**ABSTRACT**

Tsetse-transmitted trypanosomiases are among the most neglected tropical diseases in sub-Sahara Africa. Although all tsetse species are susceptible to trypanosome infections, their differential attraction/feeding preferences for different wildlife, domestic animals, and/or humans constitute critical determinants of trypanosomes species they predominantly transmit. Artificial bait technologies, based on long-range tsetse olfactory responses to natural cues emitted by preferred hosts and blends of synthetic versions that mimic these cues, have successfully been applied in attractant-odor-based ("pull" tactic) reduction of field populations of some tsetse species. Olfactory attribute associated with active avoidance of tsetse-refractory non-hosts has similarly been exploited in design of repellent-odor-based ("push" tactic) protection of livestock. These tactics have opened possibility of spatially strategic deployment of the two sets of odor baits in "push-pull" tactics. Possibility of developing blends with enhanced attraction and repellence compared with those associated with savannah tsetse fly hosts and non-hosts, respectively, have been explored, where structure activity and blends of different components generated two novel blends. The studies evaluated structure activity and blends of different components. One based on attractive constituents associated with buffalo (Syncerus caffer) comprised of ε-nonalactone, nonanoic acid, 2-nonanone (in 1:3:2 proportion) delivered together with acetone, which showed significantly better attractancy on savannah tsetse fly than the standard blend comprised of 3-propylphenol, octenol, p-cresol, and acetone (POCA). The other blend comprised of δ-nonalactone, heptanoic acid, 4-methylguaiacol and geranylacetone (in 6:4:2:1 proportion) was significantly more repellent than previously characterized blend based on tsetse fly refractory waterbuck (Kobus defassa) constituents (δ-octalactone, pentanoic acid, guaiacol and geranylacetone). So far, no effective attractants or repellents of riverine tsetse fly species have been characterized. Optimized attractant and repellent blends for savannah tsetse flies lay down useful groundwork for future development of the "push-pull" deployment tactic for area-wide control of tsetse flies. Better understanding of the physiological, cellular, and molecular basis of response in the tsetse fly to odors can potentially augment the current tsetse fly-control interventions.