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Infectivity of Glossina pallidipes Salivary Gland Hypertrophy Virus (GpSGHV) to Various Tsetse Species

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Abstract : Several tsetse fly species (Diptera: Glossinidae) in natural or colonized populations can be infected with the salivary gland hypertrophy virus (SGHV), a circular dsDNA virus (Hytrosaviridae). The virus infection is mainly asymptomatic but, in some species under certain conditions, the infection can produce salivary gland hypertrophy (SGH) symptoms. In the laboratory colonized tsetse, flies with SGH have reduced fertility, which negatively affects colony performance. Therefore, a high prevalence of SGH in insect mass rearing represents a major challenge for tsetse control using the sterile insect technique. The main objective of this study is to analyze the impact of Glossina pallidipes SGHV infection in various tsetse species on mortality and productivity and its impact on the symbiotic bacteria. Hypertropied salivary glands (SG) were collected from G. pallidipes into phosphate buffered saline (PBS) to prepare suspension; 2 µl aliquots were injected into adults of several tsetse species (G. pallidipes (Gp), G. p. gambiensis (Gpg), G. brevipalpis (Gb), G. morsitans morsitans (Gmm), G. morsitans centralis (Gmc) and G. fuscipes (Gf)) and the change in virus and symbiont titers were analyzed using qPCR. The development of SGH in the F1 was detected by dissection 10 days after emergence and virus infection was confirmed by PCR. The impact of virus infection on fly mortality and productivity was recorded. 2 µl aliquots were also injected into 3rd instar larvae of the different species and the adult SGs assayed by PCR for virus. Virus positive SGs from each species were homogenized in PBS and pooled within species for injection into larvae of the same species. Flies injected with PBS were used as control. Injecting teneral flies with SGHV caused increasing virus titer over time in all species but no SGH was detected. Dissection of the F1 also showed no development of SGH except in Gp (the homologous host). Injection of SGHV did not have any impact on the prevalence of the tsetse symbionts, but an increase in Sodalis titer was observed correlated with fly age regardless of virus infection. The virus infection had a negative impact on productivity and mortality. SGHV injection into larvae of the different species produced SGHV infected glands in the adults determined by PCR with a rate of 60%, 27%, 16%, 7% and 7% for Gp, Gf, Gpg, Gmm and Gmc, respectively. Virus positive SGs observed in the heterologous species were smaller than SGH found in Gp. No virus positive SG was detected by PCR in Gb and no SGH was observed in any adults except in Gp. Injecting virus suspension from the virus positive SGs into conspecific larvae did not produce any adults with infected SGs (except in Gp). SGHV can infect all tested tsetse species. Although the virus can infect and increase in titer in other tsetse species and affect fly mortality and productivity, no vertical virus transmission was observed in other tsetse species with might indicate a transmission barrier in these species, and virus collected from flies injected as larvae was not infective by injection.

Keywords : DNA viruses, glossina, hytrosaviridae, symbiotic bacteria, tsetse
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