Attractiveness of sand fly baits and the effects of long-lasting insecticidal nets on the feeding behaviour and survival of *Phlebotomus (Phlebotomus) duboscqi* Neveu-Lemaire (Diptera: Psychodidae).

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ABSTRACT

Control of phlebotomuine sand flies is of utmost importance because of the role they play as vectors of leishmaniases and other diseases. Long-lasting insecticidal nets (LLINs), as possible tools for control have not been widely tested against sand flies. Baiting traps during sand fly sampling leads to increased catch. Currently, there is no standard or better alternative bait to dry ice. In this study, LLINs in comparison with hand treated insecticide treated nets (ITNs) were tested against *Phlebotomus duboscqi* female sand flies both in the laboratory and semi-field environments using hamsters and goats as hosts respectively. Various animal baits alongside dry ice as carbon dioxide source were evaluated for *P. duboscqi* attractiveness.

Laboratory and semi-field results from this study show that all the tested bednets including LLINs, allowed some *P. duboscqi* female sand flies to take blood meals. Permethrin treated Olyset nets allowed fewer sand flies to feed than deltamethrin treated PermaNet though there was no statistically significant difference ($z = -0.155$, $P = 0.8770$, $\alpha = 0.05$). The number of sand flies that fed under Olyset bednet was significantly lower than that under conventionally K-O TAB® treated Supanet (25 mg deltamethrin a.i./m^2) ($z = 2.071$, $P = 0.0384$, $\alpha = 0.05$). Supanet and PermaNet (55 mg deltamethrin a.i./m^2) were not different in terms of the number of sand flies that fed ($z = 1.183$, $P = 0.2367$, $\alpha = 0.05$). The treated Supanet provided greater protection of the host from sand fly blood feeding than the untreated Supanet and treatment without bednet, "No net" ($P < 0.05$). The results also showed that Olyset nets allowed in the highest number of sand flies when compared with other net treatments ($P < 0.05$). I addition, the net also had the

highest number of sand flies that could not feed ($P < 0.05$). This was the same case when batches of sand flies that were infected with *L. major*.

Ordinary hand washing 20 times at home using a local bar soap of the two LLINs did not significantly increase the number of sand flies feeding in the laboratory and in semi-field environment ($P > 0.05$).

Of all the bednets, Unwashed Olyset had the highest number of sand flies killed or totally paralyzed within the bednets but this was only significant in the laboratory ($P < 0.05$). When washed, Olyset bioefficacy was much more reduced, though insignificantly ($z = 1.607$, $P = 0.1081$, $\alpha = 0.05$) than in the semi-field environment ($z = 0.290$, $P = 0.7720$, $\alpha = 0.05$). The highest sand fly mortality rates were also observed in Olyset bednets (53.4% in the laboratory). On the other hand mortality rate for sand flies that passed through PermaNet bednet were 6.2%. Among the baits tested, the goat elicited the highest attraction by P. duboscqi sand flies ($P < 0.05$. Its attraction was equal to that of dry ice used to bait a CDC light trap ($z = 0.080$, $P = 0.9361$)

The results from this study therefore demonstrated that Olyset bednet is better than treated supanet in preventing sand fly bites and therefore recommended for use in areas where sand flies are nuisance biters or disease vectors. A goat bait elicited highest attraction to *P. dubosqi* sand flies among animal baits. Recommendations to help improve LLINs for sand fly control were proposed.