# African animal trypanosomiasis

Wetlands inhabited by the tsetse fly and susceptible animals

**Wildlife ✓**
**Livestock ✓**
**Human ✓**

Synonyms: Trypanosomosis, nagana, nagana pest, tsetse disease, tsetse fly disease, souma or soumaya (in Sudan), baleri (in Sudan), surra, dourine, cachexial fevers, Gambian horse sickness (in central Africa), kaodzera (Rhodesian trypanosomiasis), tahaga (a disease of camels in Algeria), galziekte or galzietzke (bilious fever of cattle), gall sickness (in South Africa), mal de caderas and peste boba (South America).

## KEY FACTS

**What is African animal trypanosomiasis?**

A disease caused by protozoa primarily transmitted by tsetse flies *Glossina spp*. that can affect almost all domestic mammals and infect a wide range of wild mammal species but these are mostly trypanotolerant. Trypanosomiasis is considered the most important disease of livestock in Africa where it causes severe economic losses. The disease has the greatest impact on domestic cattle but can also cause serious losses in domestic swine, camels, goats and sheep. Infection of susceptible cattle results in acute or chronic disease which is characterised by intermittent fever, anaemia, occasional diarrhoea and rapid loss of condition and often terminates in death.

Although most trypanosomes that cause African animal trypanosomiasis are not known to be zoonotic, some are of zoonotic concern, *e.g. Trypanosoma brucei rhodesiensi* and other closely related trypanosomes do infect humans. Non-zoonotic trypanosomes might cause disease in people with certain genetic defects.

**Causal agent**

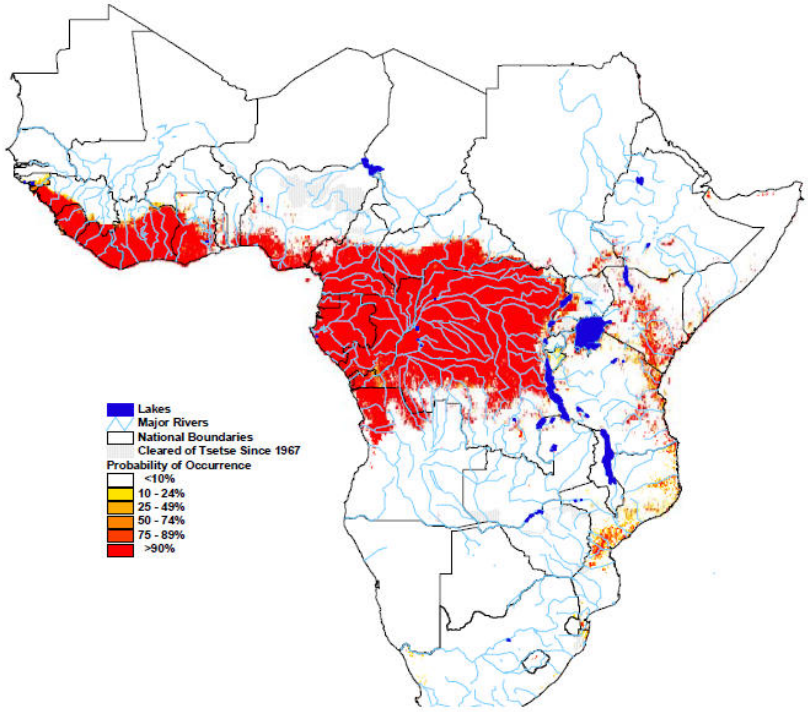
Trypanosomes, protozoan parasites of the genus *Trypanosoma* that live in the blood, lymph and various tissues of vertebrate hosts. The most important species for this disease are *Trypanosoma congolense, T. vivax* and *T. brucei subsp. brucei* and *rhodesiensi.*

**Species affected**

Many species of domestic and wild animals including cattle, swine, camels, goats and sheep. Cattle are prefered by the tsetse fly and this preference can shield other animals from the effects of trypanosomiasis. Wild animals known to be infected but which are trypanotolerant include greater kudu *Tragelaphus strepsiceros*, warthog *Phacochoerus africanus*, bushbuck *Tragelaphus scriptus*, bush pig *Potamochoerus porcus*, African buffalo *Syncerus caffer*, African elephant *Loxodonta africana*, black rhinoceros *Diceros bicornis*, lion *Panthero leo* and leopard *Panthera pardus*. Several species of wild animal appear not to be trypanotolerant, *e.g.* the southern white rhinoceros *Ceratotherium simum simum* can die from infection.

**Geographic distribution**

Endemic in Africa, primarily occurring in areas inhabited by the tsetse fly. In Africa this falls between latitude 14° N and 29° S - that is from the southern edge of the Sahara desert to Zimbabwe, Angola and Mozambique ('the tsetse fly belt') an area of 10 million square miles affecting nearly 40 countries. Some trypanosomes, particularly *T. vivax*, have spread beyond the 'tsetse fly belt', to the Americas for example, by transmission through 'mechanical vectors' (mechanical vectors transmit pathogens from one host to another but, unlike in 'biological vectors', the pathogen does not require the vector to complete its life cycle). Despite a century or more of effort to eradicate the tsetse fly, the trypanosomes have persisted across their range except in areas where all vegetation has been removed.




**Probabilities of tsetse distributions in Africa (FAO, February 2000).**

**Environment**

Any environment inhabited by the tsetse fly. The three main species of tsetse flies responsible for transmission are *Glossina morsitans*, which favours open woodland on savanna; *G. palpalis*, which prefers shaded habitat immediately adjacent to rivers and lakes; and *G. fusca*, which favours high, dense forest areas. Fly densities fluctuate seasonally which often impacts on grazing patterns.

## TRANSMISSION AND SPREAD

**Vector(s)**

Tsetse fly, genus *Glossina* and various mechanical vectors, including biting flies particularly those of the genus *Tabanus*, but also *Haematopota, Liperosia, Stomoxys,* and *Chrysops* flies. Fomites (inanimate objects such as footwear, nets and other equipment) can also mechanically transmit trypanosomes. The vector for *T. vivax* in the Americas remains unknown, but several species of haematophagous ('blood eating'; especially tabanid and hippoboscid) flies are suspected. Trypanosomes may also be mechanically transmitted – see below.

**How is the disease transmitted to animals?**

Trypanosomes must first develop within tsetse fly vectors for one to a few weeks. They are then transmitted through tsetse fly saliva - when flies feed on an animal they inject saliva before sucking blood. Tsetse flies will remain infected for life. Trypanosomes can also be mechanically transmitted by biting flies when these flies transfer blood from one animal to another. In South America *T. vivax* can be mechanically transmitted and does not require the tsetse fly to develop. One trypanosome, *T. equiperdum*, is thought to be transmitted during coitus and does not have a vector. Transplacental transmission can also occur.

**How does the disease spread between groups of animals?**

Tsetse flies or mechanical vectors carrying trypanosomes from one group of animals to another. Animals never completely clear their parasites and thus may have inapparent (subclinical) infections. Stress can reactivate the disease in these 'carriers'.

**How is the disease transmitted to humans?**

Same transmission routes as for animals. Whilst African animal trypanosomes generally do not cause disease in humans, the closely related *T. brucei gambiense* and *T. b. rhodesiense* cause significant human disease ('sleeping sickness' and 'Chagas disease').

## IDENTIFICATION AND RESPONSE

**Field signs**

Trypanosomiasis should be suspected when livestock in an endemic area are anaemic and in poor condition. Animals imported from endemic areas can be subclinical carriers and may become ill with the disease when stressed.

**Recommended action if suspected**

Contact and seek assistance from appropriate animal health professionals immediately if there is any illness in livestock. Tsetse-transmitted trypanosomiasis is a notifiable disease and suspected cases must be reported to local and national authorities and the OIE.

**Diagnosis**

The disease should be confirmed by health professionals identifying pathogenic trypanosomes in blood or lymph node smears. Anticoagulated fresh blood, dried thin and/or thick blood smears, and smears of needle lymph node biopsies can be submitted from live animals. Trypanosomes are most likely to be found in the blood by direct examination during the early stages of infection. They are less likely to be detected in chronically ill animals, and are almost never seen in healthy carriers. Xenodiagnosis (looking for the parasite in a previously uninfected vector which is exposed to the host, rather than the host itself) is also a useful technique when attempting to isolate from wildlife.

Laboratory tests should follow the methods and diagnostic thresholds described in the OIE's Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 2008, Chapter 2.4.3 (Identification of the agent).

Before collecting or sending any samples from animals with a suspected animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorised laboratories to prevent the spread of the disease. Although the trypanosomes that cause African animal trypanosomiasis are not known to be zoonotic, precautions are recommended when handling blood, tissues and infected animals.

## PREVENTION AND CONTROL IN WETLANDS

**Environment**

Control of tsetse-transmitted trypanosomiasis relies on the control of the vector, the parasite or a combination of both. Various environmental measures can be used to control the vector:

- **Buffer zones:** if tsetse fly wetlands occur near villages, a buffer zone, *i.e.* an area around the village in which cultivation is restricted to dryland crops, functions as an obstacle for the movement of tsetse flies between the village and the wet areas.
- **Habitat modification/removal:** tsetse flies need shady and relatively humid conditions. The distribution and ecology of the different species of tsetse fly are closely linked with vegetation. Any modification in vegetation cover may affect the dynamic behaviour of the tsetse fly populations and the transmission of trypanosomiasis. In extreme circumstances, it may be necessary to remove the tsetse fly habitat however bush clearing can lead to soil erosion and other ecological disruption.
  (Note: If habitat is already unfavourable for tsetse flies, trypanosomiasis would not be expected to increase through more intensive swamp farming and water management).

## Livestock

**Vector control**

Primary control methods should focus on reducing or eliminating tsetse fly populations *e.g.* using spray-on livestock insecticides, pheromone-baited traps, sterile insect techniques and other methods. Persistent chemicals are no longer used for environmental reasons and other non-persistent forms of spray are applicable in certain, mostly open, habitats *e.g.* Okavango swamps

►Section 3.4.3. Control of Vectors

Secondary control methods should employ veterinary interventions and reduce the spread of the parasite by using preventative treatments, treating infected animals and monitoring the number of animals that carry the disease.

**Vaccination**

There is currently no vaccine against human or animal trypanosomiasis.

**Livestock management**

- Good husbandry can reduce tsetse fly-livestock contact.
- Some African cattle and small ruminant breeds have some tolerance to trypanosomiasis. Introduction and development of these breeds may be effective in lessening the impact of trypanosomiasis. However it should be noted that:
  - Immunity may only be local and therefore ineffective against trypanosomes from a different region.
  - Compared with other breeds, trypanotolerant cattle are smaller in size, have lower fecundity and produce lower milk yields.
  - Immune cattle may remain carriers of trypanosomes.
  - Translocation of livestock carries the risk of spreading diseases into new areas and should be accompanied by strict sanitary controls.
- Switching from cattle to poultry farming, for example, can allow animal protein production without losses to trypanosomiasis.
- In mixed wildlife-livestock systems, tsetse can preferentially feed on wildlife species and this has a dilution effect on livestock attack.

If an outbreak is detected early, the parasite might be eradicated by:

- Movement controls and quarantine periods
- Euthanasia of infected animals - trypanosomes cannot survive for long periods outside the host and disappear quickly from the carcase after death.
- Controlling arthropod vectors to prevent new infections.
- Administration of curative drugs (*e.g.* diminazene aceturate and quinapyramine methylsulfate).
- Good nutrition and rest will allow an animal to recover more rapidly.

## Wildlife

Wild animals carry trypanosomes and are an important food source for the tsetse fly. Each type of fly derives nourishment from a narrow range of animal species, however, tsetse flies have been shown to be adaptable and will utilise novel hosts in the absence of a favoured host. For this reason, and because of the obvious detriment to the local wildlife, eradication of game hosts is no longer an acceptable method of control. Prevention should be directed towards controlling vector populations or preventing human and livestock access to tsetse habitat and dedicating the land to alternative land use and income generation.

**Humans**

Although most trypanosomes that cause African animal trypanosomiasis are not known to be zoonotic, trypanosomes related to *T. brucei brucei* and *T.brucei rhodesiense* can infect humans, and non-zoonotic trypanosomes might cause disease in people with certain genetic defects.

## IMPORTANCE

**Effect on wildlife**

Wild animals rarely show clinical signs of trypanosomiasis but wildlife hosts are a reservoir of trypanosomes. Some species such as southern white rhinoceros, which prefers open grassland, can suffer mortality from the disease.

**Effect on livestock**

Trypanosomiasis has the greatest impact on domestic cattle but can also cause serious losses in domestic swine, camels, goats and sheep. The cattle of African nomadic communities are at particular risk as they are increasingly driven to utilise higher risk habitats due to agriculture reducing their available range. The presence of the disease can reduce livestock holdings by 10-50%. Although acute cases can be caused by less pathogenic types, in general the disease has a high morbidity rate and is often chronic in susceptible animals. The mortality rate can reach 50-100% within months of exposure, particularly if the animal is exposed to poor nutrition and other stressors. The majority of untreated animals infected with *T. congolense, T. vivax* and *T. brucei brucei* will die of the disease.

In Africa, tsetse fly transmitted trypanosomiasis is a persistent endemic disease. In South America trypanosomiasis is mechanically transmitted and epizootic outbreaks occur cyclically every few years.

**Effect on humans**

African animal trypanosomes are not known to be zoonotic so health impacts are negligible but they are of concern in wildlife tourism areas where rare cases in wildlife can occur. This can have significant negative economic knock-on effects where illness deters visitors. The greatest impact to humans is felt through direct and indirect losses to livestock production.

► **Effect on livestock**
► **Economic importance**

**Economic importance**

Trypanosomiasis is the most important livestock disease in Africa. Economic impacts will vary considerably depending on a number of variables such as the affected livestock species, type, productivity, susceptibility or the extent of challenge by the fly.

Direct economic impacts are felt by livestock owners without trypanotolerant breeds who suffer significant constraints on production through morbidity, mortality and impaired fertility. Indirectly, the disease affects crop producers who rely on livestock (draught oxen) to pull farm machinery and produce manure. Farmers are also hindered by perceived risks of the disease, for example, on tsetse fly-infected ground they may reduce their numbers of livestock or exclude livestock from infested regions all together. In Africa, 7 million hectares of suitable grazing land are left ungrazed due to trypanosomiasis. However, the benefits for wildlife balance this economically where tourism and other forms of wildlife utilisation exist. In some countries the wildlife contribution to GDP is far bigger than from the agricultural sector.

Implementing prevention and control measures using trypanocidal drugs represents an additional expense.

## FURTHER INFORMATION

### Useful publications and websites


- Kristjanson, P.M., Swallow, B.M., Rowlands, G.F., Kruska, R.L. & de Leeuw, P.N. (1998). **Measuring the costs of African animal trypanosomosis, the potential benefits of control and returns to research**. *Agricultural Systems*, 59 (1): 79-98.
- Thumbi, S.M., Jung'a, J.O., Mosi, R.O. & McOdimba, F.A. (2010). **Spatial distribution of African animal trypanosomiasis in Suba and Teso districts in western Kenya**. *BMC Research Notes*, 3, 6.
- The Centre for Food Security & Public Health (CFSPH). **African animal trypanosomiasis**. http://www.cfsph.iastate.edu/Factsheets/pdfs/trypanosomiasis_african.pdf [Accessed March 2012].
- World Organisation for Animal Health (OIE). **Trypanosomiasis (tsetse-related)** http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/TRYPANO_TSETSE_FINAL.pdf [Accessed March 2012].
- World Organisation for Animal Health (OIE). **Chapter 2.4.18: Trypanosomiasis**. Manual of diagnostic tests and vaccines for terrestrial animals. http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.04.18_TRYPANOSOMOSIS.pdf [Accessed March 2012].
- Food and Agriculture Organization (FAO). **Predictions of tsetse distributions in Africa**. From FAO consultants report by Wint and Rogers of ERGO Ltd and TALA Research Group, Feb 2000. http://www.fao.org/Ag/againfo/programmes/en/paat/documents/maps/pdf/tserep.pdf [Accessed March 2012].
- The Food and Agricultural Organization (FAO). **Programme Against African Trypanosomiasis (PAAT)**. http://www.fao.org/ag/againfo/programmes/en/paat/home.html [Accessed March 2012].
- The Food and Agricultural Organization (FAO). **Cost of trypanosomiasis**. http://www.fao.org/ag/magazine/spot1.htm [Accessed March 2012].
- The Food and Agricultural Organization (FAO). **A field guide for the diagnosis, treatment and prevention of African animal trypanosomiasis**. http://www.fao.org/DOCREP/006/X0413E/X0413E00.HTM [Accessed March 2012].