

Light Brown Apple Moth (LBAM) Eradication Program: Post-Spray Effects on Animals and Pets

Report Prepared by

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Executive Summary

The State has asserted that the pheromone is safe, has been tested, and will not be detrimental to the environment or non-target organisms. Most all aspects of the safety of the products proved for use in aerial spraying were assumed not proven. After the sprays in Monterey and Santa Cruz counties, numerous pets and animals died immediately following and seemingly as a direct result of the sprays. Lost animals included birds, cats, dogs, fish, goats, and rabbits to name a few.

USDA/CDFA Allegations of Safety

USDA/CDFA Allegations of Safety

- All assertions of safety of the pheromone aerial spray are theoretical and assumed not studied or proven.
- CDFA defers to Department of Pesticide Regulation (DPR) and Office of Environmental Health Hazard Assessment (OEHHA) for determination of safety.
- DPR/OEHHA documentation acknowledges that safety studies for all pheromone pesticides approved for use in this program were exempted from such studies.
- DPR/OEHHA documentation acknowledges that most of the side effects reported were plausible for ingredients in aerial pesticide spray and microcapsules.
- No environmental impact studies were conducted.
- Safety assumed based on use over relatively unpopulated agriculture areas.
- Spray never before applied over residential areas.
- Safety on non-target organisms, pets never performed.
- Review of ingredients of aerial pesticide used (Checkmate LBAM-F) shows considerably concern for toxicity to environment in general, marine ecologies, and mammals.
- After Santa Cruz spray, rains caused a concentrated pesticide run-off into the Monterey Bay National Marine Sanctuary potentially causing or contributing to the worst red tide ever reported in Santa Cruz. No testing or investigation of run-off ever reported.
- Other products used in eradication program highly toxic; deadly to bees, cats, marine ecologies. These will be used in residential areas exposing hundreds of thousands of pets to several pesticides at once.
- Microcapsule risk underestimated by DPR/OEHHA. Particularly dangerous to animals with sensitive respiratory systems; extremely deadly to bees.

Effects of Aerial Pesticide Spray on Animals in Monterey & Santa Cruz Counties

- Spray associated with more than 650 dead seabirds, which started dying the morning immediately following the spray.
- Death and loss of songbirds throughout communities in both counties.
- Death and disorientation of bees in both counties.
- 2 litters of rabbits die in Monterey immediately after spray.
- Several cats and dogs die or injured.
- Individuals in both counties lose pond fish immediately after the spray.

LBAM Not Moth of Mass Destruction as Alleged

- Trading partners express flexibility in enforcing quarantines.
- Santa Cruz Judge Burdick finds no support for "emergency" declaration.
- US Government officials acknowledge LBAM not a threat to our trade partners.
- Government and independent scientists agree eradication neither necessary nor achievable.

Personal Testimonies

Personal Testimony: Song birds

"On the morning of Nov. 8 (the day before the spray), I observed over 100 birds active in my yard near Lighthouse field in Santa Cruz. They included three large flocks of songbirds, and various others of different varieties. Many more birds were evident around the neighborhood. The next morning, after the pesticide attacks, there were none. This was the first time I have ever seen a total absence of bird life in the almost 30 years that I have owned this home. This lasted for weeks. Over the course of the next two weeks, I observed 16 dead songbirds and one dead pigeon either on my property, or around my immediate neighborhood. I have never seen anything like this before."

Keith A, Santa Cruz

Personal Testimonies: Cats & Dogs

"As far as my other pets (dog and cat) go, the very next morning they began panting heavy and also were extremely thirsty drinking almost twice as much water as they usually drink. I kept them in for 2 full days after the spray. When I let them out, their fur felt sticky from the dew and I would towel them off but they would be really itch, scratching all the time even after I gave them a bath. This lasted at least two weeks." I also have a friend who told me her 2 silver hamsters died right after the spray. I called a number that was on a health reporting form and they told me that they had received a lot of calls about sick animals. No one ever contacted me."

Amy, Monterey

Personal Testimonies: Fish

"My wife has a outdoor goldfish pond in the backyard of our home in Monterey. They had lived in the pond for several years. They all died a few days after the spray."

Jeff H. Monterey

"I have had goldfish for years living in my old hot tub and after the aerial Checkmate spray, there was a film on the water and the fish did not want to swim up for their food. I tried to absorb it and get it off. One goldfish developed a fungus and died. That has not happened ever before."

Jaquie G, Santa Cruz

Personal Testimony: Bees

"I was in my yard gardening the day of the spray. My rosemary was filled with bees as it usually is. The next day the bees were floundering on the ground and some were even flying into the bush and falling like they were drunk. Many seemed to be dying on the ground."

Julia, Santa Cruz

LBAM Eradication Program: Post-Spray Effects on Animals and Pets

Introduction

In Fall 2007, the California Department of Agriculture (CDFA) under a mandate by the United States Department of Agriculture (USDA) instituted an aerial pesticide spraying program of residential areas of the Central coast of California in an attempt to eradicate the light brown apple moth (LBAM: *Epiphyas postvittana*). Alleging that the pesticide used was safe, the sprays, first in Monterey and then in Santa Cruz counties, were followed by one of the most severe sea-bird die-off experienced in the area, dead and disoriented bees, and numerous dead or injured pets including cats, dogs, fish, birds, hamsters, and rabbits. Most of these events went completely uninvestigated by State and Federal officials.

LBAM has been identified as being present in 12 California counties from Sonoma to Los Angeles. Agriculture officials intend to continue the aerial pesticide spraying as well as the use of highly toxic pesticides (chlorpyrifos, *Bacillus thuringiensis*, permethrin, spinosad) in private and public areas including residential backyards, parks, schools, day care centers; along hiking and biking trails, and on city streets throughout these counties, 3-4 days every month, potentially until the year 2018 or until the moth is eradicated. However, independent scientists and entomologists as well as some USDA officials have called into question the very justification of the program, stating the moth does not represent the danger to agriculture as alleged, and that the goal of eradication will not succeed. Most importantly, the materials used in this program have not been subjected to formal safety studies by the Environmental Protection Agency (EPA) but were rather exempted from such studies under claims the moth represents an agriculture emergency. Therefore, the short-and long-term effects of the multiple pesticides used in this program are unknown. Further, no environmental impact review was conducted prior to the spray to determine the effects of either the aerial or ground treatment programs on non-target species, such as wildlife and pets. However, some of the effects have been revealed in the wake of the aerial spray. This report summarizes many of the effects observed immediately following the aerial sprays in Monterey and Santa Cruz Counties.

Methodology

These reports of injured and dead animals and pets were gathered from those who observed these events directly, and include pet owners and animal rescue volunteers. Specific observations of the detrimental effect of exposure of the Checkmate pesticide spray solution in Monterey and Santa Cruz counties will be discussed, as well as the basic toxicology of the ingredients in the pesticide solution and the toxicity of the other pesticides to be used. The reports of animal deaths or sickness presented were actual accounts provided by the pet owners or individuals who witnessed the events directly.

Sea Bird Die-off

The most noticeable impact to animals due to the pesticide spray was a massive die-off of seabirds that began the morning after the all-night spraying that occurred in Santa Cruz County and included the death of several endangered brown pelicans. Residents were sprayed with the pesticide Checkmate on Thursday November 8, 2007. Birds began being found on the beaches the morning of Friday November 9. Within two days of the spray, more than 248 dead or injured birds were submitted to local native animal rescue organizations. Within 7 days more than 650 dead or injured birds had been found. The aerial spraying was followed by a torrential downpour that resulted in a large concentration of pesticide runoff into the Monterey Bay (see Figure 1), a nationally protected marine sanctuary. Many of the birds were covered in this runoff and eventually died. Few were able to be released back into the Bay. The birds were freezing, drowning, and starving apparently in an effort to maintain buoyancy.

Figure 1 Runoff in Monterey Bay National Marine Sanctuary after the Aerial Spraying of the pheromone-pesticide Checkmate (Suterra, Bend, OR)



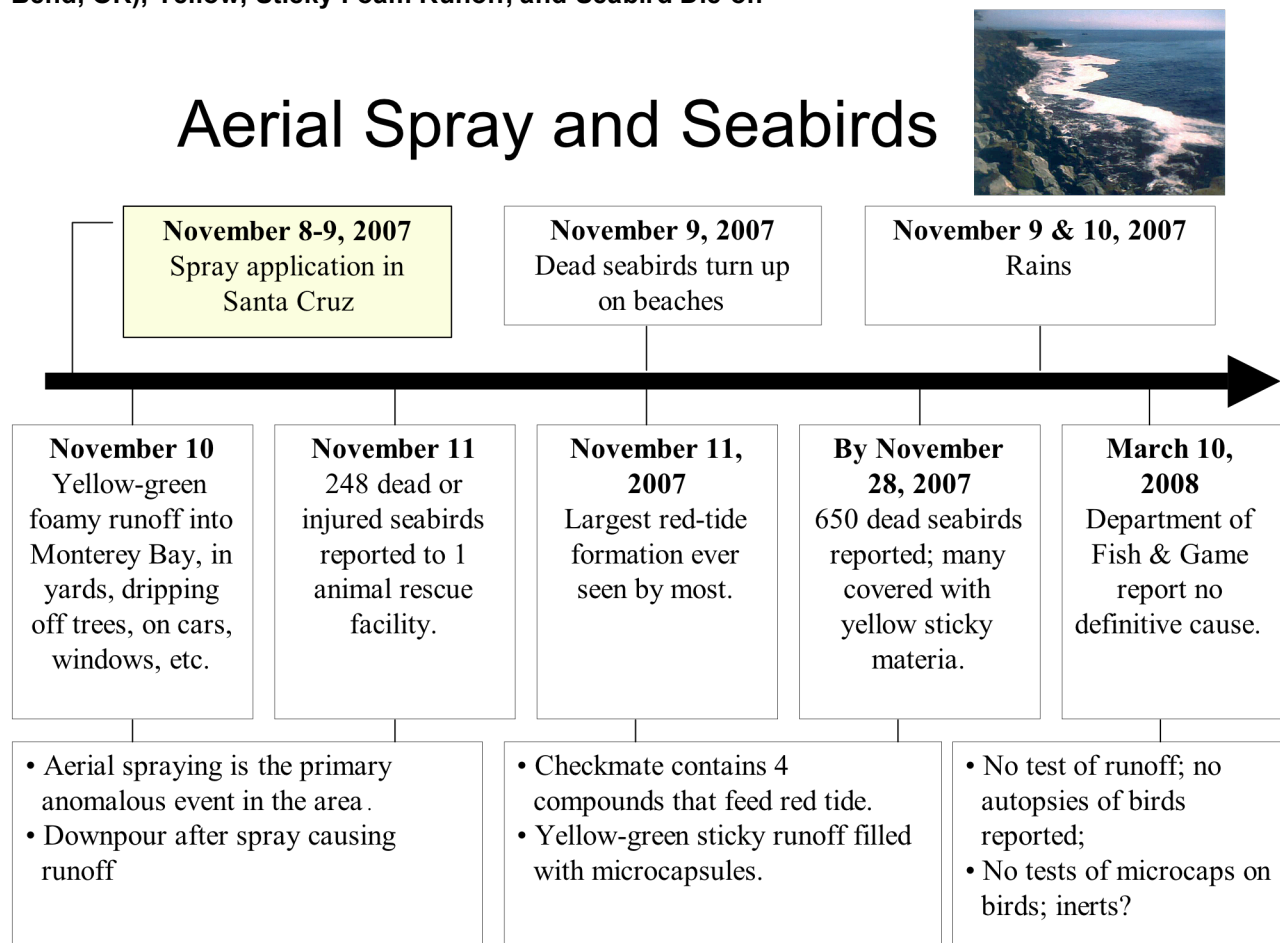
This material was observed to runoff from the rivers and through drainpipes into the Monterey Bay. Official reports reported this foam was due to red tide without explaining its occurrence on land, in backyards, and on houses. Samples of this were taken. Observations under a light microscope showed the presence of microcapsules. No official report or testing results of this material were released by USDA, Department of Fish and Game, EPA, or CDFA.

Photograph: Jefferey Vance, Santa Cruz, CA

Two days after the spray, and associated with the runoff, was an explosion of harmful red tide that was described by experts at the Santa Cruz County Environmental Health Services as “one of the more dramatic ones in recent memory”. Many Santa Cruz surfers reported this red tide as the worst they had seen in 30 years. Red tide occurs from a microplankton that creates a bacteria that fish eat and gets into shellfish and eventually works its way up the food chain to birds, which then die of paralysis. A number of the chemical ingredients (sodium phosphate, ammonium phosphate, urea, and tricapyryl methyl ammonium chloride) in the Checkmate pesticide solution feed the plankton that can give rise to red tide. The only report conducted by the State associated the death of the birds to red tide but failed to disclose that components of the Checkmate pesticide solution can contribute to red tide. The Department of Fish and Game furthermore performed no necropsies to determine the potential for systemic toxicity due to Checkmate and did not test for the systemic absorption or even presence of the plastic microcapsules. The bird die-off subsided apparently as the foam that ran off into the Monterey Bay dissipated in concentration.

Dead and injured birds were also observed by many people after the spray in Monterey. However, according to residents, attempts to communicate these findings to Fish and Game and various State wildlife departments went unanswered and apparently uninvestigated, though the observation of these birds was reported in local Monterey newspapers. To date, no published investigation of the bird die-off in Monterey has been released nor reports published. One note of interest is that high concentrations of dead and injured birds were found at the mouths of fresh water rivers (e.g. Aptos Creek in Santa Cruz and Salinas river in Monterey), suggesting that, as in Santa Cruz, run-off was a potential major factor in these events. Again, test results of the runoff, if conducted, were never reported. The temporal associations between the bird die-off and the spray are illustrated in Figure 2. For a more complete review of the Bird Die Off see LBAM Fact Sheet SB 1.0, March 25, 2008.

Figure 2 Temporal Association Between the Aerial Spraying of the Pesticide Checkmate (Suterra, Bend, OR), Yellow, Sticky Foam Runoff, and Seabird Die-off



Personal Testimony: Bird Die-off

"On November 10, 2007, on our usual Saturday morning beach walk, my daughter and I came across some sea birds sitting on the sand at the water line. Since I am aware that pelagic birds do not come on shore unless there is a problem, I stopped to see what was wrong. I was unsure of the problem, so we found some old towels and got two birds in a make shift cage. We took them to Native Animal Rescue in Santa Cruz. At the rescue center, we were informed that some birds had come ashore the previous day, which was November 9, the morning immediately following the first spray.

Upon returning to the beach in Capitola we found the birds washing up in droves. They were soaking wet, shivering and frightened. We inspected them for oil, since the Cosco-Busan spill had happened a few weeks prior, but there was no sign of oil. The next round of birds proved to be too much for Native Animal Rescue, so they asked us to take any more birds to the Dept of Fish & Game in Santa Cruz. We did. And for another week we, along with just a few others, spent most of our non-work hours picking up sick or dead birds.

There were some tests conducted by the Dept of Fish & Game, but none were conclusive. The only answer we got was that the birds' feathers were stripped of weather and water-proofing by a mysterious waxy substance. The 'staying' substance used in the LBAM pheromone/pesticide is believed by the majority to be the culprit of the birds' struggle. At some times there were birds, Grebes, Loons & Scoters, literally drowning before our eyes. They were unable to make it all the way to shore, so they just sank. It was awful to watch.

Pet Smart donated 20 cardboard kitty carriers so my daughter and I could transport many birds at once. We have a small car, but we managed to get up to 8 birds per trip to Dept of Fish & Game. The impending doom of this happening again in June and thereafter, for 9 months of the year for up to 10 years is hard to imagine. These pelagic bird population may not survive this moth eradication attempt.

Jacquie R, Santa Cruz

“A few weeks after the last spray in Monterey, I was hiking in Elkhorn Slough, a protected bird sanctuary just South of Watsonville. I was horrified to find in one small area, 29 dead cormorants. I occasionally see a lone dead bird but in 25 years in the Santa Cruz area had never seen such a sight. Unusual about these birds is that they were all in pristine condition, not eaten by flies or maggots, and all fresh and pliable, as if they all died the same time and recently. I could not imagine what could have killed them all. Then immediately following the Santa Cruz spray the local newspapers began reporting on “hundreds of dead seabirds along the Santa Cruz coast”. Then, after reading of the potential toxicity of the “inert” ingredients in the pesticide solution that was sprayed, and reading how these can be very toxic to aquatic organisms and feed red-tide I could not believe it was a coincidence. Though I reported this to Elkhorn Slough these dead birds were not included in the report of the Department of Fish and Game who only listed ”

Roy U, Soquel

Table 1 Dead birds associated with the aerial spraying of Santa Cruz County, November 8-9, 2008

Location Found	Dead Species and Approximate Numbers
Marina Street Beach	Sooty shearwater (1), Northern fulmar (127), Surf scoter (3), Clark’s grebe (1)
Capitola	Surf scoter (9), Clark’s grebe (27), Western grebe (38), California gull (1), Pacific loon (7), Rednecked grebe (1), Horned grebe (2), Western gull (1), Red-throated loon (2), Eared grebe (2), White-winged scoter (1)
Moss Landing	Western grebe (24), Northern fulmar (3), Clark’s grebe (19), Common murre (1), Horned grebe (1), Brown pelican (8), Western gull (2)
Cowell’s Beach	Surf scoter (3), Western grebe (3)
Main Beach	Western grebe (18), Surf scoter (7), Clark’s grebe (7), Common murre (2), Pacific loon (1), Red-throated loon (1)
Rio Del Mar	Surf scoter (13), White-winged scoter (1), Horned grebe (2), Common loon(3), Western Grebe (4), Red-throated loon (1)
26th Street Beach	Surf scoter (1)
San Lorenzo	Western grebe (2)
Natural Bridges	Common murre (1), Brandt’s cormorant (1)
Santa Cruz Boardwalk	Western grebe (9), Clark’s grebe (1)
Santa Cruz Wharf	Surf scoter (1), Brown pelican (1)
Yacht Harbor	Clark’s grebe (9), Western grebe (28), Common loon (1), Red-throated loon (2), Northern fulmar (1), Eared grebe (1), Horned grebe (1), Brown pelican (1)
New Brighton Beach	Brandt’s Cormorant (1), Surf scoter (3), Common loon (1), Western grebe (13), Western gull (1), Horned grebe (3), Red-throated loon (1), Clark’s grebe (15), Eared grebe (1)
Seascape	Surf scoter (2), California gull (1), Western grebe (1)
HS Beach	Western grebe (1)
Waddell	Rhinoceros auklet (1), Western grebe (1)
Salinas River	Refuge Northern fulmar (5), Common murre (1)
Seabright	Western grebe (5), Brandt’s cormorant (2), Surf scoter (2), Common murre (2), Red-throated loon (1), Pacific loon (1)
Seacliff	White-winged scoter (3), Surf scoter (14), Western grebe (4), California gull (1), Common murre (1), Common loon (1), Horned grebe (2), Red-throated loon (2), Western gull (2), Clark’s grebe (1)

Source: Pesticides Investigation Unit, Department of Fish and Game. Report Date: March 7, 2008

Table 2 Aerial Pesticide Spraying-Associated Bird Deaths by Species

Species	Number Reported Dead
Brandt's cormorant	4 (at least 24 not counted)
Brown pelican (endangered species)	10
California gull	3
Clark's grebe	80
Common loon	6
Common murre	8
Eared grebe	4
Horned grebe	11
Northern fulmar	131
Pacific loon	9

Source: Pesticides Investigation Unit, Department of Fish and Game. Report Date: March 7, 2008

Loss of Song Birds

Immediately following the sprayings, numerous residents in Monterey, Santa Cruz, Soquel, and Scotts Valley reported a lack of songbirds in their communities that lasted for up to two weeks before songbird activity appeared to return to normal.

Personal Testimony: Song birds

"On the morning of Nov. 8 (the day before the spray), I observed over 100 birds active in my yard near Lighthouse field in Santa Cruz. They included three large flocks of songbirds, and various others of different varieties. Many more birds were evident around the neighborhood. The next morning, after the pesticide attacks, there were none. This was the first time I have ever seen a total absence of bird life in the almost 30 years that I have owned this home. This lasted for weeks. Over the course of the next two weeks, I observed 16 dead songbirds and one dead pigeon either on my property, or around my immediate neighborhood. I have never seen anything like this before."

Keith A, Santa Cruz

"After the spray the birds disappeared from our back yard. It was eerily silent. It was during our Indian summer, very warm. The birdseed suddenly went untouched. The birds didn't return for many weeks."

Kathy K, Monterey-Pebble Beach

"All birds disappeared from my neighborhood and garden (I live in Felton and there were many winter birds I was feeding and seeing prior to the spray). They did not return for over 2 weeks. There are fewer birds this year and hardly any insects."

Martine, Felton

"Each morning I awake I am very conscious of the song birds in our backyard. They are always here because we have one of the larger yards in the neighborhood and we have feeders and a birdbath. The night of the spray, the planes seemed to literally be going over all night long like dive bombers. The next morning and persisting for at least 2 weeks, there were no song birds at all in our yard in the mornings."

Diana S, Soquel

"We have 3 bird feeders and 3 bird baths and enjoy hundreds of birds each day in our yard. We have counted up to 15 different species. We live in Scotts Valley, and were just at the limit of the spraying zone, outside of it, yet we could see the planes spraying a few blocks away. The day after the spraying, we did not see ANY bird. The following day we saw 2 birds. (The bird's area is just in front of our office windows) For 3 weeks, we did not see more than a couple of birds a day. Now end of April 2008, almost 5 months after the sprayings, we still have not seen any finches, they seem to have been wiped away. Usually at this time of the year, April 26, we have a lot of humming birds, also because we have lots of humming bird plants. None, absolutely NONE this year."

Geoffrey M, Scotts Valley

Dead Rabbits

"I knew the spray was going to happen but there was confusion about the exact date. I had called someone at the state and was assured the spray would not be harmful to my animals (cat, dog, rabbits). Still, I was planning on bringing them in the house but because of the unclarity of the actual spraying they ended up getting exposed for about 3 hours before I got them in. One of my rabbits had a litter of 9 prior to the spray. The morning after the spray, 6 of the litter were dead. One week later, another of my rabbits had an entire litter of 7 stillborn. I have raised rabbits for almost 20 years and have never had litters die like this or have the entire litter stillborn. The same momma has given birth to multiple healthy litters before and never anything like this.

Amy, Monterey

Personal Testimony: Rabbits

"I have a friend whose single rabbit died. The owners had it for about 6 mos. It was still young. No health problems. It was found dead in its outdoor cage the morning after the spraying. The rabbit had no prior symptoms. The owner, who lives on a hill at 850 ft elevation, said the thing was so low it was level with and vibrating their house. They don't know if the rabbit died of fright or poisoning. I also have a friend whose goat died."

Nancy B, Santa Cruz

Dead and Sickened Cats and Dogs

Personal Testimony: Cats & Dogs

"As far as my other pets (dog and cat) go, the very next morning they began panting heavy and also were extremely thirsty drinking almost twice as much water as they usually drink. I kept them in for 2 full days after the spray. When I let them out, their fur felt sticky from the dew and I would towel them off but they would be really itch, scratching all the time even after I gave them a bath. This lasted at least two weeks." I also have a friend who told me her 2 silver hamsters died right after the spray. I called a number that was on a health reporting form and they told me that they had received a lot of calls about sick animals. No one ever contacted me."

Amy, Monterey

"My wife and I have 3 cats, had 3 cats! The night of the spray we brought all 3 inside to avoid exposure. At about 3 am we heard scratching on the door and one of the cats had gotten out. She was covered with the spray. We immediately toweled her down and got everything off that we could see. Three days later, she dropped dead in the backyard with no injuries. Up until that moment she had been a very healthy cat. It was the only one of our three that got exposed and the only one that died. I do not think it was a coincidence."

Tom D, Santa Cruz

"I have a adult female cat who is typically very active. Immediately following the spray she became sluggish and lethargic. She would sleep all day and not want to move or eat. For about 5-6 weeks after the Checkmate aerial spray, when she would go outside, especially if it was windy she would get lethargic again and seem to forget where her food bowl was. She had never behaved like this."

Jaquie G, Santa Cruz

"After the spray, our cat vomited 3 times. She was so freaked out that she scratched me on my face immediately after the spraying. One of our neighbor's cats also vomited."

Anonymous, Santa Cruz

"One of my dogs got sick. In order to avoid the spray I left town with my dogs to stay with a friend in Los Gatos. I boarded my dogs in Oakland, at Happy Hound, until I felt it was safe to bring them home. We live in the Jewel Box in Capitola. Since it rained so hard on the day after the spray I felt a bit more secure to return myself. I left the dogs a little longer. When I brought them home, Boomer, my healthy 5-year-old mixed breed developed an awful cough, I just assumed it was kennel cough (that's what the vet thought, as well). But, he has always had his medication for that regularly and this is a very well regarded kennel

that they've been to 3 times before without any sickness and it did not occur until I brought him back to Santa Cruz. I will definitely sell and move if the spraying is not canceled for good."

Linda, Santa Cruz

"Big Cat had not adopted us yet at the time of the spraying. He was a "neighborhood cat". We noticed after the spraying he developed a wheeze, but he didn't adopt us until the rains came this winter. He wheeze got worse, last month he began coughing. We kept him in thinking it would help but it didn't. Soon his breathing seemed labored and he was coughing a lot. Although we do not know who owns Big Cat, he thinks he owns us so we decided to take him to our Vet. The Vet did not find evidence of an infection, tests came back normal. She said he did not test positive for asthma. She decided to treat him with antibiotics. His cough is much better now. There is no wheeze. We asked the Vet if she thought was caused by the spray. She said she could not say for sure, but it is possible it was caused by the spray."

Janis D, Monterey

"We own a black male cat, extremely healthy, spoiled, muscular -lean - indoor and outdoor cat. Hunts, plays and sleeps. After the spray - we thought he was getting old – he didn't want to get up, slept a lot. Only until the spray was months gone, did he return to normal. I'd say his "new lazy ways" lasted a few months."

Kathy K, Monterey

"My 6 year old Siamese, Kernel Popcorn (KP) was in very good health.

Thought that the fog would prevent the spraying, I let KP out in very, very early am hrs of Nov. 9th. He came in with a cough and general malaise that lasted for several months. I reported this to the CDFA hotline."

Amber, Santa Cruz

"Our house was sprayed the night of Nov. 8. It seemed that the plane was going over our house about 10 times. It seemed like over kill. This was late at night and early in the morning. The last pass was around 1 or 2 am. At 3 am our very healthy Shar pei went out to go "potty" in the back yard. We have an electric dog door so she went out on her own. On Nov. 14 she collapsed in the back yard and was rushed to the Emergency Vet and her kidneys and liver had shut down and her blood wouldn't clot. The first thing that they ask was was she poisoned or did she get into anything poison or did she eat wild mushrooms? She had done none of the above. After being put on fluids, oxygen, antibiotics to fight the poison we lost her. They did CPR on her when she went into cardiac arrest but that didn't help. We had her to our Vet a couple of weeks before for her Checkup and Physical exam and her vaccines and there was no sign of sickness in anyway. They only thing we can connect to her death is the spraying."

KM, Santa Cruz

"Dear Dr. Haferman, I live on the north boundary of Marina. My dog, who only goes out on the lawn briefly and stayed indoors until after 8 am developed shortness of breath after the initial Monterey spraying that lasted 2 months and an enlarged heart identified on x-ray in mid-October. There had been no symptoms prior to the spraying at all. I am convinced that my neighborhood was below the "extra dump" from the planes and it is deplorable that those of us who inform our county and state officials of such bad reactions are ridiculed in the press and scorned by their fellow citizens and some of their elected officials."

Anonymous, Marina

"My cat, a very healthy indoor and outdoor cat, that spent her whole life at my home, became suddenly sick after the spray. She always had a very good appetite and was a lively, happy, healthy cat. After the spray, she started to vomit many times, and would eat less and less, even her favorite food. She was hungry, would start to eat, and soon after would walk away from her food, not feeling good. She has lost a lot of weight, and we are very concerned for her health. An ultra-sound showed that her stomach and intestine were quite irritated. We took her away from Scotts Valley area for a few weeks, to Davis, and she became much better. Thinking that she was cured we brought her back to Scotts Valley, but she started to vomit again. She is back in Davis, and is better, but has a hard time to fully recover, and to regain weight, she still vomits once in a while. This has never happened to her before the spray, and we are quite upset."

Martine M, Scotts Valley

“My cat was completely skittish and weird for 6 weeks after the spray – literally a changed personality. Super wide-eyed, restless, antsy and in a constant state of agitation. He is finally relaxed now but it took a long time to get him back. He also felt sticky to the touch after he'd go out in the dewy morning.”

Kimberly G, Soquel

Dead and Injured Fish

Personal Testimony: Fish

“My wife has a outdoor goldfish pond in the backyard of our home in Monterey. They had lived in the pond for several years. They all died a few days after the spray.”

Jeff H. Monterey

“I have a fish pond in my yard. The morning after the spray the pond was covered with a foamy substance. I first moved it out of the way to feed the fish but they did not want to come to the surface at all, which is completely unusual. I immediately caught them all up and then drained the pond to clean it. They did not die but they were very lethargic for days after.”

Marita H, Aptos

“I have had goldfish for years living in my old hot tub and after the aerial Checkmate spray, there was a film on the water and the fish did not want to swim up for their food. I tried to absorb it and get it off. One goldfish developed a fungus and died. That has not happened ever before.”

Jaquie G, Santa Cruz

Bee Die-off

Pesticides can severely impact bee colonies and are considered to be one of the four primary stressors on bee colonies. Yet, the EPA only requires that pesticides be assessed for adult bees, neglecting any effect pesticides may have on the brood and immature bees (COA 2007). In the case of the pheromone pesticide solutions approved for use in the LBAM eradication program, no tests on bees were performed. Moreover, individual pesticides may not be found to be injurious to bees but when bees are exposed sequentially to an array of pesticides that may be in the environment, these collective pesticides may become lethal. A recent study from Canada reported that low-level exposure of pesticides to bees while in the larval development stage has an adverse effect on the adults that are not detected with current tests required by regulatory agencies (Morandin et al. 2005).

By far the most potentially damaging pesticides affecting honey bees thus far developed are those packaged in microcapsules, which present a very distinct and serious threat to bees (Sanford 2003; Tarpay 2008). Entire hives have been killed due to such delivery systems (Adams 2008). Pesticides delivered in microencapsulated delivery systems are exactly the same size as pollen grains. The bees get these caps stuck to their wings and bodies, which impairs their flying. Then they gather the caps, thinking they are pollen, and carry it back to the hive where they feed the brood, queen, and emerging adults with the pesticide content which breaks down over a period of 30 to 90 days. For a more comprehensive review of the impact of the aerial pesticide spraying on bees see LBAM Fact Sheet EPB 1.1.

Personal Testimony: Bees

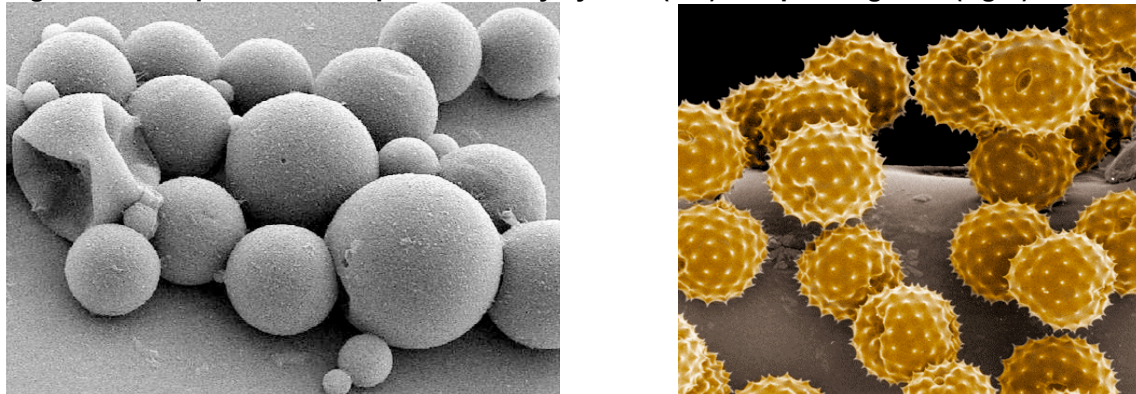
“I was in my yard gardening the day of the spray. My rosemary was filled with bees as it usually is. The next day the bees were floundering on the ground and some were even flying into the bush and falling like they were drunk. Many seemed to be dying on the ground.”

Julia, Santa Cruz

“A friend told me she saw bees the morning after the spray, laying on her patio table struggling and going no where, but as if trying to survive but dying, almost like they couldn't breathe, and lying sideways and fluttering.”

HCP, Santa Cruz

Figure 3 Example of microcapsule delivery system (left) and pollen grains (right)



Review of Toxicity of Checkmate Aerial Pesticide Solution

The Checkmate LBAM-F is a cocktail of chemicals, 2 pheromones, surfactant (tricaprylyl methyl ammonium chloride; aka Aliquat 336), plastic resins, an antioxidant, and emulsifier. The solution is designed to persist in the environment for a period of 30 to 90 days and CDFA is experimenting with pesticide solutions designed to persist even longer. All forms of animal life will be subjected to chronic exposure of these chemicals for the potential 10-year duration of the program.

When testing pesticide solutions, only the active ingredients are often tested. However, research suggests that the so-called “inert” ingredients in a pesticide are often among the most toxic. The word “inert” as used on a pesticide label is commonly mistaken to mean inactive or benign. However the EPA states that “although the term “inert” may connote physical, chemical or biological inactivity, use of the word “inert” to describe a component in a pesticide product means only that the substance is not intended to exert a pesticidal effect in that product. The “inert” ingredient may have biological activity of its own, “it may be toxic to humans, and it may be chemically active” (EPA 2002). Typically, pesticide formulations are comprised largely of inert ingredients. A review of 100 agricultural pesticide products found that the formulations contained on average 50% inert ingredients, with many containing 90% or more (NCAP 2006). The majority of safety tests required to register a pesticide are performed with the active ingredient alone, not the complete formulation (Cox and Surgan 2006). The Checkmate LBAM-F formulation consists of 17.61% moth hormonal disruptors and 82.39% other ingredients (see Table 3).

Numerous studies have shown that inerts can increase the toxicity of pesticides to body systems such as the nervous, cardiovascular, and hormonal systems, the mitochondria, and genetic material. Inerts can also interact with other chemicals in pesticide formulations, to increase exposure levels to the active pesticide. Additionally, inerts have been shown to raise the ecotoxicity of pesticide formulations, increasing the severity of toxic effects to plants, animals, and non-target organisms (Cox and Surgan 2006).

State and Federal Agencies have alleged that the Checkmate LBAM-F formula, consisting of pheromones as active ingredients, is an environmentally safe product with no known negative human or environmental effects. However, the greatest concern regarding the safety of the pheromone portion of the formulation is that it has not been tested with regards to what effects it may have on non-target organisms. CDFA has noted that at least 5 moths other than LBAM are being found in the LBAM traps suggesting a potential effect on non-target species, to what degree is unknown. As the pheromone being used in the traps is identical to that being aerially sprayed, it is likely the aerial spraying can similarly have a negative effect on non-target organisms, many of which are important sources for food for emerging hatchlings and aquatic organisms.

There is significant concern regarding the so-called “inert” ingredients in the Checkmate formula, a number of which have a detrimental effect on bees, aquatic ecology, and animals higher on the food chain. A review of the available data for these chemicals indicates a high potential for toxicity for many of the ingredients labeled as inert, even at low concentrations. Moreover, the degradation products of a

number of the Checkmate inert ingredients are more toxic than the parent compound. In addition, all of the other treatments being used in the LBAM eradication program are highly toxic to the environment in general and aquatic ecology specifically. Because, CDFA declared this program an emergency, environmental impact reviews were not conducted prior to the spray so the environmental consequences of the combination of pesticide products being used is completely unknown.

The following toxicological information was derived from database reviews, primary published scientific literature, and Material Safety Data Sheets (MSDS). A MSDS is designed to provide workers and emergency personnel with the proper procedures for handling or working with potentially toxic substances. MSDSs include information such as physical data (melting point, boiling point, flash point etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and information regarding environmental accidents such as spills or accidents. The information here presented provides a partial overview of the toxicity of the compounds, with special emphasis on known ecological toxicities.

Table 3 Ingredients in Checkmate LBAM-F and OLR-F

Water	
(E)-11-Tetradecen-1-yl acetate	16.9% (pheromone)
(E,E)-9,11 Tetradecadien-1-yl acetate	0.71% (pheromone)
(z)-11-Tetradecenyl acetate (pheromone)*	
11-Tetradecen-1-ol acetate (pheromone)	
Tricaprylyl methyl ammonium chloride (syn. methyltrioctylammonium chloride)	
Sodium phosphate	
Ammonium phosphate	
1,2-benzisothiazoli-3-one	
2-hydroxy-4-n-octyloxybenzophenone	
Butylated hydroxytoluene	
Polyvinyl alcohol	
Cross linked polyurea polymer	
Polymethylene polyphenyl isocyanate*	

* The actual presence of this compound in the solution has been questioned. It may be used as a building block for the crosslinked polyurea polymer. (z)-11-Tetradecenyl acetate is a component of Checkmate OLR-F.

a. Tricaprylyl Methyl Ammonium Chloride (synonym methyltrioctylammonium chloride)

Also known by the trade name Aliquat 336 (Acros MSDS; de Oliveira and Bertazzoli 2007; Sigma-Aldrich MSDS) tricapyrylyl methyl ammonium chloride (TMAC) is a low-foaming surfactant that keeps polymer beads from sticking together. Surfactants in general allow other compounds to dissolve in water and change the surface tension of water (Abraham 2007; Gyenge and Oloman 2001; de Oliveira and Bertazzoli 2007). This effect on water can affect zooplankton and even at low doses can significantly impact amphibians such as frogs (Abraham 2007). European labeling warns against releasing the substance into the environment, cautioning that it may cause long-term adverse effects in the aquatic environment. Surfactants can increase the systemic toxicity of substances through increased absorption.

b. 1,2-Benzisothiazoli-3-one (synonym BIT)

1,2-Benzisothiazolin-3-one is a preservative associated with occupational asthma. Multiple accounts of occupational dermatitis have been reported with exposure to the chemical. In the European Union, it is classified as irritating to the skin and as a potential risk of causing serious eye damage. Canadian authorities list it as causing skin sensitization in humans. BIT is a known dermal irritant at levels as low as 0.1% concentration and individuals with dermal conditions should avoid repeated exposure to BIT (Damstra et al. 1992; Muhn and Sasseville 2003; Roberts et al. 1981; Taran and Delaney 1997). Individuals with chronic pulmonary or asthmatic conditions or chronic skin conditions are warned to avoid repetitive exposure to BIT. This portends a potential danger to animals with sensitive respiratory systems. According to data compiled by the Occupational Safety and Health Administration (OSHA) BIT has been shown to be a mutagen with genotoxicity to human cells.

In the European Union BIT is classified as dangerous to the environment and as very toxic to aquatic organisms with specific negative effects against mollusks, fish, and zooplankton. It is highly toxic to green algae and can disturb aquatic ecosystems. According to the EPA, it has a low to moderate toxicity to birds and mammals, a moderate toxicity to fresh water fish and invertebrates (starfish, crabs, insects), and is highly toxic to estuarine and marine habitats. European labeling warns against releasing the substance into the environment. It is classified as “hazardous waste” by the European Waste

Catalogue Ordinance and as a “hazard to waters” by the European Administrative Regulation of Substances Hazardous to Water. Domestic MSDS sheets for BIT warn that water polluted with the substance should not be discharged into sewage or natural areas. Documents of the EPA on BIT state that it is highly toxic to green algae and other invertebrate species. The EPA also states that if it is used outdoors, BIT may possibly move with soil during rainfall events and potentially reach surface waters. The Santa Cruz county sprayings on November 8th and 9th were followed by a significant rainfall on November 10th and 11th. The rainfall was associated with an anomalous yellow runoff from the land into the Monterey Bay via several drainpipes. This runoff was yellow and sticky and left a thick layer of foam on top of the water for miles along the Santa Cruz shore. No published testing of this runoff was reported by State or Federal Agencies. The material that many of the dead birds were covered with has not been identified but is similar in appearance to the yellow oily material observed by numerous individuals as being associated with the spray and was found to contain round beads identical in appearance and size as that ascribed to the Checkmate microcapsule delivery system (Porter 2008).

c. 2-Hydroxy-4-n-octyloxybenzophenone (synonym benzophenone 12)

2-Hydroxy-4-n-octyl benzophenone is a UV light absorber of unknown health impact, however related compounds in the benzophenone family have been shown to form estrogenic photoproducts, upon exposure to UV or sunlight (Hayashi et al. 2006). In the European Union it is classified as an irritant that may cause sensitization upon skin contact and is irritating to the eyes, respiratory system, and skin. Symptoms of exposure include reddening and irritation of the skin and eyes, mucous membrane irritation, and upper respiratory tract irritation.

2-Hydroxy-4-n-octyl benzophenone is classified as harmful to aquatic organisms and may cause long-term adverse effects in the aquatic environment. European labeling warns against releasing the substance into the environment. It is classified as hazardous by OSHA.

d. Butylated Hydroxytoluene (BHT) (synonym 2,6-Di-tert-butyl-p-cresol)

Butylated hydroxytoluene (BHT) is classified in the European Union as being irritating to the eyes, respiratory system, and skin. Allergic contact dermatitis and contact urticaria are associated with exposure to BHT (HAZ-MAP). Studies have shown BHT to be carcinogenic, hepatotoxic, tumorigenic, mutagenic, and teratogenic in animals as well as in human cells (Sigma-Aldrich MSDS). Studies have also confirmed BHT to have estrogenic activity (Miller et al. 2001; Wada et al. 2004) and MSDS sheets state that chronic exposure to BHT may cause adverse reproductive and birth defects (Acros MSDS). BHT is classified by OSHA as an ecological toxin with specific toxicity to marine life. It is a known eye and skin irritant and can cause a multitude of respiratory symptoms (e.g. cough, sore throat).

e. Sodium Phosphate (Disodium Phosphate, Monosodium Phosphate, Sodium Phosphate, Trisodium)

There are a number of different forms of sodium phosphate. The exact type of sodium phosphate used in the Checkmate formulas has not been publicly disclosed, and therefore it is not possible to give a precise description of potential adverse effects. However, a review of the most common forms of sodium phosphate share similar toxicity profiles and it would be expected that the range of exposure symptoms would vary from mild to severe depending on the specific type of sodium phosphate used in the formula. Symptoms of exposure to the various kinds of sodium phosphate would range from mild to severe gastrointestinal effects (varying degrees of gastrointestinal irritation, abdominal pain/cramping, vomiting, diarrhea, nausea, abdominal discomfort, burning sensation), mild to severe respiratory symptoms (throat irritation, respiratory tract/mucous membrane irritation, coughing, sneezing, choking, difficulty breathing, pulmonary edema), mild to severe effects on the eye (irritation, redness, pain, conjunctival edema and corneal clouding followed by subsequent cataract formation could occur) eye burns, and mild to severe skin symptoms (skin/mucous membrane irritation, dermatitis, local skin destruction, burning pain, skin burns, blisters).

Environmentally, these compounds are classified as hazardous substances with potential detrimental effects on ground water and aquatic ecosystems. These most especially affect blue gill sunfish, rainbow trout, crustaceans, mollusks, and phyto- and zooplankton that can contribute to red tides (Feyzioglu and Ogut 2006), which in turn are toxic to marine habitats.

Sodium Phosphate (SP): Classified as a hazardous substance on California Director's List of Hazardous Substances & CERCLA (Science Lab MSDS). May cause irritation of the digestive tract and may cause purging. It is slowly absorbed. Expected to be a low ingestion hazard for usual industrial handling. Ingestion of large doses may affect behavior/central nervous system. If a significant amount of phosphate is absorbed, hypophosphatemia will occur (Science Lab MSDS). SP is extremely caustic to eyes.

Sodium Acid Phosphate (SAP): Considered a low hazard for usual industrial handling and systemic reactions are unlikely when ingested (because they are slowly and incompletely absorbed in the intestinal tract). The most frequently seen effect is gastrointestinal irritation with abdominal pain and cramping, vomiting, diarrhea. If a significant amount of phosphate is absorbed. The following symptoms may occur: mineral imbalance in the body, adversely affecting the osmotic pressure of body fluids resulting in hyperphosphatemia, hypocalcemia, hypomagnesemia (Science Lab MSDS).

Trisodium Phosphate (TSP): Classified as “hazardous waste” under the European Waste Catalogue Ordinance (AVV) (Gestis Database); classified as a hazardous substance on California Director's List of Hazardous Substances, CERCLA, and OSHA (Science Lab MSDS). May be harmful if swallowed and may cause severe gastrointestinal (digestive) tract irritation with severe nausea, vomiting, abdominal discomfort, violent purging, diarrhea, and burning sensation. Ingestion of large amounts may induce hypocalcemia or hyponatremia characterized by tetanus-like spasms, due to the sequestration of calcium ions by the phosphate moiety. It may also cause caustic burns of the mouth oropharynx, esophagus, or gastrointestinal tract. TSP is extremely caustic to the eyes.

In general, sodium phosphate is a pH buffer. If runoff concentrations are high enough sodium phosphate could contribute to a change in water pH and lead to algal blooms (Abraham 2007) that can give rise to red tide. Increased phosphate levels are known to be a contributing factor in the occurrence of red tides (Feyzioglu and Ogut 2006). It may also be hazardous to drinking water when large quantities get into groundwater.

Following the sprayings in Monterey and Santa Cruz counties, a large number of the reported human adverse effects reported were consistent with the adverse effects profile of these various compounds. Similarly, a harmful algal bloom (red tide) described by a water specialist with the Santa Cruz County Environmental Health Services as “one of the more dramatic ones in recent memory”, occurred in the Monterey Bay (Ragan 2007) four days after the spray. More than 650 dead seabirds were found from the day immediately following the spray to the several days following the spray including the days associated with this dramatic red tide. The temporal association and mechanistic plausibility between the actual spray and the dead and injured sea birds suggests more than a coincidental occurrence. Similarly, the consistency between high concentrations of the inert ingredients and the adverse effects reported suggests that environmental exposure to these chemicals is greater than anticipated by CDFA.

f. Ammonium Phosphate (Monoammonium Phosphate, Diammonium Phosphate)

The exact type of ammonium phosphate used in the Checkmate formulas is currently unspecified, and could be either *monoammonium phosphate* or *diammonium phosphate*.

Monoammonium phosphate can cause mild respiratory tract irritation, nausea, vomiting (after inhalation of high concentrations of dust), coughing, shortness of breath, mild irritation, redness, and pain of eyes. Classified as hazardous by OSHA (Science Lab MSDS).

Diammonium phosphate is toxic to lungs and mucous membranes and can cause irritation to the respiratory tract, coughing, shortness of breath and eye inflammation characterized by redness, watering, itching, and pain. Characterized in Canada as very toxic. Repeated or prolonged exposure can produce target organ damage and cause damage to lungs and mucous membranes. Classified as hazardous by OSHA; long term degradation products may arise and products of degradation are more toxic than the parent compounds (Science Lab MSDS). May be a hazardous to drinking water when larger quantities get into groundwater (Gestis Database).

Following the sprayings in Monterey and Santa Cruz counties there were numerous reports of respiratory symptoms including asthma, bronchial irritation, difficulty breathing, shortness of breath, coughing and wheezing, lung congestion/soreness, and chest pain/tightness. Nausea, blurred vision, eye irritation, and skin rashes were also reported (HOPE 2008).

g. Polyvinyl Alcohol (PVA)

Polyvinyl Alcohol (PVA) is an emulsifier that allows other compounds to mix together and may keep the microcapsules suspended in water. The Society of Plastics Industry considers it a plastic resin. There is limited human data regarding the toxicity of polyvinyl alcohol. Animal data has shown it to be tumorigenic (Science Lab MSDS). Inhalation or ingestion of PVA for a prolonged period of time may affect blood, metabolism, and behavior (Science Lab MSDS). Symptoms of PVA exposure include digestive tract irritation, respiratory irritation or cough, and red/irritated eyes.

According to the National Institute of Occupational Safety and Health (NIOSH) polyvinyl alcohol may be hazardous in the environment, with specific toxicity to fish. It may also be hazardous to ground water (Gestis Database). It is considered to be harmless in isolation, but PVA could potentially dissolve other compounds on impervious surfaces into runoff.

Following the sprayings in Monterey and Santa Cruz counties there were numerous adverse effects reported, including nausea, diarrhea, coughing, wheezing, and eye irritation (HOPE 2008) as well as an anomalous runoff of yellow sticky substance that was observed coming from runoff drain pipes, in back yards, the rivers, and which accumulated in the Monterey Bay in the form of a thick yellow foam floating on top of the water along the coastline. Dead and injured birds were found with this sticky substance. It is possible this thick yellow sticky substance was an accumulation of the billions of microcapsules that were dispensed, mixed with the surfactants and emulsifiers that can dissolve other compounds on impervious surfaces (oils, other chemicals, pollutants) during the rainfall and keep them in suspension in the water, which is a function of emulsifiers.

h. Crosslinked Polyurea Polymer and Polymethylene Polyphenyl Isocyanate (PPI)*

According to Checkmate manufacturer Suterra, polymethylene polyphenyl isocyanate is used to create the encapsulation polymer that makes up the shell of the microcapsule that contains the Checkmate solution. The PPI starter compound is reported by the manufacturer to be used up during the reaction (Renner 2007). The *Consensus Statement* states that the polyurea shell biodegrades into urea. Research has linked urea to the occurrence of harmful algal blooms (HAB's), also known as red tides. Following the spraying, a harmful algal bloom (red tide) described by a water specialist with the Santa Cruz County Environmental Health Services as "one of the more dramatic ones in recent memory", occurred in the Monterey Bay (Ragan 2007).

Review of Toxicity of Other Pesticides Used in the LBAM Eradication Program

In addition to the basic toxicity of the inert ingredients in the sprays that were applied and are projected to be applied (e.g. Checkmate LBAM-F), there are tremendous potential environmental consequences in the other products that are being used or, are projected to be used, as part of the LBAM eradication program. Most of these other products are directly insecticidal and directly toxic pesticides, most of which are known to be extremely toxic to an array of insects, marine life, birds, and cats.

a. *Bacillus thuringiensis* (Bt)

Bacillus thuringiensis (Bt) is a naturally occurring bacteria used in the control of a variety of pests though its effects against LBAM appear to be limited. It is approved for use on organic produce. The primary concern with Bt is its potential environmental effects and effects against beneficial insect predators and non-target organisms. Large-scale applications of Bt can have far-reaching ecological impacts. Bt can reduce dramatically the number and variety of moth and butterfly species, which in turn impacts birds and mammals that feed on caterpillars. In addition to negatively affecting food chain of wildlife, there is a potential for Bt to negatively affect the large populations of monarch butterflies that migrate and breed in Santa Cruz each year.

Bt is less toxic to mammals and shows fewer environmental effects than many synthetic insecticides. The EPA reports that Bt may give rise to secondary toxins that can affect non-target species. CDFG has announced intentions to treat residential areas with Bt. Treatments in Washington State to control the gypsy moth resulted in reduced bird, bee, butterfly, and native wasp populations and toxicity to coho salmon, rainbow trout, and pond fish (Washington State Department of Health 2001; Young 1994)

b. Chlorpyrifos

Chlorpyrifos is a toxic crystalline organophosphate insecticide that inhibits acetylcholinesterase and is used to control insect pests. Product names include Dursban, Empire, and Lorsban. As part of the LBAM eradication program, chlorpyrifos is currently required to be used in wholesale nurseries if a single sign of LBAM is found. In such cases, the entire acreage is required to be treated. This requirement presents a significant environmental health hazard as many of these nurseries are in residential areas, are along waterways, and are in close proximity to agricultural areas that utilize pollinators. The safety of chlorpyrifos has been questioned for more than a decade. In 1995, Dow Chemical was fined \$732,000 for not sending to the EPA reports it had received on 249 poisoning incidents associated with the product Dursban. In 2003, Dow agreed to pay \$2 million, the largest penalty ever in a pesticide case, to the state of New York, in response to a lawsuit filed by the Attorney General to end Dow's illegal advertising of

Dursban as "safe". Concern over the safety of chlorpyrifos continues. On July 31st, 2007, a coalition of farm worker and advocacy groups filed a lawsuit against the EPA seeking to end agricultural use of chlorpyrifos. The suit claims that the continued use of chlorpyrifos poses an unnecessary risk to farm workers and their families (Earth Justice 2007). Additionally, the Natural Resources Defense Council (NRDC) and Pesticide Action Network of North America (PANNA) have formally petitioned the EPA to revoke all registrations and approvals for the use of chlorpyrifos. USDA has opposed this reclassification.

Chlorpyrifos is also a skin and eye irritant. While some organophosphates are readily absorbed through the skin, studies in humans suggest that skin absorption of chlorpyrifos is limited. Symptoms of acute exposure to organophosphate or cholinesterase-inhibiting compounds may include the following: numbness, tingling sensations, incoordination, headache, dizziness, tremor, nausea, abdominal cramps, sweating, blurred vision, difficulty breathing or respiratory depression, and slow heartbeat. Very high doses may result in unconsciousness, incontinence, convulsions, and death.

Chlorpyrifos is highly toxic to amphibians. A recent study by the United States Geological Survey (USGS) found that the main breakdown product in the environment, chlorpyrifos oxon, is even more toxic to amphibians than the primary compound (Science Daily 2007). When pure chlorpyrifos was fed to dogs for 2 years, increased liver weight occurred at 3.0 mg/kg/day. Signs of cholinesterase inhibition occurred at 1 mg/kg/day. Rats and mice given technical chlorpyrifos in the diet for 104 weeks showed no adverse effects other than cholinesterase inhibition. Two-year feeding studies using doses of 1 and 3 mg/kg/day of chlorpyrifos in rats showed moderate depression of cholinesterase. Cholinesterase levels recovered when the experimental feeding was discontinued. Identical results occurred in a 2-year feeding study with dogs. Occupationally, a single application of chlorpyrifos poses risks to small mammals, birds, fish and aquatic invertebrate species for nearly all registered outdoor uses.

Effects on birds: Chlorpyrifos is moderately to very highly toxic to birds. Its oral LD50 is 8.41 mg/kg in pheasants, 112 mg/kg in mallard ducks, 21.0 mg/kg in house sparrows, and 32 mg/kg in chickens. The LD50 for a granular product (15G) in bobwhite quail is 108 mg/kg. At 125 ppm, mallards laid significantly fewer eggs. There was no evidence of changes in weight gain, or in the number, weight, and quality of eggs produced by hens fed dietary levels of 50 ppm of chlorpyrifos.

Effects on bees: Chlorpyrifos is rated as highly toxic to bees, which means exposure can kill more than 1000 bees per hive daily. Exposure of hives to chlorpyrifos have resulted in 85 to 100% mortality in colonies (Bianu et al. year unknown).

Effects on aquatic organisms: Chlorpyrifos is very highly toxic to freshwater fish, aquatic invertebrates and estuarine and marine organisms. Cholinesterase inhibition was observed in acute toxicity tests of fish exposed to very low concentrations of this insecticide. Application of concentrations as low as 0.01 pounds of active ingredient per acre may cause fish and aquatic invertebrate deaths. The 96-hour LC50 for chlorpyrifos is 0.009 mg/L in mature rainbow trout, 0.098 mg/L in lake trout, 0.806 mg/L in goldfish, 0.01 mg/L in bluegill, and 0.331 mg/L in fathead minnow. When fathead minnows were exposed to Dursban for a 200-day period during which they reproduced, the first generation of offspring had decreased survival and growth, as well as a significant number of deformities. This occurred at approximately 0.002 mg/L exposure for a 30-day period. Chlorpyrifos accumulates in the tissues of aquatic organisms. Studies involving continuous exposure of fish during the embryonic through fry stages have shown bioconcentration values of 58 to 5100. Due to its high acute toxicity and its persistence in sediments, chlorpyrifos may represent a hazard to sea bottom dwellers. Smaller organisms appear to be more sensitive than larger ones (EXTOXNET 1996).

Effects on other organisms: Aquatic and general agricultural uses of chlorpyrifos pose a serious hazard to wildlife and pollinators.

Multiple applications increase the risks to wildlife and prolong exposures to toxic concentrations. Many nurseries in Santa Cruz County have been required to treat their entire acreage multiple times in a period of only a few months.

c. Permethrin

Permethrin is one of a class of insecticides known as pyrethroids. It inhibits respiration in a manner similar to other neurotoxic drugs (Gassner et al. 1997 as cited by Cox 1998). Like other pyrethroids, permethrin kills insects by strongly exciting their nervous systems. In mammals it has been shown to cause a wide variety of neurotoxic symptoms including tremors, incoordination, elevated body temperature, increased aggressive behavior, and disruption of learning (Cox 1998). In an EPA summary of 17 medium-term and long-term laboratory studies that exposed test animals to permethrin, effects on the liver were noted at the "lowest effect level" in all of them (EPA 1997 as cited by Cox 1998).

Studies have shown that most cats (96%) exposed to permethrin develop toxic effects, including excitability, twitching, tremors, convulsions, muscular weakness, respiratory distress, vomiting, diarrhea, hypersalivation, and death (Sutton 2007).

Experiments with laboratory animals indicate that the immune system appears to be a sensitive target for permethrin activity. Ingestion of permethrin reduces the ability of T-lymphocytes to recognize and respond to foreign proteins (Cox 1998). Even small doses equivalent to 1/100 of the LD₅₀, have been shown to inhibit T-lymphocytes by more than 40% (Cox 1998). Permethrin ingestion has also been shown to reduce the activity of natural killer cells by about 40% (Blaylock et al. as cited by Cox 1998).

Both the EPA and World Health Organizations have reported that permethrin increased the frequency of lung tumors in female mice, and increased the frequency of liver tumors in male and female mice (EPA 1997; WHO 1990 as cited by Cox 1998). The toxic effects of permethrin are often greatly increased when combined with other chemicals, such as other pesticides in the environment.

Permethrin is highly toxic to a wide variety of animals including honeybees (and other beneficial insects), fish, aquatic insects, crayfish, and shrimp. It is especially toxic to cats. The potential toxicity of permethrin to beneficial insects is of specific concern with regards to the long term management of pests as a healthy ecosystem that fosters, not destroys, beneficial predators is the most effective, environmentally sound, and sustainable manner of controlling pests, including the LBAM.

In addition to toxic effects on beneficial insects needed for pollination of crops and a healthy ecosystem of natural predators, permethrin is highly toxic to both fresh water and estuarine aquatic organisms and can pose a serious threat to the Monterey Bay, a nationally protected marine sanctuary.

The State of California and the USDA intends to apply permethrin to pheromone traps and place tens of thousands of these traps in residential areas, the yards of private residents, schools, city parks, around day care centers, and on telephone poles throughout neighborhoods (3000 telephones per square mile). Dew, fog, mist, and rains will cause these toxins to leach into the surrounding areas, potentially acutely exposing pets and wildlife to this highly toxic compound. These compounds in Monterey and Santa Cruz counties will wash into the Monterey Bay marine sanctuary; and in the Bay Area, they will wash in the estuaries and wetlands of San Francisco, Marin, and the East Bay. Even small amounts of permethrin are classified as a "severe hazard to waters" under the European Administrative Regulation of Substances Hazardous to Water (Gestis Database).

Effects on bees: Permethrin is rated as highly toxic to bees, which means exposure can kill more than 1000 bees per hive daily.

d. Spinosad CAS Numbers

Spinosad is a mixture of compounds formed from the fermentation of the soil organism *Saccharopolyspora spinosa*. The mixture is composed of approximately 10 related chemicals, with a variety of compounds derived from the fermentation process. Two closely related compounds, spinosyn A and spinosyn D, comprise about 88% of the composition of spinosad and are responsible for most of its insecticidal activity (JMPR 2001b). It kills insects through activation of the acetylcholine nervous system through nicotinic receptors. Continuous activation of motor neurons causes insects to die of exhaustion (USDA 2002).

The Dow Agrosciences products *Conserve* and *Entrust*, are the specific formulations recommended by the CDFA on its *Light Brown Apple Moth Approved Treatments for Nurseries and Host Crops* list. Both products contain spinosads (spinosyns) A & D as well as a variety of "inerts". *Conserve* includes the well-known environmental toxin propylene glycol (antifreeze).

Spinosad is known to be highly toxic to honeybees as well as to beneficial parasitoid insects such as the *Trichogramma* wasp, which both provides biological protection against a host of pests and acts as a food source for other organisms within the ecosystem. Spinosad is also highly toxic to oysters and other marine mollusks, moderately toxic to fish and marine invertebrates, and slightly toxic to birds. Adverse impacts against beneficial organisms are a particular concern; fresh sprays could kill honeybees and other parasitoids (Bret et al. 1997; Suh et al. 2000).

Effects on bees: Spinosad is rated as highly toxic to bees, which means exposure can kill more than 1000 bees per hive daily. Spinosad was previously believed to be relatively safe to bees but a recent study by Canadian researchers demonstrated that bees in larval stage exposed to spinosad resulted in disruption of the ability of the adult bee to forage and that high degrees of exposure caused rapid colony collapse.

Animals as Bioindicators of the Environment

Animals are often the “canaries in the coal mine” for humans. Negative health effects observed in animals are often a prelude to eventual sickness in humans. This was clearly shown with the effects of DDT on animals and eventually DDT’s human adverse health effects became known resulting in its ban. Bees, aquatic life, rabbits, and cats are particularly sensitive organisms that can forewarn of dangers of exposure to various stressors, including pesticides. Rabbits, because of their particularly sensitive respiratory system, are used by the military as a biological monitoring system to detect chemical warfare. Bees are considered primary bioindicators of healthy or diseased ecosystems. The poisoning of bees has an incredible impact on human life and ecosystems as 1/3 of the world’s food population depends on pollination. Bees are particularly sensitive to pesticides so their destruction from pesticides results in the destruction of a huge percentage of the food supply. This will have drastic consequences in terms of both public and environmental health and the economy as bees support industries that generate approximately \$30 billion in California annually (Mussen 2004).

Before any further aerial or ground pesticide treatments are conducted for the eradication of the LBAM, environmental assessments on the impact on all of the LBAM eradication treatment products should be conducted. Their impact on the ecosystems and individuals who inhabit those systems need to be evaluated and those systems need to be protected, especially in light of scientific evidence that has questioned whether LBAM needs to be eradicated and if eradication can be achieved.

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