tried unsuccessfully but another chemical, the anti-malarial mepacrine hydrochloride 4-(3-Chloro-7-methoxy acridin-9-ylamino)-NN-diethylpentylamine dihydrochloride dihydrate, gave promising results. It was thought likely that this would kill ciliates as it is known to kill both sporozoan and flagellate Protozoa (Bowman and Rand 1980). This article describes the results of these tests.

Mepacrine hydrochloride was dissolved in distilled water so as to provide a series of 5 concentrations from 0.0009 to 0.0045%. Infested 3rd or 4th instar larvae of *Ae. juppi,* recently dead, were placed into each of the 5 solutions. The lowest concentration at which all the *Vorticella* died was 0.0018% and the time required 21 hr. The discovery of *Vorticella* on larvae of *Ae. juppi* prompted us to examine our healthy colonies of *Culex perexiguus* Theobald and *Culex univittatus* Theobald and *Vorticella* was found on dead larvae but not on any living larvae of the 2 species. The vorticellids on these 2 mosquitoes appeared to differ morphologically and that infesting *Cx. perexiguus* also differed from the vorticellid infesting *Ae. juppi.* This may explain why less than 4 hr exposure to 0.0018% mepacrine hydrochloride was needed to kill the *Vorticella* on *Cx. perexiguus* larvae but 21.5 hr for the *Vorticella* species on *Cx. univittatus* larvae. This suggests that the *Vorticella* species on *Cx. univittatus* may have been the same as that infesting *Ae. juppi.* When dead infested *Ae. juppi* larvae were mixed with live uninfested *Cx. univittatus* 2nd instar larvae and cultured together for 2 weeks, the *Vorticella* did not spread to the *Cx. univittatus* larvae while they were alive. However, if a *Cx. univittatus* larva died from another cause, after death it swiftly became infested with *Vorticella.*

Having established the minimum concentration of mepacrine hydrochloride and the length of exposure to kill the *Vorticella,* experiments were undertaken to ascertain whether the same concentration would be detrimental to the larva itself. Since at the time of the tests no live *Ae. juppi* were available, experiments were performed using other species of mosquitoes from laboratory colonies. Exposure of mature larvae of *Cx. univittatus* for up to 8 days to mepacrine hydrochloride at concentrations greater than 0.0018% caused a 54% mortality mainly in the subsequent pupal and adult stages. The mortality rate at 0.0018% was not established although it was lower than 50%. When eggs of *Aedes aegypti formosus* (Walker) were hatched using the technique of Novak and Shroyer (1978), except that the hatching tubes contained 0.1% nutrient broth made up in 0.0018% mepcrine hydrochloride, 3 days later 10–85% of the young larvae were found dead. When the rearing of the surviving larvae was continued in dishes of mepacrine hydrochloride, 6–25% of them failed to become adults. If eggs of *Ae. aegypti formosus* were hatched in the same way but the young larvae were transferred on the first and second days to distilled water and fed in the usual way, about 87% of these larvae reached adulthood.

In conclusion, there are two possible procedures for using mepacrine hydrochloride to control *Vorticella* infestations. In the first, eggs are hatched in 0.0018% mepacrine hydrochloride made up in 0.1% nutrient broth and the first instar larvae are transferred to clean water a minimum of 21 hr later. The second procedure is to place 2nd, 3rd and 4th instar infested larvae into mepacrine hydrochloride solution for at least 21 hr and afterwards transfer them to clean water in rearing dishes.

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EVALUATION OF A SUSTAINED RELEASE FORMULATION OF *BACILLUS THURINGIENSIS* (H-14) FOR CONTROL OF WOODLAND *CULEX* MOSQUITOES[1]

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Bacillus thuringiensis var. *israelensis (B.t.i.),* or *B. thuringiensis* (H-14) as designated by de Barjac (1978), is a bacterial agent effective against several nematocerous dipteran families, including mosquitoes (Culicidae) and blackflies (Simuliidae). During sporogenesis of the bacterium, a proteinaceous crystal or parasporal body is formed. This crystal contains a delta-endotoxin which is responsible for most of the

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toxic action of *B. thuringiensis* (H-14) (Lacey 1985). In the field this parasporal body becomes unavailable to larvae by a number of mechanisms. Because they are unattached, the crystals sink rather rapidly (Ignoffo et al. 1981). Particulate matter in the water tends to bind the active moiety (Van Essen and Hembree 1982), and it is also biodegraded by nontarget organisms which are not adversely affected (Rishikesh et al. 1983).

Thus, slow release formulations are desirable and have been shown to increase the active life of the material (Lacey et al. 1984). One of these, manufactured by Biochem Products, is known as the Bactimos® briquet or "donut." This floating formulation releases the active ingredient at the water surface, effectively prolonging its exposure time within the feeding zone of the larvae. Lacey et al. (1984) reported control for 3 wk with briquets against *Culex quinquefasciatus* Say in artificial containers in Gainesville, Florida. In studies conducted in Puerto Rico, Novak et al. (1985) reported up to 78 days control of *Aedes aegypti* (Linn.) in a 55-liter drum.

The purpose of our investigation was to evaluate the effectiveness of the briquets in woodland pool habitats in North Carolina against *Culex* larvae. Field trials were carried out in flooded depressions or tire ruts in deforested woodlands in Sampson County, NC, during fall 1984. The pools were circular or oblong, and they varied in depth (on the day of treatment) from 20 to 40 cm.

Mosquito larvae were monitored with the standard pint dipper (0.47 liter). Each sample of larvae consisted of 5 dips taken along the margins of treated and untreated control pools. On each evaluation date, one sample was collected for each briquet placed. Samples were collected the day before or just before briquets were placed and at varying times afterward. Larvae were preserved in the field and subsequently identified and counted.

Bactimos briquets (10% AI, *B. thuringiensis*, serotype H-14) were placed, according to label directions, at the rate of one briquet per 100 ft^2 (9.29 m^2) of pool surface. To anchor each briquet, a wire surveyor's flag was inserted through the hole in its center and into the bottom of the pool. Control pools were located ca. 50–100 m from treated pools.

An analysis of variance test was used to determine if differences in the number of larvae collected per sample for the treated and control pools were significantly ($P \leq 0.05$) different.

Results of the field trial are presented in Table 1. The briquets were active against *Culex territans* Walker larvae. Larvae were not found in either the treated or control pools until 2 days after the briquets were placed. Appreciable levels of control of *Cx. territans* larvae occurred 28 days after the briquets were placed. Larval populations in the treated pools remained at low levels, but in the control pools larval abundance increased and was stable at moderate levels throughout the trial. The briquets were also effective against *Culex restuans* Theobald. Relative to the control pools, larval populations in the treated pools remained at low levels throughout the trial.

Although *Cx. territans* and *Cx. restuans* are of questionable economic importance, our results indicate the briquet provided sustained control of these *Culex* mosquitoes. The briquet would appear to be a highly suitable formulation for use in a variety of natural and artificial

Table 1. Evaluation of sustained release briquet (10% A.I.) of *Bacillus thuringiensis* (H-14) against *Culex* mosquitoes near Newton Grove, Sampson County, NC (September–October 1984).

Days pre- (−) or post-treatment (+)	Mean no. larvae per 5 dips[a]			
	Cx. territans		*Cx. restuans*	
	Treatment	Control	Treatment	Control
−1	0	0	0*	0.8
0	0	0	0*	4.5
+2	0.2	0.5	1.6*	43.3
+6	1.0*	10.3	0.6*	31.0
+13	1.1	4.3	1.2*	22.3
+20	1.9	4.3	0.1*	24.3
+28	2.0	16.0	0	5.3
+33	0.7*	14.0	0	0
+41	0.6*	7.0	0	0
+48	0.4*	36.0	0	0

[a] Six treatment and 4 control pools were used in this field trial.

* Differences between the treated and control pools were significant ($P \leq 0.05$) by ANOVA for the given evaluation date.

mosquito breeding habitats such as woodland pools, rock holes, catch basins and abandoned swimming pools.

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ERRATUM: *AEDES ALBOPICTUS* DOES NOT OCCUR IN AFRICA

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In the paper "*Aedes albopictus* in Memphis, Tennessee (USA): an achievement of modern transportation?" (Reiter, P. and R. F. Darsie, Jr., 1984, *Mosq. News* 44(3):396–399), we stated that *Ae. albopictus* (Skuse) occurs on the African mainland in Djibouti. We based this on a table of the geographic distribution of the species given by Ho Beng-Chuan, Chan Kai-Lok and Chan Yow-Cheong (1973), "The biology and bionomics of *Aedes albopictus* (Skuse)" *Vector Control in Southeast Asia; Proceedings of the First SEAMEO Workshop,* pp. 125–143. Following an inquiry by Dr. F. Rodhain of the Institut Pasteur, Paris, we traced this record to its origin, "Boat off Djibouti (as *scutellaris* Walker, Doreau, 1909)" which was mentioned by Mattingly, P. F. (1953) "The subgenus *Stegomyia* (Diptera: Culicidae) in the Ethiopian region. II. Distribution of species confirmed to the east and south African region," *Bulletin of the British Museum (Natural History) Entomology* 3(1):1–65, but which Mattingly stressed was based on a casual observation and could not be confirmed. Dr. Rodhain has assured us that the species was not present in Djibouti when he worked there in 1973–74, and so we feel that we were in error when we included that country in our distribution map for the species. We should also add that, in a separate part of their paper, Ho Beng-Chuan et al. did state that *Ae. albopictus* does not appear on the African mainland.

NEW STATE RECORDS FOR *AEDES COMMUNIS* AND *AEDES PUNCTOR* IN CONNECTICUT

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While conducting an extensive larval survey for microsporidian pathogens of northern *Aedes* mosquitoes, several 4th instar larvae and pupae of *Aedes communis* (De Geer) and *Aedes punctor* (Kirby) were collected from Mohawk State Forest in Cornwall, Connecticut. Collections of both mosquito species were initially made on May 17, 1984 in a heavily wooded mixed hardwood forest at an elevation of 445 meters. The forest was dominated by oaks, *Quercus* spp., maples, *Acer* spp., birches, *Betula* spp., and beech, *Fagus grandifolia* Ehrh. Also present but scattered were eastern hemlock, *Tsuga canadensis* (L.) Carr. and eastern white pine, *Pinus strobus* L.

Larvae and pupae of *Ae. communis* were found in a manmade, mountain roadside drainage ditch (approx. 2 m x 2 m in size and 30 cm deep) located 0.1 km south of Lookout Tower. The ditch was lined with leaves and large rocks and contained cool clear water that was slightly acidic (pH 6.5). Mosquito species found in association with *Ae. communis* included *Aedes abserratus* (Felt and Young), *Ae. canadensis canadensis* (Theobald), *Ae. excrucians* (Walker) and *Ae. provocans* (Walker).

Fourth instar larvae and pupae of *Ae. punctor* were collected from a small leaf lined pool