NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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March 16, 2015

Ms. Cathy Elmi
Wellmark International
1501 East Woodfield Road, Suite 200 West
Schaumburg, IL 60173

Dear Ms. Elmi:

Re: Withdrawal of the Application to Register a Major Change in Labeling for the Active Ingredient Etofenprox (Chemical Code 128965) as Contained in Zenivex E20 and Zenivex E4 RTU

The New York State Department of Environmental Conservation (Department) has received your request to withdraw the application for registration of the subject products in New York State. The initial application was received January 18, 2011, with additional application materials received at various dates throughout the review process.

Zenivex E20 (EPA Reg. No. 2724-791) and Zenivex E4 RTU (EPA Reg. No. 2724-807) contain 20.0% and 4% of the active ingredient etofenprox, respectively. They are labeled for the control of adult mosquitoes, non-biting midges, and black flies. The product labels limit application to persons certified by the Department to apply pesticides for public health or vector control. Both products can be applied aerially or through mist blowers, backpack, and handheld sprayers in or near residential, industrial, commercial, urban, and recreational areas, woodlands, golf courses, and other areas where the above listed pests are a concern. Application rates are 0.00175 to 0.0070 pounds of etofenprox per acre per application (with a maximum of 25 applications per year) and 0.18 pounds of etofenprox per acre per year.

The application package was deemed complete for purposes of technical review on April 5, 2013. Pursuant to the review time frame specified in Environmental Conservation Law §33-0704.2, a registration decision date of September 2, 2013 was established. Technical reviews of the proposed uses included on the Zenivex labels have been performed by the Department and the New York State Department of Health. These reviews encompassed the expected impacts of labeled use of the subject products with respect to human health, ecological effects, and environmental fate. Neither the environmental fate review nor the human health review resulted in objection to registration of the proposed uses. However, the ecological effects technical review resulted in unmitigated concerns with respect to data gaps and risks to aquatic species.

A “Technical Issues” letter was sent to Wellmark International (Wellmark) on September 3, 2013 detailing the ecological data gaps and concerns identified by the Department during the ecological effects assessment. Wellmark subsequently waived the legislatively mandated decision date in order to have sufficient time to review, investigate and respond to the Department’s concerns.

On December 30, 2013, Wellmark contacted the Department with a proposal to incorporate additional application sites for the pending review. The proposal was for mosquito adulticiding over agricultural crops, pasture and rangeland at the same application rates proposed for the residential/commercial/non-crop sites described earlier in this letter. The Department determined that these additional sites did not require a separate review and that the final decision would include all proposed sites.

The Department allowed a substantial amount of time for Wellmark to submit additional materials with respect to data gaps and risks to aquatic species. The Department received additional information in support of Wellmark’s application on September 18, 2014. This additional information has been reviewed by the Department’s Bureau of Habitat. Upon review, the Department maintained its objection to registration of Zenivex E20 and Zenivex E4 RTU in New York State. **In a letter dated March 11, 2015, Wellmark requested to withdraw the application for registration of the Zenivex products in New York State. The Department confirms that your application has been withdrawn, effective March 16, 2015.**

Please see the ecological effects assessment shown in the Appendix for more information regarding the Department’s concerns.

Sincerely,

Scott Menrath

Scott Menrath, P.E.
Director
Bureau of Pest Management

APPENDIX

ECOLOGICAL EFFECTS ASSESSMENT:

The following assessment was prepared by staff from the Bureau of Habitat (BOH) within the Department's Division of Fish, Wildlife and Marine Resources.

Toxicity & Environmental Fate:

Etofenprox is practically non-toxic to birds and mammals on an acute basis but is very highly toxic to freshwater fish and invertebrates, estuarine/marine invertebrates, and honey bees. Chronic toxicity symptoms occur in birds and mammals only at concentrations several orders of magnitude greater than those expected to occur in the field. It is not toxic to estuarine/marine fish and mollusks below its' water solubility limit.

The groups most likely to be adversely impacted from labeled etofenprox use are aquatic benthic and/or sediment dwelling organisms and the species dependant on such organisms for food. Unfortunately, the only benthic organism study submitted in the initial etofenprox data package was a chironomid study classified as supplemental by U.S. EPA reviewers. Many aspects of the study were substandard making it of very limited value for risk assessment purposes.

Etofenprox is expected to exhibit little mobility in soil and partition rapidly into sediments in aquatic habitats. It is expected to bioconcentrate in organisms and may bioaccumulate in food chains. The major routes of dissipation post application are via aerobic microbial metabolism and, to a lesser degree, by aqueous photolysis. A number of the etofenprox environmental fate studies are deficient to varying degrees. Several were required to be repeated by the U.S. EPA and are still outstanding.

Based on the studies submitted, etofenprox is stable to hydrolysis, has an aquatic photolysis half-life of roughly 21 days and a soil surface photolysis half-life somewhere between 140-340 days. Aerobic soil half-lives range between 6.5 and 25 days and were 14-25 days in U.S. soils. Aerobic aquatic metabolism in water/sediment systems yielded very brief water column half-lives of roughly ½ hour, and sediment half-lives between 9 and 44 days. An anaerobic sediment/water study showed a similar pattern. The water column half-life was 2.6 days and the sediment half-life was 315 days.

Results from only one terrestrial field dissipation trial were submitted. The dissipation half-lives in California, Georgia, and New York sites were 4.8, 13.6, and 13.4 days, respectively. Parent etofenprox did not leach below the 15 cm depth in Georgia, but was detected in the 15-30 cm layer in California, and the 30-45 cm layer in New York. This degree of mobility is inconsistent with a compound having the K_{ow} that etofenprox does. This discrepancy is not explained in the submitted materials.

Exposure Modeling:

Standard BOH terrestrial and aquatic non-target organism screening modeling was conducted for a range of residue levels representing etofenprox applications from the first through the highest number/amount allowed by the Zenivex labels.

Maximum residue concentrations on terrestrial mammal and bird food items following application of the yearly maximum labeled rate are several orders of magnitude below toxicity thresholds. No adverse impacts are anticipated to those groups.

Aquatic exposure modeling efforts are compromised by significant gaps in the supporting study base for etofenprox. The lack of toxicity data for sediment associated aquatic organisms, the most likely to experience adverse impacts, and the uncertainty with regard to etofenprox post application mobility as evidenced by the terrestrial field dissipation study preclude assessment of these products with a reasonable degree of confidence beyond a screening level.

The BOH Half-life module is used to calculate the amount of active ingredient likely to remain on the soil surface and be available for runoff following multiple successive applications. The module is not particularly well suited for products with application rates as low as etofenprox. It does not report residue concentrations below 2 decimal places (hundredths of a pound) and only simulates a maximum of 10 applications. It does, however, use the value entered (0.007 lb in this case), it just rounds up to the nearest hundredth. The last value reported in the 10 application simulation was multiplied by 2.5 to approximate a yearly residue total.

Model Results & Risk Assessment:

The PONDTOX Direct application module indicates that a single Zenivex application at the lowest label rate applied directly to the surface of the 1 foot deep model pond results in an etofenprox concentration that exceeds freshwater and marine invertebrate LC_{50} values and the rainbow trout NOEC value. An application at the highest single application rate exceeds all non-plant LC_{50} values.

The PONDTOX Runoff module results for four points in a use season, assuming 7 day application intervals, use of the higher single application rate, 50% product interception by vegetation, and 50% of runoff water reaching the model pond, suggest water concentrations that are not a concern for organisms other than estuarine/marine invertebrates. The mysid shrimp LC_{50} is exceeded in the 1 foot pond depth and the NOEC is exceeded in all depths by water concentrations resulting from runoff following the first application. The first freshwater toxicity threshold, the Daphnia NOEC, is exceeded later in the season around the 8^{th} application.

The exposure modeling possible with the information currently available is over-simplified and very likely to significantly underestimate the ecological risks associated

with etofenprox.

Etofenprox rapidly partitions into sediments where concentrations will build over time. Residues will carry over year to year. Once use is established, aquatic sediments will serve as a reservoir and separate exposure source in addition to applications made in a single season. Food chain bioaccumulation is not addressed here but may be a relevant additional exposure factor for water column organisms.

Data Gaps & Uncertainties:

The June 30, 2008 U.S. EPA EFED Ecological Risk Assessment for use of etofenprox as a mosquito adulticide describes a number of study deficiencies and data gaps concerning primarily non-target aquatic organisms but includes several environmental fate gaps as well. Historically, data gaps of the significance described by EFED reviewers are included on the U.S. EPA Notice of Pesticide Registration as conditions of continued registration. Neither of the notices for the Zenivex products listed any of the items of concern.

Earlier in the BOH review process, an EFED document was located on the Regulations.gov site in the etofenprox docket titled Justification to Support a Data Call-In (DCI) for Registration Review of Etofenprox, dated November 17, 2009. It listed many of the items of concern identified in the EFED Risk Assessment. No other record of the DCI could be located by BOH at that time. A recent search of the etofenprox docket yielded two items that were posted to the docket on Aug. 5, 2013. They are Data Call-in Response sheets apparently provided to the applicant. They list each item required by the DCI, time frames, and descriptions of procedures to follow. The documents are identified as Etofenprox Generic Data Call In (GDCI-128965-954) dated June 28, 2011 and (GDCI-128965-1041) dated October 20, 2011.

The following are included in the DCI:

(GDCI-128965-954)

1. Sediment and soil absorption/desorption for parent and degradates
2. Direct photolysis rate of parent and degradates in water
3. Aquatic field dissipation
4. Aquatic invertebrate acute toxicity test, freshwater daphnids
5. Daphnia toxicity with the 4'-OH degradate
6. Daphnia chronic test
7. Mysid chronic test
8. Fish early life stage with Rainbow trout

(GDCI-128965-1041)

9. Whole sediment life cycle toxicity test with estuarine/marine invertebrates amphipod *Leptochrirus plumulosus*
10. Sediment Life cycle test with freshwater invertebrates *Chironomus dilutus* and *Hyalella azteca* toxicity and bioaccumulation
11. Aquatic invertebrate Acute toxicity with *Hyalella azteca*

Given the probable impacts to aquatic resources and large degree of uncertainty resulting from the identified data gaps, BOH did not support registration of the Zenivex products as labeled.

Additional application info was submitted on behalf of Wellmark on September 18, 2014. The remainder of this assessment is a discussion of the BOH review of the additional information except items identified otherwise.

Seven of eleven of the studies shown above were submitted in September 2014. U.S. EPA DERs were submitted for numbers 5, 6, 7, and 8. A *Chironomus riparius* emergence test DER was submitted as well, it doesn't appear to be the test identified in number 10 as it started with 1-4 day post-hatch larva and was terminated after emergence. Additionally, a letter from the applicant's representative, dated August 8, 2014, states that the "Chironomus and Leptochrirus studies have been delayed due to difficulty completing the studies as requested by the EPA… The studies will not be available until March 2015."

Two study Final Reports, one for number 11 and one for, presumably, the Hyalella requirement in number 10 were submitted also. BOH located the applicable U.S. EPA Ecological Effects Test Guidelines for each. Both studies appear to have adhered to their respective guidelines reasonably well. BOH did not evaluate either study's statistical methods. The study completion dates for the *Hyalella* acute and 42-day tests was August 29, 2014. BOH staff contacted the EPA etofenprox product manager via email and inquired about the status of the two studies on the chance that they might have been reviewed. As of this writing no response has been received.

Toxicity & Environmental Fate (addendum):

Results for the studies received, DERs and final reports, are given in Table 1.

Table 1. Study results received September 2014

Study	EPA MRID No.	Study Acceptable?	Results	Comments
#5 Daphnia Acute with 4-OH metabolite	48280201	Acceptable	24 hr,48 hr EC_{50}=18.1,6.6 ppb* LOEC=2.3 ppb NOEC=1.0 ppb	LOEC and NOEC on immobility
#6 Daphnia Chronic	48280203	Acceptable	EC_{50}>0.274 ppb LOAEC=0.274 ppb NOAEC=0.103 ppb	Delayed first brood, fewer and immobile offspring,growth
#7 Mysid shrimp life cycle	48280204	Supplemental	LOAEC=0.0069 ppb NOAEC=0.0037 ppb (based on live young	High analytical variability, low control survival

			produced/day)	
#8 Rainbow trout early life stage	48280205	Supplemental	LOAEC=2.5 ppb NOAEC=0.67 ppb (based on time to swim up & post hatch survival)	High variability in measured exposure concentrations
Chironomus riparious emergence 28-day	48280202	Supplemental	**Sediment**: LC_{50}>6.4 ppm LOAEC=6.4 ppm NOAEC=2.9 ppm **Pore water**: LC_{50}>4.0 ppb LOAEC=6.4 ppb NOAEC=1.4 ppb **Water column**: LC_{50}<LOQ (0.6 ppb) LOAEC-same NOEC-same	Scientifically sound but conducted by OECD guideline. spiked sediment test
Hyalella azteca acute	49461601	? No DER, study final report	LC_{50}= 0.19 ppb NOEC= 0.15 ppb	Test in water only
Hyalella azteca 42-day survival, growth, and reproduction	49461602	? No DER, study final report	**Sediment**: LC_{50}=57 ppb** LOEC=95 ppb NOEC=30 ppb **Pore water**: LC_{50}=4.0 ppb LOEC=5.6 ppb NOEC=2.6 ppb	Spiked sediment test

*-parts per billion, µg/L
**- ppb ai/Kg dry sediment

The stated results of the 42-day study are problematic. Having a LOEC (Lowest Observable Effect Concentration) that equals roughly 1.7X the LC_{50} for the same endpoints, survival growth, and reproduction, is irrational. What the authors are saying with those results is that the mortality observed around the LC_{50} and up to the LOEC is not an effect. The statistical treatments reported in the study report are extensive and evaluation of those treatments is beyond the scope of this review. The reported results are likely a statistical artifact involving the LC_{50} 95% confidence interval, but it's not discussed in the report.

Exposure Modeling (addendum)

Both Zenivex products use the same active ingredient application rates. Single applications ranging from 0.00175 to 0.007 pound active ingredient per acre depending on local vegetation density are allowed. The application directions are ambiguous with respect to retreatment intervals, as described in the initial BOH Zenivex review.

Neither Zenivex label states a retreatment interval. They give the same yearly limits on the total amount of active ingredient allowed per acre and limit the number of applications in one location to 25 per year, but don't say how often an area can be treated. The U.S. EPA stamped "Accepted" label for the E20 product, dated Aug 15, 2008 states "Do not retreat a site more than once in 3 days; make no more than 2 applications to a site in any 1 week or 25 applications in one year. More frequent treatments may be made to prevent or control a threat to public and/or animal health…" The E4 U.S. EPA stamped "Accepted" label dated Jul 6, 2010, however, does not include the same statement regarding the 3 day or 1 week limits, nor do the two final printed labels submitted to BOH. The three later labels do contain the "More frequent treatments..." sentence but don't include the preceding sentence establishing a frequency. A clarification of the intended treatment intervals would be helpful. The use clarification BOH requested as a result of the initial technical review was not received.

Exposure of aquatic habitat through drift is the primary BOH concern. The toxicity values used in the 2013 review are as follows:

Rainbow trout- LC_{50} = 2.7 ppb
NOEC = 0.7 ppb

Daphnia- LC_{50} = 0.57 ppb
NOEC << 0.54 ppb

Mysid shrimp- LC_{50} = 0.0188 ppb
NOAEC = 0.002 ppb

An EPA EFED Spray Drift Analysis for Raw Agricultural Commodities, RAC, March 28, 2013, produced in response to a petition by the applicant to allow Zenivex applications over or near agricultural fields was located by BOH during the current review. In it, aerial and ground based ULV applications were determined to be essentially equal in terms of deposition potential on agricultural areas. That being the case, the BOH Direct Application exposure module is a useful means of gauging aquatic habitat risks.

Toxicity values received for the current review and those used in the initial BOH review can be compared to expected exposures as follows:

PONDTOX - DIRECT APPLICATION

This program evaluates the toxicity of a direct application of etofenprox to biota in a pond with a surface area of one acre. If the concentration of etofenprox in the water exceeds a toxicity threshold, the model prints EXCEEDED. If the toxicity threshold is not exceeded, the model prints SAFE.

For this use the standard EXCEEDED or SAFE results have been replaced with risk quotients. A risk quotient (RQ) is the ratio of the expected concentration in the water column/the toxicity value.

Depth of pond = 0.5 feet
Application rate = 0.007 lbs AI/acre
The water column concentration of etofenprox is 0.005 mg/L

SPECIES	**LC_{50} Risk Quotient**	**NOEC Risk Quotient**
Rainbow trout	1.9	7.1
Daphnia	8.8	? ≥9.3
Mysid shrimp	266	2500
Rainbow trout early life stage	2 (LOAEC)	7.5 (NOAEC)
Daphnia w/ 4-OH metabolite	-	-
Daphnia chronic	18.2 (LOAEC)	48.5 (NOAEC)
Mysid shrimp life cycle	724 (LOAEC)	1351 (NOAEC)
Hyalella azteca acute	26.3	33.3

Depth of pond = 1 feet
Application rate = 0.007 lbs AI/acre
The water column concentration of etofenprox is 0.003 mg/L

SPECIES	**LC_{50} Risk Quotient**	**NOEC Risk Quotient**
Rainbow trout	1.1	4.3
Daphnia	5.3	? ≥5.6
Mysid shrimp	159	1500
Rainbow trout early life stage	1.2 (LOAEC)	4.5 (NOAEC)
Daphnia w/ 4-OH metabolite	-	-
Daphnia chronic	10.9 (LOAEC)	29.1 (NOAEC)
Mysid shrimp life cycle	434 (LOAEC)	811 (NOAEC)
Hyalella azteca acute	15.8	20

Lowest label rate, single application.
Depth of pond = 1 feet
Application rate = 0.00175 lbs AI/acre
The water column concentration of etofenprox is 0.001 mg/L

SPECIES	LC_{50} Risk Quotient	NOEC Risk Quotient
Rainbow trout	0.37	1.4
Daphnia	1.7	? ≥1.9
Mysid shrimp	53.2	500
Rainbow trout early life stage	0.4 (LOAEC)	1.5(NOAEC)
Daphnia w/ 4-OH metabolite	-	-
Daphnia chronic	3.6 (LOAEC)	9.7(NOAEC)
Mysid shrimp life cycle	145 (LOAEC)	270 (NOAEC)
Hyalella azteca acute	5.3	6.7

The data is significantly more limited for sediment associated aquatic invertebrates. Results submitted for this review are from studies conducted with spiked sediment which are intended for characterizing longer term risks.

When etofenprox enters surface waters it will rapidly adsorb to organic carbon in the water column and sediments. In laboratory studies it dissipated from the water column with observed 50% dissipation times, DT_{50}s, ranging from less than 1 hour to 1-7 days. In the same studies sediment DT_{50}s were reported as approximately 9 days, 44 days, and 14-30 days in aerobic sediments. In the one submitted anaerobic sediment study the sediment DT_{50} is reported as >14 days. In that study the total sediment/water system DT_{50} is >121 days (study was terminated at 121 days). With the partitioning to sediment rates being rapid, the total system dissipation rates are primarily determined by the sediment proper rates so the sediment time is likely *much* greater than the 14 days. The calculated sediment $T_{1/2}$ in that study was 306-315 days. Aquatic dissipation times reported in the 2008 EPA EFED etofenprox Ecological Risk Assessment were half-lives of 26-52 days in aerobic water bodies and 195 days in anaerobic systems. Field water column dissipation times will be longer than those observed in the small-volume test vessel laboratory studies.

Etofenprox concentrations in the top one inch of sediment in a water body following one application at the label rate(s) can range from 5-21 ppb ai/Kg dry sediment, once binding is complete, if the entire application, 0.00175-0.007 lb ai/A, reaches the water body.

The EFED RAC Spray Drift Analysis describes deposition rates from applications of the 0.007 lb ai/A rate at distances from 100 feet to 900 feet from the downwind edge of a treatment swath at 1-3 mph wind speeds during application. At 300 feet downwind the model predicts deposition of 0.2 mg ai/M^2 with 1 mph wind speed, and slightly over 0.1 mg ai/M^2 using a 2 mph wind. At 700 feet downwind the deposition rate with a 1 mph wind drops to the 0.1 mg/M^2 value, the deposition using 2 mph wind speed stays the same. The 0.2 mg ai/M^2 deposition rate is equal to 0.0018 lb ai/A, the 0.1 mg ai/m^2 value is 0.0009 lb/A. The drift analysis uses a 500 foot swath width for the treatment area. That means that the 300 and 700 foot deposition estimate distances are actually 800 and 1200 feet from the point of application.

Sediment concentrations in an exposed water body from such an application will be around 2.5-5 ppb. Using a 20 day mean degradation $T_{1/2}$ in aerobic sediments and 3 day application intervals, concentrations may reach 35 ppb in a season just from the drift component. Anaerobic sediments may reach roughly 48 ppb over the same period.

Additionally, in aerobic aquatic degradation studies the metabolite 4′-OH etofenprox (4-OH) represented, on average, 21% of the applied parent compound on study day 7. It declined slowly to 6-8.5% at the 100 day study termination. Its degradation $T_{1/2}$ is 55-62 days. Physical/chemical characteristics of 4-OH are not established, they are assumed to be the same as the parent compound.

4-OH is also classified as being very highly toxic to aquatic invertebrates:

Chironomus riparious-	Acute LC_{50} = 50 ppb LOEC = 38 ppb NOEC = 17.6 ppb
Daphnia- Acute	LC_{50} = 6.6 ppb LOAEC = 2.3 ppb NOAEC = 1.0 ppb

Residues of concern are the parent plus 4-OH. The 4-OH component raises the top 1 inch layer of sediment residues by roughly 9.5 ppb to 47.5 ppb.

Although etofenprox water column residence time is fairly short due adsorption to particulate and dissolved organic carbon, it is a fast-acting toxin. In the *Hyalella* acute toxicity study effects were observed in the highest 3 concentrations (the only 3 to produce effects) within 2.5 hours, the first observation period reported. At 2.5 hours in 2.5 ppb concentration there was 100% mortality, in 0.54 and 0.26 ppb the animals were lethargic. By the 24 hour observations there was 100% mortality at all three levels.

Conclusions

At 800 feet downwind from the point of application of a labeled use rate, water surface deposition can equal the last scenario in the above PONDTOX examples. With 25 applications per year allowed at 3 day and 4 day intervals (no more than 2 per week) water column invertebrates are likely to be impacted.

This evaluation doesn’t include input to aquatic areas from post-application runoff. There will be additional slight increases in the water concentrations described from that. Zenivex applications may result in significant adverse impacts to aquatic resources at distances beyond those practical to request as label buffer zones. Therefore, BOH staff objects to registration of the subject products in New York State.