Hytrosaviridae as a threat to the success application of SIT for *Glossina pallidipes*

Adly Abd-Alla

Insect Pest Control Laboratory,
Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Vienna, Austria

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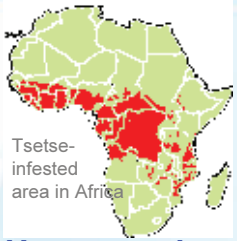
Tsetse and Poverty



- 36 African countries
- 60 million people
- 50 million cattle

Humans: sleeping sickness

- 300– 500 thousands people infected
- $ 3.5 million lost

Livestock: Nagana

- 3 million cattle lost / year
- Cost: > $ 35 million/ year
- potential loses : $ 4.5 billion

Disease Control

In the absence of :
1) Sensitive diagnostic tools
2) Vaccine

→ VECTOR CONTROL

- Insecticides
- Sterile insect technique (SIT)

Mass production → Sterilization → Male release

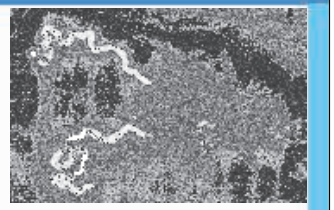
Rearing *G. pallidipes* in FAO/IAEA laboratory

- Since 1980: *G. pallidipes* colony from Uganda maintained
- 1996 : *G. pallidipes* colony established from Ethiopia
- 2000: Ethiopian colony reached 15,000 female
- 2001-2: Ethiopian colony productivity declined and colony became extinct
- >85% of individuals with SGH syndrome

Assumption: colony decline was due to the virus

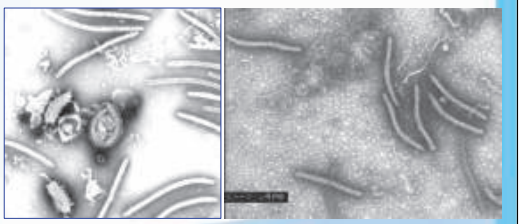
SGH Syndrome in tsetse

- SGH (Whitnall, 1934)
- Glands enlarged >4 times



- Virus-like particles in SGH (Jenni, 1973)
- SGHV (Jaenson,1978)

Length: 700-1000 nm
Diameter : 50 nm



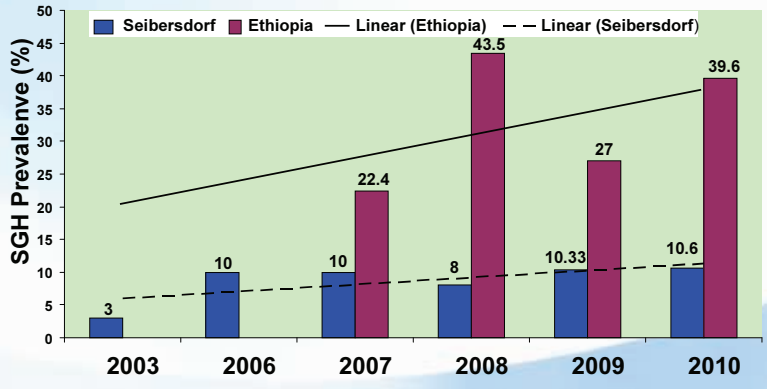
Impact of SGHV on Tsetse Reproduction

- Males with SGH completely sterile
- Progeny of females with SGH fully sterile
- For SIT - major problem - no large scale release
- **Supported assumption: the virus caused the collapse of the *G. pallidipes* colony originating from Ethiopia in the FAO/IAEA laboratory in 2002**

Virus problem in Ethiopia

The *G. pallidipes* colonies

- In Seibersdorf: SGH low
- In Ethiopia: SGH high



Overall Objective

Obtain virus-free tsetse colonies

Or at least

Manage virus contamination to maintain colony productivity and survival

Specific objectives

- **Detection and assessment of virus infection**
  PCR and qPCR, wide asymptomatic infection
- **Characterize and sequence virus genome**
  Sequence the genome of Uganda and Ethiopia isolates
- **Epidemiology and virus transmission**
  Vertical transmission in field, Horizontal transmission in colony
- **Genetic analysis of SGHV in wild tsetse**

☞ - **Develop virus management strategies**

Virus management strategies

☞ 1. **Membrane feeding system modification**

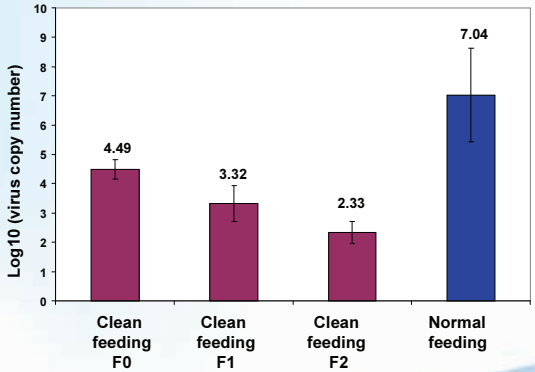
2. **Virus specific antibodies**

3. **Commercial antiviral drugs**

4. **RNAi**

Membrane feeding system

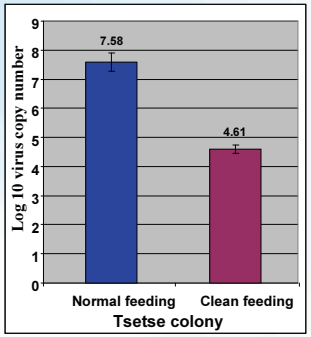
- **4-10 cages fed successively on the same membrane**
- **Favours horizontal virus transmission**

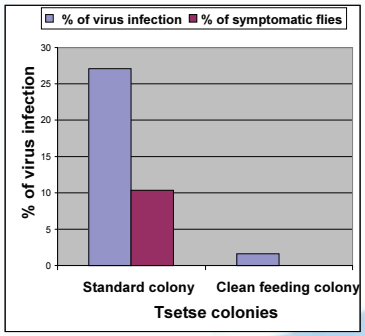


Clean feeding tsetse colony established

Membrane feeding system

- Clean feeding colony maintained for six months
- Virus infection tested by PCR, qPCR and fly dissections





Virus load decreasing in the clean feeding colony

Clean feeding system

Advantages

Simple and efficient way to reduce virus infection load in small tsetse colonies

Disadvantages

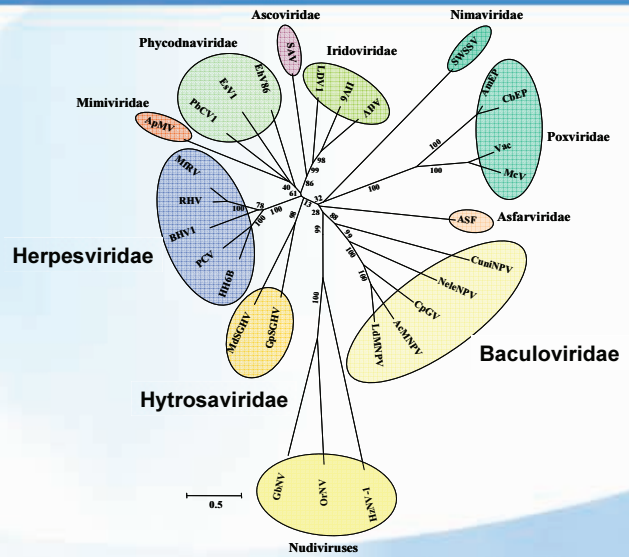
- Labour intensive
- More equipment needed

Other virus management strategies should be developed

Virus management strategies

1. Membrane feeding system modification
2. Virus specific antibodies
3. Commercial antiviral drugs
4. RNAi

Antiviral drugs



Antiviral drugs

Selection of antiviral products

- Toxicity to tsetse flies
- Availability
- Efficiency
- Price
- Effect on productivity and survival

Two products were selected

- Valacyclovir
- Acyclovir

Valacyclovir is a prodrug, an esterified version of acyclovir that has greater oral bioavailability (about 55%) than acyclovir (10-20%).

Antiviral drugs

Conclusions

- Valacyclovir and acyclovir at 300 µg/ml: slight reduction in virus copy number
- Valacyclovir could be applied in large scale tsetse rearing :
  - No negative impact
  - Economically affordable
  - Combination with CFS
- More antiviral drugs should be screened