, WHO and pharmaceutical producers was commissioned to updating estimates of need for each HAT drug for the coming years; to negotiate with potential producers of new drugs such as eflornithine; to secure sustainable manufacturing of existing drugs; to undertake clinical research into new combinations of these drugs for first and second-line treatments; to centralize drug purchases and their distribution through a unique non-profit entity; and to address regulatory and legal issues concerning new drugs.

12072 **Matovu, E., Geiser, F, Schneider, V., Maser, P., Enyaru, J.C.K., Kaminsky, R., Gallati, S. and Seebeck, T., 2001.** Genetic variants of the *TbAT1* adenosine transporter from African trypanosomes in relapse infections following melarsoprol therapy. *Molecular and Biochemical Parasitology*, **117** (1): 73-81.

Seebeck: Institute of Cell Biology, University of Bern, Baltzerstrasse 4, CH-3012 Bern, Switzerland.

We have analyzed the *TbAT1* gene, which codes for the P2 adenosine transporter, from *Trypanosoma brucei* field isolates to investigate a possible link between the presence of mutations in this gene and melarsoprol treatment failure. Of 65 *T. b. gambiense* isolates analyzed from a focus in north-western Uganda with high treatment failure rates following melarsoprol therapy, 38 had a mutated *TbAT1*. Unexpectedly, all individual isolates contained the same set of nine mutations in their *TbAT1* genes. Of these, five point mutations resulted in amino acid substitutions, one resulted in the deletion of an entire codon, and three were silent point mutations. Eight of these mutations had previously been reported in a laboratory-derived Cymelarsan-resistant *T. b. brucei* clone. Identical sets of mutations were also found in a drug-resistant *T. b. rhodesiense* isolate from south-eastern Uganda and in a *T. b. gambiense* isolate from a relapsing patient from northern Angola. A deletion of the *TbAT1* gene was found in a single *T. b. gambiense* isolate from a relapsing patient from northern Angola. The data presented demonstrate the surprising finding that trypanosomes from individual relapse patients of one area, as well as from geographically distant localities, contain an identical set of point mutations in the transporter gene *TbAT1*. They further demonstrate that many isolates from relapse patients contained the wild-type *TbAT1* genes, suggesting that melarsoprol refractoriness is not solely due to a mutational inactivation of *TbAT1*.

12073 **Ollivier, G. and Legros, D., 2001.** African human trypanosomiasis: History of treatment successes and failures. *Tropical Medicine and International Health*, **6** (11): 855-863.

Legros: Epicentre 8 rue Saint Sabin, 75011 Paris, France. [dlegros@epicenter.msf.org]

This paper gives an overview of the treatment of Human African Trypanosomiasis from the early 20th century until today.

6. ANIMAL TRYPANOSOMIASIS

(a) SURVEY AND DISTRIBUTION

12074 **Catley, A., Okoth, S., Osman, J., Fison, T., Njiru, Z., Mwangi, J., Jones B.A. and Leyland, T.J., 2001.** Participatory diagnosis of a chronic wasting disease in cattle in southern Sudan. [*Trypanosoma*]. *Preventive Veterinary Medicine*, **51**: 161-181.

Catley: OAU/IBAR, P.O. Box 30786, Nairobi, Kenya. [andy.catley@oau-ibar.org]

In southern Sudan, livestock keepers identified a chronic wasting disease in adult cattle as one of their most serious animal health problems. Participatory appraisal (PA)

methods and conventional veterinary investigation methods were used to characterise the chronic wasting disease and identify linkages between indigenous knowledge and modern veterinary knowledge. The local characterisation of chronic wasting encompassed trypanosomosis, fasciolosis, parasitic gastroenteritis and schistosomosis (as both single and mixed infections). A standardised PA method called matrix scoring had good reproducibility when investigating local perceptions of disease signs and disease causes. Comparison of matrix scoring results showed much overlap with modern veterinary descriptions of cattle diseases and the results of conventional veterinary investigation. Applications of PA methods in remote areas with very limited veterinary infrastructure are discussed. The validation of data derived from PA is discussed by reference to the low sensitivity of 'field-friendly' diagnostic tests for important cattle diseases.

12075 **Jones, T.W. and Dávila, A.M.R., 2001.** *Trypanosoma vivax* - out of Africa. (Review). *Trends in Parasitology*, **17** (2): 99-101.

Jones: CTVR, University of Edinburgh, Roslin, Midlothian EH25 9RG, UK. [t.w.jones@ed.ac.uk]

Trypanosoma vivax is a blood parasite of ruminants that was introduced into Latin America in cattle imported from Africa, possibly in the late 19th century. The parasite has now spread to ten of the 13 countries of the South American continent, often resulting in a severe wasting disease and death. Here, we review the current state of knowledge about this parasite and the problems faced by animal health agencies in controlling the disease.

12076 **Morlais, I., Ravel, S., Grébaut, P., Dumas, V. and Cuny, G., 2001.** New molecular marker for *Trypanosoma* (*Duttonella*) *vivax* identification. *Acta Tropica*, **80** (3): 207-213.

Morlais: Laboratoire d'Epidémiologie des Maladies à Vecteur, IRD, BP 5045, 34032 Montpellier, France. [isabelle.morlais.l@nd.edu]

Trypanosoma vivax is a widespread haemoparasite in tropical areas and is pathogenic to ruminant domestic livestock as well as wild ruminants. The accurate identification of parasites in both hosts and vectors is crucial for epidemiological studies and disease control programs. We describe here the development of molecular markers specific for *T. vivax* identification. These markers were used to identify mouthpart infections in field-collected tsetse flies from Cameroon. The markers target the genomic sequence of a species-specific antigen from the bloodstream stages. No cross amplification with other trypanosome species was observed, which makes the markers a reliable tool to detect *T. vivax* infections, both in hosts and vectors. The PCR-amplified sequence contains a $(CA)_n$ microsatellite repeat for which 11 different alleles were identified. This microsatellite, which showed high polymorphism, provides a suitable marker for population genetic studies.

12077 **Rowlands, G.J., Leak, S.G.A., Peregrine, A.S., Nagda, S.M., Mulatu, W. and d'Ieteren, G.D.M., 2001.** The incidence of new and the prevalence and persistence of recurrent trypanosome infections in cattle in southwest Ethiopia exposed to a high challenge with drug-resistant parasites. *Acta Tropica*, **79** (2): 149-163.

Rowlands: ILRI, P.O.Box 30709, Nairobi, Kenya. [j.rowlands@cgiar.org]

A method is described for calculating new infection incidence from monthly field data collected between April 1994 and February 1998 from an average of 770 Ethiopian Highland Zebu cattle maintained under traditional management in the Ghibe valley, southwest Ethiopia and exposed to a high challenge with drug-resistant parasites. Each month cattle with a packed cell volume (PCV) < 26% and detected as parasitaemic, or cattle showing clinical signs of trypanosomosis, were treated with diminazene aceturate at 3.5 mg/kg body weight. An infection was defined as a new infection if it was preceded by 2 previous months in which both samples had a PCV ≥ 26% and were not detected with trypanosomes. Using this definition the average monthly incidence of infections of *Trypanosoma congolense* in cattle over 36 months of age was 13.3%, and the prevalence of recurrent infections 13.0%. Assuming that an animal had recovered from infection when PCV again returned to 26% without parasites being detected, mean persistence of infection was 3.8 months (median between 2 and 3 months). In contrast, *T. vivax* infections were susceptible to diminazene. The incidence of *T. vivax* infections in adults was lower than for *T. congolense* (2.8%), and they were less pathogenic (mean reduction of 3.1% units of PCV due to *T. vivax* infection compared with 4.6% units for *T. congolense*). Also, fewer cases were treated. Calves were first detected parasitaemic at an average age of 8.8 months and their infections persisted longer than those in adults. The effect of age on incidence of infection was not significant beyond 15 months of age. Adult male cattle appeared to be more susceptible to *T. congolense* infection than adult female cattle.

12078 **Solano, P., Guegan, J.F., Reifenberg, J.M. and Thomas, F., 2001.** Trying to predict and explain the presence of African trypanosomes in tsetse flies. *Journal of Parasitology*, **87** (5): 1058-1063.

Solano: Institut Pierre Richet, 01 BP 1500, Bouake 01, Côte d'Ivoire.

Trypanosome infections identified by polymerase chain reaction on field-caught tsetse flies from various locations were analyzed with respect to factors intrinsic and extrinsic to the trypanosome-tsetse association. These factors were then simultaneously analyzed using artificial neural networks and the important factors were identified to predict and explain the presence of trypanosomes in tsetse. Among four trypanosome subgroups (*Trypanosoma brucei s.l.*, *T. congolense* of the 'savannah' and of the 'riverine-forest' types, and *T. simiae*), the presence of the two types of *T. congolense* was predictable in more than 80% of cases, suggesting that the model incorporated some of

the key variables. These two types of *T. congolense* were significantly associated in tsetse. Among all the factors examined, it was the presence of *T. congolense* savannah type that best explained the presence of *T. congolense* riverine forest type. One possible biological mechanism would be 'hitchhiking', as previously suspected for other parasites. The model could be improved by adding other important variables to the trypanosome tsetse associations.

(b) PATHOLOGY AND IMMUNOLOGY

(c) TRYPANOTOLERANCE

12079 **Falconi, C.A., Omamo, S.W., d'Ieteren, G. and Iraqi, F., 2001.** An ex ante economic and policy analysis of research on genetic resistance to livestock disease: trypanosomosis in Africa. *Agricultural Economics*, **25** (2-3): 153-163.

Falconi: Inter-American Bank, 1300 New York Avenue NW, Washington, DC 20577, USA. [cesarf@iadb.org]

This paper undertakes an *ex ante* economic analysis of research on how resistance to trypanosomosis - a dominant livestock disease in Africa - can be maintained and enhanced while retaining and reinforcing characteristics of economic importance to farmers, and on how 'trypanotolerance' can be imparted to susceptible animals while retaining their other important traits. The results indicate that potential benefits to research, historically field-based but increasingly biotechnology-driven, range from two to nine times potential costs and that the internal rate of return on investments can be six times the real interest rate. Field-based research, while exhibiting lower potential benefits on aggregate than does biotechnology research, is also less costly and, because of its more immediate payback, has higher internal rates of return. Returns to biotechnology research hinge on close links with field-based research and on strategic but relatively small incremental human and capital investments. The results also suggest that further research is needed to consistently identify and track the impacts of alternative intellectual property rights options on the levels and distributions of biotechnology research benefits.

(d) TREATMENT

12080 **Anon., 2001.** *Report on the investigation of the quality of diminazene preparations in sub-Saharan Africa*.

Food and Agricultural Organisation of the United Nations, Viale delle Terme di Caracalla, 00100 – Rome, Italy.

Report prepared under a FAO Special Services Agreement to investigate the quality of veterinary trypanocides in sub-Saharan Africa.

7. EXPERIMENTAL TRYPANOSOMIASIS

(a) DIAGNOSTICS

(b) PATHOLOGY AND IMMUNOLOGY

12081 **Barker, C., Barbour, K.W., Berger, F.G. and Hajduk, S.L., 2001.** Activity of human trypanosome lytic factor in mice. [*T. brucei*]. *Molecular and Biochemical Parasitology*, **117** (2): 129-136.

Hajduk: Department of Biochemistry and Molecular Genetics, University of Alabama at Birmingham, Birmingham, Alabama 35294, USA. [shajduk@uab.edu]

12082 **Eckersall, P.D., Gow, J.W., McComb, C., Bradley, B., Rodgers, J., Murray, M. and Kennedy, P.G.E., 2001.** Cytokines and the acute phase response in post-treatment reactive encephalopathy of *Trypanosoma brucei brucei* infected mice. *Parasitology International*, **50** (1): 15-26.

Eckersall, Department of Veterinary Clinical Studies, Veterinary School, University of Glasgow, Bearsden Road, Glasgow G61 1QH, Lanark, UK. [p.d.eckersall@vet.gla.ac.uk]

12083 **Haas, K.M., Taylor, K.A., MacHugh, N.D., Kreeger, J.M. and Estes, D.M., 2001.** Enhancing effects of anti-CD40 treatment on the immune response of SCID-bovine mice to *Trypanosoma congolense* infection. *Journal of Leucocyte Biology*, **70** (6): 931-940.

Estes: Departments of Molecular Microbiology and Immunology, and Veterinary Pathobiology, University of Missouri, Columbia, USA. [EstesD@Missouri.edu]

12084 **Tabel, H., Shi, M.Q. and Pan, W.L., 2001.** Experimental African trypanosomiasis: Interleukin-10 is crucial for survival. (Meeting Abstract) *Journal of Leucocyte Biology (Suppl.)*, p. 65.

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

(c) CHEMOTHERAPEUTICS

12085 **Adewunmi, C.O., Agbedahunsi, J.M., Adebajo, A.C., Aladesanmi, A.J., Murphy, N. and Wando, J., 2001**. Ethno-veterinary medicine: screening of

Nigerian medicinal plants for trypanocidal properties. [*T. congolense*; *T. brucei*]. *Journal of Ethnopharmacology*, **77** (1): 19-24.

Adewunmi: Drug Research and Production Unit, Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. [cadewumi@oauife.edu.ng]

12086 **Augustyns, K., Amssoms, K., Yamani, A., Rajan, P.K. and Haemers, A., 2001.** Trypanothione as a target in the design of antitrypanosomal and antileishmanial agents. [*T. brucei*]. *Current Pharmaceutical Design*, **7** (12): 1117-1141.

Augustyns: Department of Medicinal Chemistry, University of Antwerp (UIA), Universiteitsplein, 1, B-2610 Antwerpen, Belgium. [Koen.Augustyns@uia.ua.ac.be]

12087 **Bressi, J.C., Verlinde, C.L.M.J., Aronov, A.M., Le Shaw, M., Shin, S.S., Nguyen, L.N., Suresh, S., Buckner, F.S., Van Voorhis, W.C., Kuntz, I.D., Hol, W.G.J. and Gelb, M.H., 2001.** Adenosine analogues as selective inhibitors of glyceraldehyde-3-phosphate dehydrogenase of Trypanosomatidae via structure-based drug design. [*T. brucei*]. *Journal of Medicinal Chemistry*, **44** (13): 2080-2093.

Gelb: Departments of Chemistry and Biochemistry, Box 351700, University of Washington, Seattle, WA 98195-1700, USA. [gelb@chem.washington.edu]

12088 **de Koning, H.P. and Jarvis, S.M., 2001.** Uptake of pentamidine in *Trypanosoma brucei brucei* is mediated by the P2 adenosine transporter and at least one novel, unrelated transporter. *Acta Tropica*, **80** (3): 245-250.

De Koning: Institute of Biomedical and Life Sciences, Division of Infection and Immunity, University of Glasgow, Glasgow G12 8QQ, UK. [h.de-koning@bio.gla.ac.uk]

12089 **Donkor, I.O., Assefa, H., Rattendi, D., Lane, S., Vargas, M., Goldberg, B. and Bacchi, C., 2001.** Trypanocidal activity of dicationic compounds related to pentamidine. [*T. brucei rhodesiense*; mice]. *European Journal of Medicinal Chemistry*, **36** (6): 531-538.

Donkor: Room 327E, Department of Pharmaceutical Studies, University of Tenessee Health Science Center, Memphis Johnson Building, 847 Monroe Avenue, Memphis, TN 38163, USA. [idonkor@utmem.edu]

12090 **Ho, C.K. and Shuman, S., 2001.** *Trypanosoma brucei* RNA triphosphatase – Antiprotozoal drug target and guide to eukaryotic phylogeny. *Journal of Biological Chemistry*, **276** (49): 46182-46186.

Shuman: Molecular Biology Program, Sloan-Kettering Institute, New York, New York 10021, USA. [s-shuman@ski.mskcc.org]

12091 **Merschjohann, K., Sporer, F., Steverding, D. and Wink, M., 2001.** *In vitro* effect of alkaloids on bloodstream forms of *Trypanosoma brucei* and *T. congolense*. *Planta Medica*, **67** (7): 623-627.

Wink: University of Heidelberg, Inst. Pharmazeut. Biol., Neuenheimer Feld 364, D-69120 Heidelberg, Germany. [Wink@urz.uni-heidelberg.de]

8. TRYPANOSOME RESEARCH

(a) CULTIVATION OF TRYPANOSOMES

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

12092 **Kabiri, M. and Steverding, D., 2001.** *Trypanosoma evansi*: Demonstration of a transferrin receptor derived from expression site-associated genes 6 and 7. [*T. brucei*] *Journal of Parasitology*, **87** (5): 1189-1191.

Steverding: Abteilung Parasitologie, Hygiene-Institut der Ruprecht-Karls Universitat, im Neuenheimer Feld 324, D-69120 Heidelberg, Germany. [dsteverding@hotmail.com]

12093 **MacLeod, A., Turner, C.M.R. and Tait, A., 2001**. The detection of geographical substructuring of *Trypanosoma brucei* populations by the analysis of minisatellite polymorphisms. *Parasitology*, **123** (5): 475-482.

MacLeod: Wellcome Centre of Molecular Parasitology, Anderson College, University of Glasgow, 56 Dumbarton Rd, Glasgow G11 6NU, UK. [gvwa08@udcf.gla.ac.uk]

12094 **Mookherjee, N. and Pearson, T.W., 2001.** Surface molecules of procyclic forms of *Trypanosoma simiae* and *Trypanosoma congolense*, members of the subgenus *Nannomonas*, share immunodominant carbohydrate epitopes. (Short communication.) *Molecular and Biochemical Parasitology*, **118** (1): 123-126.

Pearson: Department of Biochemistry and Microbiology, Petch Building, STN CSC, P.O.Box 3055, University of Victoria, Victoria, British Columbia V8W 3P6, Canada. [parasite@uvvm.uvic.ca]

12095 **Ventura, R.M., Paiva, F., Silva, R.A.M.S., Takeda, G.R., Buck, G.A. and Teixeira, M.M.G., 2001.** *Trypanosoma vivax*: Characterization of the spliced-leader gene of a Brazilian stock and species-specific detection by PCR amplification of an intergenic spacer sequence. *Experimental Parasitology*, **99** (1): 37-48.

Teixeira: Departmento de Parasitologia, Instituto de Ciencias Biomedicas, Universidade de Sao Paulo, Sao Paulo, 05508-900, Brazil. [mmgteix@icb.usp.br]

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

12096 **Bayele, H.K., 2001.** Critical parameters for functional reconstitution of glucose transport in *Trypanosoma brucei* membrane vesicles. *Biochemica et Biophyssica Acta,* **1513** (2): 223-231.

Bayele: Department of Biochemistry and Molecular Biology, University College London, Royal Free Campus, London NW3 2PF, UK. [h.bayele@rfc.ucl.ac.uk]

12097 **Bayele, H.K., 2001**. Triazinyl derivatives that are potent inhibitors of glucose transport in *Trypanosoma brucei*. *Parasitology Research*, **87** (11): 911-914.

Bayele: Department of Biochemistry and Molecular Biology, University College London, Royal Free Campus, London NW3 2PF, UK. [h.bayele@rfc.ucl.ac.uk]

12098 **Bingle, L.E.H., Eastlake, J.L., Bailey, M. and Gibson, W.C., 2001.** A novel GFP approach for the analysis of genetic exchange in trypanosomes allowing the *in situ* detection of mating events. *Microbiology – SGM*, **147** (12): 3231-3240.

Gibson: School of Biological Sciences, University of Bristol, Woodland Road, Bristol B58 1UG, UK. [w.gibson@bris.ac.uk]

12099 **Bishop, J.R., Shimamura, M. and Hajduk, S.L., 2001.** Insight into the mechanism of trypanosome lytic factor-1 killing of *Trypanosoma brucei brucei*. *Molecular and Biochemical Parasitology*, **118** (1): 33-40.

Hajduk: Department of Biochemistry and Molecular Genetics, University of Alabama at Birmingham, Birmingham, Alabama 35294, USA. [shajduk@uab.edu]

12100 **Blom, D., van den Burg, J., Breek, C.K.D., Speijer, D., Muijsers, A.O. and Benne, R., 2001.** Cloning and characterization of two guide RNA-binding proteins from mitochondria of *Crithidia fasciculata*: gBP27, a novel protein, and gBP29, the orthologue of *Trypanosoma brucei* gBP21. *Nucleic Acids Research*, **29** (14): 2950-2962.

Benne: Department of Biochemistry, Academic Medical Centre, University of Amsterdam, Meibergdreef 15, 1105 AZ Amsterdam, The Netherlands. [r.benne@amc.uva.nl]

12101 **Caffrey, C.R., Hansell, E., Lucas, K.D., Brinen, L.S., Hernandez, A.A., Cheng, J.N., Gwaltney, S.L. II, Roush, W.R., Stierhof, Y.D., Bogyo, M., Steverding, D. and McKerrow, J.H., 2001.** Active site mapping, biochemical properties and subcellular localization of rhodesain, the major cysteine protease of *Trypanosoma brucei rhodesiense*. *Molecular and Biochemical Parasitology*, **118** (1): 61-73.

McKerrow: Tropical Disease Research Unit, Department of Pathology, University of California San Francisco, VAMC, 4150 Clement Street-113B, San Francisco, CA 94121, USA.

12102 **Clement, S.L. and Koslowsky, D.J., 2001.** Unusual organization of a developmentally regulated mitochondrial RNA polymerase (*TBMTRNAP*) gene in *Trypanosoma brucei*. *Gene*, **272** (1-2): 209-218.

Koslowsky: Department of Microbiology and Molecular Genetics, Michigan State University, East Lansing, MI 48824, USA. [koslowsk@msu.edu]

12103 **Collet, J.F., Stroobant, V. and Van Schaftingen, E., 2001.** The 2,3-bisphosphoglycerate-independent phosphoglycerate mutase from *Trypanosoma brucei*: metal-ion dependency and phosphoenzyme formation. *FEMS Microbiology Letters*, **204** (1): 39-44.

Schaftingen: Laboratoire de Chimie Physiologique, Christian de Duve Institute of Cellular Pathology and Université Catholique de Louvain, UCL 75-39 B-1200 Brussels, Belgium [vanschaftingen@bchm.ucl.ac.be]

12104 **Concepci✱n, J.L., Adj■, C.A., Qui✶ones, W., Chevalier, N., Dubourdieu, M. and Michels, P.A.M., 2001.** The expression and intracellular distribution of

phosphoglycerate kinase isoenzymes in *Trypanosoma cruzi*. [*T. brucei*] *Molecular and Biochemical Parasitology*, **118** (1): 111-121.

Michels: Christian de Duve Institute of Cellular Pathology, Tropical Diseases Research Unit, Université Catholique de Louvain, Avenue Hippocrate 74, B-1200 Brussels, Belgium. [michels@trop.ucl.ac.be]

12105 **Djikeng, A., Shi, H.F., Tschudi, C. and Ullu, E., 2001.** RNA interference in *Trypanosoma brucei*: Cloning of small interfering RNAs provides evidence for retroposon-derived 24-26-nucleotide RNAs. *RNA*, **7** (11): 1522-1530.

Ullu: Department of Internal Medicine, Yale University School of Medicine, P.O.Box 208022, 333 Cedar Street, New Haven, Connecticut 06520-8022, USA. [elisabetta.ullu@yale.edu]

12106 **Fontt, E.O., Beschin, A., Van Dijck, E., Vercruysse, V., Bilej, M., Lucas, R., De Baetselier, P. and Vray, B., 2001.** *Trypanosoma cruzi* is lysed by coelomic cytolytic factor-1, an invertebrate analogue of tumor necrosis factor, and induces phenoloxidase activity in the coelomic fluid of *Eisenia foetida foetida*. [*T. brucei*.] *Developmental and Comparative Immunology*, **26** (1): 27-34.

Vray: Laboratoire d'Immunologie Expérimentale (CP 615), Faculté de Médecine, 808 route de Lennik, B-1070 Brussels, Belgium. [bvray@ulb.ac.be]

12107 **Furger, A., Jungi, T.W., Salomone, J.-Y., Weynants, V. and Roditi, I., 2001.** Stable expression of biologically active recombinant bovine interleukin-4 in *Trypanosoma brucei*. *FEBS Letters*, **508** (1): 90-94.

Roditi: Institut für Zellbiologie, Universität Bern, Baltzerstrasse 4, CH-3012 Bern, Switzerland. [isabel.roditi@izb.unibe.ch]

12108 **Girault, S., Davioud-Charvet, E., Maes, L., Dubremetz, J.F., Debreu, M.A., Landry, V. and Sergheraert, C., 2001.** Potent and specific inhibitors of trypanothione reductase from *Trypanosoma cruzi*: Bis(2-aminodiphenylsulfides) for fluorescent labeling studies. [*T. brucei*]. *Bioorganic and Medicinal Chemistry*, **9** (4): 837-846.

Sergheraert: UMR8525 CNRS, Université de Lille II. Institut de Biologie et Institut Pasteur de Lille, 1 rue du Professeur Calmette, B.P.447, 59021 Lille, France. [christian.sergheraert@pasteur-lille.fr]

12109 **Grüter, E. and Betschart, B., 2001.** Isolation, characterisation and organisation of histone H1 genes in African trypanosomes. *Parasitology Research*, **87** (12):977-984.

Betschart: Department of Parasitology, Institute of Zoology, University of Neuchâtel, 2007 Neuchâtel, Switzerland.

12110 **Hartshorne, T., Toyofuku, W. and Hollenbaugh, J., 2001.** *Trypanosoma brucei* 5′ ETS A′-cleavage is directed by 3′-adjacent sequences, but not two U3 snoRNA-binding elements, which are all required for subsequent pre-small subunit rRNA processing events. *Journal of Molecular Biology*, **313** (4): 733-749.

Hartshorne: Incyte Genomics, Inc., 3160 Porter Drive, Palo Alto, CA 94304, USA [toinette@incite.com]

12111 **Hayman, M.L., Miller, M.M., Chandler, D.M., Goulah, C.C. and Read, L.K., 2001.** The trypanosome homolog of human p32 interacts with RBP16 and stimulates its gRNA binding activity. *Nucleic Acids Research*, **29** (24): 5216-5225.

Read: Department of Microbiology, Witebsky Center for Microbial Pathogenesis and Immunology, SUNY at Buffalo School of Medicine, Buffalo NY 14214, USA. [lread@acsu.buffalo.edu]

12112 **Hertz-Fowler, C., Ersfeld, K. and Gull, K., 2001.** CAP5.5, a life-cycle-regulated, cytoskeleton-associated protein is a member of a novel family of calpain-related proteins in *Trypanosoma brucei* (Mol. Biochem.Parasitol. vol **116**, pg 25, 2001) [Correction: see TTIQ No. 12009]. *Molecular and Biochemical Parasitology*, **117** (1): 119.

Gull: School of Biological Sciences, University of Manchester, 2.205 Stopford Building, Oxford Road, Manchester M13 9PT, UK. [k.gull@man.ac.uk]

12113 **Hoek, M. and Cross, G.A.M., 2001.** Expression-site-associated-gene-8 (*ESAG8*) is not required for regulation of the *VSG* expression site in *Trypanosoma brucei*. (Short communication.) *Molecular and Biochemical Parasitology*, **117** (2): 211-215.

Cross: Laboratory of Molecular Parasitology, Rockefeller University, Box 185, 1230 York Avenue, New York, NY10021-6399, USA. [george.cross@rockefeller.edu]

12114 **Homann, M. and Göringer, H.U., 2001.** Uptake and intracellular transport of RNA aptamers in African trypanosomes suggest therapeutic "piggy-back" approach. *Bioorganic and Medicinal Chemistry*, **9** (10): 2571-2580.

Göringer: Department of Microbiology and Genetics, Darmstadt University of Technology, Schnittpahnstrasse 10, 64287 Darmstadt, Germany. [goringer@hrzpub.tu-darmstadt.de]

12115 **Irmer, H. and Clayton, C., 2001.** Degradation of the unstable *EP1* mRNA in *Trypanosoma brucei* involves initial destruction of the 3′-untranslated region. *Nucleic Acids Research*, **29** (22): 4707-4715.

Clayton: ZMBH, University of Heidelberg im Neuenheimer Feld 282, D-69120 Heidelberg, Germany. [cclayton@zmbh.uni-heidelberg.de]

12116 **Joubert, B.M., Nguyen, L.N., Matsuda, S.P.T. and Buckner, F.S. (2001).** Cloning and functional characterization of a *Trypanosoma brucei* lanosterol 14 α-demethylase gene. (Short communication.) *Molecular and Biochemical Parasitology*, **117** (1): 115-117.

Buckner: Department of Medicine, University of Washington, Box 357185, Seattle, WA 98195, USA. [fbuckner@u.washington.edu]

12117 **Jiang, D.W. and Englund, P.T., 2001.** Four *Trypanosoma brucei* fatty acyl-CoA synthetases: fatty acid specificity of the recombinant proteins. *Biochemical Journal*, **358** (3):757-761.

Englund: Department of Biological Chemistry, John Hopkins University, 725 N Wolfe Street, Baltimore, MD 21205, USA. [penglund@jhmi.edu]

12118 **Lecaille, F., Cotton, J., McKerrow, J.H., Ferrer-Di Martino, M., Boll-Bataille, E., Gauthier, F. and Lalmanach, G., 2001.** Reversible inhibition of cathepsin L-like proteases by 4-mer pseudopeptides. [*T. congolense*.] *FEBS Letters*, **507** (3): 362-366.

Lalmanach: Laboratory of Enzymology and Protein Chemistry, INSERM EMI-U 00-10, University Francois Rabelais, Faculty of Medicine, Boulevard Tonnellé, F-37032 Tours, France. [lalmanach@univ-tours.fr]

12119 **Liang, X.H., Liu, L. and Michaeli, S., 2001.** Identification of the first trypanosome H/ACA RNA that guides pseudouridine formation on rRNA. *Journal of Biological Chemistry*, **276** (43): 40313-40318.

Michaeli: Faculty of Life Sciences, Bar-ilan University, Ramat-Gan 52900, Israel. [michaes@mail.bui.ac.il]

12120 **Moreira-Leite, F.F., Sherwin, T., Kohl, L. and Gull, K., 2001.** A trypanosome structure involved in transmitting cytoplasmic information during cell division. *Science*, **294** (5542): 610-612.

Gull: School of Biological Sciences, University of Manchester, 2.205 Stopford Building, Oxford Road, Manchester M13 9PT, UK. [k.gull@man.ac.uk]

12121 **Morris, J.C., Wang, Z.F., Drew, M.E., Paul, K.S. and Englund, P.T., 2001.** Inhibition of bloodstream form *Trypanosoma brucei* gene expression by RNA interference using the pZJM dual T7 vector. (Short communication.) *Molecular and Biochemical Parasitology*, **117** (1): 111-113.

Englund: Department of Biological Chemistry, John Hopkins University, 725 N Wolfe Street, Baltimore, MD 21205 USA. [penglund@jhmi.edu]

12122 **Mu✶oz-Jordán, J.L. and Cross, G.A.M., 2001.** Telomere shortening and cell cycle arrest in *Trypanosoma brucei* expressing human telomeric repeat factor TRF1. *Molecular and Biochemical Parasitology*, **114** (2): 169-181.

Cross: Laboratory of Molecular Parasitology, Rockefeller University, Box 185, 1230 York Avenue, New York, NY10021-6399, USA. [george.cross@rockefeller.edu]

12123 **Navarro, M. and Gull, K., 2001.** A pol I transcriptional body associated with VSG mono-allelic expression in *Trypanosoma brucei*. *Nature*, **414** (6865): 759-763.

Navarro: School of Biological Sciences, University of Manchester, 2.205 Stopford building, Oxford Road, Manchester M13 9PT, UK. [miguel.navarro@ipb.csic.es]

12124 **Oliveira, M.F., Bijovsky, A.T., Carvalho, T.U., de Souza, W., Alves, M.J.M. and Colli, W., 2001.** A monoclonal antibody to *Trypanosoma cruzi* trypomastigotes recognizes a myosin tail epitope. [*T. brucei.*] *Parasitology Research*, **87** (12): 1043-1049.

Colli: Departmento de Bioquímica, Instituto de Química, Universidade de São Paulo, Caixa Postal 26077, 05513-970 São Paulo, Brazil. [walcolli@usp.br]

12125 **Paul, K.S., Jiang, D., Morita, Y.S. and Englund, P.T. 2001.** Fatty acid synthesis in African trypanosomes: a solution to the myristate mystery. (Review). *Trends in Parasitology*, **17** (8): 381-387.

Englund: Department of Biological Chemistry, John Hopkins University, 725 N Wolfe Street, Baltimore, MD 21205, USA. [penglund@jhmi.edu]

12126 **Pelletier, M., Xu, Y., Wang, X., Zahariev, S., Pongor, S., Aletta, J.M. and Read, L.K., 2001.** Arginine methylation of a mitochondrial guide RNA binding protein from *Trypanosoma brucei*. *Molecular and Biochemical Parasitology*, **118** (1): 49-59.

Read: Department of Microbiology, Witebsky Center for Microbial Pathogenesis and Immunology, SUNY at Buffalo School of Medicine, Buffalo NY 14214, USA. [lread@acsu.buffalo.edu]

12127 **Shalaby, T., Liniger, M. and Seebeck, T., 2001.** The regulatory subunit of a cGMP-regulated protein kinase A of *Trypanosoma brucei*. *European Journal of Biochemistry*, **268** (23): 6197-6206.

Seebeck: Institute of Cell Biology, University of Bern, Baltzerstrasse 4, CH-3012 Bern, Switzerland. [thomas.seebeck@izb.unibe.ch]

12128 **Shen, S.Y., Arhin, G.K., Ullu, E. and Tschudi, C., 2001.** In vivo epitope tagging of *Trypanosoma brucei* genes using a one step PCR-based strategy. *Molecular and Biochemical Parasitology*, **113** (1): 171-173.

Tschudi: Department of Internal Medicine, Yale University, POBox 208022, 333 Cedar Street, New Haven, CT 06520, USA. [christian.tschudi@yale.edu]

12129 **Sollner-Webb, B., Rusche, L.N. and Cruz-Reyes, J., 2001.** Ribonuclease activities of trypanosome RNA editing complex directed to cleave specifically at a chosen site. *Ribonucleases*, Pt A **341**: 154-174.

Sollner-Webb: Department of Biological Chemistry, John Hopkins University School of Medicine, 725 North Wolfe Street, Baltimore, MD 21205, USA. [bsw@jhmi.edu]

12130 **Stiles, J.K., Meade, J.C., Kucerova, Z., Lyn, D., Thompson, W., Zakeri, Z. and Whittaker, J., 2001.** *Trypanosoma brucei* infection induces apoptosis and up-regulates neuroleukin expression in the cerebellum. *Annals of Tropical Medicine and Parasitology*, **95** (8): 797-810.

Stiles: Department of Microbiology, Biochemistry and Immunology, Morehouse School of Medicine, 720 Westview Drive S.W., Atlanta, GA 30310-1495, USA. [stilesj@msm.edu]

12131 **Vanhamme, L., Pays, E., McCulloch, R. and Barry, J.D. (2001).** An update on antigenic variation in African trypanosomes. (Review). *Trends in Parasitology*, **17** (7): 338-343.

Lavhamme: Laboratory of Molecular Parasitology, IBMM, Free University of Brussels, rue des Professeurs Jeener et Brachet 12, B-6041, Gosselies, Belgium. [lvanham@dbm.ulbac.be]

12132 **Vernal, J., Mu✶oz-Jordán, J., Müller, M., Cazzulo, J.J. and Nowicki, C., 2001.** Sequencing and heterologous expression of a cytosolic-type malate dehydrogenase of *Trypanosoma brucei*. (Short communication.) *Molecular and Biochemical Parasitology*, **117** (2): 217-221.

Nowicki: Instituto de Quimica y Fisicoquimica Biológica IQUIFIB-CONICET, Facultad de Farmicia y Bioquimica, Universidad de Buenos Aires, Junin 956, 1113 Buenos Aires, Argentina. [cnowicki@criba.edu.ar]

12133 **Zuccotto, F., Zvelebil, M., Brun, R., Chowdhury, S.F., Di Lucrezia, R., Leal, I., Maes, L., Ruiz-Perez, LM., Pacanowska, D.G. and Gilbert, I.H., 2001.** Novel inhibitors of *Trypanosoma cruzi* dihydrofolate reductase. [*T. brucei*]. *European Journal of Medicinal Chemistry*, **36** (5): 395-405.

Gilbert: Welsh School of Pharmacy, Cardiff University, Redwood Building, King Edward VII Avenue, Cardiff CF10 3XF, UK.