Appendix G

ECOTOX Open Literature Reviews

Chemical Name:
Bromadiolone

CAS No:
28774-56-7

PC Code:
112001

Citation and MRID:
Giraudoux, P., Tremollieres, C., Barbier, B., Defaut, R., Rieffel, D., Bernard, N., Lucot, E., Berny, P. 2006. Persistence of bromadiolone anticoagulant rodenticide in *Arvicola terrestris* populations after field control. Environmental Research 102: 291-298. MRID: 48590801

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Review:
08/29/11

Summary of Findings:
Residues of bromadiolone were measured in the water voles (*Arvicola terrestris*) that were allowed to feed on bromadiolone bait placed in artificial burrows. Wheat bait (50 mg a.i./kg, Lipatech) was applied at a rate of 1 kg bait per 100 m over 21 acres. Rodents were trapped or collected above and below ground every day from day 1 to day 3, day 6 to day 8, and day 10 to day 20. No captures were possible on days 4, 5, and 21 due to snowstorms. "The average concentration of bromadiolone was 5.95 mg/kg (95% CI 4.30–7.79), maximum 30.23, in the liver; 2.28 mg/kg (95% CI 1.70–2.95), maximum 12.37, in the digestive tract; 0.75 mg/kg (95% CI 0.58–0.92), maximum 3.19, in the rest of the body." In this study, the average whole body weight of *A. terrestris* was 77.02 g (SE 1.89), and the average quantity of bromadiolone/vole was 93.97 µg (95% QI: 73.8–113.5) yielding an average whole body bromadiolone concentration of 1.22 mg a.i./kg-carcass.

Description of Use in Document:
Quantitative

Rational for Use:
Provides bromadiolone residues in whole carcasses of voles for use in exposure assessment via secondary exposure

Major Limitations of Study:
(1) Numerical data for concentrations of bromadiolone in water voles were limited to those provided in the above summary of findings.
(2) Although the authors reported that the site had never been treated with bromadiolone before the trial, no concentrations of bromadiolone were quantified in voles collected pre-treatment.

Primary Reviewers:
Robin Sternberg

Chemical Name:
Bromadiolone

CAS No:
28772-56-7

PC Code:
112001

Citation and MRID:
Lund, M., and Rasmussen, A.M. 1986. Secondary Poisoning Hazards to Stone Martens (*Martes foina*) Fed Bromadiolone-Poisoned Mice. ***Nord. Vet.-Med.*** 38, 241-243. MRID: 48590802

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Review:
8/18/2011

Summary of Study Findings:
Four stone martens (*Martes foina*) were fed yellow-necked field mice (*Apodemus flavifollis*) for either 1 or 4 days. Field mice were caged individually and given bromadiolone bait (0.005%) in excess to feed on for 4 days. At the end of 4 days, each mouse was killed via CO_2 and feed consumption and mouse body weights were measured. The bromadiolone-fed mice were then fed to 2 stone martens as the only food source for 1 day, and to 2 stone martens for 4 days. Mice remains not eaten were weighed. Measured parameters included sex and weight of each marten, the number of mice consumed, total weight of mice offered as food minus mice remains not eaten, bromadiolone (mg) in mice consumed, and maximum amount of bromadiolone consumed (mg ai/kg-bw). Martens were monitored for 3 weeks and were killed by ether and autopsied at study termination. Results are presented in the Table (reproduced) below.

Table 1. Calculated maximum amount of bromadiolone consumed by single caged stone martens offered bromadiolone-fed field mice for one or four days

Stone Marten		Feeding Date	No. of mice consumed	Total weight of mice minus possible remains (g)	Bromadiolone consumed in mice (mg a.i.)	Maximum bromadiolone consumed (mg a.i./kg-bw)
Sex	Weight (g)					
1. Female	1171	1/15/85	7	200.6-26.2= 174.4	4.44	3.8
2. Male	1518	1/15/85	8	239.1-7.5= 231.6	5.19	3.4
3. Female	1525	1/15/85	7	246.6-40.2= 206.4	5.33	--
		1/16/85	8	202.8	6.15	--
		1/17/85	8	280.2-6.6= 273.6	6.50	--
		1/18/85	8	149.6	3.23	--
		total	31	832.4	21.1	13.9
4. Male	1437	1/15/85	6	291.4-75.9= 215.5	5.11	--
		1/16/85	7	248.4-33.1= 215.3	5.45	--
		1/17/85	6	293.3-90.9= 202.4	4.78	--
		1/18/85	4	169.3-83.0= 86.3	2.08	--
		total	34	719.5	17.42	12.1

At the end of the observation period, all four stone martens survived with no apparent signs of sublethal effects. Autopsies of the four carcasses revealed no internal hemorrhaging or discolored livers. In the male and female fed mice for 4 days, an increased fragility of the small blood vessels of the muscles on top of the skull was found.

Description of Use in Document:
Qualitative

Rationale for Use:
Provides lethal and sublethal effect information on the secondary poisoning of mammals through bromadiolone-poisoned prey

Major Limitations of Study:
(1) This study did not determine an endpoint for quantitative use.
(2) No control was used.
(3) Sample size was small.

Primary Reviewer: Alicia Korol

Chemical Name:
Bromadiolone

CAS No:
28772-56-7

PC Code:
112001

Citation and MRID:
Pank, L.F., and Hirata, D.N., 1976. Primary and Secondary Toxicity of Anticoagulant Rodenticides. Work Unit DF-103.7. Wildlife Damage Research Station and Denver Wildlife Research Center, U.S. Fish and Wildlife Service, Hilo, Hawaii. MRID 157732

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Review:
8/18/2011

Summary of Study Findings:
Secondary hazard of bromadiolone toxicity was studied with mongoose fed bromadiolone-poisoned rats. Mongooses were trapped from the wild and caged individually (41 x 24 x 18 cm). The mongooses were conditioned on a diet of rats with water *ad libitum* for a week. Mongoose were fed rats for 10 days straight and were divided into 4 treatment trials and a control. Two mongoose each were assigned to a feeding trial entailing daily feeding of one bromadiolone-loaded rat for 1, 3, 5, and 6 days; after the mongoose were then fed bromadiolone-free rats for the remaining of the 10 days. The control mongooses were fed control rats throughout the 10 day test. Norway and black rats with the highest potential for containing bromadiolone residues were fed to the mongoose. The rats had previously been used for a primary exposure bioassay with bromadiolone and had received 5, 10, or 13 grams of bromadiolone treated or control bait for 5 days. Bait consumption was calculated by subtracting spilled or uneaten bait from offered bait. Bait consisted of technical grade bromadiolone, slightly crimped oat groats, and alcolec S (adhesive phospholipid) at either the registered or recommended concentration for bromadiolone; percent a.i. was not reported. Rats were frozen upon death for use in the secondary exposure study with mongoose. Rats serving as controls receiving untreated bait were sacrificed and also frozen. Parameters measured were mongoose weight at study initiation and termination, rat weight fed to mongoose, rat weight consumed by mongoose, numbers of livers, stomachs, and intestines consumed by mongoose, total bromadiolone consumed, and coagulation time. These results are presented in **Table 1** below. Coagulation time was measured 10 days after the last dosing on day 1, 3, 5 and 6, or on the day of death.

Table 1 (reproduced from article): Secondary Toxicity of Bromadiolone-killed rats to Mongoose

Mongoose			Anticoagulant-killed rats fed to mongoose			Mongoose Consumption				Mongoose Coagulation Time		
Sex	Weight (g)		No.	Total Wt. (g)	Bromadiolone consumed (mg)	Rats (g)	No. Livers	No. Stomachs	No. Intestines	pre-test	post-test	Mongoose Days to death
	Pre-trt	Post-trt										
Treated Mongoose												
1F	395	471	1	214	2.8	192	1	1	1	2.2	2.1	-
2F	412	436	3	479	6.6	371	3	3	3	2.1	30+	4
3F	488	497	5	764	11.9	432	5	4	4.8	2.7	30+	7
4M	613	678	6	985	13.3	745	5	6	6	2.6	30+	8
5M	499	578	1	167	2.03	145	1	1	1	2.0	3.0	-
6M	562	629	3	448	6.51	313	2.3	3	3	1.6	2.0	-
7M	646	615	5	530	9.50	333	3	3	4	1.3	30+	6
8M	803	770	6	694	10.59	552	6	5	5.3	1.5	27.0	8
Controls												
F	620	634	10	1430	0	746	10	2	5.8	2.0	1.7	-
M	569	613	10	1442	0	864	7	2	6.8	1.0	1.5	-
F	412	434	10	1851	0	870	7.5	8	10	2.8	2.6	-
F	423	469	10	1598	0	1005	7.5	3	8.5	1.6	1.5	-
F	431	528	10	1709	0	1242	4.8	4	8.5	1.3	1.7	-
M	612	649	10	1698	0	1151	5	1	5.3	1.1	0.9	-

Reviewer's Calculations

The reviewer calculated bromadiolone consumption per unit body weight (as measured pre-treatment) in the **Table 2**.

Table 2: Bromadiolone consumption per unit body weight

Mongoose ID	Pre-Treatment Weight (kg)	Bromadiolone Consumed (mg)	Bromadiolone Consumed per pre-treatment body weight (mg a.i./kg-bw)
1F	0.395	2.8	7.09
2F	0.412	6.6	16.0
3F	0.488	11.9	24.4
4M	0.613	13.3	21.7
5M	0.499	2.03	4.07
6M	0.562	6.51	11.6
7M	0.646	9.50	14.7
8M	0.803	10.59	13.2

Description of Use in Document:

Qualitative

Rationale for Use:

Provides lethal and sublethal effect information on the secondary poisoning of mammals through bromadiolone-poisoned prey

Major Limitations of Study:
(1) This study did not determine an endpoint for quantitative use.
(2) Sample size was small.
(3) Concentration in the bait was not reported.

Primary Reviewer: Alicia Korol

Chemical Name:
Bromadiolone

CAS No:
28774-56-7

PC Code:
112001

Citation and MRID:
Sage, M., Coerdassier, M., Defaut, R., Gimbert, F., Berny, P., Giraudoux, P. 2008. Kinetics of bromadiolone in rodent populations and implications for predators after field control of the water vole, *Arvicola terrestris*. Science of the Total Environment 407: 211-222. MRID: 48590803

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Review:
08/29/11

Summary of Findings:
Residues of bromadiolone were measured in water voles (*Arvicola terrestris*) and common voles (*Microtus arvali*) that were allowed to feed on bromadiolone bait placed in artificial burrows. Bait was prepared by mixing dried wheat grains with a commercial formulation of bromadiolone (Super Caid® A659, ref. R227002, France) to achieve a concentration of 50 mg a.i./kg-bait and applied to the field at a rate of 8.1 kg bait/A over 24 acres. Rodents were trapped or collected above and below ground every day for 10 days after treatment, and then every three to four or more days until day 135 (sampling occurred on day 1 to day 10, day 13, day 16, day 19, day 24, day 27, day 49, and day 135). The study focused on the kinetics of residues within rodent populations and thus did not present the measured residue data with the exception of one water vole trapped underground on day 135. The concentrations in the whole body, liver, and digestive tract for this one vole were 1.43, 16.63, and 0.86 mg a.i./kg-tissue, respectively. The study also reported that the average body concentration in water voles collected on day 1 was 1.83 ± 0.96 mg a.i./kg-carcass and that the average concentration in collected common voles on D1 was lower. No bromadiolone residues were found in the eight rodents trapped before the treatment.

Description of Use in Document:
Quantitative

Rational for Use:
Provides bromadiolone residues in whole carcasses of voles for use in exposure assessment via secondary exposure

Major Limitations of Study:
(1) Numerical values for whole body bromadiolone residues were provided only for 1 water vole trapped underground on day 135 and for water voles collected on day 1 although kinetic

models indicate that concentrations of bromadiolone were maximal between 3.3 and 6.5 days and 1.3 and 3.7 days for water voles and common voles, respectively.

Primary Reviewers:
Alicia Korol
Robin Sternberg

Chemical Name:
Bromadiolone

CAS No:
28772-56-7

PC Code:
112001

Citations:
Teeters, W.R. 1981. Bromadiolone technical: Toxicity to Laboratory Rat: Test No. 100. (U.S. Environmental Protection Agency, Pesticides Regulation Div., Agricultural Research Center, Animal Biology Laboratory, unpublished report.)

Teeters, W.R. 1981. Bromadiolone technical: Toxicity to Laboratory Rat: Test No. 102. (U.S. Environmental Protection Agency, Pesticides Regulation Div., Agricultural Research Center, Animal Biology Laboratory, unpublished report.)

Teeters, W.R. 1981. Bromadiolone technical: Toxicity to Laboratory Rat: Test No. 105. (U.S. Environmental Protection Agency, Pesticides Regulation Div., Agricultural Research Center, Animal Biology Laboratory, unpublished report.)

Teeters, W.R. 1981. Bromadiolone technical: Toxicity to Laboratory Rat: Test No. 107. (U.S. Environmental Protection Agency, Pesticides Regulation Div., Agricultural Research Center, Animal Biology Laboratory, unpublished report.)

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Data Review:
9/2/11

Brief Summary of Study Findings:

Methods

All four studies were conducted in the same lab using very similar methodology. An outline of the available methodology information for each study is provided in **Table 1**.

Table 1. Study methods for Albino rat feeding studies with Bromadiolone conducted at Beltsville Lab

	Test 100	Test 102	Test 105	Test 107
Date Started	1/9/81	1/23/81	2/6/81	2/20/81
Active Ingredient	100%			
Mixing in feed	Bromadiolone was mixed with 40 g corn oil and then added to sufficient lab mash to make 2000 g diet.	Bromadiolone was dissolved in acetone for measurement and then the acetone was evaporated off. The residue was taken in 40 g corn oil which was then mixed with sufficient lab mash to make 2000 g diet for each concentration.	Bromadiolone was dissolved in acetone for measurement and then the acetone was evaporated off. The residue was taken in 40 g corn oil which was then mixed with sufficient lab mash to make 2000 g diet for each concentration.	Bromadiolone was dissolved in acetone for measurement and then acetone was evaporated off. The residue was taken in 40 g corn oil which was them mixed with sufficient lab mash to make 2000 g diet for each concentration.
Species tested	Albino rats			
Test animal weight range	91-117 g	95-118 g	54-69 g	58-75 g
Number of animals per concentration	5 males and 5 females			
Number of control animals	5 males and 5 females			
Test concentrations (mg a.i./kg-diet)	0.42, 0.71, 1.21, 2.06, 3.50	0.83, 1.16, 1.62, 2.27, 3.18	0.83, 1.16, 1.62, 2.27, 3.18	0.83, 1.16, 1.62, 2.27, 3.18
Length of test	5 days pre-test; 5 days treated feed; 9 days post-treatment			
Environmental conditions	Individually caged, no other laboratory conditions reported			
Variables recorded	Date of death Weight at start of pre-treatment Weight start of treatment Weight start of post-treatment Final weight (end of test or at death) Food consumption during each of the three observation intervals			

Results

ToxAnal2009 was used to determine the LC50 and slope (if possible) for each of the studies; statistical output can be found at the end of the data review. These results are reported in **Table 2**. All four studies resulted in LC50 values ranging from 0.95 to 1.99 mg a.i./kg-diet.

Table 2. Summary of test results f or the Albino rat feeding studies conducted at Beltsville Lab.

Test Number	LC50 (95% CI) (mg a.i./kg-diet)	Probit slope (95% CI)
100	1.49 (1.21-2.06)	n/a; binomial method
102	1.99 (1.62-2.27)	n/a; binomial method
105	0.92 (0.54-1.14)	5.20 (1.91-8.50)
107	1.80 (1.57-2.06)	13.20 (5.59, 20.80)

n/a= not applicable

The reviewer selected Test Number 105 as the most sensitive because it had the lowest LC_{50}. No control animals died during the study. Animals were followed for 14 days after starting the treated diet (5 days treated diet, followed by 9 days clean diet). All mortalities occurred between days 5 and 9 after the feeding of treated diet started. Although the study reports included data on body weight and food consumption, statistical analysis was not conducted for these parameters because of the high rate of mortality.

Description of Use in Document:
All four studies are classified as Supplemental. Data can be used quantitatively in risk assessments, but do not meet any OSCPP 850 series guideline protocols.

Rationale for Use:
These are the only available short-term feeding studies for mammals.

Limitations of Study:
(1) Details regarding laboratory conditions were not provided.
(2) Occurrences of sub-lethal signs of toxicity were not reported.
(3) Necropsy results were not reported.

Primary Reviewer:
Robin Sternberg

Test 100

NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

Robin Sternberg Bromadiolone Albino rat 5-day dietary #100

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
3.5	10	10	100	9.765625E-02
2.06	10	10	100	9.765625E-02
1.21	10	1	10	1.074219
.71	10	0	0	9.765625E-02
.42	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT 1.21 AND 2.06 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 1.492645

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE
PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE
NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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Test 102

NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

Robin Sternberg Bromadiolone Albino rat 5-day dietary #102

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
3.18	10	10	100	9.765625E-02
2.27	10	9	90	1.074219
1.62	10	0	0	9.765625E-02
1.16	10	0	0	9.765625E-02
.83	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT 1.62 AND 2.27 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 1.987108

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE
PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE
NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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Test 105

NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

Robin Sternberg Bromadiolone Albino rat 5-day dietary #105

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
3.18	10	10	100	9.765625E-02
2.27	10	9	90	1.074219
1.62	10	10	100	9.765625E-02
1.16	10	8	80	5.46875
.83	10	3	30	17.1875

THE BINOMIAL TEST SHOWS THAT 0 AND 1.62 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS .9462962

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
1	.8025485	.9462962	.5610788	1.188698

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
4	.4000145	1	.1552885

SLOPE = 5.207435
95 PERCENT CONFIDENCE LIMITS = 1.913905 AND 8.500965

INTERCEPT= .1885315

LC50 = .9200166
95 PERCENT CONFIDENCE LIMITS = .541489 AND 1.136802

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          LC25 =         .682762
     95 PERCENT CONFIDENCE LIMITS =  .2546357 AND  .8945208

          LC10 =         .5220187
     95 PERCENT CONFIDENCE LIMITS =  .125076 AND  .7442438

          LC05 =         .4445499
     95 PERCENT CONFIDENCE LIMITS =  8.134163E-02 AND  .6699132

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Test 107

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     NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
      OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
      THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

     Robin Sternberg  Bromadiolone  Albino rat 5-day dietary #107

*************************************************************************
     CONC.    NUMBER        NUMBER        PERCENT       BINOMIAL
              EXPOSED       DEAD          DEAD          PROB.(PERCENT)
      3.18     10            10            100           9.765625E-02
      2.27     10            9             90            1.074219
      1.62     10            3             30            17.1875
      1.16     10            0             0             9.765625E-02
      .83      10            0             0             9.765625E-02

     THE BINOMIAL TEST SHOWS THAT 1.16 AND 2.27 CAN BE
     USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
     CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
     ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.


     AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 1.799937


     RESULTS CALCULATED USING THE MOVING AVERAGE METHOD
        SPAN     G          LC50          95 PERCENT CONFIDENCE LIMITS
      4         .1139164      1.80831       1.555188      2.162888


     RESULTS CALCULATED USING THE PROBIT METHOD
     ITERATIONS             G              H            GOODNESS OF FIT
PROBABILITY
         6                  .3320848      1
.9912026

     SLOPE   =              13.19641
     95 PERCENT CONFIDENCE LIMITS = 5.591741    AND    20.80108

     INTERCEPT=-3.353628

     LC50 =    1.795279
     95 PERCENT CONFIDENCE LIMITS =  1.566171 AND  2.0585
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          LC25 =         1.595951
     95 PERCENT CONFIDENCE LIMITS =  1.269961 AND  1.784634

          LC10 =         1.435537
     95 PERCENT CONFIDENCE LIMITS =  1.01437 AND  1.626996

          LC05 =         1.347362
     95 PERCENT CONFIDENCE LIMITS =  .8807096 AND  1.549936

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Chemical Name:
Bromadiolone

CAS No:

PC Code:
112001

Citation and MRID:
Wyllie, Ian. 1995. Potential Secondary Poisoning of Barn Owls by Rodenticides. Pesticide Outlook, June 1995. MRID: 48590804

Purpose of Review:
For consideration in a litigation assessment of bromadiolone risk to select SF Bay species

Date of Review:
8/18/2011

Summary of Study Findings:
Six barn owls (*Tyto alba*) were fed bromadiolone-fed mice for either 1-day, 3-days, or 6-days. Mice were allowed to feed on commercially available bromadiolone bait (product and percent a.i. were not reported) for one day and then allowed to die. Mouse carcasses were fed to the owls for specific duration of the treatment trials and then the owls were observed for signs of toxicity. The mean residue value in mice was multiplied by the number of mice eaten to determine the total bromadiolone consumption by the test owls. None of the owls died or exhibited signs of hemorrhaging. Blood coagulation times were slower after dosing but returned to normal within 4-10 days. Results are provided in **Table 1** (reproduced from article) below.

Table 1: Results of feeding Barn Owls with Rodenticide-poisoned mice for 1,3 and 6 days.

Trial Period	Number of Owls	Number Died	Number Mice/Owl	Total Bromadiolone Consumed (mg)	Time to Die	Signs of Hemorrhage	Time to Normal Coagulation (days)
1 day	6	0	3	10.8-11.9	n/a	No	<7
3 days	6	0	6	12.1-13.5	n/a	No	<3
6 days	6	0	12-13	22.0-24.4	n/a	not reported*	4-6

*Table omitted a "yes" or "no" entry for this cell. It is stated in the article that none of the owls exhibited signs of hemorrhaging.

Description of Use in Document:
Qualitative

Rationale for Use:
Provides lethal and sublethal effect information on the secondary poisoning of mammals through bromadiolone-poisoned prey

Major Limitations of Study:
(1) This study did not determine an endpoint for quantitative use.

(2) No control was used.
(3) Sample size was small.
(4) Body weight of the owls was not measured for calculation of total bromadiolone consumption (mg) per unit body weight (mg).
(5) Surviving owls used in the study may have been re-dosed in additional trials. Surviving owls were allotted several months between doses for recovery. It is therefore unknown whether the owls had also been used previously for identical trials of owls secondarily exposed to other rodenticides (*i.e.*, brodifacoum, difenacoum, and flocoumafen), the results of which are presented along with the results of the bromadiolone trials.

Primary Reviewer: Alicia Korol