

EFFECT OF ADDITION OF CALCIUM CHLORIDE TO LARVAL MEDIUM ON SURVIVAL OF IMMATURE SNOW-MELT *Aedes* (DIPTERA:CULICIDAE)¹

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ABSTRACT. The addition of calcium chloride to larval medium was detrimental to the survival of immature snow-melt *Aedes*. Addition of 5000 ppm CaCl_2 to the larval medium

was fatal to immatures of all 5 species. Tolerance for the heightened levels of calcium chloride varied between species.

INTRODUCTION

Larvae of snow-melt *Aedes* appear early in the spring in collections of run-off water, much of which may contain salt applied to de-ice road surfaces. Two major de-icing salts are NaCl and CaCl_2 . Kardatzke (1980) previously reported the effect of NaCl on immature snow-melt *Aedes*. The present study reports the effect of addition of CaCl_2 .

(Theobald), *Ae. provocans* (Walker), *Ae. punctor* (Kirby), *Ae. sticticus* (Meigen), and *Ae. stimulans* (Walker) differed from 500 ppm CaCl_2 to 4000 ppm CaCl_2 in their tolerance to the addition of CaCl_2 in the larval medium (Table 1).

Both *Ae. provocans* and *Ae. stimulans* were relatively intolerant of the addition of CaCl_2 to their larval medium. Adding 500 ppm CaCl_2 to the medium caused only a slight decrease in survival to adult (Table 1). Addition of 1000 ppm CaCl_2 resulted in death of all immatures of both species.

METHODS AND MATERIALS

Larvae used in this study were obtained from eggs laid by feral females which were collected, transported, and maintained following procedures of Kardatzke (1976). The standard rearing medium and techniques were those described by Kardatzke (1979). Calcium chloride was added to the medium in increments of 500 ppm. Addition was from day 0 of larval development. Survival was based on number of immatures emerging as adults, normalized for control mortality.

Both *Ae. canadensis* and *Ae. punctor* were moderately tolerant of the addition of CaCl_2 to the larval medium. For *Ae. canadensis* survival to adult did not decrease to below 50% until 2000 ppm CaCl_2 had been added to the medium (Table 1). Once 1500 ppm CaCl_2 had been added to the larval medium of *Ae. punctor*, survival to adult dropped to below 50%.

RESULTS

The addition of CaCl_2 to the standard larval rearing medium used for snow-melt *Aedes* variably affected survival of these species. The 5 species, *Ae. canadensis*

Of the five species examined, immatures of *Ae. sticticus* were the most tolerant of the addition of CaCl_2 to the standard larval medium. Survival to adult did not become less than 50% until 3000 ppm CaCl_2 had been added to the larval medium (Table 1). Even when 4000 ppm CaCl_2 was added to the medium, a few *Ae. sticticus* could develop to adults.

¹ Opinions and assertions contained herein are the private views of the author and are not to be construed as official nor as reflecting the views or endorsements of the Department of the Army nor the Department of Defense.

DISCUSSION

Although many salts may occur naturally in vernal pools inhabited by snow-

Table 1. Percentage of survival to adult emergence, normalized for control mortality, of snow-melt *Aedes* larvae when CaCl_2 is added to the medium.

Species of <i>Aedes</i>	No. larvae/ treatment	ppm CaCl_2 added to medium										
		0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>Canadensis</i>	60	100	93	84	61	31	14	0	0	0	—	—
<i>Provocans</i>	60	100	83	0	0	0	0	0	—	—	—	—
<i>Punctor</i>	60	100	86	67	47	21	11	3	0	0	0	0
<i>Sticticus</i>	60	100	100	95	95	92	63	27	12	9	0	0
<i>Stimulans</i>	60	100	93	0	0	0	0	—	—	—	—	—

melt *Aedes*, the total salinity of these pools seldom exceeds 1000 ppm (Kenk 1949). Thus, the addition of small amounts of de-icing salts, such as CaCl_2 , in run-off waters may be detrimental to snow-melt *Aedes*. From results of the above laboratory studies, the abrupt addition of as little as 1000 ppm CaCl_2 into pools inhabited by *Ae. provocans* and *Ae. stimulans* may kill all larvae present. Other species such as *Ae. sticticus* may have a higher tolerance.

If addition of CaCl_2 is a gradual process, the species may become more tolerant of CaCl_2 . Parker (1979) demonstrated with *Ae. dorsalis* (Meigen) that a species could become more tolerant of high concentrations of salts over the short span of 4 generations. Kardatzke (1980) when comparing his work with previous work showed that larvae of *Ae. stimulans* varied geographically in their tolerance of the

addition of salt to identical larval media. Since the addition of salts to the laboratory larval environment is detrimental, field studies on the effects of road de-icing salts on larval snow-melt *Aedes* should be made.

Literature Cited

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