

African Trypanosomiasis Summary

Introduction

1. This note provides a brief summary of an analysis undertaken by a DISCONTTOOLS group of experts on African trypanosomiasis. They reviewed the current knowledge on the disease, considered the existing disease control tools, identified current gaps in the availability and quality of these control tools and finally suggested the research necessary to develop new or improved tools. Full details can be downloaded from the web site at <http://www.discontools.eu/> by selecting Disease Database, then the specific disease and highlighting the variables of interest. This is completed by selecting “create a report” which can then be downloaded as either a PDF or Excel spread sheet.

Disease profile

2. Trypanosomiasis is caused by trypanosome protozoans that inhabit the blood plasma, the lymph and various tissues of their hosts. Human African Trypanosomiasis (HAT), or sleeping sickness, only occurs in Sub-Saharan Africa and is caused by two subspecies of *Trypanosoma brucei*: *T. b. gambiense* and *T. b. rhodesiense*. Untreated, the disease is always fatal in humans and devastating epidemics have occurred over the last century.
3. African Animal Trypanosomiasis (AAT) is caused by a number of trypanosome species and subspecies. The most important species, *Trypanosoma congolense*, *T. vivax* and *T. brucei* subsp. *brucei* have a wide host range among domesticated and wild animals.
4. Both HAT and AAT are mainly transmitted through the bite of tsetse flies, *Glossina* species, which occur in Sub-Saharan Africa. A wide range of wild and domestic animals can act as reservoirs of the parasites. Tsetse-transmitted animal trypanosomiasis cause acute to chronic disease with signs including intermittent fever, anaemia, loss of appetite and weight in acute forms, and emaciation and eventually death in chronic forms; morbidity and mortality rates can be high. Wild mammals and some domestic animal breeds, including certain African humpless *Bos taurus* and small ruminant breeds, possess a certain degree of tolerance to the infection and appear to be able to control the anaemia it causes. East African Zebu cattle exhibit tolerance to *T. brucei* s.l.
5. Certain trypanosome species do not require tsetse flies for transmission. These include *T. equiperdum* in equids spread by sexual transmission and *T. evansi* that is transmitted mechanically by non-tsetse haematophagous insects. *T. vivax* can also be transmitted by haematophagous insects other than tsetse flies. These non-tsetse transmitted trypanosomes have a wider distribution occurring in Asia and Latin America and other regions as well as Africa. *T. evansi* and *T. vivax* are pathogenic for a very wide range of mammals and cause disease ranging from acute to chronic. Maternal transmission of *T. b. gambiense* may be a far greater risk than previously thought.
6. Several approaches can be used to reduce or eliminate tsetse fly populations including traps, insecticide-impregnated targets, insecticides applied from aircraft and the sterile insect technique. Control or elimination of the tsetse fly in affected areas is, however, complex and costly and where it has been achieved, preventing reinvasion can be difficult.

Risk

7. HAT affects mostly poor populations living in remote rural areas of Africa. Travellers visiting the sub-Saharan part of the continent may also become infected when they travel through tsetse infested zones. It is difficult to assess the current situation in a number of endemic countries because of a lack of surveillance and diagnostic expertise. In 2007, the number of new cases reported was 10 769. Recently, country level, WHO, bilateral and NGO HAT control programmes claim to have brought the resurgence of the disease under control, although HAT continues to be under-reported in most affected communities.
8. AAT occurs in 37 sub-Saharan countries covering about 9 million km² and threatens an estimated 50 million head of cattle.

Diagnostics

9. There are no commercially available kits for the diagnosis of AAT. Several parasite detection techniques can be used, including the microscopic examination of wet and stained thick or thin blood films or examination of the buffy coat following blood centrifugation. PCR techniques are highly specific and sensitive and can identify parasites at the genus, species or subspecies level.
10. Indirect fluorescent antibody tests and ELISAs are routinely used for the detection of antibodies in cattle. They have high sensitivity and specificity but as antibodies persist for weeks or months after all trypanosomes have disappeared from the animal a positive result is no proof of active infection. Improved and simpler techniques for the diagnosis of animal trypanosomiasis are required.
11. For detection of human HAT, the CATT test is used to detect antibody for *T.b. gambiense* infection. Microscopy or less frequently, DNA based tests are applied for *T.b. rhodesiense*. The application of PCR based tests for both *T.b. gambiense* and *T.b. rhodesiense* identifies greater numbers of putative positive individuals, however treatment for HAT is only applied when parasites are visualised.

Vaccines

12. No vaccines are available at the present time. The prospects of developing a vaccine are very poor as trypanosomes have evolved a system to evade the host's immune system by varying the structure of their surface coating. Research on specific and stable immunodominant antigens or recombinant immunoproteins may help in progressing towards the development of a vaccine.

Pharmaceuticals

13. Treatment in humans is expensive and, in the later stages of the disease, treatment itself involves some 5% mortality.
14. Trypanocidal drugs for use in cattle and other animals are limited to three compounds, diminazene aceturate, homidium and isometamidium chloride. Drugs are used both therapeutically and prophylactically. Prophylactic use of trypanocidal drugs to prevent the disease in animals can also protect people since in many rhodesiense HAT areas domestic cattle are now the main reservoir of the human infective *T. b.rhodesiense*. Trypanocidal drugs are becoming more expensive and their efficacy is reduced by the appearance of chemoresistance. No new and cheap animal trypanocides have been developed.
15. Tsetse control by applying insecticide to cattle has been shown to be effective by reducing the numbers of tsetse in an area which in turn means fewer cattle will be bitten.

Knowledge

16. Gaps in knowledge remain. The immunology of animal trypanosomiasis is not well understood and requires further investigation. The presence of *T.b. rhodesiense* and *T.b. gambiense* DNA in individuals within HAT foci who show no clinical signs of HAT is not understood and will require development of protocols for monitoring and/or treatment and a change in WHO policy. The impact of climate change on AAT and HAT is largely unknown.
17. Optimal intervention strategies are not understood for all tsetse fly vectors and agro-ecological settings. Critical and quantitative analyses of socio-economic costs and benefits of control are scant.
18. Novel funding models are urgently needed to provide long term funds for AAT and HAT management.

Conclusions

19. Historically, epidemics of HAT have been devastating, leading to the depopulation of some affected areas. Where tsetse are present, trypanosomiasis in livestock acts as a constant drain on livestock productivity and livestock keepers' time and money. Those affecting cattle are the most important economically since they are a major cause of reduced meat and milk production and limit the use of draught power for agricultural production
20. Due to its biological nature and its links with agro-ecological settings, the disease constitutes a complex and vast sub-Saharan problem to be solved. Investments have to spread over five main areas: (i) human resource development; (ii) improved technology for diagnosis and disease treatment; (iii) improved vector control; (iv) increased exchange of information and (v) regional, national and local institutional support.