Investment in new knowledge and tools for control of Glossina: Current status and future perspectives

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Total Papers Published

- 44 new papers published with Glossina in the title in 2012/13 (34 covered here)

- In comparison

- 1510 mosquito papers in the same period

Symbionts (*Wolbachia* and *Sodalis*) and other associates

The need for very large scale field samples to be able to draw statistically significant conclusions on the importance of symbionts for infection with trypanosomes

Wamwiri, F.N., Alam, U., Thande, P.C., Aksoy, E., Ngure, R.M., Aksoy, S., Ouma, J.O., Murilla, G.A., 2013. Wolbachia, Sodalis and trypanosome co-infections in natural populations of Glossina austeni and Glossina pallidipes. Parasites & Vectors 6, 232-232.

Have reported a more sensitive technique for detecting Wolbachia suggesting we may be underestimating prevalence in the field.

Schneider, D. I., K. I. Garschall, et al. (2013). "Global Wolbachia prevalence, titer fluctuations and their potential of causing cytoplasmic incompatibilities in tsetse flies and hybrids of Glossina morsitans subgroup species." Journal of Invertebrate Pathology **112: S104-S115.**

Extends our knowledge of the extent of Wolbachia infections in fly species and populations

Doudoumis, V., G. Tsiamis, et al. (2012). "Detection and characterization of Wolbachia infections in laboratory and natural populations of different species of tsetse flies (genus Glossina)." Bmc Microbiology **12.**

Complex multivariate interactions between Wolbachia, SGHV and trypanosome infection patterns

Alam, U., C. Hyseni, et al. (2012). "Implications of Microfauna-Host Interactions for Trypanosome Transmission Dynamics in Glossina fuscipes fuscipes in Uganda." Applied and Environmental Microbiology **78(13): 4627-4637.**

Symbionts (*Wolbachia* and *Sodalis*) and other associates 2

Showed, to their surpise, that Sodalis as well as Wigglesworthia is continuous and adaptive in its presence in tsetse throughout development

Soumana, I. H., D. Berthier, et al. (2013). "Population dynamics of Glossina palpalis gambiensis symbionts, Sodalis glossinidius, and Wigglesworthia glossinidia, throughout host-fly development." Infection Genetics and Evolution **13**: 41-48.

Reported on gut bacteria which may influence trypanosome establishment.

Geiger, A., M.-L. Fardeau, et al. (2013). "Glossina spp. gut bacterial flora and their putative role in fly-hosted trypanosome development." Frontiers in cellular and infection microbiology **3: 34-34.**

Population genetics, taxonomy of tsetse flies

Evidence has been gathered for movement of tsetse between river basins.

Vreysen, M.J.B., Balenghien, T., Saleh, K.M., Maiga, S., Koudougou, Z., Cecchi, G., Bouyer, J., 2013. Release-Recapture Studies Confirm Dispersal of Glossina palpalis gambiensis between River Basins in Mali. Plos Neglected Tropical Diseases 7.

Gathered data to show that *G. f. fuscipes* is superinfected with *Wolbachia* in Uganda. But, despite this, the data suggests that cytoplasmic incompatibility has not influenced tsetse genetic diversity in Uganda.

Symula, R.E., Alam, U., Brelsfoard, C., Wu, Y., Echodu, R., Okedi, L.M., Aksoy, S., Caccone, A., 2013. Wolbachia association with the tsetse fly, Glossina fuscipes fuscipes, reveals high levels of genetic diversity and complex evolutionary dynamics. Bmc Evolutionary Biology 13.

Used population genetic tools to show the separate populations of tachinoides in E and W Burkina Faso separated around 10 years ago.

Ravel, S., J.-B. Rayaisse, et al. (2013). "Genetic signature of a recent southern range shift in Glossina tachinoides in East Burkina Faso." Infection, genetics and evolution : journal of molecular epidemiology and evolutionary genetics in infectious diseases **18: 309-314.**

Population genetics, taxonomy of tsetse flies 2

Demonstrated a MALDI-TOF method for indentifying tsetse species

Hoppenheit, A., J. Murugaiyan, et al. (2013). "Identification of Tsetse (Glossina spp.) Using Matrix-Assisted Laser Desorption/Ionisation Time of Flight Mass Spectrometry." Plos Neglected Tropical Diseases **7(7): e2305-e2305.**

Morphometrics is a cheap and fast technique for investigating population structure.

Kaba, D., S. Ravel, et al. (2012). "Phenetic and genetic structure of tsetse fly populations (Glossina palpalis palpalis) in southern Ivory Coast." Parasites & Vectors **5.**

Island and mainland populations in the Lake Victoria basin are not isolated

Hyseni, C., A. B. Kato, et al. (2012). "The population structure of Glossina fuscipes fuscipes in the Lake Victoria basin in Uganda: implications for vector control." Parasites & Vectors **5: 1-14.**

Identified an isolated population of flies – importance for accurately determining genetic measurements and for control activities

De Meeus, T., S. Ravel, et al. (2012). "Understanding local population genetics of tsetse: The case of an isolated population of Glossina palpalis gambiensis in Burkina Faso." Infection Genetics and Evolution **12(6): 1229-1234.**

Insecticides

Ivermectin decreases survival of tsetse feeding on treated cattle.

Pooda, S. H., K. Mouline, et al. (2013). "Decrease in survival and fecundity of Glossina palpalis gambiensis vanderplank 1949 (Diptera: Glossinidae) fed on cattle treated with single doses of ivermectin." Parasites & Vectors **6.**

SIT

Undertook a molecular study on salivary gland hypertrophy virus

Kariithi, H. M., J. W. M. van Lent, et al. (2013). "Correlation between structure, protein composition, morphogenesis and cytopathology of Glossina pallidipes salivary gland hypertrophy virus." Journal of General Virology **94: 193-208.**

Showed low diversity in salivary gland hypertrophy virus from geographically distant sites

Kariithi, H. M., M. Ahmadi, et al. (2013). "Prevalence and genetic variation of salivary gland hypertrophy virus in wild populations of the tsetse fly Glossina pallidipes from southern and eastern Africa." Journal of Invertebrate Pathology **112: S123-S132.**

Undertook electron microscopical studies on salivary gland hypertrophy virus infected salivary glands.

Guerra, L., J. G. Stoffolano, Jr., et al. (2013). "Ultrastructure of the salivary glands of non-infected and infected glands in Glossina pallidipes by the salivary glands hypertrophy virus." Journal of Invertebrate Pathology **112: S53-S61.**

Developed a clean feeding approach suitable for the minimisation or elimination of salivary gland hypertrophy virus from colonies

Abd-Alla, A. M. M., H. M. Kariithi, et al. (2013). "Managing Hytrosavirus Infections in Glossina pallidipes Colonies: Feeding Regime Affects the Prevalence of Salivary Gland Hypertrophy Syndrome." Plos One **8(5).**

SIT 2

Valocylovir can reduce colony loads of SGHV virus

Abd-Alla, A. M. M., H. Adun, et al. (2012). "The Antiviral Drug Valacyclovir Successfully Suppresses Salivary Gland Hypertrophy Virus (SGHV) in Laboratory Colonies of Glossina pallidipes." Plos One **7(6).**

showed that salivary gland hypertrophy virus reduces mating frequency of males.

Mutika, G. N., C. Marin, et al. (2012). "Impact of Salivary Gland Hypertrophy Virus Infection on the Mating Success of Male Glossina pallidipes: Consequences for the Sterile Insect Technique." Plos One **7(8).**

Decreased population density has little impact on mating status and little evidence for polyandry in Zimbabwe

Hargrove, J. W. (2012). "Age-specific changes in sperm levels among female tsetse (Glossina spp.) with a model for the time course of insemination." Physiological Entomology **37(3): 278-290.**

Showed an absence of mating barriers suggesting flies, though of different origins may be of use in SIT programmes.

Mutika, G. N., I. Kabore, et al. (2013). "Mating performance of Glossina palpalis gambiensis strains from Burkina Faso, Mali, and Senegal." Entomologia Experimentalis Et Applicata **146(1): 177-185.**

Targets and Traps

Report on a promising new control and monitoring device for *G swynnertoni*.

Mramba, F., F. Oloo, et al. (2013). "Standardizing Visual Control Devices for Tsetse Flies: East African Species Glossina swynnertoni." Plos Neglected Tropical Diseases **7(2).**

Showed targets are the cost efficient control devices for these three species and highlighted the low trapping efficiency of bi- and monoconicals.

Rayaisse, J.-B., T. Kroeber, et al. (2012). "Standardizing Visual Control Devices for Tsetse Flies: West African Species Glossina tachinoides, G. palpalis gambiensis and G. morsitans submorsitans." Plos Neglected Tropical Diseases **6(2).**

blue targets made of materials that reflect UV attract fewer flies

Lindh, J. M., P. Goswami, et al. (2012). "Optimizing the Colour and Fabric of Targets for the Control of the Tsetse Fly Glossina fuscipes fuscipes." Plos Neglected Tropical Diseases **6(5).**

different flight heights of two vectors and discuss implications for target placement

Salou, E., J. B. Rayaisse, et al. (2012). "Behavioural interactions and rhythms of activity of *Glossina palpalis gambiensis and G. tachinoides (Diptera: Glossinidae) in forest gallery in Burkina Faso. ." Parasite **19(3): 217-225.***

Biological control

Showed transmission of fungi during fly mating.

Maniania, N. K., M. A. Okech, et al. (2013). "Transfer of inoculum of Metarhizium anisopliae between adult Glossina morsitans morsitans and effects of fungal infection on blood feeding and mating behaviors." Journal of Pest Science **86(2): 285-292.**

A virus which is vertically transmitted through tsetse generations

Boucias, D. G., H. M. Kariithi, et al. (2013). "Transgenerational Transmission of the Glossina pallidipes Hytrosavirus Depends on the Presence of a Functional Symbiome." Plos One **8(4).**

Host Choice

Provide host choice data for tachinoides and gambiensis in Mali

Hoppenheit, A., B. Bauer, et al. (2013). "Multiple host feeding in Glossina palpalis gambiensis and Glossina tachinoides in southeast Mali." Medical and Veterinary Entomology **27(2): 222-225.**

work that may allow a serological test to measure levels of exposure to tsetse bites.

Dama, E., S. Cornelie, et al. (2013). "Identification of Glossina palpalis gambiensis specific salivary antigens: towards the development of a serologic biomarker of human exposure to tsetse flies in West Africa." Microbes and Infection **15(5): 416-42**

Describe chemosensory proteins in tsetse as a step in describing host finding at a molecular level

Liu, R., X. He, et al. (2012). "Expression of chemosensory proteins in the tsetse fly Glossina morsitans morsitans is related to female host-seeking behaviour." Insect Molecular Biology **21(1): 41-48.**

Modelling in control

Used modelling to try to better understand optimisation of control techniques

Barclay, H. J. and M. J. B. Vreysen (2013). "The interaction of dispersal and control methods for the riverine tsetse fly Glossina palpalis gambiensis (Diptera: Glossinidae): a modelling study." Population Ecology **55(1): 53-68.**

Vector competence

Suggested austeni is a better vector than brevipalpis in Kwa Zulu Natal

Motloang, M., J. Masumu, et al. (2012). "Vector competence of Glossina austeni and Glossina brevipalpis for Trypanosoma congolense in KwaZulu-Natal, South Africa." The Onderstepoort journal of veterinary research **79(1): E1-6.**

Biology

A detailed molecular study of lipid metabolism in lactation

Attardo, G. M., J. B. Benoit, et al. (2012). "Analysis of lipolysis underlying lactation in the tsetse fly, Glossina morsitans." Insect Biochemistry and Molecular Biology **42(5): 360-370.**

No Magic Bullet

- 44 new papers published with Glossina in the title in 2012/13
- In comparison
- 1510 mosquito papers in the same period
- Malaria control relies on bednets and IRS. Advances have largely come from improved organisation, logistics and political will
- In my opinion we have the tools, political will and sometimes the money – the problem is commonly near the end of the delivery chain – South American Example

Thank you for listening