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COMMERCIAL MOSQUITO TRAP AND GRAVID TRAP OVIPOSITION MEDIA EVALUATION, ATLANTA, GEORGIA[1]

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ABSTRACT. Field trials evaluating the effectiveness of selected gravid trap oviposition media and commercially available mosquito traps were conducted in southern Fulton County (Atlanta), GA, from June 9 to June 18 and June 24 to July 4, 2002, respectively. Total number of mosquitoes and number of each species captured during the tests were compared using a Latin square design. For the gravid trap infusion media, significant differences were found for total number of mosquitoes collected where sod ≥ hay ≥ hay side-by-side diluted hay > dilute hay side-by-side hay ≥ oak > diluted hay. Only *Aedes albopictus* (oak), *Culex quinquefasciatus* (sod and both concentrated hay infusions), and *Culex restuans* (sod) were captured in significantly greater numbers using a particular infusion. Significant differences for the total number of mosquitoes collected were also observed in the commercial mosquito traps such that the gravid trap > ultra violet up-draft ≥ Mosquito Magnet® Pro ≥ omnidirectional Fay-Prince trap with CO_2 > up-draft CDC-style with CO_2 ≥ CDC-style with CO_2. Significant differences in numbers collected among traps were noted for several species, including *Aedes vexans, Aedes albopictus, Cx. quinquefasciatus, Cx. restuans,* and *Culex salinarius.* Results from these field trap and infusion evaluations can enhance current surveillance efforts, especially for the primary vectors of West Nile virus and other arboviruses.

KEY WORDS Surveillance, mosquito traps, gravid traps

INTRODUCTION

Until recently, a paucity of mosquitoes and mosquito-borne diseases in the Atlanta area has largely negated the need for organized mosquito control, surveillance, and testing of mosquitoes for human pathogens. Two recent events have resulted in the need to reestablish waning to nonexistent mosquito-related programs. Aggressive and medically important *Aedes albopictus* (Skuse) arrived in the Atlanta area in 1985 (Womak et al. 1995) and has since become well established in the ideal habitat found in residential urban/suburban areas. As a result, many common seasonal outdoor activities have become undesirable without the use of repellents and protective clothing. Additionally, the arrival of mosquito-borne West Nile virus in Georgia with the subsequent human cases in 2001 (Rebmann et al. 2002) have pressured local public health and military organizations to engage in control activities, surveillance, and the testing of mosquito pools for infection rates. With the exception of a single *Ae. albopictus* pool, all mosquitoes testing positive for West Nile virus in 2001 and 2002 from Fulton and DeKalb Counties (Atlanta) were *Culex quinquefasciatus* Say, *Cx. restuans* Theobald, *Cx. salinarius* Coquillett, and mixed *Culex* species samples (Kelly, personal communication). Unfortunately, because of the lack of information concerning mosquito populations in Georgia, local surveillance program managers were given conflicting recommendations about what approaches would provide them with the most information with the least amount of effort. Trap trials were conducted to evaluate which commercially available adult mosquito traps and gravid trap infusion media are most effective in the local area for collecting medically important species of interest.

Commercial trap trials (Service 1993; Jensen et al. 1994; Vaidyanathan and Edman 1997; Kline 1999; Reisen et al. 1999, 2000; Burkett et al. 2001a, 2001b; Johansen et al. 2003; Sithiprasasna et al. 2004) and infusion evaluations (Reiter et al. 1986, Reisen and Meyer 1990, Meyer 1991, Trexler et al. 1998) have been conducted in other geographic locations. However, none of these previous trials accurately represent mosquito populations encountered in urban/suburban Atlanta, using current mosquito-trapping technology.

METHODS AND MATERIALS

Both the commercial mosquito trap and gravid trap oviposition media evaluations were conducted near Grant Park in Fulton County (Atlanta) Georgia. Evaluations were done using a 6 × 6 and 5 × 5 Latin square design for the commercial trap and gravid trap infusion trials, respectively. Trap, day, and location effects were evaluated using a 3-way ANOVA (SAS Institute 1995). Trap data were transformed to $\log_{10}(x + 1)$ prior to analysis. Multiple comparisons were made using Duncan's multiple range test ($\alpha = 0.05$).

[1] The mention of trade names or commercial products does not constitute endorsement or recommendation for use by the Centers for Disease Control and Prevention, Department of Defense, or the State of Georgia.

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Commercial trap evaluation

Mosquito trap field trials were conducted from 24 June–4 July, 2002. Each trapping period ran for 24 h from 1000 to 1000 h the following day. Traps were placed along the fence/tree line separating a maintenance area from the public area of the park and were spaced 35 m or more apart. After each trap night, mosquito collections were placed in shipping containers over dry ice and transported to the Entomology Branch Laboratory at the Centers for Disease Control and Prevention (CDC), Atlanta, where they were counted and identified to species. Mosquitoes were separated by species over a chill table, placed in cryovials (30/vial), and then maintained on dry ice. *Culex* specimens that could not be positively identified due to poor condition were combined and analyzed as *Culex* species. All male *Culex* were combined. Specimens were sent on dry ice to the Southeastern Cooperative Wildlife Disease Study at the University of Georgia for arbovirus testing. A total of 6 commercially available trap and attractant combinations were evaluated. All traps are briefly described below.

CDC-type light traps: Two CDC-style light traps were tested, including both a standard down-draft (Trapkit1, American Biophysics Corp, East Greenwich, RI) and an up-draft version (Trapkit1 with updraft lid adapter). Carbon dioxide (CO_2) was provided using locally obtained 9-kg compressed gas cylinders dispensed at 250 ml/min using regulators, restriction couplings, filters, and rubber tubing (Flowkit1, American Biophysics Corp). Battery power to run the fan motor and incandescent light was provided using Powersonic® (PowerSonic Corp, San Diego, CA) 6-V, 10-amp-h rechargeable gel cell batteries. Traps were operated with light set to flicker (32.5 Hz) and hung so that the tops of the trap were approximately 150 cm above the ground.

Up-draft blacklight trap: A miniature blacklight (ultraviolet) trap (Model 1312, John W. Hock, Gainesville, FL), using no CO_2 as an additional attractant, was tested. This trap used a rechargeable 12V, 10-amp-h battery, but was otherwise used as described for the incandescent updraft CDC-type trap.

Mosquito Magnet: The propane powered Mosquito Magnet® (Pro Model, American Biophysics Corp) was used as received and per instructions from the manufacturer. No octenol cartridge was used and propane was obtained locally. See Kline (2002) for additional operational details for these traps.

Omnidirectional Fay-Prince trap: The Fay-Prince trap (Model 112; John W. Hock, Gainesville FL) used CO_2 and battery power as described above for the CDC light traps. The CO_2 was dispensed about 5 cm above the center of the trap. The trap was hung so the top was 60 cm from the ground.

Gravid trap: The gravid trap (Model 1712; John W. Hock) was used as received from the manufacturer and used 6.0 V battery power as described above. A green RubberMaid™ plastic tub comprised the base of the gravid trap. Prior to use, the plastic tubs were aged by filling with water and set in an area receiving partial sun for 3 wk. The oviposition infusion lure was made as described by Reiter (1983). Fresh infusion media was made daily and allowed to ferment for 6–7 days before use. A mixture of 95 g fresh alfalfa hay, 5 g of brewers yeast, and 5 g of lactalbumin (Sigma-Aldrich Co., St. Louis, MO) was added to 10.5 liters of distilled water in a 17.5-liter plastic container. The mixture was stirred daily until used. The resulting media was poured through a fine-mesh screen to remove particulate matter. Each gravid trap used 3.5 liters of hay infusion. Fresh infusion was used for each trap night.

Gravid trap oviposition media: The field gravid trap media evaluation was conducted from 10–20 June 2002, using all but 1 of the sampling sites for the trap evaluation. Times, experimental design (5 × 5 Latin square), and sample processing were as described for the trap evaluation. A total of 5 different infusion combinations (6 total traps, 1 set of 2 side by side) were evaluated and are described below. Gravid trap details are as described in the previous section. The following oviposition infusion media were evaluated.

Reiter's hay infusion: See gravid trap description in Commercial Trap Evaluation.

Reiter's hay adjacent dilute hay infusions: Reiter et al. (1991) used a 7-day-old hay infusion for monitoring *Ae. aegypti* populations in Puerto Rico and found that an ovitrap containing a weak solution paired with an ovitrap containing an infusion concentrate collected more eggs than single ovitraps containing tap water. The same logic was applied to this trial, where 2 gravid traps were placed side-by-side with 1 of the traps using 7-day-old Reiter's hay infusion and the adjacent trap using 3.5 liters of rain water containing 5 ml of the concentrated hay infusion.

Sod infusion: The sod infusion consisted of a 30- × 30-cm section of Bermuda grass in 11.5 liters of distilled water allowed to age for 7 days in a closed, 18.5-liter plastic container. As with the other media, each trap used 3.5 liters of infusion poured through a fine-mesh screen. Fresh, 7-day-old infusions for each gravid trap were used for each trap night.

Oak infusion: Oak infusion was prepared by adding 95 g of locally collected red oak leaves (*Quercus rubra*) to 10.5 liters of distilled water. The mixture was aged for 7 days before use.

Dilute hay in rain water: See description above for dilute hay.

RESULTS

Commercial trap evaluation

A total of 1,361 mosquitoes were collected during 6 trap nights. Arithmetic means, standard errors, *P*-values, and significant differences for the common species collected are shown in Table 1. As noted in the table, there were significant location effects for *Cx. restuans* ($P = 0.002$) and significant day and location effects for *Cx. salinarius* ($P = 0.019$). Significant differences in the number of total mosquitoes ($P = 0.0001$) captured were found for the various traps, where the gravid trap > ultra violet up-draft ≥ Mosquito Magnet ≥ omnidirectional Fay-Prince Trap with CO_2 > up-draft CDC-style with CO_2 ≥ CDC-style with CO_2. Likewise, significant differences were found for the females of individual species, including *Ae. albopictus* ($P = 0.0001$), *Ae. vexans* (Meigen) ($P = 0.0003$), *Cx. restuans* ($P = 0.0001$), *Cx. quinquefasciatus* ($P = 0.0001$), *Cx. salinarius* ($P = 0.0001$), and both female and male *Cx. species* ($P = 0.0001$ and 0.05), respectively. As for individual species, significantly more *Cx. quinquefasciatus* (108.7 ± 15.2), *Cx. restuans* (3.8 ± 1.4), and *Cx. salinarius* (15.3 ± 2.5) were collected using gravid traps than with all other traps combined. *Aedes vexans* (4.2 ± 1.3) and male *Culex* spp. (8.0 ± 3.7) were captured in significantly greater numbers using the ultraviolet up-draft trap. Even though the ultraviolet up-draft trap did not use CO_2, this trap was the 2nd best trap for collecting *Cx. quinquefasciatus* (7.2 ± 3.0). The omnidirectional Fay-Prince trap (9.8 ± 2.1) and the Mosquito Magnet (8.5 ± 1.7) were not significantly different for collecting the most *Ae. albopictus*. Small numbers of *Ochlerotatus triseriatus* Say were collected in each of the trap types. Overall species diversity was relatively low, with only 8 species captured in these trials. *Anopheles punctipennis* (Say) (5) *Oc. triseriatus* (9), and *Psorophora columbiae* (Dyar and Knab) (2) were captured in 1 or more traps, but not collected in sufficient numbers for analysis (totals in parentheses).

Gravid trap media evaluation

A total of 1,669 mosquitoes were collected during 5 trap nights. Arithmetic means, standard errors, *P*-values, and significant differences for the common species collected are shown in Table 2. As noted in the table, there were significant day effects for *Cx. quinquefasciatus* ($P = 0.002$) and *Cx. salinarius* ($P = 0.019$). No significant trap location effects were noted. Significant differences in the total number of mosquitoes ($P = 0.0001$) captured were noted for different infusions where sod ≥ hay ≥ hay side-by-side with dilute hay > dilute hay side-by-side with hay ≥ oak > dilute hay. Likewise, significant differences were found for individual species, including female *Ae. albopictus* ($P = 0.02$), *Cx. restuans* ($P = 0.02$), *Cx. quinquefasciatus* ($P = 0.0001$), and female *Culex* spp. ($P = 0.0001$).

Of those species that were captured in significantly greater numbers per night in certain media, oak infusion captured the most female *Ae. albop-*

Table 1. Mosquito species composition (means ± SE) for variously baited commercially available mosquito traps. Three-way ANOVA and a multiple comparison (Duncan's multiple range test) were performed following $\log(x + 1)$ transformation. Means within each row having the same letter are not significantly different ($n = 6$ nights, $\alpha = 0.05$).

Species	Mosquito Magnet	Omnidirectional Fay + CO_2	CDC + CO_2	Up-draft CDC + CO_2	Up-draft blacklight	Gravid	*P*-value
Total mosquitoes	19.5 ± 4.7 b	14.2 ± 2.2 b	5.7 ± 1.4 c	5.7 ± 0.8 c	29.8 ± 7.4 b	152.0 ± 20.9 a	0.0001
Aedes albopictus (females)	9.8 ± 2.1 a	8.5 ± 1.7 a	1.2 ± 0.7 b	1.6 ± 0.5 b	0.5 ± 0.3 b	2.3 ± 0.4 b	0.0001
Ae. albopictus (males)	6.5 ± 3.4 a	1.7 ± 1.0 b	0.2 ± 0.2 b	0.0 ± 0.0 b	4.0 ± 4.0 a	0.0 ± 0.0 b	0.05
Ae. vexans	0.3 ± 0.3 b	0.5 ± 0.3 b	0.2 ± 0.2 b	0.7 ± 0.3 b	4.2 ± 1.3 a	0.0 ± 0.0 b	0.0003
Anopheles punctipennis	0.0 ± 0.0	0.0 ± 0.0	0.3 ± 0.3	0.0 ± 0.0	0.5 ± 0.3	0.0 ± 0.0	0.346
Culex quinquefasciatus	0.7 ± 0.2 c	2.0 ± 1.2 c	2.5 ± 0.7 c	2.2 ± 0.7 c	7.2 ± 3.0 b	108.7 ± 15.2 a	0.0001
Cx. species[1] (females)	0.0 ± 0.0 b	0.2 ± 0.2 b	0.0 ± 0.0 b	0.0 ± 0.0 b	1.0 ± 1.0 b	19.7 ± 3.3 a	0.0001
Cx. species (males)	1.0 ± 0.5 b	0.8 ± 0.7 b	0.2 ± 0.2 b	0.3 ± 0.3 b	8.0 ± 3.7 a	1.8 ± 0.9 b	0.05
Cx. restuans[2]	0.0 ± 0.0 b	0.0 ± 0.0 b	0.7 ± 0.7 b	0.2 ± 0.2 b	2.5 ± 1.3 a	3.8 ± 1.4 a	0.0001
Cx. salinarius[2,3]	0.7 ± 0.5 b	0.2 ± 0.2 b	0.5 ± 0.3 b	0.7 ± 0.3 b	1.7 ± 1.3 b	15.3 ± 2.5 a	0.0001
Ochlerotatus triseriatus	0.5 ± 0.2	0.3 ± 0.2	0.0 ± 0.0	0.3 ± 0.3	0.2 ± 0.2	0.2 ± 0.2	0.683
Psorophora columbia	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2	0.2 ± 0.2	0.611

[1] *Culex* species = damaged *Culex* specimens that could not be differentiated.
[2] Significant location effect ($P < 0.05$).
[3] Significant day effect ($P < 0.05$).

Table 2. Mosquito species composition (means ± SE) for various gravid trap media. Three-way ANOVA and a multiple comparison (Duncan's multiple range test) were performed following $\log(x + 1)$ transformation. Means within each row having the same letter are not significantly different ($n = 6$ nights, $\alpha = 0.05$).

Species	Hay	Hay adjacent dilute	Dilute adjacent hay	Oak	Dilute hay (control)	Sod	*P*-value
Total mosquitoes	93.4 ± 24.7 a	69.2 ± 15.4 a	28.2 ± 5.5 b	27.8 ± 6.1 b	11.4 ± 3.5 c	103.8 ± 30.0 a	0.0001
Aedes albopictus (females)	0.8 ± 0.2 b	0.2 ± 0.2 b	0.4 ± 0.2 b	4.9 ± 1.6 a	0.8 ± 0.6 b	0.8 ± 0.4 b	0.02
Ae. albopictus (males)	0.2 ± 0.2	0.0 ± 0.0	0.4 ± 0.4	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.496
Ochlerotatus triseriatus	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.4	0.0 ± 0.0	0.2 ± 0.2	0.2 ± 0.2	0.693
Culex quinquefasciatus[1]	52.2 ± 14.2 a	43.0 ± 14.7 a	16.2 ± 3.2 b	9.4 ± 2.3 c	3.6 ± 3.1 d	57.8 ± 19.0 a	0.0001
Cx. species[2] (females)	27.0 ± 8.2 a	18.0 ± 2.5 a	5.6 ± 1.0 b	3.2 ± 1.2 b	2.2 ± 1.2 b	27.7 ± 7.1 a	0.0001
Cx. species (males)	9.8 ± 3.0	6.0 ± 2.7	5.0 ± 1.9	11.2 ± 6.1	4.6 ± 2.0	10.8 ± 3.2	0.329
Cx. restuans	1.6 ± 0.9 b	1.0 ± 0.6 b	0.2 ± 0.2 b	1.4 ± 0.9 b	0.0 ± 0.0 b	6.2 ± 2.6 a	0.02
Cx. salinarius[1]	1.8 ± 1.8	1.0 ± 1.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.4	0.482

[1] Significant day effect ($P < 0.05$).
[2] *Culex* species = damaged *Culex* specimens that could not be differentiated.

ictus (4.9 ± 1.6). Hay (52.2 ± 14.2), sod (57.8 ± 19.0), and hay adjacent dilute (43.0 ± 14.7) captured significantly more *Cx. quinquefasciatus* than oak and dilute hay combinations. Similar results were obtained for female *Culex* spp. *Culex restuans* (6.2 ± 2.6) were captured in significantly greatest numbers using sod. None of the other species sampled showed preferences for a particular infusion media. *Ochlerotatus triseriatus* (4) and male *Ae. albopictus* (3) were captured in 1 or more traps, but not collected in sufficient numbers for analysis (totals in parentheses).

DISCUSSION

With the emergence and rapid spread of West Nile virus across the USA, various public health, vector control, and military organizations have established or significantly revamped waning to nonexistent mosquito surveillance and control programs. In many areas, the objective of mosquito surveillance has changed from one of monitoring changing populations to capturing as many potential vector mosquito species as possible for determining infection rates and foci for West Nile virus and other arboviruses. The wide variety of commercially available mosquito traps, conflicting surveillance recommendations, lack of attractant standardization, and real or perceived regional differences in trap/attractant effectiveness for mosquito populations led to evaluations of the commonly used trap and attractant combinations used for mosquito surveillance in different parts of the country.

In this study, the overall number of mosquitoes captured and the species composition differed considerably among trap designs ranging from <6 total mosquitoes per trap-night for the standard up- or down-draft CO_2-baited CDC type trap to >150 per trap-night for the gravid trap using Reiter's hay infusion. The gravid trap was clearly the most effective trap for collecting *Cx. quinquefasciatus, Cx. restuans,* and *Cx. salinarius.* At least for the former, this agrees with Meyer (1991), who found *Cx. quinquefasciatus* was sampled more effectively in urban (but not rural) areas using gravid traps when compared with CO_2-baited light traps. Reisen et al. (1990) likewise found the two primary *Culex* species were captured in significantly smaller numbers using CO_2-baited traps when compared with gravid traps. In our trials, both CO_2-baited CDC light trap styles (up- or down-draft) captured representatives of all common species except *Cx. salinarius*; however, they did not capture significantly more specimens of any of the species collected when compared with the other traps. Surprisingly, the ultraviolet updraft trap that used no CO_2 captured significantly more *Cx. quinquefasciatus* per trap-night (7.2 ± 3.0) than all but the gravid trap, and significantly more *Ae. vexans* (4.0 ± 1.3) and male *Culex* species (12.0 ± 3.7) than all other traps. The ultraviolet trap results are important, as these traps do not have the logistical constraints and extra expense associated with using dry ice or compressed gas cylinders as a source of CO_2.

Aedes albopictus has long been known to be poorly represented in light trap collections (Hawley 1988). These trials again showed low capture numbers of this species using CDC-type light traps. The Mosquito Magnet (9.8 ± 2.1) and CO_2-baited omnidirectional Fay-Prince traps (12 ± 1.7) were the most effective traps for *Ae. albopictus,* capturing significantly more than the other traps evaluated. These results agree with those for a similar trap evaluation conducted in Okinawa, Japan (Burkett 2001). Both the Mosquito Magnet (0.7 ± 0.2) and omnidirectional Fay-Prince trap (2.0 ± 1.2) were, however, the least effective traps for collecting any of the *Culex* species. For *Cx. salinarius* (only *Culex* species captured), Kline (2002) also found the Mosquito Magnet Pro design collected significantly fewer of this species than other similarly propane-powered Counter Flow Technology traps evaluated. Interestingly, the Mosquito Magnet Pro is effective at collecting medically important *Culex* species in other parts of the world. In both Korea (Burkett et al. 2001a, 2001b) and Okinawa (Burkett 2001), comparable Mosquito Magnets (without octenol) collected significantly more *Cx. quinquefasciatus* and *Cx. tritaeniorhynchus* than all other traps evaluated. Johansen et al. (2003) found Mosquito Magnets did not capture significantly more mosquitoes of any species when compared with CO_2-baited CDC-style light traps.

Relatively large numbers of various *Culex* species and smaller numbers of *Ae. albopictus* and *Oc. triseriatus* collected in gravid traps placed in our study area the previous fall led us to evaluate different oviposition media to see if we could increase collection numbers and target particular species. Several oviposition infusions as used by other researchers, including hay (Reiter 1983, Reiter et al. 1986, Reisen and Meyer 1990), sod (Reisen and Meyer 1990, Lampman and Novak 1996), oak, (Trexler et al. 1998), and a weak hay infusion side-by-side a concentrate (Reiter et al. 1991) were evaluated against the local Atlanta species composition. Significant differences were found for various species using different oviposition media. *Culex restuans,* for example, were captured in significantly greater numbers using the sod infusion. Likewise, the dominant species, *Cx. quinquefasciatus* and the unidentifiable *Culex* spp. were captured in the greatest numbers using the sod infusion, followed by the concentrated hay and hay adjacent the dilute infusion. Conversely, and though represented in small numbers, infusion media did not seem to matter for *Cx. salinarius* or *Oc. triseriatus.* For *Cx. salinarius,* however, there was a significant day effect, with trap numbers increasing at the end of the test period.

Aedes albopictus were captured in greater numbers using oak when compared with the other infusions. Based on the successful *Ae. aegypti* ovitrapping methodology used in Puerto Rico (Reiter et al. 1991), one of the gravid trap treatments consisted of 2 side-by-side traps (weak adjacent concentrated hay infusion). In our case, adjacent gravid traps did not yield significant increases in the capture numbers for *Ae. albopictus* or any of the other common species. However, the dilute hay infusion adjacent the concentrate did capture more *Cx. quinquefasciatus* and *Culex* spp. than the dilute hay infusion by itself. Given that more *Ae. albopictus* were captured in oak infusion-baited traps, this technique should be repeated using a dilute oak infusion adjacent a concentrate.

Results from this study indicate that the Atlanta area needs to focus on an integrated trapping program using a combination of trap types depending on the species of interest. No single trap type or infusion captured large numbers of all species of interest. For all 3 *Culex* species of interest, gravid traps using sod or hay were most effective at collecting large numbers. The advantages of gravid traps are obvious. They are inexpensive, require less maintenance than other traps, and collect the desirable portion of the mosquito population that includes the older blood-fed females (at least for the *Culex*) that are more likely to contain arboviruses of interest than those specimens collected in other kinds of traps (Reiter 1983). Almost all of the Georgia West Nile virus-positive mosquito pool samples from 2001–2003 were collected from gravid traps (Rose Kelly, personal communication).

For commercial traps, both the Mosquito Magnet and omnidirectional Fay-Prince trap collected the largest numbers of *Ae. albopictus.* Each of these traps has advantages, the former by minimizing logistical and personnel problems associated with batteries and compressed gas cylinders or dry ice as a source of CO_2, and the latter by currently costing 1/5 that of the Mosquito Magnet.

The results from the 2 CDC-style CO_2-baited light traps were not very impressive. Although these traps collected most of the common species, they did not collect them in numbers appropriate for determining pathogen infection rates. Of the light traps evaluated, the ultraviolet trap was the most effective, capturing the most *Ae. vexans* and the 2nd most *Cx. quinquefasciatus.* Note that the ultraviolet trap did not use CO_2, with the associated logistical burden.

Both the commercial adult mosquito trap trials and gravid trap media evaluations showed how results for several species, especially the *Culex* species, differed from those found in other studies in different geographical areas. Indeed, the unique mosquito fauna in urban Atlanta makes it critical that tests are conducted for the local species composition and not extrapolated from similar populations elsewhere. Evaluating new trap and attractant designs and technologies where vector-borne diseases are or can potentially occur will increase our knowledge of vectors and assist in the development and implementation of vector surveillance and disease-control strategies. Future mosquito work in Atlanta and elsewhere should focus on testing additional gravid trap attractant media and determining the host feeding preferences for the local medically important species, especially the *Culex* species. This could be accomplished using blood meal analysis or by using a Shannon-type trap (Burkett et al. 2001a, 2001b) to evaluate diel human host-seeking activity for mosquitoes as a substitute for human landing/biting collections.

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