

# Eradication of Human African Trypanosomiasis? Don't forget the pigs!

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## Background

- Human African Trypanosomiasis (HAT) is a Neglected Tropical Disease that only occurs in the tsetse belt in sub-Saharan Africa
- There are 2 forms of the disease: The chronic, or g-HAT, caused by *Trypanosoma (T.) brucei gambiense* and the acute, or r-HAT, caused by *T. brucei rhodesiense*; g-HAT accounts for more than 98% of reported cases; r-HAT only 2% (Figure 1)
- WHO targets elimination as a public health problem ( $\leq 2,000$  cases p.a.) by 2020 and zero-transmission (eradication) by 2030 (WHO, 2017; Franco et al., 2017)
- Human latent infections (g-HAT) and possible animal reservoirs (r-HAT and g-HAT) may challenge these goals (Büscher et al., 2018)
- WHO acknowledges a One Health approach in controlling the disease in humans by including livestock and wildlife to surveillance activities (Figure 2)
- Improved knowledge on the epidemiological importance of cryptic parasite reservoirs in g-HAT both in humans and animals is mandatory for elimination/eradication (WHO Informal Expert Group on G-HAT Reservoirs; Büscher, Bart et al., 2018)

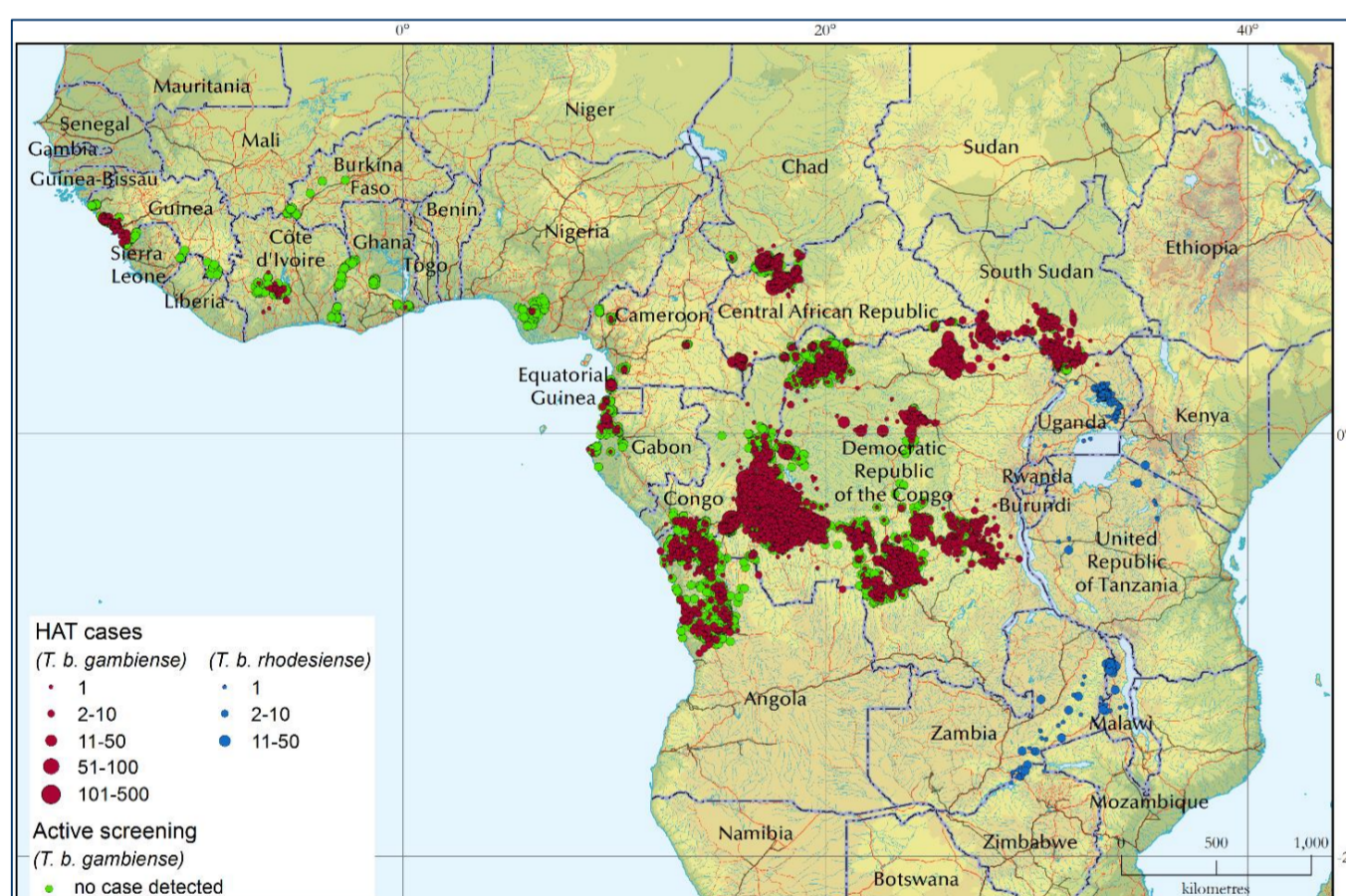


Figure 1. Monitoring the elimination of human African Trypanosomiasis: Update to 2014. Source: Franco et al., 2017

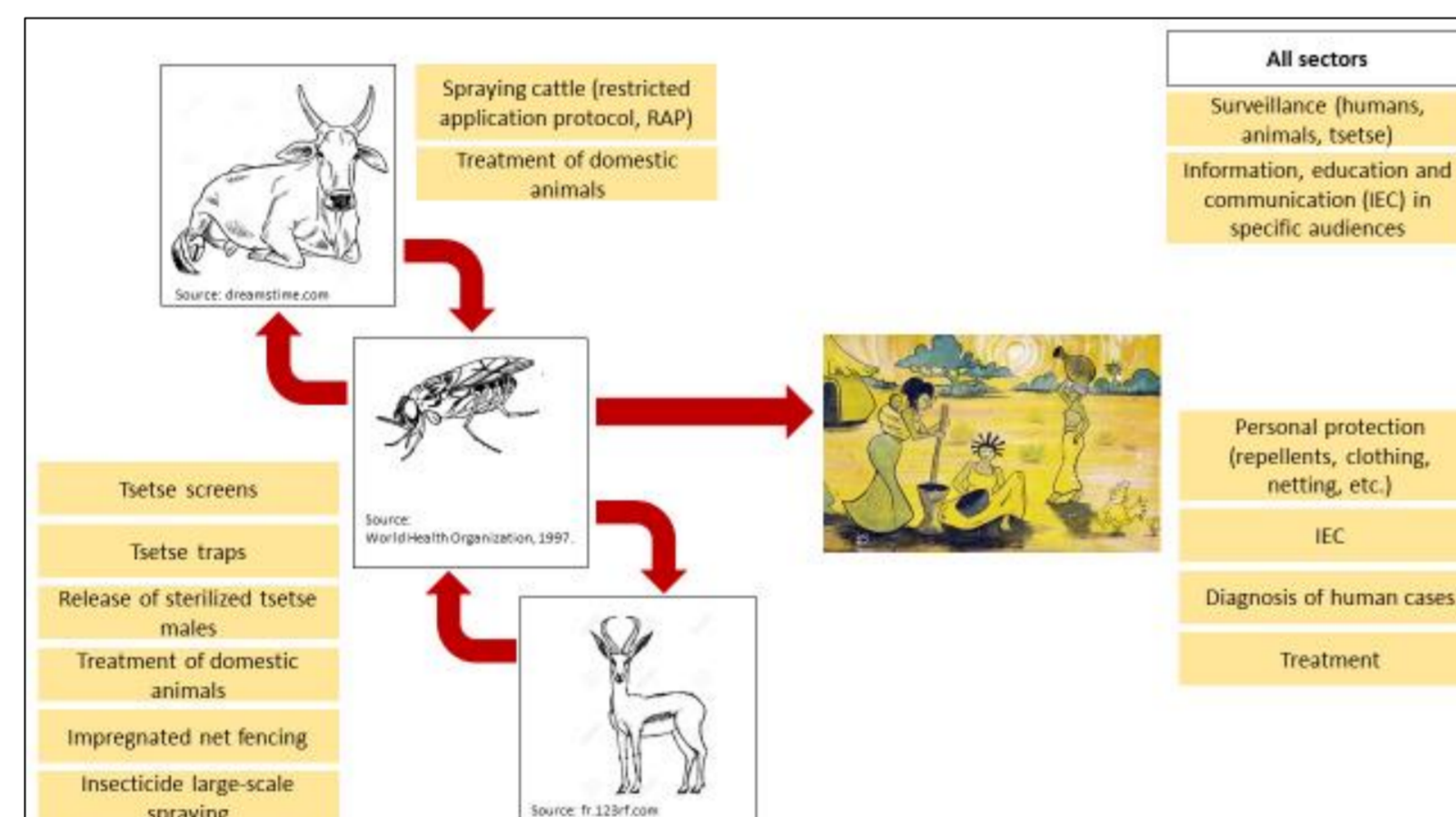


Figure 2. Adapted from the report of the second WHO stakeholders meeting on rhodesiense human African trypanosomiasis, Geneva, 26–28 April 2017. Source: [http://www.who.int/trypanosomiasis\\_african/](http://www.who.int/trypanosomiasis_african/)

## Results

- ✓ **Pigs are increasingly important as an income generating activity to smallholder farmers in Uganda**  
Figure 3, and Muhanguzi et al., 2012; FAOSTAT, 2011; Ugandan Ministry of Agriculture, Animal Industry and Fisheries /Uganda Bureau of Standards, 2009
- ✓ **Pigs are kept near human homesteads**  
Balyeidhusa et al., 2012; Waiswa, 2010; Okoth and Kapaata, 1986
- ✓ **Pigs are one of the preferred hosts of *Glossina fuscipes fuscipes*, the dominant vector in Uganda**  
Balyeidhusa et al., 2012; Waiswa et al., 2006; Magona et al., 1999; Nowak et al., 1992; Tietjen et al., 1992
- ✓ **Pigs often have mixed infections, and are able to carry both human pathogenic *T. brucei* subspecies** (Table 1)
- ✓ **Fever in pigs is common but rarely investigated**  
Atherstone et al., 2015; Dione et al., 2014

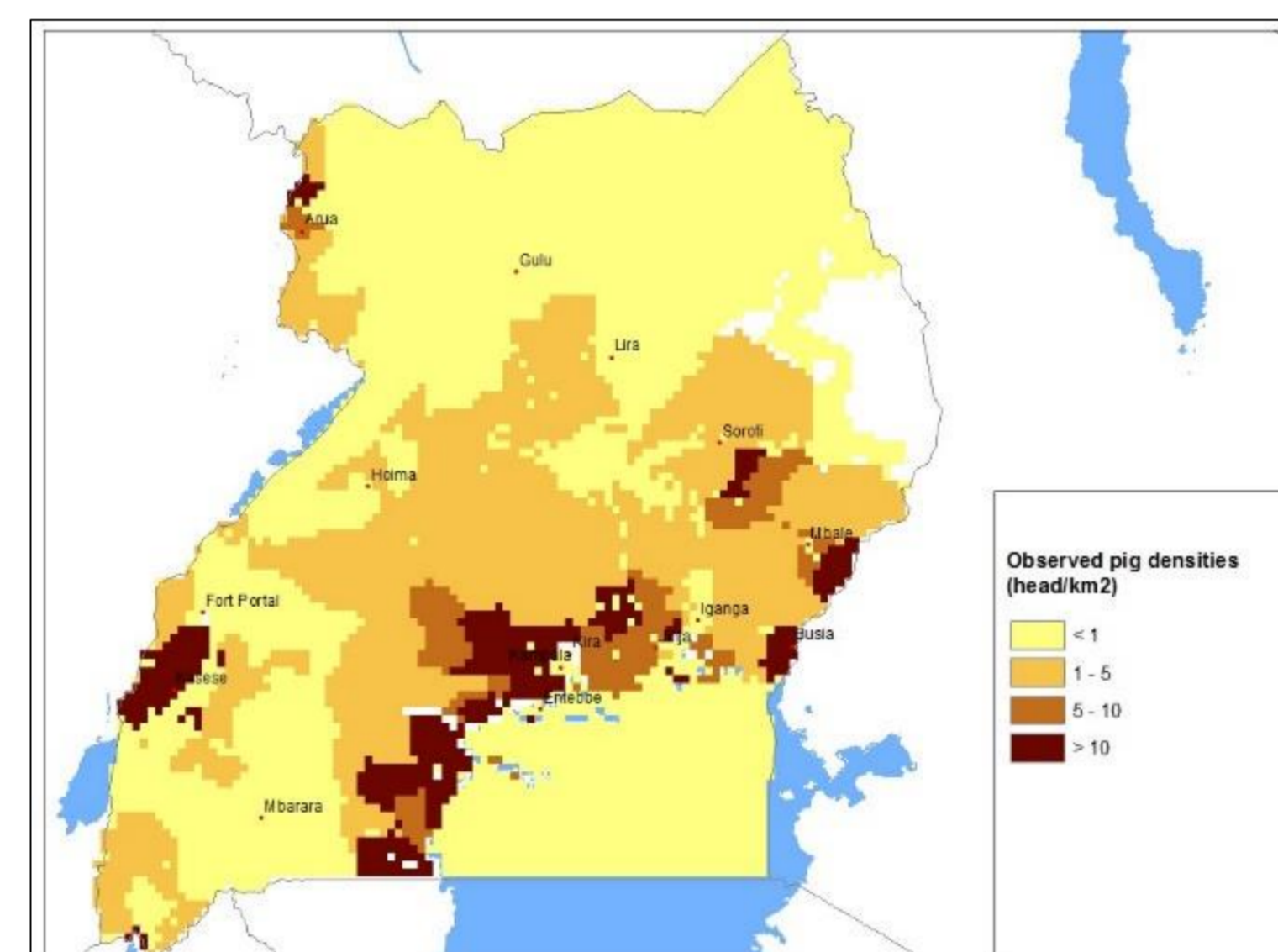


Figure 3. Average pig densities in Uganda. Source: Robinson et al., 2014



Figure 4. Village livestock in Busia, Western Kenya. Source: flickr.com/photos/ilri (photo credit: ILRI/Charlie Pye-Smith).

Table 1. Cyclical, *Glossina*-transmitted *Trypanosoma* species and their distribution in domestic pigs. Adapted from Hoare (1972) and Deplazes et al. (2016).

Species and subspecies	Host range	Evidence for occurrence in domestic pigs*
<i>T. vivax</i>	Bovinae <sup>3</sup> , Equidae <sup>2</sup> , Camelidae <sup>2</sup> , Caprinae <sup>1</sup> , Suidae <sup>0</sup> , Carnivora <sup>0</sup> , antelopes and giraffe <sup>0</sup>	Biryomumaisho et al., 2013, 2009; Hamill et al., 2013; Balyeidhusa et al., 2012; Waiswa, 2010; Ng'ayo et al., 2005
<i>T. congolense</i>	Bovinae <sup>2</sup> , Equidae <sup>1</sup> , Camelidae <sup>1</sup> , Caprinae <sup>1</sup> , Carnivora <sup>1</sup> , Suidae <sup>1</sup> , antelopes <sup>0</sup> , giraffe <sup>0</sup>	Biryomumaisho et al., 2013; Hamill et al., 2013; Balyeidhusa et al., 2012; Ng'ayo et al., 2005; Waiswa, 2005; Waiswa et al., 2003; Magona et al., 1999; Katunguka-Rwakishaya, 1996; Omeke, 1994; Makumyaviri et al., 1989; Mehlitz, 1979
<i>T. simiae</i>	Camelidae <sup>3</sup> , Suidae <sup>3</sup> , Equidae <sup>0</sup> , Bovinae <sup>0</sup> , Caprinae <sup>0</sup> , Carnivora <sup>0</sup>	Ademola and Onyiche, 2013; Waiswa, 2010, 2005; Ng'ayo et al., 2005; Waiswa et al., 2003; Zweggarth and Rötter, 1987; Janssen and Wijers, 1974
<i>T. godfreyi</i>	Suidae	Hamill et al., 2013; Masiga et al., 1996; McNamara et al., 1994
<i>T. brucei brucei</i>	Equidae <sup>3</sup> , Camelidae <sup>3</sup> , Carnivora <sup>2</sup> , Bovinae <sup>1</sup> , Suidae <sup>1</sup> , Caprinae <sup>0</sup> , antelopes <sup>0</sup>	Balyeidhusa et al., 2012; Onah and Uzoukwu, 1991; Mehlitz, 1979
<i>T. brucei gambiense</i>	Humans <sup>2</sup> , pigs <sup>0</sup> , cattle <sup>0</sup> , sheep <sup>0</sup> , dog <sup>0</sup> , antelopes <sup>0</sup>	Mehlitz et al., 1982; Gibson et al., 1978
<i>T. brucei rhodesiense</i>	Humans <sup>3</sup> , pigs <sup>0</sup> , wildlife <sup>0</sup> (antelopes, giraffe, hippopotamus, hyena, lion, warthog)	Hamill et al., 2013; Ng'ayo et al., 2005; Njiru et al., 2004; Waiswa et al., 2003; Okuna et al., 1986
<i>T. suis</i>	Suidae <sup>1/2</sup>	Hutchinson and Gibson, 2015; Hoare, 1972; Peel and Chardome, 1954

\* Infection of pigs with Trypanozoon has been reported from Uganda (e.g., Tietjen et al., 1992, 1991) but were not included to the table if not further specified  
R = domestic pigs not a known host (resistant or refractory)  
0 = reservoir but no clinical symptoms; 1 = low pathogenicity; 2 = moderate pathogenicity; 3 = high pathogenicity

## Objective

Collate evidence on why pigs should not be left out of the surveillance agenda using the example of Uganda where both forms of HAT co-exist.

## Methods

(Non-systematic) Literature review with focus on the role of pigs in the HAT epidemiology

## Acknowledgments

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## Conclusions

- Need to monitor (competent) vector abundance in smallholder pig keeping communities in endemic areas
- Need to determine host preference of tsetse flies in pig keeping communities (who also keep other animals)
- Need to include monitoring of human pathogenic *Trypanosoma* in livestock species including pigs

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