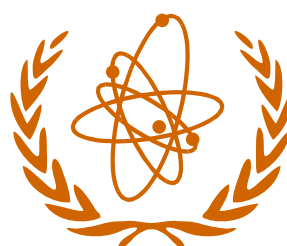


TSETSE AND TRYPANOSOMIASIS INFORMATION QUARTERLY

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Section B – abstracts

1. geNeral (including land use)

6546 **Frezil, J.-L., 1990.** La maladie du sommeil existe-t-elle encore? [Does sleeping sickness still exist?] *ORSTOM Actualités*, no. 29: 11-18.

ORSTOM, Centre de Montpellier, B.P. 5045, 3403 Montpellier Cedex, France.

The author describes the two types of human sleeping sickness and their distribution, epidemiology and pathology, and the life cycle and ecological requirements of tsetse flies. Although the disease was already well known to the ancient slave traders, the scientific study of the disease began in earnest only in the early part of this century when sleeping sickness epidemics ravaged colonial Africa as a result of the 'colonial peace' which allowed safe movement of populations across West and Central Africa. Since the last great epidemic in 1940, major efforts had all but eradicated the disease. However, lack of adequate means in the newly independent nations resulted in the reappearance of the disease in the 1970s. Since then new tools have been developed, particularly the serological screening of the human population and the Challier-Laveissière trap for riverine tsetse flies. Together these two methods have proved effective in eliminating the disease from affected areas in less than three years. Today the disease is relatively well controlled in West Africa but remains a serious threat in some Central and East African nations, mainly because of a lack of technical and financial resources.

6547 **International Atomic Energy Agency, 1990.** *Sterile insect technique for tsetse control and eradication*. Proceedings of the Final Research Co-ordination Meeting organised by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, held in Vom, Plateau State, Nigeria, 6-10 June 1988. Vienna, Austria; IAEA. (STI/PUB/830.) 228 pp. IAEA, P.O. Box 100, A-1400 Vienna, Austria.

These proceedings contain the final reports of the scientists participating in the Co-ordinated Research Programme on the Development of Methodologies for the Application of the Sterile Insect Technique for Tsetse Eradication or Control (1984-88), the main objectives of which were (a) to provide a research base and support for ongoing and future tsetse control/eradication programmes involving the application of SIT; (b) to develop methods for evaluating and monitoring tsetse SIT campaigns; and (c) to develop strategies for incorporating SIT into national and regional tsetse and trypanosomiasis control programmes. Two successful SIT projects, in Burkino Faso and Nigeria, are described (see nos. 6572, 6578), together with details of the technical back-up provided by the FAO/IAEA Seibersdorf Laboratory (no. 6554). Three papers describe the population dynamics of tsetse in Zimbabwe, Uganda and Nigeria (nos. 6565,

6568, 6585) and one describes methods (including the use of sentinel cattle) for monitoring progress during control operations (no. 6599). Several papers describe aspects of the mass-rearing of tsetse species: two discuss the nutritional quality of diets (nos. 6552, 6553) (a paper concerning only ticks is not abstracted here); others discuss the tsetse mycetome and symbionts (no. 6561), virus particle infection (no. 6560), and the effect of diet on the establishment of trypanosome midgut infection (no. 6586). Two other papers describe the use of juvenile hormone mimics for tsetse sterilisation (no. 6558) and recent studies of tsetse genetics in relation to breeding and genetic control (no. 6555).

6548 **International Laboratory for Research on Animal Diseases, 1989.**

ILRAD 1988 (Annual report). Nairobi; ILRAD. 103 pp.

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

ILRAD's approach to trypanosomiasis is to seek primarily immunological solutions to the problems posed by the disease. In the short term, ILRAD is studying ways to develop more accurate tests to diagnose trypanosome infections in livestock, including the use of monoclonal antibodies in enzyme-linked immunosorbent assays. Research on chemotherapy and chemoprophylaxis includes the use of trypanosome culture systems and advanced chromatographic and fluorometric technology to measure drug levels in bovine body fluids as well as drug-sensitivity in parasites. Studies of natural livestock trypanotolerance include the search for genetic markers and the use of embryo-transfer techniques to produce N'Dama calves for in-depth studies. In the long term, ILRAD is conducting research in two main areas. It is studying the responses ruminant hosts make to trypanosome infection, with the aim of enhancing normal mechanisms of resistance, and it is scrutinising molecules and processes of the parasite in a search for key elements or activities that can be attacked with drugs without adversely affecting the host.

6549 **International Laboratory for Research on Animal Diseases, 1990.**

Annual scientific report 1989. Nairobi; ILRAD. 120 pp.

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

This report contains the individual summaries of the scientific work carried out by ILRAD staff and their collaborators during 1989. It also lists the scientific publications and the papers presented by staff at international meetings as well as the names, affiliations and research topics of visiting scientists who worked at ILRAD during the year. The trypanosomiasis research programme is divided into four project areas: epidemiology of trypanosomiasis; trypanosome biology and biochemistry; immunology of trypanosomiasis; and resistance to pathogenic effects of trypanosomes.

6550 **Overseas Development Administration and University of Bristol,**

1990. *Tsetse Research Laboratory Annual Report 1989*. Bristol; ODA and University of Bristol. 68 pp.

TRL, Langford House, Langford, Bristol BS18 7DU, UK.

Research at TRL in 1989 continued to be concerned both with the development of methods of tsetse control and with more basic research on the biology of tsetse flies and trypanosomes. In a successful field trial in Zimbabwe, the juvenile hormone mimic, pyriproxifen, was used in traps to sterilise female *Glossina morsitans morsitans* and *G. pallidipes*, resulting in a greatly reduced emergence rate from puparia. Nutritional studies suggested the existence of a food store in

the thorax. The main theme of behavioural work continued to be the study of responses to natural and artificial baits for tsetse sampling and control, including components of ox breath and sebum. Work on landing behaviour on targets confirmed the importance of visual factors but not so far of olfactory factors other than carbon dioxide. Studies continued on collecting and analysing extensive field data from Zimbabwe with a view to providing realistic estimates of the biases inherent in different sampling techniques with respect to age, and work continued on the development of a DNA probe to distinguish tsetse material in the tissues of potential predators. Research on the vectorial capacity of tsetse showed that a lectin is responsible for the initiation of infections in the tsetse salivary glands, and also indicated that a single sex-linked gene may regulate the maturation of salivary gland infections. A survey in Uganda suggested that domestic livestock may form the most important sleeping sickness reservoir there. Research on trypanosomes included the characterisation of isolates, including the new *Nannomonas* trypanosome isolated in The Gambia.

6551 **University of Bristol, 1990.** *The Tsetse Research Laboratory*. Bristol; University of Bristol. 20 pp.

TRL, Langford House, Langford, Bristol BS18 7DU, UK.

The booklet briefly describes the biology of tsetse flies, their importance and distribution, and the methods of trypanosomiasis control. The history and functions of the TRL are then described, followed by an outline of the laboratory's research programme covering laboratory rearing, control, behaviour (vision, odours), sterilisation, and tsetse-trypanosome relationships. The services TRL provides for research workers – of supplying flies and of determining the nutritional status and age of wild tsetse – are also mentioned, as is the advisory work undertaken by TRL in Africa. The booklet is liberally illustrated with colour photographs.

2. TSETSE BIOLOGY

(a) REARING OF TSETSE FLIES

[See also 14: no. 6560]

6552 **Ajayi, S.A., 1990.** Effects of the nutritional quality of locally obtained blood diets on the performance of *Glossina palpalis palpalis* fed *in vitro*. In: IAEA, 1990 (see 14: no. 6547), pp. 151-158.

National Veterinary Research Institute, Vom, Plateau State, Nigeria.

Three separate experiments were conducted to evaluate the nutritional quality of locally obtained blood diets on the overall performance of *G. p. palpalis* fed *in vitro*. In the first experiment, 30 teneral *G. p. palpalis* females were fed *in vitro* 6 days a week on a protein-deficient bovine blood diet for 25 days. Thirty teneral females fed on a normal bovine blood diet were used as the control. The performance of the test and control groups in terms of survival rate, productivity and puparial weight were observed for 25 days post-emergence. The mean puparial weight of the control flies was significantly greater than that of the test flies. However, the survival rate and fecundity in the two groups did not differ significantly. In the second experiment, batches of female *G. p. palpalis* were similarly fed *in vitro* on camel or bovine blood diets for 25 days. More puparia of higher weight classes were produced by flies fed on bovine blood than those on camel blood. In a third experiment, six groups of teneral female flies (50 in each

group) were maintained on blood diets with different cellular and plasma concentrations for 35 days. Flies fed on diets with a PCV of 20-30% performed better than those on diets with a PCV of 60% and above. The groups maintained on 100% plasma or 100% cells performed poorly.

6553 **DeLoach, J.R., Spates, G.E., Kabayo, J.P., Kapatsa, G.M. and Sheffield, C.L., 1990.** Freeze dried blood and development of an artificial diet for blood feeding arthropods. *In: IAEA, 1990 (see 14: no. 6547), pp. 129-150.* Kabayo: FAO/IAEA Entomology Unit, IAEA Seibersdorf Laboratory, P.O. Box 100, A-1400 Vienna, Austria; other authors: Veterinary Toxicology and Entomology Research Laboratory, ARS, USDA, College Station, TX 77841, USA.

The goals of the research were to determine the biochemical differences between freeze-dried bovine and porcine blood relative to their nutritional value to *Glossina palpalis palpalis* and *Stomoxys calcitrans* and to develop an artificial diet for mass-rearing these flies. Freeze-dried bovine and porcine blood were found to differ in their amino acid content; total dietary lipids did not differ significantly, but some notable exceptions were found in fatty acid content. Both sonication and addition of foetal bovine serum to freeze-dried bovine blood improved its nutritional value for *G. p. palpalis*. A two-component, semi-defined artificial diet was developed for *G. p. palpalis* and *S. calcitrans*. The College Station diet consisted of lipid contaminated bovine haemoglobin (BHb) and bovine serum albumin (BSA). To conduct dietary deletion tests, a process was developed for preparing large quantities of ultrapure lipid-free bovine haemoglobin. *S. calcitrans* and *G. p. palpalis* fed on lipid-free BHb plus BSA had zero fecundity, showing that lipids are an essential component of the bloodmeal. Addition of various lipids to the basic diet established which ones were needed to restore normal fecundity to *S. calcitrans*.

6554 **Vloedt, A.M.V. van der, Feldmann, U., Hamann, H.-J., Luger, D., Barnor, H., Taher, M. and Baumgartner, H., 1990.** Research and development in the IAEA Laboratory at Seibersdorf in support of BICOT for the eradication of *Glossina palpalis palpalis*. *In: IAEA, 1990 (see 14: no. 6547), pp. 25-29.* Vloedt: Insect and Pest Control Section, Joint FAO/IAEA Division, IAEA, P.O. Box 100, A-1400 Vienna, Austria; other authors: FAO/IAEA Entomology Unit, IAEA Seibersdorf Laboratory, Vienna, Austria.

A brief summary is given of the major contributions made by the FAO/IAEA Entomology Unit of the IAEA Laboratory at Seibersdorf and the Insect and Pest Control Section of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in Vienna to the BICOT project in Nigeria. Most of the procedures used for the laboratory mass-rearing of *G. p. palpalis* and the field operations in BICOT were based on techniques developed at Seibersdorf.

(b) TAXONOMY, ANATOMY, PHYSIOLOGY, BIOCHEMISTRY

6555 **Gooding, R.H., 1990.** Studies of *Glossina pallidipes* and *G. morsitans* subspecies related to the genetic control of tsetse flies. *In: IAEA, 1990 (see 14: no. 6547), pp. 213-226.*

Department of Entomology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3.

The amount of genetic variation for three taxa, *G. m. morsitans*, *G. m. centralis*

and *G. pallidipes*, was determined in field-collected flies and laboratory-reared flies using electrophoretic markers. Since sex ratio distortion, resulting in the production of an excess of females, in colonies of *G. m. submorsitans* is controlled by an X chromosome locus, it was possible to set up a breeding programme that resulted in establishing a colony with 50% males. Preliminary evidence suggests that a relationship exists between sex ratio distortion and an electrophoretically detectable esterase (designated EST-Xnull). Hybridisation techniques were used to confirm that a tsetse fly colony maintained by the Zambian National Council for Scientific Research was *G. m. centralis*. Studies of the genetic basis of sterility in hybrid males, produced by crossing *G. m. morsitans* and *G. m. centralis*, have been continued and limitations to the proposed use of maternally inherited sterility factors, as agents for genetic control of *G. m. centralis*, have been uncovered.

6556 **Gooding, R.H., 1990.** Postmating barriers to gene flow among species and subspecies of tsetse flies (Diptera: Glossinidae). *Canadian Journal of Zoology*, **68** (8): 1727-1734.

Department of Entomology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3.

Postmating barriers to gene flow between closely related species and subspecies of tsetse flies include (i) reduced fecundity of hybridised and hybrid females and (ii) sterility of hybrid and backcross males, owing mainly to incompatibility between X and Y chromosomes from two different taxa or, possibly, incompatibility between the X from one taxon and autosomes from the other. There are also maternally inherited factors that confer unidirectional sterility upon males; these factors may influence the direction of gene flow. When *Glossina morsitans morsitans* and *G. m. centralis* are crossed, these factors appear to be unstable and lose their effectiveness as barriers to gene flow when hybrid females, from several consecutive generations, are backcrossed to *G. m. centralis*. In hybrid females of the *morsitans* group, intrachromosomal recombination is suppressed in the X chromosomes, but it may occur at near normal levels in at least part of linkage group II. Some backcross flies with chromosomes composed of segments from two different taxa are fertile. Naturally occurring hybrids have been found, but it appears that hybridisation zones are narrow. It remains to be determined whether introgression of genes plays a significant role in the evolution of tsetse flies.

6557 **Kokwaro, E.D., Nyindo, M. and Chintawi, M., 1990.** Ultrastructural changes in salivary glands of tsetse, *Glossina morsitans morsitans*, infected with virus and rickettsia-like organisms. *Journal of Invertebrate Pathology*, **56** (3): 337-346.

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

Electron microscope observations on enlarged hypertrophied salivary glands dissected from adult laboratory-reared male *G. m. morsitans* show a concurrent infection of the salivary gland tissue with rod-shaped virus particles and intracellular rickettsia-like organisms. The latter are found intracellularly in the epithelium and in the gland lumen enclosed within lytic zones. The virus particles are found within the degenerating cytoplasm, nuclei, and lumen of the cell where they are especially numerous. Stratified epithelium and gland enlargement are a prominent feature of infection. These observations suggest that

biological associations between salivary gland tissue and diverse microbes may be more common than formerly recognised. The microbes appear to cause damage to salivary gland cells, causing hyperplasia which assumes pathologic proportions.

6558 **Langley, P.A., 1990.** Use of juvenile hormone mimics in the sterilization of tsetse flies. *In: IAEA, 1990 (see 14: no. 6547), pp. 207-211.*

TRL, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Three juvenile hormone mimics were tested for their ability to sterilise *Glossina morsitans morsitans*. S-31183 (Sumitomo) was the most effective chemical tested, a topical application of 2 µg being sufficient to sterilise a female for life. Furthermore, application of 20 µg of S-31183 to male *G. m. morsitans* was sufficient to sterilise females mating with such males. These juvenile hormones are currently being tested in the field as a replacement for insecticides used in the baiting of targets and traps for tsetse flies.

6559 **Langley, P.A. and Stafford, K., 1990.** Feeding frequency in relation to reproduction in *Glossina morsitans morsitans* and *G. pallidipes*. *Physiological Entomology*, **15** (4): 415-421.

TRL, ODA/University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Measurements of residual haematin in males of *G. m. morsitans* reared in the laboratory at 25°C suggest that blood meal digestion is completed 4 or 5 days after feeding. However, a high proportion of haematin is present as faecal matter 2 days after feeding and it is concluded that digestion is completed sooner than indicated by the regression of log₁₀ haematin on time. Therefore, low levels of residual haematin in field-caught tsetse provide no indication of the frequency with which they feed. For this reason the effects of feeding frequency upon various reproductive parameters in the laboratory have been examined. It is concluded that the best performance is achieved by *G. m. morsitans* females which ingest four blood meals per inter-larval period and that for a similar performance in *G. pallidipes* five blood meals are required. The extent to which such feeding frequencies are a reflection of feeding activity in the field is discussed in terms of the biochemical requirements to maintain a reproductive adult female tsetse in positive energy balance.

6560 **Otieno, L.H., Odindo, M.O., Kaaya, G.P. and Banda, H.K., 1990.**

Virus particles infection in laboratory reared *Glossina pallidipes* Austen (Diptera: Glossinidae). *In: IAEA, 1990 (see 14: no. 6547), pp. 173-178.*

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

The performance of a self-supporting colony of *Glossina pallidipes* reared under semi-natural conditions at Mbita Point, Kenya, was studied. The percentage of producing females fluctuated between 70% and 83%, being lowest in June. The fecundity of these flies was, however, highest between May and July, resulting in an inverse relationship between the number of producing females and the number of puparia produced per female. The decline in producing females between February and June coincided with high mortality from bacterial infection with *Proteus rettgeri* ('black abdomen'). The number of flies with virus infections of the salivary glands increased quite rapidly (0-4%) between January and March but thereafter slowed down, reaching about 6% by December, suggesting a self-

regulating mechanism within the flies that checks the rate of spread in the colony. 6561 **Soldán, T., Matha, V. and Weyda, F., 1990.** Mycetomes and symbionts of tsetse flies maintained on a membrane feeding system and the agents interfering with natural reproduction. *In: IAEA, 1990* (see **14**: no. 6547), pp. 159-171.

Institute of Entomology, Czechoslovak Academy of Sciences, CS-370 05 České Budejovice, Czechoslovakia.

Mycetomes from male and female adults and puparia of *Glossina palpalis palpalis* were dissected from specimens obtained from the IAEA Laboratory at Seibersdorf, Austria. The structure and ultrastructure of the mycetocytes and endosymbionts and their quantitative changes are described and compared with other species of tsetse fly. Pronounced degenerative morphological changes can be caused by, among other factors, starvation. Irradiation by gamma rays produced only slight structural changes and non-significant changes in the endosymbiont number. In organ culture (Leibowitz medium), mycetomes of unfed females release spherical clusters of mycetocytes and lose their dense cover of microvilli. The ultrastructural changes of individual endosymbionts under these conditions are described in detail. The results of basic bioassays showing intensive DNA synthesis and *in vitro* production of several *de novo* synthesised proteins of molecular weights of 52-159 kDa are given. The possible role of endosymbionts in reproduction and their transmission to the offspring are discussed. While the necessity of a functional mycetome in females can, at least partially, be explained by the production of proteins necessary for reproduction, the role of the mycetome in males remains unclear. The function of the tsetse fly mycetome is shown to be much more complex than earlier supposed and further detailed data on its reproductive function are needed.

6562 **Vreysen, M.J.B. and Vloedt, A.M.V. van der, 1990.** The effect of inter-subspecific hybridization and gamma radiation on the reproductive biology of *Glossina palpalis palpalis* (Robineau-Desvoidy) and *Glossina palpalis gambiensis* Vanderplank. *Annales de la Société belge de Médecine tropicale*, **70** (2): 145-158.

Entomology Unit, Joint FAO/IAEA Programme, IAEA Laboratories, A-2444 Seibersdorf, Austria; Insect and Pest Control Section, Joint FAO/IAEA Division, Vienna, Austria.

The closely related tsetse fly subspecies *G. p. palpalis* (Nigeria origin) and *G. p. gambiensis* (Burkina Faso origin) hybridise readily in the laboratory. Hybridised *G. p. palpalis* females produced fewer offspring than the parental intrasubspecific crosses. Adult emergence was below 70% with at least 78% being females. Most female hybrids were fertile whereas most of the male hybrids were sterile when backcrossed to the *G. p. palpalis* parental line. All F₁ males were capable of transferring a spermatophore but their mates rarely had sperm-impregnated spermathecae. Their testes rarely contained mature sperm; moreover, sperm, when present, had low or no motility. During laboratory cage tests with virgin females of both subspecies and either sexually mature male *G. p. palpalis* or *G. p. gambiensis*, there was no indication of selective mating. The same was true when gamma-irradiated males (120 Gy treatment in air) were used. In the latter case complete sterility was induced causing embryonic arrest in all inseminated female mates. Consequently, in ratio tests with untreated virgin *G. p. palpalis* females,

untreated *G. p. palpalis* males and an increasing number of irradiated *G. p. gambiensis* males, there was a gradual decrease in production of viable offspring. The results of the present study are discussed with a view to using a combination of hybridisation and induced sterility in distinct geographical zones where the two subspecies are present.

(c) DISTRIBUTION, ECOLOGY, BEHAVIOUR, POPULATION STUDIES

[See also 14: no. 6585.]

6563 **Bursell, E., 1990.** The effect of host odour on the landing responses of tsetse flies (*Glossina morsitans morsitans*) in a wind tunnel with and without visual targets. *Physiological Entomology*, **15** (4): 369-376.

'La Sabotière', Mérigot, 47120 Pardaillan, France.

The effect of artificial host odour on the landing responses of males of *G. m. morsitans* and on their reaction to visual targets has been investigated in a wind tunnel. Landing was induced in flies that traversed steep odour gradients as they flew upwind and downwind across the edge of an odour plume, irrespective of whether visual targets were present or not; the landing response could be elicited over a wide range of odour concentrations. When targets were present such odour gradients also tended to increase the proportion of landing flies which alighted on or near the targets; and the bigger the target, or the hungrier the flies, the greater was the propensity for target landing. In air which was more uniformly permeated with odour, the propensity to land on targets was increased only at high odour concentration.

6564 **Green, C.H., 1990.** The effect of colour on the numbers, age and nutritional status of *Glossina tachinoides* (Diptera: Glossinidae) attracted to targets. *Physiological Entomology*, **15** (3): 317-329.

TRL, University of Bristol, School of Veterinary Science, Langford, Bristol BS18 7DU, UK.

The effect of colour on the attractiveness of cloth targets for *G. tachinoides* was investigated, using electrified nets. The ages and nutritional states of tsetse caught by different targets were also studied. With targets of cloth and mosquito netting panels, phthalogen blue was the most attractive colour, and yellow the least, with black, red, violet and white intermediate. The strongest landing responses in females occurred on UV-reflecting white cloth. In males, landing was high with all colours except yellow. Colour combination targets were no better than all-blue targets when mosquito netting side-panels were present; in their absence, blue-and-white targets were over twice as good as all-blue targets. No consistent differences in ages or nutritional states were found between tsetse caught by differently coloured targets, but those landing directly on the cloth portion of a target had lower fat reserves than those intercepted on an adjacent netting panel.

6565 **Hargrove, J.W., 1990.** Population estimation from mark-recapture data. Equations for a pooled mark system and for pooled data, with applications to a study on island populations of tsetse flies in Zimbabwe. *In*: IAEA, 1990 (see 14: no. 6547), pp. 79-114.

Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, P.O. Box 8283, Causeway, Harare, Zimbabwe.

This study stemmed from a mark-recapture experiment carried out on Antelope

Island, Lake Kariba, Zimbabwe, using the tsetse flies *Glossina morsitans morsitans* and *G. pallidipes*. Batch marking systems were used with a view to applying the Jolly-Seber (J-S) stochastic model for estimation of the fly population levels and the allied vital parameters. Between February and May 1980 a daily batch mark was used; in this way daily J-S estimates could be calculated in the normal way. From October 1980 to April 1984 the population was still sampled daily, but the batch mark was only changed once a week. This change in design means that the J-S (Q_1) estimates cannot be used without introducing serious systematic errors. The problem arises, partly, because the apparent marked proportion declines during each week and the 'natural' pooling can underestimate the true value by as much as 50%. This bias is due to the effects of addition by birth of unmarked flies, and to the fact that a fly, once marked in a given week, is ignored until the next week. In addition, a proportion of flies marked in a given week will die before they are eligible for recapture. This tends to cause the marked population to be underestimated and the probability of survival to be overestimated. An approach which overcomes these problems has been developed by considering the further subset of the marked population. For male *G. m. morsitans*, the resulting (Q_3) estimates of the marked population and the probability of survival are very similar, on average, to the numerical solution (Q_2) estimates, and show considerably less variation. The Q_3 estimates indicate that, as expected, the Q_1 equations overestimate the probability of survival and severely underestimate the proportion of marked flies in the population. There is no consistent difference between the Q_1 and Q_3 estimates of the number of births. The above results suggest alternative solutions to the general problem of producing pooled estimates for periods longer than the initial intersample interval. Various series of estimates have been developed and tested on the Antelope Island *daily* marking data.

6566 **Jordan, A.M. and Okoth, J.O., 1990.** A record of *Glossina medicorum* Austen (Diptera: Glossinidae) from Uganda. *Annals of Tropical Medicine and Parasitology*, **84** (4): 423-426.

TRL, ODA/University of Bristol, Langford, Bristol BS18 7DU, UK; UTRO, P.O. Box 96, Tororo, Uganda.

Two specimens, one male and one female, from a loaned collection of flies from Uganda were identified as *G. medicorum*; they were labelled as originating from Bunyoro in 1978. The flies were identified by examination of the male phallosome and female signum. Previous records of *G. medicorum* are restricted to West Africa, and this record from Uganda is some 2700 km east of the previously known eastern limit for the species. Since *G. medicorum* is very similar to the closely related *G. frezili*, great care was taken over the identification. *G. medicorum* in West Africa is frequently found in forest-savanna mosaic and it is therefore surmised that the Ugandan specimens originated in an area of the same vegetation category which is known to occur in Bunyoro, east of Lake Albert. The distribution and evolution of *G. medicorum* and *G. frezili* is discussed. Uganda can be considered as the meeting ground of a typically West African tsetse fauna with a typically East African one. The tsetse fauna can be related to the vegetation as the Lake Victoria region is the meeting place of five distinct floras.

6567 **Kyorku, C., Brightwell, R. and Dransfield, R.D., 1990.** Traps and odour baits for the tsetse fly, *Glossina longipennis* (Diptera: Glossinidae).

Bulletin of Entomological Research, **80** (4): 405-415.

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

Studies were carried out at Nguruman, south-west Kenya, to develop an effective trap/odour bait system that could be used for sampling and possibly controlling the tsetse *Glossina longipennis*. Neither acetone nor cow urine increased trap catches significantly when used alone, but together they increased catches by about four to five times. Used with a target and electric screens, acetone with *p*-cresol, 3-n-propyl phenol and 1-octen-3-ol gave a significantly higher index of increase than did acetone and cow urine. The use of odour baits did not affect the age composition of the catch. The standard F3 trap was about three and a half times more effective for females than was the biconical trap and about eight times more effective when used without its blue floor. The NG2B was the best of the NGU series of designs, and caught about four times more females than did the biconical trap. Neither the F3 nor the NG2B caught significantly more males than the biconical trap. The NG2B caught a significantly higher proportion of parous females flies than the biconical. Either the F3 or the cheaper NG2B, baited with acetone and cow urine or phenols, is recommended as a sampling tool for *G. longipennis*. Electric screen experiments showed that the NG2B caught less than 10% of the flies that approached it. Despite this, it might still be effective for control of *G. longipennis* given the high mobility of this species and the consequent likelihood of encountering traps.

6568 **Ogwal, L.M. and Kangwagye, T.N., 1990.** Population dynamics of *Glossina fuscipes fuscipes* on Buvuma Island, Lake Victoria, Uganda. *In: IAEA*, 1990 (see **14**: no. 6547), pp. 67-77.

Department of Zoology, Makerere University, P.O. Box 7062, Kampala, Uganda; Tsetse Control Department, Ministry of Animal Industry and Fisheries, Kampala, Uganda.

A survey made of Buvuma Island to establish the incidence, distribution and population dynamics of tsetse flies showed that *G. f. fuscipes* was the most abundant species, occurring in the south-eastern, western and northern parts of the island. Although the fly is both riverine and peridomestic in its habits, the survey revealed that its population was concentrated mainly within a distance of about 2 km from the lake shores. Trap catches were highest in fishing villages and ports of call, followed in decreasing order by catches at forest edge and roadside locations, at water collection points, around houses, in banana plantations and on grazing grounds. Many puparia were also found on the sandy beaches around fishing villages and ports of call. Studies of the population dynamics revealed seasonal variations in the abundance of the species, with a peak during the main dry season, i.e. in January and February. The breeding peak was reached during the minor rainy season. The pyramidal traps used in this study reduced *G. f. fuscipes* populations by up to 95% in Tome and 90% in the Bulopa-Walwanda and Lwenyanja villages. There was evidence of fly movement between the islands and the mainland.

6569 **Williams, B.G., Dransfield, R.D. and Brightwell, R., 1990.** Tsetse fly (Diptera: Glossinidae) population dynamics and the estimation of mortality rates from life-table data. *Bulletin of Entomological Research*, **80** (4): 479-485.

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

The estimation of tsetse fly mortality rates from life-table data is central to population dynamics studies and to the development of tsetse fly control programmes. For a population at equilibrium with a stable age distribution, the age-specific mortalities may be estimated directly from the number of individuals in each age class, but a correction must be applied when the population is growing or declining. Furthermore, if the mortality rates are changing with time, inaccuracies will be introduced into estimates of the mortality rates derived from the age structure of the population since the population will take time to reach a new stable age distribution. In this paper we use the Euler-Lotka equation, which relates the age-specific mortality and fecundity to the overall growth rate of the population, to study the loss rate of the tsetse fly *Glossina pallidipes* as a function of pupal mortality, adult mortality and mortalities applied to each age class separately. We then present a simulation model in order to quantify and to set limits on the precision of estimates of mortalities when the mortalities are themselves changing.

3. tsetse control (including environmental side-effects)

[See also 14: nos. 6558, 6562, 6567, 6585, 6586, 6599.]

6570 **Abiola, F.A., Mohamadou, B., Baschirou and Adamou-Ndiaye, M., 1990.** Utilisation du Butox N.D. (deltaméthrine) dans le contrôle des glossines, vecteurs de la trypanosomose sur le plateau de l'Adamaoua au Cameroun. [Use of Butox (deltamethrin) for the control of tsetse, vectors of trypanosomiasis on the Adamaoua Plateau, Cameroon.] *Revue de Médecine vétérinaire*, **141** (7): 565-573.

Abiola, Baschirou: Laboratoire de Toxicologie, Ecole Inter-Etats des Sciences et Médecine Vétérinaires de Dakar, B.P. 5077, Dakar, Senegal; Mohamadou: Mission Spéciale d'Eradication des Glossines, Ngaoundere, Cameroon; Adamou-Ndiaye: Faculté des Sciences Agronomiques, UNB, Cotonou, Benin. Butox (deltamethrin) was used in an insecticidal bath for cattle in an attempt to control trypanosomiasis on the Adamaoua Plateau, Cameroon. Two batches of 85 cattle each were first treated with Berenil, and then dipped every 2 weeks (batch A) or every week (batch B). The average parasitic infection rate of batch A was 8.89% and of batch B 3.66%. Treated animals were found to attract 5 times fewer tsetse flies than untreated animals.

6571 **Chidumayo, E.N., 1988.** Regeneration of *Brachystegia* woodland canopy following felling for tsetse-fly control in Zambia. *Tropical Ecology*, **29** (2): 24-32.

Natural Resources Department, Government of Zambia, Lusaka, Zambia. Data are presented on the stem height structure of representative understorey and canopy species in an old-growth *Brachystegia/Julbernardia* (miombo) woodland and in regrowth stands 2.75, 3.5, 10.0 and 14.0 years old following clear felling for tsetse fly control in central Zambia. Regeneration of understorey and canopy

species was simultaneous but understorey species grew at a faster rate than canopy species. Height growth of understorey and canopy species was suppressed at 5 m and 8-9 m, respectively.

6572 **Clair, M., Cuisance, D., Politzar, H., Merot, P. and Bauer, B., 1990.**

Tsetse fly eradication in Burkina Faso and evaluation of traps and targets. *In*: IAEA, 1990 (see **14**: no. 6547), pp. 31-43.

CRTA, B.P. 454, Bobo-Dioulasso, Burkina Faso. Clair: IEMVT, 10 rue Pierre-Curie, F-94704 Maisons-Alfort Cedex, France.

Control operations against tsetse flies using the SIT were carried out by CRTA in 1983-85 in an area of more than 3000 km². Populations of *Glossina tachinoides* and *G. palpalis gambiensis* were first reduced by 93.0% and 88.1% respectively using deltamethrin-impregnated screens. Release of sterile males eradicated the tsetse population within 2 years. Tsetse reinvasion from surrounding areas was prevented by the use of insecticidal screens and traps, and the savanna species *G. morsitans submorsitans*, found only in the south-east, was controlled by traps and screens. Since 1985, besides monitoring of this area, CRTA has carried out research on the form and colour of targets as well as the use of olfactory attractants to discover the most effective targets and odours for particular tsetse species.

6573 **Dransfield, R.D., Brightwell, R., Kyorku, C. and Williams, B., 1990.**

Control of tsetse fly (Diptera: Glossinidae) populations using traps at Nguruman, south-west Kenya. *Bulletin of Entomological Research*, **80** (3): 265-276.

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

A field trial was carried out in a Maasai group ranch to assess the use of odour-baited traps for suppression of a population of the tsetse fly *Glossina pallidipes*. In January 1987, local people made 100 NG2B traps in their homesteads. These were then deployed within the suppression zone of about 100 km², primarily in the areas of woodland where flies aggregate in the dry season. Traps were baited with acetone (c. 150 mg/h) and cow urine (c. 1000 mg/h) and checked at monthly intervals in order to replenish odours and repair damage. A further 90 traps were added between October and December to enlarge the suppression area slightly and to strengthen the trap barriers. The population was monitored using biconical and NG2B traps as well as by mark-release-recapture estimates of population size. By October the number of *G. pallidipes* in the suppression zone was reduced by 98-99% relative to the number 3 km outside the suppression zone. Some reinvasion, mainly of parous females, occurred in November during the short rains but these flies were rapidly trapped out again. Average mortality rates due to trapping were estimated at 4-5% per day, which, combined with the natural mortality, reduced the adult population at a rate of about 2.6% per day during the dry season. The traps had less effect on the smaller population of *G. longipennis* but still gave a reduction of up to 90% in the dry season. The use of this low-technology approach offers good prospects for future community-based tsetse control operations.

6574 **Hargrove, J.W. and Langley, P.A., 1990.** Sterilizing tsetse (Diptera: Glossinidae) in the field: a successful trial. *Bulletin of Entomological Research*, **80** (4): 397-403.

ODA/TRL Research Project, Causeway, Zimbabwe; TRL, ODA/University of Bristol, School of Veterinary Science, Langford, Bristol BS18 7DU, UK.

(Correspondence to Langley.)

The juvenile hormone mimic, pyriproxyfen, applied topically to female tsetse flies, *Glossina morsitans morsitans* and *G. pallidipes*, effectively sterilises them by arresting development of their offspring in the pupal stage. Between July and November 1989, 41 odour-baited traps treated with pyriproxyfen were deployed near Rekomitjje Research Station, Zambezi Valley, Zimbabwe, in a 12.3 km² block of woodland habitat of *G. m. morsitans* and *G. pallidipes*. Tsetse entering the traps brushed against material dosed with 2 mg/cm² pyriproxyfen and were then allowed to escape. Emergence rates from pupae of the two species collected in the block fell to 30% and 2.7%, respectively, of control levels after 3 months. Of more than 750 pupae of each species dissected, 78% and 94% respectively showed incomplete development. The average ovarian age category of female *G. pallidipes* sampled in the block doubled during the trial. This was due to immigration of older flies and the declining birth rate which, if sustained over a large area for a year, was estimated as sufficient to cause a population reduction to 10⁻⁶ of its original level.

6575 **Hussain, M., Perschke, H. and Kutscher, R., 1990.** The effect of selected UV absorber compounds on the photodegradation of pyrethroid insecticides applied to cotton fabric screens. *Pesticide Science*, **28** (4): 345-355. Agrochemicals Unit, FAO/IAEA Programme, IAEA Laboratory, A-2444 Seibersdorf, Austria.

Ultraviolet radiation (UV) absorber compounds were tested to reduce the photolytic decomposition of deltamethrin, applied to 100% cotton fabric, to be used as a target screen for tsetse fly control. In the absence of UV absorbers, over 90% of deltamethrin was degraded after 6 h irradiation under an Osram UV-sun radiation lamp (equivalent to 96 h sunlight) at 35 ± 1°C. The degree of protection increased with increase in the proportion of the UV absorber compound. With a mixture of 2,4-dihydroxybenzophenone and deltamethrin (3 + 1, by mass), 7% of deltamethrin was degraded. Similarly, 2,4-dihydroxybenzophenone protected alpha-cypermethrin and cyfluthrin against photolysis. 2,4-Dihydroxybenzophenone and 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid both protected deltamethrin from 'Glossinex 200' SC formulation against photolysis, but the former was more effective than the latter.

6576 **Nitcheman, S., 1990.** Comparison of the susceptibility to deltamethrin of female *Glossina morsitans morsitans* Westwood, 1850 (Diptera: Glossinidae) uninfected and infected with *Trypanosoma (Nannomonas) congolense* Broden, 1904 (Kinetoplastida, Trypanosomatidae). *Annals of Tropical Medicine and Parasitology*, **84** (5): 483-491.

Entomology Laboratory, IEMVT, 10 rue Pierre Curie, F-94704 Maisons Alfort Cedex, France.

The susceptibility of pregnant female *G. m. morsitans* infected with *T. congolense* to deltamethrin, a synthetic pyrethroid insecticide, was compared to that of pregnant uninfected females. The results showed that infected flies have a significantly higher mortality rate than uninfected ones, and have a reduced longevity compared with uninfected control flies. These experiments suggest that

the effects of trypanosome infection on *Glossina* should be further evaluated.

6577 **Noireau, F., Okamba-Osseke, F. and Gouteux, J.P., 1990.** Impact immédiat d'une lutte antivectorielle par piégeage sur l'enzootie de trypanosomose au Sud-Congo. [Short-term impact of tsetse control by trapping on animal trypanosomiasis in South Congo.] *Revue d'Élevage et de Médecine vétérinaire des Pays tropicaux*, **43** (1): 93-96.

ORSTOM, 213 rue La Fayette, 75480 Paris Cedex 10, France; Institut de Développement Rural, Université Marien Ngouabi, B.P. 69, Brazzaville, Congo; ORSTOM, B.P. 893, Bangui, Central African Republic.

A tsetse control campaign by trapping was carried out in a village of South Congo, where trypanosomiasis due to *Trypanosoma congolense* is endemic, in order to evaluate its impact on the disease transmission in livestock. After 7 months of control, fly density was reduced by 97.4% but the intestinal infection rate of residual flies did not decrease significantly. The main host of *Glossina palpalis palpalis* was the pig. During the dry season, a transfer of usually non-peridomestic flies to the village was observed. Parasitological indices (prevalence and parasitic load) significantly decreased in the animals at the end of the control period. Simultaneously, the serological prevalence increased.

6578 **Olandunmade, M.A., Feldmann, U., Takken, W., Tenabe, S.O., Hamann, H.-J., Onah, J., Dengwat, L., Vloedt, A.M.V. van der and Gingrich, R.E., 1990.** Eradication of *Glossina palpalis palpalis* (Robineau-Desvoidy) (Diptera: Glossinidae) from agropastoral land in central Nigeria by means of the sterile insect technique. *In*: IAEA, 1990 (see **14**: no. 6547), pp. 5-23.

Olandunmade, Takken, Tenabe, Onah, Dengwat: BICOT Project, Vom, Plateau State, Nigeria; Feldmann, Hamann, Gingrich: FAO/IAEA Entomology Unit, IAEA Seibersdorf Laboratory, Vienna, Austria; Vloedt: Insect and Pest Control Section, Joint FAO/IAEA Division, IAEA, Vienna, Austria.

An agropastoral development area of 1500 km² in southern Plateau State, Nigeria, was selected for development and application of the SIT for the eradication of *G. p. palpalis*. *In vitro* and *in vivo* feeding techniques were used to mass-breed the species in the laboratory for the production of more than 1.5 million sexually sterile males for release. In the field the initial tsetse fly population could be reduced to less than 10% within 6-12 weeks, but not eradicated, by continuous trapping and placement of insecticide-impregnated targets. However, eradication was achieved when sufficient sterile males were released on a weekly basis to maintain a minimal ratio of 10 sterile males to 1 fertile wild male fly for at least three generations. The area was divided into three operational zones which were freed of *G. p. palpalis* in 1985, 1986 and 1987 by the application of SIT. After eradication the entire area of 1500 km² could be secured against reinvasion by maintaining barriers of insecticide-impregnated targets.

6579 **Overseas Development Administration, 1989.** *Environmental impact assessment of ground spraying operations against tsetse fly in Zimbabwe. DDT impact assessment. Second annual report, 14 April 1988 – 13 April 1989.* ODA and Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, Zimbabwe. 104 pp.

ODA, Eland House, Stag Place, London SW1E 5DH, UK.

The report contains separate accounts of the field work carried out by the individual staff involved in the project. No significant differences in the foraging

bat fauna were seen between unsprayed and DDT-sprayed areas, but there was some indication that high DDT burdens may affect reproductive success. Studies on woodland birds indicated significantly lower populations in sprayed areas. The possible threat to Fish Eagle breeding success on Lake Kariba was confirmed. A survey of soil invertebrates suggested that DDT spraying affected populations of Acarina, Isopoda, some Gryllidae, members of the spider families Gnaphosidae and Lycosidae, and some ants, causing either decreases or increases related to reduced predator pressure. Preliminary results of studies on the impact of DDT on fish and on soil microbiology and processes are also given.

6580 **Willemse, L., Leslie, J., Putt, S.N.H., Rooij, R.C. de, Hargrove, J.W. and Vale, G.A., 1989.** *Tsetse control Senanga West*. Report on the first phase of a project designed to test the use of odour baited, insecticide impregnated targets against *Glossina morsitans centralis* in the Senanga West District of Zambia. Reading, UK; PAN Livestock Services Ltd/Zeist, Netherlands; RDP Livestock Services B.V. 217 pp.

Willemse, Rooij: Department of Veterinary and Tsetse Control Services, Zambia; Leslie, Putt: PAN Livestock Services Ltd, Department of Agriculture, Earley Gate, P.O. Box 236, Reading RG6 2AT, UK; Hargrove, Vale: Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, Zimbabwe. The project area is located west of the Zambezi river in the Senanga District of the Western Province of Zambia and forms part of a tsetse belt running down the Kwando and Zambezi rivers through the Caprivi strip and into the Okavango Delta area of Botswana. Since 1953, the area has been the scene of considerable advances of *G. m. centralis* populations from the south-west. In the project area, cattle and crop production are closely integrated, with an estimated 19,000 head of cattle. The first phase of the project lasted from 1 June 1986 to 1 March 1989. An area of 500 km² with relatively high tsetse density was chosen as the preliminary Trial Block. Control activities were later extended into a Main Block of 1500 km² and an Expansion Block of 1050 km². The targets used in the Trial Block were S type, consisting of a panel of black cloth flanked by panels of black netting, baited with acetone and 1-octen-3-ol and sprayed with deltamethrin. Altogether 2064 targets were deployed at an average density of 3.8 per km². The targets used in the Main Block consisted of black cloth alone: 1288 were deployed at an overall density of 2.3 per km² (3.7 per km² in tsetse suitable habitat). In the Expansion Block, 550 targets were used, the highest density in tsetse suitable habitat being 1.6 per km². Tsetse populations were monitored by a combination of methods: screen fly rounds, F3 traps and motor cycle mounted electric nets. Sentinel herds were used to assess the trypanosomiasis challenge in cattle. The first phase of the project has demonstrated that the target technology can be effectively applied in the Senanga West area against *G. m. centralis* which appears to have been eradicated from the Trial Block and throughout most of the Main Block. Small, isolated, residual infestations probably still exist in small clumps of woodland in part of the Main Block. Both types of target performed satisfactorily. Initial problems of leaking or clogging of the octenol bottle dispensers were overcome by switching to sachet dispensers. The persistence of the deltamethrin appeared to be adversely affected by the addition of black dye and ultra-violet inhibitor so the use of these compounds was discontinued. Major problems were encountered with the motor cycle mounted electric nets, the rough

tracks causing the mountings to break so frequently that this survey method had to be stopped. In general, the local inhabitants were enthusiastic about the targets: extension campaigns before the targets were deployed ensured that theft and vandalism were not a major problem. Experimental work undertaken on the development of target and trap designs and odour attractants suggests that some improvements are possible. The project objective of providing training to Zambian DVTCS staff has been successful at the junior level but less satisfactory at the professional level because of frequent staff changes. The economics of target deployment in the project have been subjected to detailed analysis. Over a 20 year time horizon the annualised costs of chemoprophylaxis compare favourably with those of target deployment. However, the cost of target deployment was considerably cheaper than the other two control options considered – aerial spraying and SIT. An economic analysis of the costs and benefits of trypanosomiasis control in the project area revealed that chemoprophylaxis and target deployment were both highly beneficial.

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

[See also **14**: nos. 6576, 6598.]

6581 **Dumont, P.J.P., 1988.** *Epidémiologie de la trypanosomiase: une enquête entomologique réalisée au ranch de l'OGAPROV, au Gabon, d'octobre 1984 à septembre 1985.* [Epidemiology of trypanosomiasis: an entomological investigation carried out at the OGAPROV ranch in Gabon from October 1984 to September 1985.] Thèse pour le Doctorat Vétérinaire (Diplôme d'Etat). Université Paul Sabatier, Toulouse. (Unpublished thesis.) 99 pp.

After a description of the ranch and an account of tsetse biology, the author describes the techniques he used to catch and dissect the flies and the results of the dissections. The epidemiological implications of the results are discussed.

6582 **Gibson, W., 1990.** Trypanosome diversity in Lambwe Valley, Kenya – sex or selection? *Parasitology Today*, **6** (11): 342-343.

Department of Pathology and Microbiology, University of Bristol Veterinary School, Langford, Bristol BS18 7DU, UK.

In 1980 a striking increase in the incidence of sleeping sickness and of cattle trypanosomiasis was seen in the Lambwe Valley, together with massive infestations of *Glossina pallidipes*. Isoenzyme characterisation showed great biochemical diversity of the *T. brucei* isolates, especially those from tsetse. Two possible explanations of this diversity are discussed by Gibson (who favours genetic exchange), and by Mihok and Otieno (who favour selection) in their reply (see **14**: no. 6589).

6583 **Gouteux, J.P., Okamba-Osseke, F. and Sinda, D., 1990.** Relation entre densité glossinienne et trypanosomose bovine: le cas d'un élevage en ranching de bétail N'Dama (Louboulou, Congo). [Relationship between tsetse density and bovine trypanosomiasis: case report of an N'Dama cattle ranch at Louboulou, Congo.] *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (1): 57-62.

ORSTOM, B.P. 893, Bangui, Central African Republic; Institut de Développement Rural, Université Marien Ngouabi, B.P. 69, Brazzaville, Congo; ORSTOM, B.P. 181, Brazzaville, Congo.

The authors report the results of an entomo-parasitological survey in the State Ranch of Louboulou, Bouenza region, Congo. Over a period of more than 5 months, the average tsetse density was 0.29 *Glossina palpalis palpalis* captured per day per trap. Although some specimens of *G. fusca congolensis* were also captured, the density of the latter species was quite insignificant. No trypanosomiasis was detected among the N'Dama cattle of the ranch, as a result of 114 blood samples collected for parasitological (fresh blood sample, Woo method, thick blood film) and serological examinations (Testryp CATT on whole blood and serum). The absence of detectable trypanosomiasis is discussed and interpreted as a result of a low tsetse challenge, below a critical threshold which remains to be determined.

6584 **Jacquet, P., 1989.** *Données récentes sur l'épidémiologie des trypanosomoses animales en Afrique.* [Recent data on the epidemiology of animal trypanosomiasis in Africa.] Thèse Vétérinaire, Lyon. (Unpublished thesis.) 224 pp.

50 Faubourg Ste Catherine, 57700 Hayange, France.

The animal trypanosomiasis in Africa are parasitic diseases whose transmission is assured by biological vectors (tsetse) or by mechanical means, with one exception: dourine in equids. An in-depth study, during the last ten years, of the relationships between hosts, parasites, vectors and environment, has clarified the complex epizootiological situation. As a result, one is able today to quantify trypanosomiasis risk by evaluating certain key factors. Human activities can sometimes promote the spread of the parasite but more often tend to reduce the incidence of the disease by the deployment of appropriate means, written into a control strategy defined at the time of preliminary investigations.

6585 **Madubunyi, L.C., 1990.** Ecology of *Glossina* species inhabiting peridomestic agroecosystems in relation to options for tsetse fly control. *In*: IAEA, 1990 (see 14: no. 6547), pp. 45-65.

Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Anambra State, Nigeria.

Unbaited blue biconical traps were used to sample populations of *Glossina* once a week from April 1984 to March 1988 in three peridomestic agroecosystems of the Nsukka area, Nigeria. Only *G. palpalis* and *G. tachinoides* were caught, the latter being more widespread and constituting 99.87% of the 16,862 tsetse flies caught. Serological analysis of 1764 fly midgut contents revealed that *G. tachinoides* had fed on reptiles, birds and mammals, with the domestic pig accounting for 88.08% of the 730 identifiable bloodmeals. The frequency distribution of flies in various stages of the trophic cycle showed that males and females feed at 2.88 ± 0.42 and 2.43 ± 0.44 day intervals, respectively. Of the 10,208 flies examined for trypanosomes, about 1% were infected with *Trypanosoma brucei* or *T. congolense* group trypanosomes, the latter accounting for 53% of the 111 mature infections encountered. The sex ratio in these fly populations was variable, being 1:1 in one agroecosystem but departing significantly from 1:1 in the others, differing markedly between biotopes and seasons. Flies were caught in greater numbers in biotopes containing domestic pigs, while the presence of man

depressed trap catches. The larger the pig population in an agroecosystem, the larger the *G. tachinoides* population. However, reduction in the pig population to below five triggered the collapse of one of the *G. tachinoides* populations, which disappeared following the removal of all the pigs. The fly populations exhibited marked seasonal fluctuations in apparent density, largely caused by routine agronomic practices. These density fluctuations undermine recruitment of new adults into the population, especially during the wet season. It is suggested that tsetse populations in this area, already being kept at low density by routine agricultural procedures, could be further reduced by combining insecticide-impregnated traps or targets with insect-proofing of the piggeries. Methods aimed at undermining the recruitment of young adults into tsetse populations, capitalising on naturally occurring sex ratio distortion as well as on maintaining populations of preferred hosts of the tsetse fly at low levels, should form part of integrated tsetse control packages. Selection of sterile male release sites and the number of sterile males to be released in them during SIT campaigns should take into account the sex ratio dynamics of target tsetse populations.

6586 **Maudlin, I., 1990.** Effect of rearing diet on the infection rate in flies released for the control of tsetse populations by sterile males. *In: IAEA, 1990* (see 14: no. 6547), pp. 201-206.

TRL, Department of Veterinary Medicine, University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK.

Sterilised males for use in SIT programmes are normally given a bloodmeal before release in order to reduce the risk of their acting as disease vectors, since infection at the first feed has been shown to be essential in establishing a *Trypanosoma brucei gambiense* or *T. b. rhodesiense* infection in the fly. Seven artificial tsetse diets produced in the IAEA Laboratory at Seibersdorf were tested to determine whether they were as effective as whole blood in inhibiting infections of *T. b. rhodesiense* in the flies. *Glossina morsitans morsitans* males were fed one meal of the diet and then starved for 3 days before the infective feed. None of these diets significantly altered the infection rate of the treated flies and the seven groups produced statistically homogeneous results, with a mean midgut rate of 16% (control flies fed pig blood: 17%). Flies infected as teneral with the same trypanosome stock produced midgut rates of 61%. Three of the diets were also tested with a *T. congolense* stock. There were no significant differences between flies fed artificial (mean midgut infection rate: 15%) and the whole blood diets (19%). *G. m. morsitans* infected as teneral with this trypanosome stock produced midgut rates of 66%. As with *T. brucei* s.l. infections, teneral flies were far more likely to develop a *T. congolense* infection than fed flies; this result suggests that all the tsetse flies used in SIT programmes should be fed before release in order to reduce the risk to both man and his livestock. Artificial diets are as effective as whole blood in inhibiting trypanosome infections. The effect of bloodmeal on the fly infection rates is discussed in relation to lectin production in fed flies.

6587 **Maudlin, I., Welburn, S.C. and Mehlitz, D., 1990.** The relationship between rickettsia-like-organisms and trypanosome infections in natural populations of tsetse in Liberia. *Tropical Medicine and Parasitology*, **41** (3): 265-267.

TRL, School of Veterinary Science, Langford, Bristol BS18 7DU, UK; *ibid.*; Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany.
 A survey of natural populations of tsetse flies for rickettsia-like-organisms (RLO) has been carried out in Liberia. A population of *Glossina p. palpalis* showed a strong association between trypanosome and RLO infection; both infections were at low levels in this species suggesting that this population is highly refractory to trypanosome infection. A small sample of *G. nigrofusca*, considered the most effective vector of trypanosomiasis in Liberia, was found to have very high prevalence of RLO infection. The selection pressures which could determine RLO infection rate are discussed.

6588 **Maudlin, I., Welburn, S.C. and Milligan, P., 1990.** Salivary gland infection: a sex-linked recessive character in tsetse? *Acta Tropica*, **48** (1): 9-15.
 TRL, ODA/University of Bristol, Langford House, Langford, Bristol BS18 7DU, UK; *ibid.*; Department of Biological Sciences, University of Salford, UK.

Male tsetse, when infected in the laboratory with trypanosomes of the subgenus *Trypanozoon*, usually produce greater salivary gland infection rates than females of the same species. We show that a single sex-linked gene model can be fitted to most recently published data for salivary gland infection rates in tsetse. The maturation of *Trypanosoma congolense* infections is shown to be independent of fly sex. The possible effects of genetic control of maturation of *Trypanozoon* infections in tsetse populations on the transmission of sleeping sickness are considered.

6589 **Mihok, S. and Otieno, L.H., 1990.** Trypanosome diversity in Lambwe Valley, Kenya – sex or selection? Reply. (Letter.) *Parasitology Today*, **6** (11): 353.

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

See **14**: no. 6582.

5. human trypanosomiasis

(a) SURVEILLANCE

[See also **14**: nos. 6597, 6610.]

6590 **Asonganyi, T., Aseaku, P.A., Nasah, D.M. and Lantum, D.N., 1990.** Can education of the community help sleeping sickness control: a study from Cameroon. *Tropical Doctor*, **20** (3): 104-106.

University Centre for Health Sciences (CUSS), University of Yaoundé, Yaoundé, Cameroon.

The percentage of a population participating in diagnosis and treatment sessions which can stop transmission of sleeping sickness is generally taken to be 80%. In the Fontem focus of Cameroon the participation rate is far less. A study of the reasons for this was undertaken by means of questionnaires and interviews. Of 120 adults studied, 50 had failed to report at primary screening sessions, 30 were immunological suspects who had failed to report for confirmation of infection, and 40 were former trypanosomiasis patients who had received treatment in the previous 2 years. Most of the people knew about the disease and the fact that it can only be treated in hospital, very few believing traditional remedies to be effective. The tsetse fly is well known in the area but 30% of the people failed to link it to sleeping sickness. The lumbar puncture was identified as a painful and

frightening procedure, and the leading deterrent, given by most respondents as the cause of their failure to turn up for screening, confirmation or treatment sessions: most did not know that it was essential for judicious choice of treatment regimen or that headache and backache are usual after it. Reactivation of community interest is essential to reduce the prevalence of the disease. This can be done through (i) education to increase awareness of the disease, its treatment and its vector, and (ii) involvement of the target population in the planning and execution of sleeping sickness control programmes.

6591 **Mbulamberi, D.B., 1990.** *Uganda Ministry of Health. National Sleeping Sickness Control Programme. Second quarterly report 1990.* 17 pp.

6592 **Mbulamberi, D.B., 1990.** *Uganda Ministry of Health. National Sleeping Sickness Control Programme. Third quarterly report 1990.* 21 pp.

National Sleeping Sickness Control Programme, P.O. Box 1241, Jinja, Uganda. During the two periods under review (April to June and July to September 1990) there were increases in the numbers of new cases of *rhodesiense* sleeping sickness in the Busoga region but decreases in Tororo and Mukono districts apart from an increase in Tororo district in the third quarter. However, these apparent decreases may have been the result of inadequate surveillance. The total numbers of new cases in south-eastern Uganda in the second and third quarters were 213 and 244 respectively, of which two-thirds were in the late stage of the disease. In the North-Western region new cases of *gambiense* sleeping sickness rose to 823 in the second quarter and declined to 448 in the third quarter. The population in this area is unstable because of the alternate influx of refugees, some already infected, and their return to southern Sudan in periods of relative calm. The integrated tsetse and trypanosomiasis control programme continued in Kitayunjwa, Nsinze and Namwendwa subcounties and was extended to Namwiwa subcounty of Kamuli district. The expansion and upgrading of Namungalwe Treatment Centre to a National Sleeping Sickness Training Centre was started in September and should be completed by April 1991. The activities of the NSSCP are very dependent on support from donor and external agencies and are currently suffering from a lack of funds and trained staff. This is resulting in less than adequate active surveillance, especially in north-western Uganda.

(b) PATHOLOGY AND IMMUNOLOGY

6593 **Gati, R., Tabaraud, F., Buguet, A., Bert, J., Tapie, P., Bittel, J., Sparkes, B., Breton, J.C., Doua, F., Bogui, P., Lonsdorfer, A., Lonsdorfer, J., Moulin, J., Chameaud, J. and Dumas, M., 1990.** Analyse circadienne du sommeil, de la température rectale et de variables immunologiques et endocrinologiques dans la maladie du sommeil: étude préliminaire. [Circadian analysis of sleep, rectal temperature, and immunological and endocrinological variables in sleeping sickness: pilot study.] *Bulletin de la Société de Pathologie exotique et de ses Filiales*, **83** (2): 275-282.

Gati: Laboratoire de Physiologie, Faculté des Sciences de la Santé, Niamey, Niger; Tabaraud, Bert, Tapie, Breton, Moulin, Chameaud, Dumas: Institut de Neurologie Tropicale, Faculté de Médecine, Limoges, France; Buguet, Bittel: Centre de Recherches du Service de Santé des Armées, La Tronche, France; Sparkes: Defence and Civil Institute of Environmental Medicine, Downsview,

Canada; Doua: Projet de Recherche Clinique sur la Trypanosomiase, Daloa, Côte d'Ivoire; Bogui: Laboratoire de Physiologie, Faculté de Médecine, Abidjan, Côte d'Ivoire; A. and J. Lonsdorfer: Laboratoire de Physiologie Appliquée, UER des Sciences Biomédicales, Strasbourg, France.

A multidisciplinary study was conducted in eight patients with neurological human African trypanosomiasis. The sleep-wake cycle followed an ultradian pattern which was more pronounced in patients with more severe clinical symptoms. The EEG trace was interrupted by numerous cyclic activation patterns consisting of K complexes, rapid elements and slow high-amplitude elements. Circadian rhythmicity was also disturbed in other variables, physiological (rectal temperature), immunological (interleukins) and hormonal (cortisol, prolactin), the disturbance being greater in more severely affected patients.

6594 **Seed, J.R., Sechelski, J.B. and Loomis, M.R., 1990.** A survey for a trypanocidal factor in primate sera. *Journal of Protozoology*, **37** (5): 393-400.

Department of Parasitology and Laboratory Practice, School of Public Health, University of North Carolina, Chapel Hill, NC 27514, USA; *ibid.*; Zoological Society of San Diego, P.O. Box 551, San Diego, CA 92112, USA.

The sera of 21 different species of primates were surveyed for the presence of a trypanocidal factor to a monomorphic human serum-sensitive clone of *Trypanosoma brucei gambiense*; human, gorilla, baboon (2 species) and the mandrill were found to contain this factor. The factor in all the sera is in the high density lipoprotein fraction, and has similar modes of biological action. It has been shown that the human and gorilla trypanocidal factor share cross-reactive antigenic epitopes, but do not share similar cross-reactive epitopes with the baboon and mandrill factor. There was no relationship between the presence or absence of this factor and the primate's position on the phylogenetic tree. In addition, there was also no obvious correlation between the animals' preferred diet, and the presence or absence of trypanocidal activity. The evidence to date suggests that only African ground-dwelling primates that live in tsetse endemic areas contain the trypanocidal factor. It is assumed that this factor is involved in resistance of these primates to *T. b. brucei*. We believe that the host has developed trypanocidal substances as a result of selective evolutionary pressure by the African trypanosomes.

(c) TREATMENT

6595 **Cook, G.C., 1990.** 'Exotic' parasitic infections: recent progress in diagnosis and management. [Editorial.] *Journal of Infection*, **20** (2): 95-102.

Hospital for Tropical Diseases, 4 St Pancras Way, London NW1, UK.

The author concentrates mainly on Chagas disease, leishmaniasis and the human filariases. A short section reviews recent advances in the chemotherapy of sleeping sickness.

6596 **Hamon, J.F., Seri, B., Doua, F., Camara, P. and Aba, L., 1990.** Effects of Mel B Arsobal and alpha-difluoromethylornithine on the awakening electroencephalogram of humans with *gambiense* trypanosomiasis disease: preliminary report. *Pharmacology Biochemistry and Behavior*, **36** (4): 831-835.

Haman, Seri, Camara: Laboratoire de Physiologie Animale et de Psychophysiologie, Faculté des Sciences et des Techniques d'Abidjan, 22 B.P. 582, Abidjan 22, Côte d'Ivoire; Doua, Aba: Projet de Recherches Cliniques sur la Trypanosomiase, B.P. 1425, Daloa, Côte d'Ivoire.

Five males and three females, at the encephalic stage of sleeping sickness, were submitted to trypanocide therapies. Three of the patients were treated with the Mel B Arsobal drug, the five others with difluoromethylornithine, using different protocols. Awakening electroencephalographic data were obtained prior to treatment and at regular intervals during and after treatment. Prior to treatment the awakening tracings showed important abnormalities (slow delta waves were superimposed on theta background rhythms). During treatment (except in one patient treated with Arsobal) recordings returned gradually to fast rhythms, and several days after therapy tracings returned to the normal awakening patterns. The use of the awakening electroencephalogram as a tool to test effects of curative drugs in the sleeping sickness syndrome is discussed.

6597 **Kirchhoff, L.V., 1990.** Trypanosomiasis: Chagas' disease and sleeping sickness. *Current Opinion in Infectious Diseases*, **3** (3): 414-419.

University of Iowa and Department of Veterans Affairs, Medical Center, Iowa City, IA, USA.

The author briefly discusses parasite biology, epidemiology, diagnosis and treatment.

6. animal trypanosomiasis

(a) SURVEY AND DISTRIBUTION

[See also **14**: no. 6610.]

6598 **Asonganyi, T., Suh, S. and Tetuh, M.D., 1990.** Prevalence of domestic animal trypanosomiasis in the Fontem sleeping sickness focus, Cameroon. *Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux*, **43** (1): 69-74.

CUSS, University of Yaoundé, Yaoundé, Cameroon; Sector of Preventive Medicine and Rural Health Services, Autonomous Sector, Fontem, Cameroon; Veterinary Services, Fontem, Cameroon.

Three hundred and four domestic animals (114 goats, 93 sheep, 67 dogs and 30 pigs) in the Fontem sleeping sickness focus (Cameroon) were screened for infection with trypanosomes using parasitological and serological tests.

Nannomonas was the only sub-genus detected in the animals with a prevalence of 28.3%. The card agglutination test (Testryp CATT) for trypanosomiasis showed a positivity rate of 38.2%, indicating that it allowed a better estimation of animal trypanosomiasis. The absence of trypanosomes of the sub-genus *Trypanozoon* seems to indicate that human African trypanosomiasis is not a zoonosis in this sleeping sickness focus.

6599 **Ekejindu, G.O.C., 1990.** Surveillance of tsetse fly and cattle populations for trypanosomes in the BICOT area during the sterile insect technique control programme. *In: IAEA, 1990* (see **14**: no. 6547), pp. 115-128.

Department of Applied Microbiology, Anambra State University of Technology, P.M.B. 5025, Awka, Anambra State, Nigeria.

Between March 1984 and March 1988 animal surveys for bovine trypanosomiasis were conducted periodically on resident herds in the BICOT Project area in Lafia, Plateau State, Nigeria, using standard detection methods. Over a specified period sentinel herds were also examined in selected locations within the project area. Fly trapping and dissection were similarly used for trypanosome screening of wild and released flies. In both resident and sentinel herds, infections were detected consistently, showing the persistence of the disease throughout the period of the survey. Fly trapping and dissection revealed that the target species, *Glossina*

palpalis palpalis, was effectively eliminated from the control zone, or may be persisting only at an undetectable level. However, *G. tachinoides* was present in most of these areas and may therefore have been responsible for the persistence of infection. Infection among resident herds could have also been due to their migratory activities, taking them to areas outside the control project.

6600 **Faul, A., 1988.** Dourine in South Africa. (Letter.) *Journal of the South African Veterinary Association*, **59** (1): 7.

Private Bag X318, 0001 Pretoria, South Africa.

Serological tests for *Trypanosoma equiperdum* performed between April 1981 and March 1985 were positive in 38 (1.08%) of 3509 horses from Allerton, in 40 (0.85%) of 4719 from Middleburg and in 1 (0.03%) of 3841 from Stellenbosch, South Africa. In the Natal region the prevalence decreased from 2.3% in 1981/82 to 0.2% in 1984/85.

6601 **Puglisi, G., Sartirano, G.R. and Ferrari, A., 1989.** Cooperazione italiana in Repubblica centro-africana per una ricerca epidemiologica e miglioramenti zootecnici. [Italian cooperation in the Central African Republic in epidemiological research and zootechnical improvement.] *Obiettivi e Documenti Veterinari*, **10** (7-8): 53-60.

A disease survey in a sample of 2.5% of the cattle population in the Central African Republic gave a prevalence of 6.4% for trypanosomiasis: 641 of 9910 adult cattle were positive to Giemsa staining of blood smears (*Trypanosoma vivax* 375, *T. congolense* 228, *T. brucei* 2 and mixed *T. vivax/T. congolense* 36).

Prevalences of 9.8% for brucellosis and 69.2% for gastrointestinal nematodes and coccidia were also found.

(b) PATHOLOGY AND IMMUNOLOGY

[See also 14: no. 6594.]

6602 **Miert, A.S.J.P.A.M. van, Duin, C.T.M. van and Koot, M., 1990.**

Effects of *E. coli* endotoxin, some interferon-inducers, recombinant interferon- α_{2a} and *Trypanosoma brucei* infection on feed intake in dwarf goats. *Journal of Veterinary Pharmacology and Therapeutics*, **13** (3): 327-331.

Department of Veterinary Basic Sciences, Division of Pharmacology, Pharmacy and Toxicology, Faculty of Veterinary Medicine, Utrecht University, P.O. Box 80176, 3508 TD Utrecht, Netherlands.

The aim of the present study was to investigate the anorectic effects of the interferon-inducers Poly I:Poly C and Newcastle disease virus (NDV), recombinant human interferon IFN- α_{2a} , *Escherichia coli* endotoxin and *T. brucei* infection. In the first series of experiments 10 goats received i.v. *E. coli* and 3 weeks later 6 of them were treated with Poly I:Poly C. Eight different goats were given NDV and, 3 weeks later, IFN- α_{2a} i.m. All pyrogenic agents induced inappetence associated with fever but *E. coli* was the most potent anorectic. No clear relationship was found between the body temperature responses and the decreases in feed intake. In the second series of experiments, 6 goats were infected with *T. brucei* 1066 by i.v. inoculation with $c. 10^7$ trypanosomes per animal. Four days later, febrile reactions and inappetence occurred, coinciding with parasitaemia. Again, no clear relationship could be found between febrile episodes and decreased feed consumption. The possible mechanisms involved in the induction of fever and of inappetence during infection, and their relationship,

are discussed.

6603 **Mwangi, D.M., Hopkins, J. and Luckins, A.G., 1990.** Cellular phenotypes in *Trypanosoma congolense* infected sheep: the local skin reaction. *Parasite Immunology*, **12** (6): 647-658.

Mwangi, Luckins: CTVM, Easter Bush, Roslin, Midlothian, EH25 9RG, UK; Hopkins: Department of Veterinary Pathology, University of Edinburgh, Edinburgh, UK.

Mononuclear cell subpopulations in local skin reactions (chancres) in sheep infected with metacyclic forms of *T. congolense* were studied by indirect immunoperoxidase staining using a panel of monoclonal antibodies specific for ovine leucocyte subsets. Morphometric analysis revealed significant increases in numbers of cells expressing CD5, CD4, CD8, CD45R (mainly B cells), major histocompatibility complex (MHC) class II antigens, Fc receptors (FcR) on macrophages (VPM32) and FcR on B cells and macrophages (VPM33) from 5 days post-infection. B cells which also expressed MHC class II were found mainly in dense aggregates. The CD4/CD8 ratios were raised over pre-infection levels at 5-7 days post-infection. In sheep which had been infected, treated with trypanocidal drugs and then challenged with an heterologous serodeme of *T. congolense*, changes in cellular phenotype kinetics were similar to those seen in the skin in primary infections. Sheep superinfected with either an homologous or an heterologous *T. congolense* serodeme showed only mild cellular infiltration and slight increases in various cellular phenotypes at the sites of inoculation.

6604 **Taiwo, V.O., Nantulya, V.M., Moloo, S.K. and Ikede, B.O., 1990.** Role of the chancre in induction of immunity to tsetse-transmitted *Trypanosoma (Nannomonas) congolense* in goats. *Veterinary Immunology and Immunopathology*, **26** (1): 59-70.

ILRAD, P.O. Box 30709, Nairobi, Kenya; *ibid.*; *ibid.*; Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria. (Correspondence to Nantulya.) Local skin reactions (chancres) developed in goats at the sites of deposition, by tsetse flies, of metacyclics of *Trypanosoma congolense*. The chancres developed much faster and were more pronounced when ten infected tsetse were allowed to feed on a spot as compared to only one fly per spot. The initial host cellular reaction in the chancre was predominantly polymorphonuclear, followed at the peak of development of the chancre by a predominantly lymphoblastic and plasmacytic reaction. Trypanosomes were found in various stages of division as well as degeneration in chancre biopsies taken at various days post-infection (p.i.). Most of the trypanosomes recovered from the chancre tissue fluid were found to bear the same variable surface glycoprotein (VSG) epitopes as the corresponding metacyclics for as long as 13 days p.i., as revealed by indirect immunofluorescence using mouse anti-metacyclic VSG hyperimmune sera and monoclonal antibodies. Immunisation of goats with metacyclic trypanosomes, by exposure to infected tsetse bites followed by treatment of the infected goats on day 13 p.i., gave rise to the development of protection to homologous tsetse-transmitted challenge, whilst immunisation by intravenous inoculation of the metacyclics did not induce such protection. Chancre formation would thus appear to be vital for the induction of comprehensive immune recognition of the metacyclic variable antigen repertoire deposited in the skin by infected tsetse, and hence the development of protective immunity.

(c) TRYPANOTOLERANCE

6505 **Agyemang, K., Dwinger, R.H., Touray, B.N., Jeannin, P., Fofana, D. and Grieve, A.S., 1990.** Effects of nutrition on degree of anaemia and liveweight changes in N'Dama cattle infected with trypanosomes. *Livestock Production Science*, **26** (1): 39-51.

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

The degree of anaemia, as measured by PVC percent in 2-5-year-old female N'Dama cattle during the first month of detectable trypanosome infection, and the pattern of recovery from anaemia during the first 3 and 6 months post-infection were compared for four groups of cattle of which two groups served as controls. Group 1 consisted of 13 cattle kept under village management conditions which became infected with *Trypanosoma congolense* while grazing in woodlands and natural unimproved pastures. The 13 cattle of Group 2 were managed similarly to Group 1 but were not infected and constituted the first control group. Groups 3 and 4, with 14 cattle each, were kept in the same village but received, in addition to grazing, 4 kg per head day⁻¹ of a mixture of rice bran, groundnut cake, milled *Andropogon* hay and common salt. Cattle in Group 3 became infected with the same species of trypanosome as Group 1. Cattle in Group 4 were not infected and served as the second control group. Results from these comparisons showed that during the first 4 weeks after infection cattle in Group 3 developed anaemia to the same degree as those in Group 1, but recovered from the anaemia more rapidly. It is concluded that plane of nutrition in N'Dama plays an important role in the rate of recovery from anaemia produced by trypanosome infections and the lack of adequate nutrition that occurs under field conditions would constitute a stressful condition that could weaken the degree of trypanotolerance of the animals.

6606 **Trail, J.C.M., d'Ieteren, G.D.M., Colardelle, C., Maille, J.C., Ordner, G., Sauveroché, B. and Yangari, G., 1990.** Evaluation of a field test for trypanotolerance in young N'Dama cattle. *Acta Tropica*, **48** (1): 47-57.

ILCA, P.O. Box 46847, Nairobi, Kenya; *ibid.*; OGAPROV, Moanda, Gabon; *ibid.*; *ibid.*; *ibid.*; *ibid.*

In three separate tests in 1987, 1988 and 1989, a total of 436 one-year-old N'Dama cattle were maintained for 12, 18 and 24 weeks under a medium natural tsetse-trypanosome challenge in Gabon, Central Africa. Matching health and performance data were recorded on 4, 10 and 13 occasions respectively, to allow simultaneous evaluation of the effect of different criteria of trypanotolerance on animal performance. Under trypanosome prevalences of 25, 31 and 9%, respectively, ability to control the development of anaemia had a very major effect on daily weight gain, four times that of the ability to control parasitaemia, while previous exposure to trypanosome infection from birth to one year had no effect. Anaemia control, measured by average packed red cell volume percent (PCV) over the test period or by lowest PCV reached, was more closely associated with animal performance than when measured by average PCV when detected as parasitaemic. Above-average PCV values in the first two measures resulted in a 44% to 48% superior daily weight gain over below-average PCV values. PCV post-test recovery was shown to be rapid following a single trypanocidal drug treatment. In practice, it appeared that a suitable field test would be where natural infection could be effected as early in the test as possible

and anaemia control measurements carried out over 6 weeks of detected parasitaemia. A field test would become even more feasible if satisfactory correlation could be obtained between the results of natural infection and those of an experimental alternative.

6607 **Trail, J.C.M., d'Ieteren, G.D.M., Feron, A., Kakiese, O., Mulungo, M. and Pelo, M., 1990.** Effect of trypanosome infection, control of parasitaemia and control of anaemia development on productivity of N'Dama cattle. *Acta Tropica*, **48** (1): 37-45.

ILCA, P.O. Box 46847, Nairobi, Kenya; *ibid.*; Compagnie J. van Lancker, Kinshasa, Zaire; *ibid.*; *ibid.*; *ibid.*

One hundred and forty six calving interval records were built up from 64 N'Dama cows maintained for 3.5 years under a high natural tsetse challenge in Zaire. Matching health and performance data were recorded monthly to allow simultaneous evaluation of the effects of different criteria of trypanotolerance represented by time detected parasitaemic, parasitaemia score and packed red cell volume percent (PCV) on reproductive performance, calf weaning weight and cow productivity. Control of development of anaemia, measured by PCV value during trypanosome infection, had the major effect on all three performance traits. The repeatability of this criterion (0.33) was almost equal to that of calf weaning weight, indicating PCV measurement might be suitable for identification of more trypanotolerant animals. Simultaneous evaluation of the relative effects of control of development of anaemia in both the pre-weaner calf and its dam, on calf performance, suggested that its measurement in an animal might be feasible at an early post-weaner stage. Guidelines for work to develop practical field tests for trypanotolerance involving post-weaners maintained for varying lengths of time in high natural challenge situations are suggested.

(d) TREATMENT

6608 **Onyeyili, P.A. and Anika, S.M., 1990.** Effects of the combination of DL- α -difluoromethylornithine and diminazene aceturate in *Trypano-soma congolense* infection of dogs. *Veterinary Parasitology*, **37** (1): 9-19.

Department of Veterinary Physiology and Pharmacology, Faculty of Veterinary Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria; Department of Veterinary Physiology and Pharmacology, Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria.

The therapeutic activity of a combination of difluoromethylornithine (DFMO) with diminazene aceturate was investigated in mongrel dogs experimentally infected with *T. congolense*. The criteria used in the assessment of the trypanocidal effect of the therapy include the examination of the blood for parasites, as well as clinical and haematological changes at intervals following treatment. Diminazene aceturate and DFMO alone and in combination produced intermittent aparasitaemia in the dogs. Although relapse infection occurred with all three treatment regimes, the drug combination gave the best result. The packed red cell volume, haemoglobin concentrations and red blood cell values decreased significantly following parasite inoculation but increased after treatment. The total leucocyte counts decreased in all the infected dogs but improved with treatment, and the differential leucocyte counts indicated neutropenia in all the infected animals prior to treatment.

6609 **Tayou Kamgue, R.A., 1989.** *Mise au point de nouvelles techniques de dosage de l'isometamidium (Trypamidium^ε, Samorin^ε) et ses metabolites dans les milieux biologiques: application pharmaco-cinétique chez le bovin.* [Trial of new techniques for measuring the quantity of isometamidium and its metabolites in biological mediums: pharmacokinetic application in cattle.] Thèse de Diplôme de Doctorat, Université Claude-Bernard-Lyon I. (Unpublished thesis.) 215 pp. The objective of this study was to measure the quantity of isometamidium and its metabolites in the blood, tissue and secretory and excretory products (milk, bile, faeces and urine) of cattle after a single intramuscular or intravenous injection at 0.5 mg/kg. The author describes the new techniques he developed for extracting the drug and its metabolites from the various body products and for measuring them by means of 'paired ion' high performance liquid chromatography. These techniques allowed the measurement of the drug in blood for 1 month after i.m. treatment and for 7 days after i.v. treatment at concentrations above 2.6 ng/ml. They also allowed concentrations of the drug to be determined in milk, in the brain and in other body tissues and confirmed its affinity for the liver and the kidney. The drug's metabolites were also demonstrated, in the sulpho- and/or glucuro-conjugated forms, in the bile, the faeces and the urine. Isometamidium was shown to be distributed and eliminated rapidly, particularly in young animals. It is eliminated mostly metabolised, but also in its pure state, essentially in the faeces but also in the urine and the milk. Elimination is much slower when the drug has been given by the i.m. route (beyond 3 months in the faeces).

7. experimental trypanosomiasis

(a) DIAGNOSTICS

6610 **Levine, R.A. and Wardlaw, S.C., 1988.** A new technique for examining blood. *American Scientist*, **76** (6): 592-598.

47 Clapboard Hill Road, Guilford, CT 06437, USA.

A quantitative method of analysing the 'buffy coat' in centrifuged blood using acridine orange staining is described. Its use in the diagnosis of trypanosomiasis and other diseases is discussed.

(b) PATHOLOGY AND IMMUNOLOGY

[See also **14**: nos. 6629, 6630, 6666.]

6611 **Ahmed, J.S., Schmid, G. and Hörchner, F., 1990.** Production of interleukin 2 and expression of interleukin 2 receptors by pony peripheral blood lymphocytes after stimulation with a soluble fraction of *Trypanosoma evansi*. *Journal of Veterinary Medicine (B)*, **37** (8): 631-637.

Institut für Parasitologie und Tropenveterinärmedizin, Freie Universität Berlin, Königsweg 65, 1000 Berlin 37, Germany.

(c) CHEMOTHERAPEUTICS

[See also **14**: no. 6642.]

6612 **Akanji, M.A., 1989.** Pentamidine-induced rat kidney lysosomal membrane damage *in vitro*. *Nigerian Journal of Science*, **23** (1-2): 149-152.

Biochemistry Department, University of Ilorin, P.M.B. 1515, Ilorin, Kwara State, Nigeria.

- 6613 **Asuzu, I.U. and Chineme, C.N., 1990.** Effects of *Morinda lucida* leaf extract on *Trypanosoma brucei brucei* infection in mice. *Journal of Ethnopharmacology*, **30** (3): 307-313.
Asuzu: Department of Veterinary Physiology and Pharmacology, University of Nigeria, Nsukka, Nigeria.
- 6614 **Betbeder, D., Klæbe, A., Perie, J.J. and Baltz, T., 1990.** Anti-trypanosomal compounds. I. *In vivo* and *in vitro* activity of inhibitors of glycolysis in trypanosomes. [*T. equiperdum*, *T. brucei*; mice.] *European Journal of Medicinal Chemistry*, **25** (7): 549-555.
Perie: Groupe de Chimie Organique Biologique, UA CNRS 454 et 470, Université Paul Sabatier, 118 route de Narbonne, 31062 Toulouse Cedex, France.
- 6615 **Bitonti, A.J., Byers, T.L., Bush, T.L., Casara, P.J., Bacchi, C.J., Clarkson, A.B., McCann, P.P. and Sjoerdsma, A., 1990.** Cure of *Trypanosoma brucei brucei* and *Trypanosoma brucei rhodesiense* infections in mice with an irreversible inhibitor of S-adenosylmethionine decarboxylase. *Antimicrobial Agents and Chemotherapy*, **34** (8): 1485-1490.
Bitonti: Merrell Dow Research Institute, Cincinnati, OH 45215, USA.
- 6616 **Dreyfuss, G., Penicaut, B., Parrondo-Iglesias, E., Craciunescu, D., Dubost, G. and Nicolas, J.A., 1990.** Activité trypanocide et cinétique plasmatique de la cis-Pt(II) pentamidine chez le mouton parasité. [Trypanocidal activity and plasmatic pharmacokinetics of cis-Pt(II) pentamidine in experimental sheep trypanosomiasis.] [*T. b. brucei*.] *Bulletin de la Société de Pathologie exotique et de ses Filiales*, **83** (3): 367-375.
Dreyfuss: Laboratoire de Parasitologie, Faculté de Pharmacie, 2 rue du Docteur-Marcland, 87025 Limoges Cedex, France.
- 6617 **Dreyfuss, G., Penicaut, B., Wolf, J.G., Dubost, G. and Nicolas, J.A., 1990.** Cinétique plasmatique d'un spiroarsorane trypanocide chez le mouton parasité. [Plasmatic pharmacokinetics of a trypanocidal spiroarsorane derivative in experimental sheep trypanosomiasis.] [*T.b. brucei*.] *Bulletin de la Société de Pathologie exotique et de ses Filiales*, **83** (3): 360-366.
Dreyfuss: Laboratoire de Parasitologie, Faculté de Pharmacie, 2 rue du Docteur-Marcland, 87025 Limoges Cedex, France.
- 6618 **Kini, G.D., Henry, E.M., Robins, R.K., Larson, S.B., Marr, J.J., Berens, R.L., Bacchi, C.J., Nathan, H.C. and Keithly, J.S., 1990.** Synthesis, structure, and antiparasitic activity of sulfamoyl derivatives of ribavirin. [Incl. *T. brucei*; mice.] *Journal of Medicinal Chemistry*, **33** (1): 44-48.
Kini: ICN-Nucleic Acid Research Institute, 3300 Hyland Avenue, Costa Mesa, CA 92627, USA.
- 6619 **Owolabi, O.A., Makanga, B., Thomas, E.W., Molyneux, D.H. and Oliver, R.W.A., 1990.** Trypanocidal potentials of African woody plants: *in vitro* trial of *Khaya grandifoliola* seed extracts against *Trypanosoma brucei brucei*. *Journal of Ethnopharmacology*, **30** (2): 227-231.
Owolabi, Thomas, Molyneux, Oliver: Department of Biological Sciences, University of Salford, Salford M5 4WT, UK; Makanga: Department of Zoology, Makerere University, Uganda.

6620 **Stauffert, I., Paulini, H., Steinmann, U., Sippel, H. and Estler, C.-J., 1990.** Investigations on mutagenicity and genotoxicity of pentamidine and some related trypanocidal diamidines. *Mutation Research*, **245** (2): 93-98.

Stauffert: Institut für Pharmakologie und Toxikologie, LS Toxikologie, Universitätsstrasse 22, D-8520 Erlangen, Germany.

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The meeting was held because of the urgent need for new drugs for the three diseases and because of the feeling in TDR that it was time for theory to give way to practice. The objectives of the meeting were thus: to review the possibility of a common strategy for drug development against the three diseases; to identify current potential therapeutic targets and chemical leads; to identify gaps in knowledge; and to propose a plan of action for drug development. The first part of this report consists of summaries of 15 presentations made by a variety of international experts. The second part contains recommendations for action. For African trypanosomiasis recommendations include: (i) Facilitate increased use of DFMO on its own and stimulate research on its use in mixtures, e.g. with MDL 73,811; (ii) Consider possible advantages and disadvantages of Ro-0216 and, if usefulness seems doubtful, abandon work; (iii) Promote drug discovery in the areas of trypanothione and microtubules, encouraging synthesis and screening.

8. trypanosome research

(a) CULTIVATION OF TRYPANOSOMES

(b) TAXONOMY, CHARACTERISATION OF ISOLATES

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

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