CONTACT SEX PHEROMONE IN THE TSETSE FLY
Glossina pallidipes (Austen)
Identification and Synthesis

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Abstract—Adult male G. pallidipes attempted to copulate with decoys treated with a branched paraffin obtained from laboratory-reared female flies. The compound causing maximal response was isolated and identified as 13,23-dimethylpentatriacontane. The synthesized compound elicited increasing responses with increasing doses. This sex- and species-specific compound was always present in physiological amounts in females, as it increased from 2 μg at emergence to 10 μg per female at 14 days. It was present in wild-caught females from a wide geographical range.

Key Words—Glossina, pallidipes, tsetse fly, Diptera, Muscidae, pheromone, contact stimulant, branched alkane, 13,23-dimethylpentatriacontane.

INTRODUCTION

Glossina pallidipes Austen is sympatric with G. morsitans morsitans Westwood across large areas of eastern and central southern Africa. Both may feed on the same host animal, and both are important vectors of trypanosomiasis. Males of G. morsitans attempt to copulate with artificial or natural decoys treated with natural (Langley et al., 1975) or synthetic 15,19,23-trimethylheptatriacontane, while much weaker responses were seen to two
dimethyl homologs, 15,19- and 13,17-dimethylheptatriacontane (Carlson et al., 1978). The trimethylheptatriacontane released copulatory attempts from wild male *G. m. morsitans* visually attracted to decoys in the field (Langley et al., 1981). Some interspecific activity was seen, in that male *G. pallidipes* responded to decoys treated with 100 μg of the trimethyl alkane in the laboratory, although this dose is too high to be considered biologically meaningful (Huyton et al., 1980).

The presence of a sex stimulant pheromone in *G. pallidipes* was demonstrated in bioassays of males with live or dead females and female materials, including surface lipid extracts, total hydrocarbons, total paraffins, and the major 35-carbon paraffin isolated from mature females (Langley et al., 1982a; McDowell et al., 1981). In a preliminary report, we identified this material as 13,23-dimethylpentatriacontane and reported on the activity of the synthesized compound (Carlson et al., 1981). Copulatory responses were released in *G. pallidipes* males by newly emerged females, either live or killed by freezing, showing that a physiologically active quantity of sexual stimulant was present in very young females. Behavioral maturation, rather than development of cuticular stimulants, was thus considered responsible for the observation that females were most receptive at 9 days of age (Langley et al., 1982a).

The presence of female-produced sex stimulant pheromones has been demonstrated in a third species, *G. palpalis palpalis* Rob-Des. (Offor et al., 1981), and implied in a fourth, *G. austeni* Newstead (Huyton et al., 1980).

We report the analysis of cuticular paraffins from female *G. pallidipes*, and synthesis and bioassays of several potential pheromones that release sexual behavior in the male on contact.

**METHODS AND MATERIALS**

Wild flies for analysis were obtained as dried intact specimens shipped in capped vials (Tables 3 and 4). Larger samples were obtained as concentrates of crude ether or hexane extracts of freshly caught and chilled wild flies obtained from CO₂ plus acetone-baited traps operated in the Zambezi River Valley of Zimbabwe (Vale, 1982) (Table 2). Laboratory flies were aged for extraction in rearing cages under conditions described previously (Tables 1 and 4) (Langley et al., 1982a). Lipids from each sample were prepared for analysis by liquid chromatography on silica gel, then argentation liquid and thin-layer chromatography to obtain active paraffins (Carlson et al., 1978) for further analysis by gas chromatography (GC) and gas chromatography–mass spectrometry (GC-MS).

Gas-liquid chromatography (GC) was performed on a Varian model 2100 GC using a glass column (1.8 m × 2 mm ID) packed with 3% OV-1 on 120–140 mesh Chromosorb W AWDMCS, with flame ionization detector,