Preparing for tsetse eradication

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TSETSE-FLIES OCCUR THROUGHOUT MOST of sub-Saharan Africa, over an area approaching 10 million km^2. They suck blood and transmit a range of trypanosome species, including those that cause human sleeping sickness, and others that are responsible for a fatal syndrome of anaemia and wasting in cattle known as 'nagana' (from a Zulu word meaning to be low or depressed in spirit). Not only does this limit the availability of meat and dairy products, it also curtails the availability of oxen or horses for transport and ploughing. This severely restricts agricultural production. Without oxen, only small areas of land can be tilled by hand, leaving communities vulnerable to food shortages, hunger, and even famine.

Since the 1960s, the incidence of sleeping sickness has risen steadily, with epidemic outbreaks in several areas. The World Health Organization (WHO) now estimates that over 300 000 people are infected with African trypanosomiasis, and the UN Food and Agriculture Organization estimates that economic losses due to the livestock infections may reach around US$4.5 billion each year.

Because African trypanosomes are able to present successive waves of different surface proteins (a process known as 'antigenic variation'), it is unlikely that an effective vaccine can be developed. Treatment is possible, but relies largely on antiquated drugs such as melarsoprol, which is — loosely speaking — a mixture of arsenic and anti-freeze that will kill up to 10% of those treated (although all would succumb to the disease without treatment). There are other drugs with less severe side effects, and the WHO has now arranged that these can be provided free of charge to national treatment programmes. But it is a difficult task to find, diagnose, and treat all the patients who require such care.

Recognizing the problems of tsetse-borne trypanosomiasis, the heads of state and government of the 36 affected countries, meeting at the 2000 OAU summit in Togo, declared as priority the aim of *'rendering Africa free of tsetse in the shortest time possible'*. In response, the OAU (now the African Union) has set up a Pan-African initiative (known as AU-PATTEC) to promote and coordinate national and regional programmes to eliminate the problem of tsetse and trypanosomiasis. Several countries have already reflected this goal in their official poverty reduction strategy papers, developing or revitalizing their national programmes, and the African Development Bank is now providing a series of grants and loans through PATTEC to assist the first six countries (Ethiopia, Uganda, Kenya, Mali, Burkina Faso and Ghana) in their tsetse elimination programmes. Further grants are under discussion.

Techniques to eliminate tsetse have been known since the eradication of *Glossina palpalis* from the Island of Principe in 1914, using a form of sticky traps carried by plantation workers. Today, a series of highly effective techniques is available, including an array of odour-baited traps and targets, sequential aerial spraying with ultra-low doses of biodegradable insecticides, and, where necessary, SIT — the use of sterilized male flies to reduce the already low reproductive rate of wild tsetse. The 'proof-of-principle' of this technological package was successfully demonstrated by eradication of tsetse (*Glossina austeni*) from the Island of Zanzibar during the 1990s. Zanzibar is now a nett exporter of meat and dairy produce, where previously it was a nett importer when tsetse and trypanosomiasis limited cattle and agricultural production.

But this demonstration of the feasibility of tsetse elimination has been criticized, on the grounds that Zanzibar is a relatively small island whereas Africa is a rather large continent. So, the African Union, together with other organizations supporting the PATTEC initiative, is harnessing modern techniques of population genetics and geographic information systems (GIS) in order to find the 'biological islands' of tsetse distribution within the continent of Africa, so that these populations can be progressively targeted for elimination. The work is supported by the Leverhulme Trust in England, through a network currently involving research institutions in 19 African countries, the United Kingdom, France, and the United States.

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The article on page 132 of this issue presents the first study resulting from this new initiative. It is a comparison between gene sequencing and the developing science of morphometry as a means to differentiate tsetse populations. The techniques of geometric morphometry are statistically complex, but offer a very rapid way to screen large numbers of individuals (similar techniques are now used by the US immigration services to identify travellers by means of morphometric analysis of photographs taken when you present your passport).

Those familiar with Greek mythology will perhaps recognize the concept of Procrustean analysis, through which shapes are compared by measuring the deformations required to superimpose one shape on another. (Procrustes was reputed to fit his victims into a bed — stretching them if they were too short, cutting their extremities if they were too long.) And although morphometrics relies on phenetic rather than genetic characters, the preliminary study reported here reveals strong congruence between the two, offering hope that the large-scale analysis required in preparation for effective tsetse elimination can be carried out quickly and at low cost. ❑

NSTF awards for 2004

The National Science & Technology Forum (NSTF) has made the following awards for 2004, from many more nominations than in previous years. Category: Individual over a lifetime: **George F.R. Ellis** (University of Cape Town); individual through research and its outputs over the last five years or less: **Paul D. van Helden** (University of Stellenbosch); individual through activities other than research and its outputs over the last five years or less: **Steve J. Lennon** (Eskom); corporate organization over the last 10 years: the joint winners are **Kirstenbosch Research Centre, South African National Biological Institute**, Cape Town, and **Kumba Resources Research and Development**, Pretoria; SMME over the last three years: **Groupline Technical Ceramics (Pty) Ltd**, Jet Park, Ekurhuleni; not-for-profit organization over the last three years: **Agribusiness for Sustainable Natural African Plant Products** (Stellenbosch); Eskom Research Capacity Development Awards: **S. Priscilla Reddy** (Medical Research Council) and **Jonathan D. Jansen** (University of Pretoria); T.W. Kambule NRF Research Awards (senior black researchers): **Olive Shisana** (Human Sciences Research Council) and **Giovanni Hearne** (University of the Witwatersrand); (junior black researchers): **Debra Meyer** (University of Johannesburg) and **Vikash Sewram** (Medical Research Council).