Lambda-cyhalothr (Warrior) Zeneca

New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
50 Wolf Road, Albany, New York 12233-7250
Phone 518-457-6934 FAX 518-457-0629

John P. Cahill
Acting Commissioner

APR 25 1997

Mr. Michael S. O'Connor
Regulatory Product Manager
Registrations West
Zeneca Ag Products
1200 S. 47th Street
Richmond, CA 94804-0024

Dear Mr. O'Connor:

Re: Registration of Warrior Insecticide
(EPA Reg. No. 10182-96) in New York State

We have reviewed and accepted for registration the application received on December 13, 1996 to register the referenced pesticide product in New York State. The federal label as submitted, along with the additional supplemental labeling (details of which will be discussed later), is approved for use in New York State. The product is classified as a restricted use pesticide by the United States Environmental Protection Agency (USEPA) due to toxicity to fish and aquatic organisms. The product is registered as a restricted use pesticide in New York State.

Warrior Insecticide contains 13.1% of a synthetic pyrethroid, [redacted], as the active ingredient. The product is labeled for use on broccoli, cabbage, corn (field, pop, seed, and sweet), lettuce, onions, peanuts, sorghum, soybeans, sunflowers, tomatoes, tomatillos, wheat, hay, and triticale. The highest single application rate is 0.03 lbs. active ingredient per acre. Warrior is labeled for multiple applications with an interval of four days between applications.

Warrior was previously reviewed for registration by this Department. A registration of the full federal label for Warrior was not acceptable at that time because concerns persisted about the potential for lambda-cyhalothrin to cause acute and chronic toxicity to aquatic invertebrates. A Special Local Need (SLN) registration was granted for use of Warrior in New York State during the 1996 growing season, ostensibly because of the unavailability of alternative insecticide products. The SLN limited the maximum seasonal application rate for Warrior and expanded the interval between applications. This SLN registration expired on December 31, 1996.

The Department still required, as a condition for continued registration of Warrior in New York State, data which accurately measured how much of the active ingredient was likely to be transported off treated fields by runoff. The data was needed to negate or validate our concern about adverse impacts to aquatic ecosystems from the use of Warrior in New York State. The Department suggested that this data could best be generated by conducting a small-plot runoff study.

On December 13, 1996 Zeneca submitted additional data, in lieu of conducting the runoff study, that were intended to show that Warrior would not be as toxic to aquatic life as this Department had predicted. This Department's Division of Fish, Wildlife, and Marine Resources (DFW&MR) completed an ecological assessment of the additional information on March 17, 1997. The DFW&MR concluded that the data submitted with the December 13, 1996 application eliminated most concerns regarding acute toxicity to freshwater aquatic invertebrates; however, the data did not resolve the concern that lambda-cyhalothrin could potentially cause chronic toxicity to aquatic invertebrates. Zeneca was informed in a letter dated March 17, 1997 of the specific data which the DFW&MR needed to address the remaining concerns.

In correspondence dated March 25, 1997, Zeneca raised five points to show that the concerns regarding aquatic toxicity had been adequately addressed and that further data generation by conducting the runoff study were unnecessary. The relevant data were analyzed by the DFW&MR and, where appropriate, integrated into the risk assessment process. The revised risk assessment is presented below.

REVISED ECOLOGICAL ASSESSMENT

Of the five possible mitigative measures presented by Zeneca, the most significant issue regarded the rapid dissipation of lambda-cyhalothrin in water. Zeneca was able to demonstrate that lambda-cyhalothrin would not persist in the aquatic environment long enough for chronic toxicity to occur to aquatic invertebrates.

Chronic toxicity to aquatic invertebrates had remained a concern for DFW&MR because laboratory-derived environmental fate data shows that lambda-cyhalothrin resists photolysis and hydrolysis, and has the potential to remain in the water column for an extended period of time. To alleviate this concern, Zeneca cited the 1986 lambda-cyhalothrin mesocosm study. They submitted a graph of a limited data set derived from the mesocosm study that showed 100% lambda-cyhalothrin dissipation from the water column in about 96 hours.

The DFW&MR reviewed the 1986 mesocosm study and initially determined that chronically toxic concentrations of lambda-cyhalothrin could persist in water. The mesocosm study raw data showed a water column residue in Pond 2B of 16 pptr (mean of three samples at different depths) on September 22, 1986, 28 days after the final drift application of lambda-cyhalothrin. Thirty-four days later, the same pond had a mean

water column residue of 2 pptr lambda-cyhalothrin. Pond 3B showed similar persistence of lambda-cyhalothrin: 34 pptr on August 26; 4 pptr on September 9; 4 pptr on September 23; and 2 pptr on October 28. These data indicate that lambda-cyhalothrin concentrations exceeding the chronic LOEL for mortality to adult *daphnia* persisted from at least August 26 to sometime in mid-October 1986.

Zeneca's comments on March 25, 1997 prompted another analysis by the DFW&MR of the mesocosm data. Even though chronically toxic levels of lambda-cyhalothrin were detected in the ponds, the water residue data from the mesocosm study may have been confounded by the high application scenario. These ponds were treated with 12 direct spray drift applications and six runoff applications over a 12-week period. This application scenario is not expected to occur in New York, because the mesocosm study did not take into account the use of buffer strips to minimize spray drift.

In order to reassess the mesocosm study data, the initial water column concentration of lambda-cyhalothrin had to be determined. The volume of lambda-cyhalothrin applied to each pond was thoroughly documented, but the volume of water in the test ponds was never described in the mesocosm report, so the water column concentration of lambda-cyhalothrin following each drift and runoff application had to be estimated. Given that the pond dimensions were 30 X 30 meters with a mean depth of 1.075 meters, the pond volume was estimated as 976,500 liters. The concentration of lambda-cyhalothrin resulting from each spray drift application into a "high concentration" pond was 73 ng/l, and an additional 8.8 ng/l of bioavailable lambda-cyhalothrin resulted from each runoff application. Using a 30-day half-life for lambda-cyhalothrin in water, as environmental fate data from the lab suggests, by August 27, the day after the last spray drift application, the lambda-cyhalothrin water column concentration in both high concentration ponds should have been about 496 ng/l. By October 27 that concentration would have been reduced to only 124 ng/l if no other fate processes were occurring.

The DFW&MR assumes that buffer strips will prevent most spray drift from entering ponds, and that lambda-cyhalothrin will only affect aquatic life if it is transported off a treated field by runoff. In order to assess the potential risk of chronic toxicity from lambda-cyhalothrin in runoff, the dissipation rate in water must be estimated following a single application. The chart provided by Zeneca with the March 25, 1997 data submission is useful, but it only represents a single data point. As an alternative method of analysis, DFW&MR examined the mesocosm raw data for every instance when residue samples were taken from the same pond less than five days apart with no additional application of lambda-cyhalothrin occurring between samples. The half-life was then determined by linear regression using the difference in the lambda-cyhalothrin concentrations. Six data sets were found, from which individual and mean half-lives in water could be determined:

Pond	Sample date	Lambda-cyhalothrinDF W&MR concentration (mean of three samples taken at different depths) in ng/l	Time interval between samples, in hours	Estimated Lambda-cyhalothrinDF W&MR half-life in water, in hours
2B	14 June	20	48	8.5
	16 June	3		
3B	15 June	30	48	13
	17 June	4		
2B	26 July	90	48	36
	28 July	18		
3B	27 July	98	48	37.5
	29 July	23		
2B	30 July	28	72	11.5
	2 Aug	5		
3B	31 July	33	72	14.5
	3 Aug	4		
Arithmetic mean				20.2
Geometric mean				17

An analysis of the overall mesocosm study showed chronically-toxic concentrations persisting for several months after the cessation of multiple drift and runoff applications. However, that behavior is probably not indicative of a single application of lambda-cyhalothrin to a pond through runoff.

RISK ASSESSMENT: The AQUATOX model was run for lambda-cyhalothrin with the following changes:

A) AQUATOX model was internally modified to compute the concentration of lambda-cyhalothrin in runoff, then that value was multiplied by 0.04 to account for the bioavailable fraction of lambda-cyhalothrin in the runoff water.

B) The aquatic life toxicity thresholds were returned to their original values. In the last modeling series for lambda-cyhalothrin, the toxicity thresholds were all multiplied by 73 or 88 to account for the decreased toxicity of a sediment/water mixture. It was decided that adjusting the toxicity was inappropriate because the decreased bioavailability occurs in the water/sediment/lambda-cyhalothrin mixture during runoff, not in the pond after runoff occurred.

C) The field dissipation rate half-lives on soil were changed from low/high/mean values of 26/40/33 to 12/40/26.

D) The maximum amount of lambda-cyhalothrin on the ground following 16 applications of 0.03 lbs/acre with four-day intervals was recomputed to be 0.28 lbs lambda-cyhalothrin/acre because of the shorter half-life. Foliar intercept was not taken into account because Zeneca has never provided foliar interception data.

E) A half-life in water value of 0.71 days (17/24 hours) was entered based on the aquatic dissipation analysis of the mesocosm study. Although the mechanism of the dissipation is not known, the value was entered into the system as "aerobic metabolism."

Two AQUATOX modeling runs were made; the first assumed that 100% of the runoff water reached the ponds, the second assumed that only 60% of the runoff water would reach the ponds.

The results showed that runoff from lambda-cyhalothrin treated fields would not be acutely or chronically toxic to freshwater invertebrates following either a single application or multiple applications. Lambda-cyhalothrin in runoff continues to be acutely toxic to marine/estuarine invertebrates following both single and multiple applications. The reduction of the volume of runoff water reaching the receiving water from 100% to 60% reduced but did not eliminate the toxicity to marine invertebrates from single applications. The runoff from the multiple application model continued to exceed both NOELs and LC_{50}s for marine invertebrates at all three percentages of total applied lambda-cyhalothrin in runoff and all three pond depths. The technical report dated March 17 also noted these same concerns. Coastal marshes on Long Island are important nursery areas for marine crustaceans, including many species that are of economic importance. Lambda-cyhalothrin clearly has the potential to be harmful to populations of these type species.

A final AQUATOX model run was conducted with the following parameters: treatment scenario of five applications of 0.025 lbs AI/acre with a five day interval between applications; 40% of the applied product was intercepted by foliage; 60% of the runoff water reaches the receiving water; and only 4% of the lambda-cyhalothrin in the runoff water was bioavailable. The results showed that the resulting concentration in a one-foot deep pond from runoff containing 0.5% of the total applied pesticide exceeded the LC_{50} for mysid shrimp, and that the resulting concentration in a three-foot deep pond

from runoff containing 1% of the total applied pesticide exceeded the LC_{50} for mysid shrimp. After the maximum number of applications, runoff containing 1% of the total applied pesticide exceeded the LC_{50} for mysid shrimp in **all** test pond depths. Runoff containing 0.5% of the total applied pesticide exceeded the LC_{50} for mysid shrimp in the three-foot deep pond.

Corn is grown in areas on Eastern Long Island that are drained by streams that in turn discharge into coastal marshes that border Peconic Bay. Marine invertebrates in these marshes could be at risk of acute toxicity from lambda-cyhalothrin concentrations in runoff from these agricultural areas.

CONCLUSION

Despite all of the modifications to the modeling procedures described above, our models continue to show that lambda-cyhalothrin is acutely toxic to marine invertebrates, even following a single application. The AQUATOX model shows that in our modeling scenario, runoff from a field treated with Warrior exceeds not only no observed effect concentration (NOEC) levels, but actual LC_{50}s as well, at all levels of runoff into all pond depths tested, even when only 60% of the runoff water reaches the receiving water.

Lambda-cyhalothrin clearly has the potential to be toxic to marine invertebrates inhabiting coastal marshes. However, we realize that there is also limited potential for harm to marine invertebrates from agricultural runoff. The streams that drain agricultural fields and in turn discharge into coastal marshes are for the most part quite small.

The Department supports a careful limitation that prevents adverse impacts from use of Warrior near coastal environments. Therefore, we have required that Zeneca add label language which states that a 25-foot vegetated, non-cropped buffer strip untraversed by drainage tiles be maintained between a treated field and a coastal salt marsh or stream that drains into a coastal salt marsh, for both aerial or ground application. For aerial applications, the 25-foot vegetated non-cropped buffer strip for runoff protection would be part of the larger 150-foot buffer strip (or 450 foot buffer strip for ULV application) required for spray drift protection. Such a limitation will satisfy our concerns about use of the product in New York State.

Zeneca has chosen to satisfy this requirement in the interim (the 1997 growing season only) by adopting supplemental labeling which incorporates the necessary language, and will seek a modification of the federal label in the near future. Zeneca has indicated that an amendment to the federal label is not feasible in time for the 1997 growing season; however, the federal label will be amended at the next printing to include the New York State-specific language. Zeneca will submit the amended label to the United States Environmental Protection Agency (USEPA) via the Notification process. This Department should be informed of the progress in this regard.