Lancelot S. Houston
P.O. Box 2177
Seaside, CA. 93955

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CDFA c/o
Jim Rains
1220 N Street
Sacramento, CA 95814
Fax 916-654-1018
Jrains@cdfa.ca.gov

FOR THE ADMINISTRATIVE RECORD
Comments 6 pp. and References 129 pp.

RE; Draft EIR Comments; Light Brown Apple Moth Eradication Program

The DEIR should address and include analysis of the following including applicable references;

CEQA compliance;
Each affected City or County at a minimum should have a complete comprehensive Project EIR depository with all public comments in original form for public review.

The purpose of a legally adequate Environmental Impact Report (EIR) is to discuss, analyze, and fully disclose the impacts and potential negative impacts of a stable finite project description.

The aerial spraying action constituted a Project as defined by the California Environmental Quality Act (CEQA) and therefore the spraying was in violation of CEQA.

The EIR must be an unbiased document.

The EIR must provide full analysis of reasonable project alternatives.

It's of critical importance to accurately identify the proposed project area.

The proposed project goal must be carefully identified and irrefutable facts must be provided that support the project goal as achievable.

Eradication is not a reasonable goal.

In September and October 2007 CDFA caused Dynamic Aviation to perform night time close to the ground aerial spraying of Suterra chemical products on urban populations in Monterey and Santa Cruz Counties. These actions were taken with the concurrence of USDA and EPA. The public was not given the opportunity to review a Draft EIR prior to the 2007 aerial spraying.

The publics right to review a legally adequate DEIR prior to the project being undertaken was in violation of CEQA.

Its understood that the Geneva convention prohibits the exposure of chemicals to civilian populations when the civilian population has no advance knowledge and has not given it's consent to apply.

Precautionary Principle;
In order to protect human health, safety , and the environment to the greatest extent possible, the State should adopt The Precautionary Principle (Wingspread statement 1998) and apply it to the LBAM eradication program.(1)

Environmental /Public Protection;
All pesticide constituents and their individual CAS numbers of any proposed pesticide formula should be made available for public scrutiny.

To protect human health, safety, and the environment, the strictest comprehensive pesticide testing available should be completed, published in scientific journals, peer reviewed, publicly noticed in major print media of each affected town, publicly commented on, and if to be sprayed over urban areas voted on by the public prior to is release into the environment. Is the project proponent willing to do the above? If not, why not?

EPA administrators have discretionary authority which gives them the power to determine pesticide is "safe". "A low potential for exposure and low toxicity of either product minimizes any potential risk to children." These pesticides are being applied directly to peoples homes. What is the justification, other than money, for the USEPA making this determination? What is the scientific basis and methodology behind the determination?

Lack of evidence of harm due to lack of studies finding harmful effects to humans and the environment from pesticides and or its constituents must not be construed as pesticide is "safe". Is this a scientific conclusion? If so, explain methodology. Is this in keeping with the ***Spirit of Environmental Laws*** in place to protect the public? If not, why not?

All persons have the Constitutional Right to safety and of ***Consent to Apply***. To take away the publics Constitutional rights via an unproven emergency and subsequent declaration of an emergency, represents the abomination of due diligence and process. The discretionary authorities have abused their power and have exhibited derelict of duty. A component of a healthy environment is social well being. The public is being abused by the government . This needs to be addressed. Is the above a CEQA issue? If not, why not? (2)

Efficacy / Potential harm to non-target species;
I researched the pheromone of 942 Monterey County moth Species. **863 of the Species** that is (92%) of the moths, the **pheromone compounds are unknown**. The pheromone of 79 Species has been identified. 65 of the 79 identified Species of do not share the pheromone compounds found in OLR-F & LBAM-F. 14 of the identified Species share some of the

pheromone compounds found in OLR-F & LBAM-F. In 3 of the 14 species, their primary pheromone compound is the identical primary pheromone compound found in OLR-F & LBAM-F. (3)

To estimate the number of potentially adversely affected moths the following formula used:
Of the 942 moths 8%/79 moths pheromone identified (multiplier 12)
Of the 79 moths 18%/14 moths pheromone found in Checkmate (multiplier 14)
Of the 14 moths 22%/3 moths share primary pheromone found in Checkmate.(multiplier 22%)
12 x 14 = 168 moth species potentially affected by the Checkmate spray
168 x 22% = 37 moth species mating disruption potentially could occur. (non-target species adversely affected)

- How can the fate of non-target moth species be known if 92% of the moths pheromone is unknown?
- Its important to identify all moth species pheromone in order to understand potential harm to non-target species. Do the proponents intend to identify all the moths pheromone? If not, why not?
- What is the efficacy of the pesticide?
- How important are moths to the ecosystem and the biota?
- What other creatures and organisms may be adversely effected if non-target moth species are harmed?
- How many creatures diets are depend on moths?
- Have all the creatures dependent on moths been identified? If not, why not?
- Isn't a healthy environment more important than money? If not, why not?
- Biodiversity loss a is on a sharp rise due to environmental contamination likely caused by mans activities. Shouldn't extensive studies be conducted on individual chemicals as well as the whole composition of the pesticides before their release into the environment? If not, why not.
- Micro organisms and bacteria are necessary for mans survival. What effects will the pesticides have on these necessary and important components of our environment?

Pesticide Constituents;

- **To estimate the total gallons released into environment, the following formula used.**
  It is understood the first round of spraying on the Monterey Peninsula required 7000 gallons of pesticide. (multiplier 7000) 11 Counties in Program. (multiplier 11)
  Spraying 6 times a year (multiplier 6) Program life 3 years (multiplier 3)
  7000 x 11 x 6 x 3 = 1,386,000 gallons of pesticides dumped on urban areas. The potential harm to humans and the environment is unacceptable.
- Are any of the past or present pesticide constituents petrochemicals? If yes, which ones?
- Several of the inert ingredients tested in hundreds of studies show a wide range of adverse effects on organisms. Clearly, these inert constituents have been scientifically shown to have adverse effects on the environment the extent of which is unknown. There are very few tests involving humans, although many adverse effects to human organs and systems are suspected. Why hasn't EPA and CDFA made the public aware of this? (4)

- It is understood EPA and other Regulatory agencies no longer conduct scientific studies in house but rather outsource and rely on industry test results, analysis and conclusions. This is a blatant case of conflict of interest. EPA employees union has urged for the restoration of science to the agency. Under these circumstances, how can the public trust what their being told? Is this in keeping with the Spirit of Environmental Protection? (5)
- Often when chemicals are combined they become highly toxic, carcinogenic, mutagenic ect.. Have the pesticides as a whole been tested for toxicity on organisms? If not, why not? If yes, provide data. Are there inhalation studies on the individual constituents and combined LBAM spray formulas?
- Long term exposure to pesticides are a great concern. Are there long term human health and environmental studies of the pesticides? If not, why not?
- In 2004 EPA made a reclassification determination of several inert chemicals found in the LBAM pesticide. These inert chemicals on List 3 (inerts of unknown toxicity) were moved to List 4B (ingredients for which EPA has sufficient information to reasonably conclude that the current use pattern in pesticide products will not adversely affect public health or the environment.) Only by emergency status, using the Section 18 Quarantine Exemption, has the use of pheromone pesticide been authorized for urban areas. Under non emergency EPA rules, allowance of Pheromone is specifically for the Pheromone "active ingredients" only, applied to "growing crops", "raw agricultural commodities", and "post-harvest treatment to stored food commodities" only. EPA documents similarly state;
  1) <u>This document establishes an exemption from the requirement of a food tolerance for residues of certain Lepidopteran pheromones resulting from the use of these substances independent of formulation</u>, mode of application or physical form or shape with an annual application limitation of 150 grams active ingredient per acre (gm AI/acre) for pest control in or on all raw agricultural commodities. <u>This exemption pertains only to the pheromone active ingredient. Any encapsulating material needs to be a cleared inert for pesticidal uses on food crops.</u> 1 EPA is establishing this regulation on its own initiative. (6)
  2) Lepidopteran pheromones that are naturally occurring compounds, or identical or substantially similar synthetic compounds, designated by an unbranched aliphatic chain (between 9 and 18 carbons) ending in an alcohol, aldehyde or acetate functional group and containing up to 3 double bonds in the aliphatic backbone, are exempt from the requirement of a tolerance in or on all raw agricultural commodities. <u>This exemption only pertains to those situations when the pheromone is: Applied to growing crops</u> at a rate not to exceed 150 grams active ingredient/acre/year <u>in accordance with good agricultural practices; and applied as a post-harvest treatment to stored food commodities</u> at a rate not to exceed 3.5 grams active ingredient/1,000 ft2/year (equivalent to 150 grams active ingredient/acre/year) in accordance with good agricultural practices. (7)

  Note: It is yet to be discovered in any EPA Lepidoptera Pheromone documents a clearance for pheromone use on residential/urban areas. Use of pheromone products is expressly limited to agricultural uses. The Lepidoptera Pheromone active ingredient is approved for use on crop foods only. Any use of encapsulating material (inerts) must be cleared.

- What is the sufficient information that now allows these active and inert chemicals to be applied directly to urban areas?
- What is the basis for determining pesticide is safe to use on urban areas?
- The development of fetuses and Children are now shown to be in danger from exposure to very low doses of a wide range of environmental contamination. What is the basis for EPA's determination children will not be harmed by LBAM pesticides? What is the scientific methodology? (8)
- One of the reported inert chemical is used for mothproofing of clothing. Why is this constituent in the pesticide formula? What other moths may be harmed by the chemical?(9)
- Clean air belongs to all of us. What gives the government or anyone else the right to force the public into having unavoidable contact with chemical products against their will.
- Many pesticide constituents are known endocrine disruptors, carcinogens, mutagens, ect. Several LBAM constituent MHSD sheets show these adverse effects have occurred in test findings. Environmental contamination is reaching epidemic levels likely due to lax regulation, oversight, and enforcement of environmental laws overseeing industry and commerce. Nationally, conservatively, 1 in 150 children has Autism. Cancer, Asthma, Diabetes, Alzheimer's Disease, to list a few are at epidemic levels. Today, the U.S. public is sicker than ever before. USGS studies show pharmaceuticals are increasingly showing up in U.S. reclaimed and drinking water supplies. Is there endocrine disruption and other screening being conducted in this program? If not, why not? (10) (11)
- It is illegal, immoral, and unethical to spray people with chemicals against there will. Normal human beings don't do this to other people emergency or not. Historically, chemical experiments on the public have had negative outcomes. Do you believe it is legal, moral, and ethical to experiment with pesticide on the public? If so, Why?
- EPA and CDFA need to use sound science and must not assume anything. (12)

Thank you for the opportunity to provide comments on the LBAM eradicaton Program DEIR

Sincerely;

Lancelot S. Houston

Lancelot S. Houston
Concerned citizen

References;

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(2) California Code of Regulation 6614, 6616
www.cdpr.ca.gov/docs/legbills/calcode/030201.htm#a6614
www.cdpr.ca.gov/docs/legbills/calcode/030201.htm#a6616

(3) Pheromone Search 942 Monterey County Moths
www.lbamspray.com/00_Documents/2008/PheromoneSearch.pdf
(4) Safety Review: Ingredients in Checkmate LBAM-F
www.dontspraycalifornia.org/Checkmate%20Chemicals%20Safety.htm
(5) EPA, Why we need a code of professional ethics 1999
www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm
(6) Lepidopteran Pheromones: Tolerance Exemption 1995
www.epa.gov/fedrgstr/EPA-PEST/1995/August/Day-30/pr-388.html
(7) Lepidopteran Pheromones; Exemption from the Requirement of a Tolerance 2006
www.epa.gov/fedrgstr/EPA-PEST/2006/August/Day-09/p12971.htm
(8) The Faroes Statement 2007
www.ncrlc.com/1-pfd-files/faroes_statement.pdf
(9) Relative Toxicity of Candidate Mothproofing Uniform Impregnant
Methyl Tricaprylyl Ammonium Chloride Aliquat 336
toxnet.nlm.nih.gov/ - enter tile- search
(10) EPA, Endocrine Disruptor Screening Program (EDSP)
www.epa.gov/endo/
(11) Endocrine Disrupters: The Need for a Refocused Vision
toxsci.oxfordjournals.org/cgi/reprint/74/2/231
(12) Scientific Integrity in Policy Making Update-July 2004- Full Report @
www.ucsusa.org

Cc.
David Dilworth; HOPE
John Laird; CA Assemblyman
Mike Weaver; Highway 68 coalition
Vienna Merrit Moore; FOCAG
Jeff Haferman; Monterey City Council
CASS; California Alliance to Stop the Spray
Gina Renee; L.Ac., Dipl.Ac.(NCCAOM)
John Russo Stop The Spray
Pesticide Action Network North America
Jared Huffman; CA Assemblyman
Carole Migden; CA Senator
Barbra Boxer; CA Senator
Ed Porter; Santa Cruz City Council
Pesticide Watch

Briefing Paper on the Precautionary Principle

> *"We recommend that where synthetic chemicals are found in elevated concentrations in biological fluids such as breast milk and tissues of humans, marine mammals or top predators, regulatory steps be taken to remove them from the market immediately."*
>
> (Royal Commission on Environmental Pollution 2003)[1]

Numerous analyses of the umbilical cord blood of newborn infants and of mothers' breast milk have revealed the presence of a number of synthetic chemicals.[2] The exact lifetime effects of these accumulating mixtures of synthetic chemicals, on health, are currently unknown and may never be known. However, there is evidence from laboratory studies that many of these chemicals can be hazardous to health. Therefore the UK Royal Commission deemed it prudent to reduce the accumulation of these chemicals in humans and animals, by removing them from the market – *immediately*.

This is a clear expression of the precautionary principle in action.

The precautionary principle explained

Essentially the precautionary principle directs that action be taken to reduce risk from chemicals in the face of uncertain but suggestive evidence of harm.

There are many definitions of the precautionary principle, but the most well known are those of the 1992 Rio Declaration's definition of a precautionary approach and the 1998 Wingspread Conference on Implementing the Precautionary Principle.

The Rio Declaration from the UN Conference on Environment and Development (Principle 15) stated:

> *In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

The Wingspread Conference included human health in their definition of the precautionary principle:[3]

> *When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.*

In 1995, the 4th North Sea Conference of Ministers directly addressed the issue of hazardous chemicals in the environment:

> *"The Ministers agree that the objective is to ensure a sustainable, sound and healthy North Sea ecosystem. The guiding principle for achieving this objective is the precautionary principle. This implies the prevention of the pollution of the North Sea by continuously reducing discharges, missions and losses of hazardous substances thereby moving towards the target of their cessation within one generation (25 years) with the ultimate aim of concentrations in the environment near background values for naturally occurring substances and close to zero concentrations for man-made synthetic substances.*

In 2000 the European Commission Communication on the Precautionary Principle stated:

> *The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU.*

In its most recently proposed new Regulation on the placing of pesticides in the European Union market (12 July 2006), the European Commission has been even more explicit in its use of the precautionary principle to protect human health and the environment:

> *"The purpose of this Regulation is to ensure a high level of protection of both human and animal health and the environment. Particular attention should be paid to the protection of vulnerable groups of the population, including pregnant women, infants and children. The precautionary principle should be applied and ensure that industry demonstrates that substances or products produced or placed on the market do not adversely affect human health or the environment."*[4]

The precautionary principle has been reiterated in many forms in many documents, but the central message remains the same: **action should be taken to prevent harm to the environment and human health, even if scientific evidence is inconclusive.** It permits a lower level of proof of harm to be used in policy making whenever the consequences of waiting for higher levels of proof may be very costly and/or irreversible.

The Wingspread Statement on the Precautionary Principle identifies four central components of precautionary policies, and these have since been elaborated frequently:

- taking preventive action in the face of uncertainty
- placing responsibility on those who create risks to study and prevent them
- seeking alternatives to potentially harmful activities
- increasing public participation and transparency in decision-making.

In contrast, current pesticide regimes worldwide require substantial evidence of harm before regulatory action is taken, regardless of the availability of safer alternatives.

The precautionary principle emerged into public thinking about the risks resulting from various human activities during the 1980s and 90s, although it actually found expression in Scandinavian and European legislation as far back as the 1970s. In Sweden, the principle first found expression in the 1973 Act on Products Hazardous to Man or the Environment; in Germany, the 'Vorsorgeprinzip' or 'foresight principle' was established in water protection law in 1970.[5]

It has been incorporated in some from in regional, national and state legislation in a number of countries, such as a 2000 European Union directive regarding food safety (Article 7 of Regulation (EC) No 178/2002).[6]

The precautionary principle in conventions

Since then it has been incorporated, in some form, in many international conventions:[7]

- World Charter for Nature, adopted by the UN General Assembly in 1982
- [Montreal] Protocol on Substances that Deplete the Ozone Layer (1987)
- Second North Sea Declaration – Calling for Reduction of Pollution (1987)
- Nordic Council's International Conference on Pollution of the seas (1989)
- Paris convention for the Prevention of Marine Pollution from Land-based sources (PARCOM) (1989)
- Bergen Declaration of Sustainable Development (1990)
- Second World Climate Conference – Ministerial Declaration (1990)
- Bamako Convention on Transboundary Hazardous Waste into Africa (1991)
- Rio Declaration on Environment and Development (1992)
- Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992)
- Framework Convention on Climate change (1992)
- Maastricht Treaty on the European Union (1994)
- 4th North Sea Conference of Ministers (1995)
- Barcelona Convention
- United Nations Agreement on the Conservation and Management of Straddling Stocks and Highly Migratory Fish Stocks (1995)
- UN Intergovernmental Panel on Climate Change used the precautionary principle in concluding that "the balance of evidence … suggests a discernible human influence on global climate" (IPCC 1995).
- Article 10 of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (2000).
- Stockholm Convention on Persistent Organic Pollutants (2004)
- REACH (2006) - Registration, Evaluation, Authorisation and Restriction of Chemicals – European Union
- SAICM (2006) - the Strategic Approach to International Chemicals Management, agreed at Dubai.

In 1989, the United Nations Environmental programme recommend that "all governments adopt the principle of precautionary action", with regard to the prevention and elimination of marine pollution. [8]

Implementing the precautionary principle for pesticides

Public authorities are increasingly adopting the "precautionary principle" as a prudent response to potential chemical hazards. It is still however, inadequately applied to pesticides management worldwide.

There is a massive volume of laboratory generated-toxicological data on pesticides showing that many of them are potentially hazardous to humans and the environment. There is a smaller amount of somewhat equivocal epidemiological data that, whilst it frequently does not prove a link between exposures to pesticides and chronic diseases such as cancer and Parkinson's disease, certainly does not disprove a link.

Therefore, although a direct casual link has not been established in most cases, there is significant suggestive evidence of harm to humans and the environment, and it is in precisely this situation of scientific uncertainty that the precautionary principle should be applied.

The application of the precautionary principle to pesticides policy and regulation will require a shifting thinking and a number of policy and process adjustments.

1. The level of scientific proof

Under current pesticide regulatory regimes action to remove pesticides or reduce exposure is usually taken only after significant proof of harm is established, at the cost of substantial human suffering and/or environmental damage. The benefit of doubt is given to the chemical, safety is assumed until proven otherwise.

The risk assessment process seeks to set a level of acceptable risk from hazardous substances. However if the precautionary principle is applied to this process, instead of seeking a level of acceptable risk, the potential for harm is acknowledged and ways are sought to reduce that harm. The benefit of doubt is given to humans and the environment instead of the chemical and safety is no longer assumed.

The assessments of hazard and fate are important and valuable parts of the risk assessment process. The problem lies with attempts to determine whether the risk resulting from the proposed use of the chemical is acceptable or not:

- the process cannot identify accurately the real risk because of lack of information about the effects of mixtures and ongoing low-dose exposure, and the effects on especially sensitive people
- acceptability is a social, not a scientific decision, and the practice of unilaterally deciding what is acceptable risk is fundamentally undemocratic.

Therefore in a pesticide regulatory process incorporating the precautionary principle, the relative risks of substances are determined, without any attempt to decree that these are acceptable or safe. Bottom lines for unacceptability can be set, for example persistence in the environment or carcinogenicity, and if these are breached the substance can be removed from the market.

2. Evaluating less harmful methods – reducing risk

The precautionary approach brings a focus onto safer alternatives to a hazardous pesticide, rather than simply attempting to define a level of acceptable risk. It seeks to reduce the risk by providing/using a safer chemical or method for managing pests, weed and diseases. This approach is sometimes described as alternatives assessment,[9] the principle of minimum harm,[10] or the substitution principle. The later is embodied in

Swedish policy and law, first appearing in the Swedish Act on Chemical Properties, SFA 1965, p426, section 5.[11] It is employed in Swedish pesticide policy in a manner that only partially addresses the precautionary principle: it does not allow for the substitution of a harmful pesticide by non-pesticide methods to manage weeds, pest and diseases.[12]

The European Union's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), proposed by the European Commission in 2003, is in its final stage of discussion and will be agreed by the European Parliament and Council in November 2006. This new policy includes the substitution principle with the aim of replacing substances of very high concern by suitable alternative substances or technologies. All companies applying for authorisation of chemical substances should provide an analysis of alternatives considering their risks and the technical and economic feasibility of substitution. Furthermore, authorisations will be subject to time-limited review whose periods would be determined on a case-by-case basis and normally be subject to conditions, including monitoring.[13]

Both the principle of minimum harm and alternatives assessment satisfy the precautionary principle by requiring a full risk-benefit analysis comparing the pesticide in question with other appropriate pesticides and all known techniques of controlling the particular organism of concern. The principal of minimum harm then states that the least harmful method should be used.
The precautionary approach requires that the practicable method least harmful to human health and the environment be used to control pests, weeds, and diseases.

3. Looking at the larger picture – banning persistent, accumulative and highly toxic pesticides

Instead of focusing simply on one chemical at a time, as the current risk assessment process does, the precautionary principle encourages a focus on the larger picture – for example developing policies for banning or phasing out persistent and bioaccumulative chemicals – Sweden for example has taken a precautionary approach to these chemicals and set a timeframe for their phase out by 2007.[14] This attention to the larger picture provides space to acknowledge the problem of ongoing low doses exposures to mixtures of chemicals, and the cumulative effects of small doses.

4. The burdens of proof and responsibility

Those who have the power, resources and control to act and prevent harm must bear responsibility for preventing the harm. This includes the manufactures of hazardous pesticides, who should have financial liability for the effects of their products and, together with the authorities that permit use of the products, a duty to monitor environmental and health effects.

5. Regulating on the basis of the most affected

Exposure limits for pesticides should be set on the basis of the most sensitive people, not the average, for example pregnant women and babies.

6. Inclusion of democratic principles: participation and knowledge

Greater transparency and pubic involvement in pesticide policy and regulatory processes are required to satisfy democratic principles. Additionally the public and workers have the right to know what pesticides they are exposed to and the hazardous natures of those pesticides. Without such knowledge they cannot take precautionary measures themselves to avoid potential harm.

7. Act on early warnings

International and national pesticide management regimes must act on early warnings that a pesticide is posing an unnecessary risk, such as evidence of accumulation in the environment or human tissue, and evidence of ill health. This includes listening to and acting on the experiences of those who are exposed to pesticides, such as plantation workers in Asia and small farmers in Africa, or bystanders and neighbours in the UK, USA, New Zealand and many other countries.

PAN's Position

Taking into consideration that:

- pesticide use poses grave consequences for human health, the environment and livelihoods;
- current regulatory regimes generally require significant proof of harm to be established before action is taken to remove pesticides or reduce exposure;
- there is significant uncertainty about the effects of pesticides, especially long-term effects, on present and future generations and the environment present and future; and that
- precaution is more thorough and more scientific than the standard risk assessment process because it requires recognition of the limitations of science such as uncertainly about the chronic effects from ongoing low-dose exposure to mixtures of chemicals, recognition of the lack of knowledge about casual links, recognition of the value judgements involved in risk assessment, and attention to all other factors involved such as less harmful alternatives;

PAN International demands the application of the precautionary principle in national and international pesticide regulatory mechanisms, including:

1. Early preventative action be taken to eliminate harmful pesticides including those that are persistent, accumulative or highly toxic such as WHO Class Ia and Ib and those that cause or are suspected to cause chronic health effects including cancer, reproductive problems, birth defects, developmental and behavioural impacts, and effects on the immune, endocrine and neurological systems.
2. Substitution of harmful pesticides with less harmful alternatives, including agro-ecological methods, and holistic approaches to control pests, weeds, and diseases.
3. Regulation on the basis of the most vulnerable groups affected, for example pregnant women, the unborn foetus and the newly-born child.
4. A full data set including long-term effects before pesticides are released into the environment.
5. Recognition of the experiences of workers and communities with regard to adverse effects of pesticides.
6. The right of those using or exposed to pesticides to know what it is they are exposed to, and the hazardous properties of the pesticide.
7. The right of popular participation in decision-making regarding pesticide regulation, including active participation in national pesticides committees.

Endnotes

[1] Royal Commission on Environmental Pollution. 2003. Twenty-fourth Report, Chemicals in Products: Safeguarding the Environment and Human Health. June 2003. UK.

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[3] Wingspread Conference on the Precautionary Principle. January 26, 1998. http://www.sehn.org/wing.html

[4] Commission of the European Communities. 2006. Proposal for a Regulation of the European Parliament and of the Council concerning the placing of plant protection products on the market. COM (2006) 388 final. Brussels. p. 14

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California Code of Regulation 6614 and 6616

6614. Protection of Persons, Animals, and Property.
www.cdpr.ca.gov/docs/legbills/calcode/030201.htm#a6614
(a) An applicator prior to and while applying a pesticide shall evaluate the equipment to be used, meteorological conditions, the property to be treated, and surrounding properties to determine the likelihood of harm or damage.
(b) Notwithstanding that substantial drift would be prevented, no pesticide application shall be made or continued when:
(1) There is a reasonable possibility of contamination of the bodies or clothing of persons not involved in the application process;
(2) There is a reasonable possibility of damage to nontarget crops, animals, or other public or private property; or
(3) There is a reasonable possibility of contamination of nontarget public or private property, including the creation of a health hazard, preventing normal use of such property. In determining a health hazard, the amount and toxicity of the pesticide, the type and uses of the property and related factors shall be considered.
NOTE: Authority cited: Sections 12976 and 12981, Food and Agricultural Code. Reference: Sections 11501 and 11791, Food and Agricultural Code.

6616. Consent to Apply.
www.cdpr.ca.gov/docs/legbills/calcode/030201.htm#a6616
No person shall directly discharge a pesticide onto a property without the consent of the owner or operator of the property.
NOTE: Authority cited: Sections 11456 and 12976, Food and Agricultural Code. Reference: Section 11501, Food and Agricultural Code.

Pheromone Search of 942 Monterey County Moth Species

California LBAM Eradication Plan
Potentially Affected Non-Target Species
2-16-08

By
Lancelot S. Houston

Blank

Pheromone Search of 942 Monterey County Lepidoptera Species

Potentially Affected Non-Target Species / California LBAM Eradication Plan

10-06-07

Search summary:

I recently researched the pheromone of 942 Monterey County moth Species. **863 of the Species** that is (92%) of the moths, the **pheromone compounds are unknown**. The pheromone of 79 Species has been identified. 65 of the 79 identified Species of do not share the pheromone compounds found in OLR-F & LBAM-F. 14 of the identified Species share some of the pheromone compounds found in OLR-F & LBAM-F. In 3 of the 14 species, their primary pheromone compound is the identical primary pheromone compound found in OLR-F & LBAM-F.

The Pheromone of only 8% or 79 of the Monterey County (MC) moth population could be identified.
Nearly 18% or 14 of the identified MC moths share pheromones found in Checkmate.
Nearly 22% or 3 of the 14 identified MC moths share primary pheromone found in Checkmate.

14 Species that share Pheromone compounds found in Checkmate Pesticide

genus	species	
Agonopterix	alstroemeriana	Z11-14Ac
Agrotis	ipsilon	Z11-14Ac
Amphipoea	americana pacifica	Z11-14Ac
Archips	argyrospila	*E11-14Ac
Argyrotaenia	citrana	Z11-14Ac
Choristoneura	rosaceana	E11-14Ac, Z11-14Ac
Cochylis	nana	E11-14Ac
Discestra	trifolii	E11-14Ac
Etiella	zinckenella	E11-14Ac, Z11-14Ac
Oidaematophorus	mathewianus?	*E11-14Ac
Sparganothis	tunicana	*E11-14Ac
Spodoptera	exigua	E11-14Ac

*essential pheromone

Pheromone compounds in CheckMate spray:

LBAM-F & OLR-F: E11-14Ac primary compound of attractant pheromone found in 8 species
Z11-14Ac compound of attractant pheromone found in 6 species
E9E11-14Ac

To estimate the number of potentially adversely affected moths the following formula used:

Of the 942 moths 8%/79 moths pheromone identified (multiplier 12)
Of the 79 moths 18%/14 moths pheromone found in Checkmate (multiplier 14)
Of the 14 moths 22%/3 moths share primary pheromone found in Checkmate.(multiplier 22%)
12 x 14 = 168 moth species potentially affected by the Checkmate spray
168 x 22% = 37 moth species mating disruption potentially could occur. (non-target species adversely affected)

Alternatives:

Wide spread aerial spraying may cause irreparable harm to non-target species including humans, the extent of which is unknown. Non-spraying methods such as sticky traps would greatly reduce the potential harm to non-target species and the environment.

According to CDFA and the manufacturer (proponents), the OLR-F is specific to the *Omnivorous leafroller*. The proponents claim the OLR-F spray is expected to have a 80% efficacy rate against the LBA moth. By the proponents own admission, the OLR-F spray is affecting non-target species, such as the LBA moth. Additionally, there are many Lepidoptera that share the same primary attractant pheromone as the LBAM and *Omnivorous leafroller*. Therefore many Lepidoptera share the same primary attractant pheromone that is in OLR-F & LBAM-F spray.

Conclusion:
It is likely non-target species who share the E11-14Ac as their essential pheromone compound are in danger of mating disruption.

Active ingredients LBAM-F & OLR-F: (primary pheromone compound E11-14Ac)

CheckMate© LBAM-F
acitve ingredients:
(E)-11-Tetradecen-l-yl Acetate ..... 16.90% = Tetradecenyl acetate E11-14Ac
(E,E)-9,11-Tetradecadien-l-yl Acetate..... 0.71% = Tetradecadienyl acetate E9E11-14Ac
Other ingredients:……82.39%

CheckMate© OLR-F
acitve ingredients:
(E)-11-Tetradecen-1-yl acetate …….. 20.6 % = Tetradecenyl acetate E11-14Ac
(Z)-11-Tetradecen-1-yl acetate ……3.19 % = Tetradecenyl acetate Z11-14Ac
Other ingredients:……76.24%

Research sources :
942 moths in Monterey County: http://bscit.berkeley.edu/eme/Browse_Calmoth_Counties.html
Pheromone database: http://www.pherobase.com/
Pheromone database: http://www.nysaes.cornell.edu/pheronet/speciesindex.html

Attachments:
CheckMate Pheromone confirmed Monterey County Moth Species
942 Monterey County Moth Species

942 Monterey County Moth Species

seq_num	genus	species	sex	location	county	collector	coll_date	specimen_loc
? 59002	Abagrotis	apposita		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
? 58914	Abagrotis	denticulata		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
? 59030	Abagrotis	reedi		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
? 58980	Abagrotis	scopeops		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
? 58850	Abagrotis	trigona		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
? 58967	Abagrotis	variata		Big Creek Reserve	Monterey	J.Powell	Sep 27 87	UCB
? 29915	Acanthopteroctetes	unifascia		Pfeiffer-Big Sur St Pk	Monterey	D.L. Wagner	Mar 11 84	UConn
? 56359	Acerra	normalis		Big Creek Reserve	Monterey	J.Powell	Mar 26 87	UCB
? 38631	Achyra	occidentalis		Big Creek Reserve	Monterey	J. Powell	Apr 27 90	UCB
? 36990	Acleris	brittania		Big Creek Reserve	Monterey	YFH	Apr 27 90	
? 36961	Acleris	hastiana	F	Bixby Cyn	Monterey	W.Tilden	Jul 23 48	UCB
? 36980	Acleris	keiferi	F	Bixby Cyn	Monterey	W.Tilden	Aug 25 48	UCB
N 37046	Acleris	maximana		Carmel	Monterey	L.Slevin	Dec 19 26	UCB
? 37038	Acleris	nigrolinea	F	Carmel	Monterey	L.S.Slevin	Dec 19 26	
? 37006	Acleris	senescens		Big Creek Reserve	Monterey	J.Powell	Jun 7 89	UCB
? 52267	Acontia	sedata cacola		Carmel	Monterey	Buckett & Bauer coll.	Apr 28 24	UCD
? 40220	Acrobasis	comptella		Big Creek Reserve	Monterey	J.A. Powell	Jul 6 92	UCB
? 40194	Acrobasis	tricolorella		Big Creek Reserve	Monterey	J.A. Powell	Sep 4 91	UCB
? 34899	Acrolepiopsis	californica		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
? 30773	Acrolophus	laticapitanus		Big Creek Reserve	Monterey	J. Powell	Aug 18 88	UCB
? 30794	Acrolophus	pyramellus		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
? 30809	Acrolophus	variabilis		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
? 52451	Acronicta	funeralis		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
? 52483	Acronicta	marmorata		Big Creek Reserve	Monterey	J. Powell	Sep 3 91	UCB
? 52532	Acronicta	perdita		Big Creek Reserve	Monterey	J. Powell	Apr 23 87	UCB
? 30433	Adela	flammeusella		Big Creek Reserve	Monterey	Powell, Hsu	May 4 91	UCB
? 30355	Adela	punctiferella		Big Creek Reserve	Monterey	J. Powell	May 4 91	UCB
? 30384	Adela	septentrionella		SW Arroyo Seco	Monterey	J. Powell	May 3-9 75	UCB
? 30369	Adela	singulella		NE Arroyo Seco	Monterey	Powell, Chemsak	May 5 75	UCB
? 30410	Adela	thorpella	M	6 mi N Jolon	Monterey	R.W.Thorp	Apr 15 64	
? 30462	Adela	trigrapha		Big Creek Reserve	Monterey	J. Powell	Apr 10 89	UCB
? 58747	Adelphagrotis	indeterminata		Big Creek Reserve	Monterey	J.Powell	Oct 2 91	UCB
? 58737	Adelphagrotis	stellaris		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
? 55710	Admetovis	similaris		Big Creek Reserve	Monterey	Hsu, Powell	Jun 14-16 91	UCB
? 44303	Aethaloida	packardia		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
Y 31788	Agonopterix	alstroemeriana Z11-14Ac		Big Creek Reserve	Monterey	F.Arias	Oct 23 89	UCB
? 31733	Agonopterix	clarkei		Carmel	Monterey	R.H. Leuschner	Apr 6 90	RHL
? 31742	Agonopterix	fusciterminella			Monterey			UCB
? 31825	Agonopterix	nervosa?		Big Creek Reserve	Monterey	J. Powell	Sep 28 87	UCB
? 31839	Agonopterix	new sp (Petasites)		Big Creek Reserve	Monterey			
? 31717	Agonopterix	oregonensis	F	Marina	Monterey	J.F.G.Clarke	Apr 13 44	USNM
? 31801	Agonopterix	rosaciliella		Big Sur	Monterey	J. Arnold	Jun 2 59	UCB
? 31762	Agonopterix	sabulella		Big Creek Reserve	Monterey	J. Powell	Jun 7 89	UCB

? = Pheromone unknown N = CheckMate pheromone compounds not identified Y = CheckMate pheromone compounds Identified

?	39717	Agriphila	anceps		Carmel	Monterey	L. S. Slevin	Oct 16 27	LACM
?	54632	Agrochola	purpurea		Pfeiffer Redwoods at Bi	Monterey	R.L. Langston	May 10 69	RLL
?	57250	Agrotis	aeneipennis		Big Creek Reserve	Monterey	J.Powell	May 4 91	UCB
?	57240	Agrotis	gravis			Monterey	not given	late March	USNM
Y	57303	Agrotis	ipsilon Z11-14Ac		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
N	57222	Agrotis	vancouverensis	M	Salinas	Monterey	G.T. York	May 27 43	CNC
N	57175	Agrotis	vetusta		Big Creek Reserve	Monterey	J.Powell	Sep 27 87	UCB
?	35242	Alcathoe	verrugo		Hastings Res nr Jamest	Monterey	not given	Jul 19 40	UCB
?	34496	Alucita	hexadactyla		Big Creek Reserve	Monterey	RZ, BS	Jun 24 92	UCB
?	52672	Alypia	mariposa		SE Carmel Vly Village	Monterey	W. Patterson	Apr 22 92	WDP
?	41563	Amblyptilia	pica marina		Monterey	Monterey	F. Sala	Aug 10 98	LACM
N	37773	Amorbia	cuneana		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
Y	53118	Amphipoea	americana pacifica Z11-14Ac		Big Creek Reserve	Monterey	J. Powell	Sep 3 91	UCB
?	53679	Amphipyra	pyramidoides		Big Sur	Monterey	J. Powell	Oct 5 86	UCB
?	30699	Amydria	arizonella		Big Creek Reserve	Monterey		Jul 21-22 92	UCB
?	30711	Amydria	confusella		Bigler Reserve, Whale F	Monterey	Arias, Goderez	Oct 12 89	UCB
?	40337	Anadelosemia	condigna?		Big Creek Reserve	Monterey	J.A. Powell	Oct 23-31 89	UCB
?	41342	Anagasta	kuehniella		Big Creek Reserve	Monterey	J.A. Powell	Nov 6 88	UCB
?	43342	Anavitrinella	ocularia		Hastings Reserve	Monterey	D.D. Linsdale	Mar 28 59	UCB
N	36572	Ancylis	columbiana		Monterey	Monterey	Stevens, Sartwell, Koe	1977-78	CoSU or UCB
N	36616	Ancylis	mediofasciana		Big Creek Reserve	Monterey	J.Powell	Apr 12 85	UCB
?	36569	Ancylis	metamelana angulifasciana		Big Creek Preserve	Monterey			
N	36585	Ancylis	simuloides		Big Creek Reserve	Monterey	YFH	Apr 13 90	UCB
?	56831	Anhimella	contrahens conar		Big Creek Reserve	Monterey	B. Scaccia	May 27-28 92	UCB
?	56822	Anhimella	perbrunnea		Big Creek Reserve	Monterey	J.Powell	Aug 25 89	UCB
?	54247	Annaphila	astrologa	F	Monterey	Monterey	B.Weber	in Jul 41	
?	54197	Annaphila	danistica	M	Salinas Riv nr Salinas	Monterey	B.Weber	Mar 9 41	
?	54344	Annaphila	decia	M	Monterey	Monterey		Mar 30 27	
?	54380	Annaphila	diva		Big Creek Reserve	Monterey	J. Powell	Mar 26 80	UCB
?	54265	Annaphila	divinula		Big Creek Reserve	Monterey	J.DeBenedictis	Apr 13 85	UCB
?	54279	Annaphila	lithosina		S Arroyo Seco	Monterey	R. Wharton	May 7 75	UCB
?	54406	Annaphila	spila		Big Creek Reserve	Monterey	J. Powell	Apr 10 89	UCB
?	32761	Anoncia	orites		Big Creek Reserve	Monterey	J. Powell	Jun 6 92	UCB
?	37214	Anopina	triangulana	M	Hastings Reservation	Monterey	B.Davis	Aug 15 54	UCB
?	41536	Anstenoptilia	marmarodactyla		Big Creek Reserve	Monterey	J.A. Powell	Jun 16 91	UCB
?	32125	Antaeotricha	manzanitae		Arroyo Seco	Monterey	B. Villegas	Jun 4 75	UCD
N	48991	Antheraea	polyphemus polyphemus		Big Creek Reserve	Monterey	J.Powell	Jun 6 89	UCB
?	52766	Apamea	albina		Big Creek Reserve	Monterey	JAP, YFH	May 3 91	UCB
?	52788	Apamea	amputatrix		Big Creek Reserve	Monterey	J. Powell	Jun 6 89	UCB
?	52804	Apamea	castanea		Big Creek Reserve	Monterey	Hsu, Powell	Jun 5-8-89	UCB
?	52844	Apamea	cinefacta		Big Creek Reserve	Monterey	J. Powell	Apr 30 90	UCB
?	52695	Apamea	cuculliformis		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
?	52870	Apamea	finitima cerivana		Big Creek Reserve	Monterey	J. Powell	Apr 13 85	UCB
?	50177	Apantesis	hewletti		Big Sur	Monterey	R. Mattoni	Jun 16 49	LACM

? = Pheromone unknown N = CheckMate pheromone compounds not identified Y = CheckMate pheromone compounds Identified

?	50191	Apantesis	nevadensis		Chualar	Monterey	W.H. Lange	Oct 19 67	UCD
?	50150	Apantesis	ornata ornata		Big Creek Reserve	Monterey	J.Powell	May 1 92	UCB
?	50211	Apantesis	proxima		Big Creek Reserve	Monterey	J.Powell	Apr 21 93	UCB
?	44026	Apodrepanulatrix	litaria		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	40304	Apomyelois	bistriatella	F	Big Creek Reserve	Monterey	J.A. Powell	Oct 3-4 85	UCB
?	50080	Arachnis	picta		Carmel Valley	Monterey	B.Walsh	Oct 14 73	
Y	37508	Archips	argyrospila E11-14Ac	M	Hastings Reservation	Monterey	B.Davis	May 23 54	UCB
?	46779	Archirhoe	neomexicana		Big Creek Reserve	Monterey	J.A. Powell	Feb 21 88	UCB
?	49382	Arctonotus	lucidus	M	Chualar	Monterey	W.H. Lange	Feb 18 62	UCD
?	34869	Argyresthia	cupressella		Big Creek Reserve	Monterey	J. Powell	Jun 3 91	UCB
?	34871	Argyresthia	franciscella		Big Creek Reserve	Monterey	J. Powell	Jun 5 92	UCB
Y	37315	Argyrotaenia	citrana Z11-14Ac	M	Carmel	Monterey	J.Kusche	Oct 8 33	UCB
?	37294	Argyrotaenia	franciscana franciscana	M	Bixby Cyn	Monterey	Tilden	Aug 24 48	UCB
?	37281	Argyrotaenia	niscana	M	Hastings Reservation	Monterey	B.Davis	May 23 54	UCB
?	33028	Aristotelia	adenostomae		Big Creek Reserve	Monterey	J. Powell	Sep 3 91	UCB
?	33042	Aristotelia	argentifera		5 mi NE Arroyo Seco	Monterey	J. Powell	May 4 75	UCB
?	33061	Aristotelia	sp nr corrollina		Big Creek Reserve	Monterey			
?	33080	Aristotelia	sp nr isopelta		Big Creek Reserve	Monterey	Y.F. Hsu	Jun 7 93	UCD
?	33403	Arla	diversella		Big Creek Reserve	Monterey	J. Powell	Jun 5 90	UCB
?	34338	Aroga	eriogonella		Big Creek Reserve	Monterey			
?	34385	Aroga	new sp RWH		Big Creek Reserve	Monterey			
?	34356	Aroga	paraplutella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	34388	Aroga	sp (Eriogonum latifolium)		Big Creek Reserve	Monterey			
?	34382	Aroga	unifasciella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	32970	Arotrura	new sp nr powelli		Big Creek Reserve	Monterey			
?	40052	Arta	epicoenalis		Big Creek Reserve	Monterey	Powell, Hsu	Jun 6 89	UCB
?	53273	Aseptis	binotata binotata		Big Creek Reserve	Monterey	B.Scaccia	Mar 13 93	UCB
?	53239	Aseptis	ethnica		Big Creek Reserve	Monterey	JAP, YFH	Jun 6 89	UCB
?	53216	Aseptis	fumeola		Big Creek Reserve	Monterey	B.Scaccia	Apr 24 93	UCB
?	53166	Aseptis	fumosa		Big Creek Reserve	Monterey	Zuniga, Scaccia	Jun 23-24 92	UCB
?	53315	Aseptis	paviae		Big Creek Reserve	Monterey	J. Powell	Jul 7 86	UCB
?	53194	Aseptis	perfumosa		Big Creek Reserve	Monterey	J. Powell	Apr 21 93	UCB
?	50854	Asticta	victoria		Big Creek Reserve	Monterey	J.Powell	Aug 25 89	UCB
N	51834	Autographa	californica		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	51887	Autographa	labrosa		Carmel	Monterey	L.S. Slavin	May 23 31	UCD
?	51865	Autographa	pasiphaeia		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	51764	Autoplusia	olivacea		Carmel	Monterey	Buckett & Bauer coll.	Apr 26 34	UCD
?	54175	Axenus	arvalis		Big Creek Reserve	Monterey	JAP, YFH	May 4 91	UCB
?	35458	Bactra	maioriana	F	Castroville	Monterey	W.H. Lange	Jun 2 61	UCD
?	35464	Bactra	miwok	M	Asilomar	Monterey	G.I.Stage	May 17 59	UCB
?	32613	Batrachedra	striolata		Big Cr Reserve	Monterey	Powell, Zuniga	Jun 5-7 92	UCB
?	30989	Bedellia	somnulentella		Big Creek Reserve	Monterey	J. Powell	Nov 6 88	UCB
?	55357	Behrensia	conchiformis conchiformis		Big Cr Reserve	Monterey	J. Powell	Mar 2 87	UCB
?	53072	Benjaminiola	colorada		Big Sur	Monterey	J. Powell	Oct 5 86	UCB

? = Pheromone unknown N = CheckMate pheromone compounds not identified Y = CheckMate pheromone compounds Identified

?	43404	Biston	betularia cognitaria		Big Creek Reserve	Monterey	J.Powell	Mar 23 89	UCB
?	34520	Bondia	?shastana		Big Creek Reserve	Monterey	Powell, Hsu	Apr 12 90	UCB
?	34509	Bondia	comonana		Big Creek Reserve	Monterey	J. Powell	Oct 30 89	UCB
?	32228	Borkhausenia	nefrax		Big Creek Reserve	Monterey	J. Powell	Sep 27 87	UCB
?	31098	Bucculatrix	albertiella		Oak Hills	Monterey	D.Green	May 10 77	UCB
?	31120	Bucculatrix	ceanothiella		Pfeiffer-Big Sur SP	Monterey	D.L. Wagner	Mar 11 84	UConn
?	31074	Bucculatrix	koebelella		Big Creek Reserve	Monterey	J. Powell	Jun 7 93	UCB
?	31133	Bucculatrix	quadrigemina		Carmel High Mdw	Monterey	F. Sala	Oct 16 97	UCB
?	31065	Bucculatrix	taeniola		Salinas	Monterey			
?	31045	Bucculatrix	variabilis		Big Creek Reserve	Monterey	J. Powell	Mar 22 89	UCB
N	41368	Cadra	cautella	F	5 mi S Salinas	Monterey	not given	Nov 15 71	UCB
?	51397	Caenurgia	togataria		Big Creek Reserve	Monterey	J.Powell	Aug 25 89	UCB
?	51429	Caenurgina	caerulea		Big Creek Reserve	Monterey	J.Powell	Apr 22 93	UCB
N	51478	Caenurgina	erechtea		Big Creek Reserve	Monterey	K.Osborne	Jun 5 92	UCB
?	31151	Caloptilia	aceriella (or sp nr)		Big Creek Reserve	Monterey	J. Powell	Aug 2 92	
?	31159	Caloptilia	agrifoliella		Bixby Cyn	Monterey	J.W.Tilden	Jul 27 48	
?	31177	Caloptilia	alnivorella		Pfeifffer-Big Sur SP	Monterey	D.L. Wagner	May 19 85	UConn
?	31197	Caloptilia	diversilobiella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	31242	Caloptilia	palustriella		Big Creek Reserve	Monterey	J. Powell	Jun 7 89	UCB
?	31259	Caloptilia	reticulata		Fort Ord	Monterey	D.Green	May 10 77	
?	31289	Caloptilia	stigmatella		Carmel	Monterey	R.H. Leuschner	Nov 15 90	RHL
?	35265	Caloreas	apocynoglossa		Big Creek Reserve	Monterey	J. Powell	Apr 11-13 85	UCB
?	31532	Cameraria	agrifoliella		Prunedale	Monterey	D.Green	Mar 25 77	UCB
?	31552	Cameraria	diabloensis	F	17.5 mi W Jolon	Monterey		Mar 19 69	
?	31566	Cameraria	jacintoensis		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	31603	Cameraria	mediodorsella		Arroyo Seco Park	Monterey	P.A. Opler	Oct 7 67	UCB
?	31621	Cameraria	nemoris		Big Creek Reserve	Monterey	JAP & JBW	Mar 26 80	UCB
?	31678	Cameraria	wislizeniella		17.5 mi W Jolon	Monterey	J. Powell	Mar 19 69	
?	41440	Capperia	ningoris		Big Creek Reserve	Monterey	J.A. Powell	Apr 12 85	UCB
?	53778	Caradrina	extima		Big Creek Reserve	Monterey	JB, JAD	May 27 87	UCB
?	54907	Catabena	lineolata		Arroyo Seco	Monterey	D. Burdick	May 23 58	UCB
?	51514	Catocala	aholibah		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	51570	Catocala	cleopatra?		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	51538	Catocala	ilia zoe		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	51690	Catocala	ophelia		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	51667	Catocala	verrilliana verrilliana		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	58776	Cerastis	gloriosa		Big Cr Reserve	Monterey	Powell, Prentice	Feb 28 89	UCB
?	58782	Cerastis	robertsoni	F	Big Cr Reserve	Monterey	Crabo,Powell,Robertso	Feb 2 94	CNC
?	46286	Ceratodalia	gueneata		nr Carmel	Monterey	J.A. Comstock	Jun 2 31	LACM
?	30339	Chalceopla	lobata		Ft Ord, Marina Dunes	Monterey	J. Powell	May 18 77	UCB
?	30324	Chalceopla	simpliciella		Paloma Cr	Monterey	J. Chemsak	May 9 75	UCB
?	38452	Chalcoela	iphitalis		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	45742	Cheteoscelis	fasceolaria		Big Creek Reserve	Monterey	J.A. Powell	Jun 5 82	UCB
?	33731	Chionodes	acrina		Big Creek Reserve	Monterey	J. Powell	Oct 29 89	UCB

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?	33752	Chionodes	bicolor		Carmel	Monterey	R.H. Leuschner	Jun 25 69	RHL
?	33771	Chionodes	braunella	M	Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
?	33799	Chionodes	ceanothiella		Big Creek Reserve	Monterey	J. Powell	Feb 22 88	UCB
?	33820	Chionodes	chrysopyla	M	Hastings Reservation	Monterey	J. Powell	May 4 58	UCB
?	33839	Chionodes	dammersi	F	Marina Dunes , Fort Ord	Monterey	J. Powell	May 18 77	UCB
?	33861	Chionodes	donahuerum		Big Creek Reserve	Monterey	J. Powell	Apr 11 85	UCB
?	33920	Chionodes	impes	F	Carmel	Monterey	A.H. Vachell	in Jun	
?	33964	Chionodes	lophosella	F	Big Creek Reserve	Monterey	in MONA	Apr 23-25 87	UCB
?	34003	Chionodes	nanodella	M	Big Creek Reserve	Monterey	J. Powell	Jul 7-8 86	UCB
?	34045	Chionodes	occidentella	M	Carmel	Monterey	A.H. Vachell	Mar 26 38	USNM
?	34115	Chionodes	petalumensis		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
?	34177	Chionodes	restio	M	Arroyo Seco Camp	Monterey	J. Donahue	May 26-28 78	LACM
?	34192	Chionodes	retiniella		Big Creek Reserve	Monterey	J. Powell	Jul 6 92	UCB
?	34217	Chionodes	sabinianae?		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
?	34258	Chionodes	trichostola		Big Creek Reserve	Monterey	F.Arias	Sep 18 89	UCB
?	45764	Chlorochlamys	triangularis		Big Creek Reserve	Monterey	J.A. Powell	Sep 4 91	UCB
?	45425	Chlorosea	banksaria banksaria	F	Carmel	Monterey	L.S. Slevin	Jul 2 33	LACM
Y	37394	Choristoneura	rosaceana E11-14Ac, Z11-14Ac	F	Hastings Reservation	Monterey	D.Linsdale	Jun 12 49	
?	39368	Choristostigma	elegantalis		Big Creek Reserve	Monterey	J. Powell	Jun 8 89	UCB
?	39353	Choristostigma	zephyralis		Big Creek Reserve	Monterey	JAP, YFH	May 1 92	UCB
?	33020	Chrysoesthia	versicolorella		Carmel	Monterey			
?	53444	Chytonix	divesta		Big Creek Reserve	Monterey	BS, RZ	Jul 21 92	UCB
?	50891	Cissusa	indiscreta		Big Creek Reserve	Monterey	J.Powell	Mar 22 89	UCB
?	49824	Cisthene	deserta		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	49838	Cisthene	faustinula		Salinas	Monterey	R.L. Langston	Jun 12 81	RLL
?	49810	Cisthene	liberomacula		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	37553	Clepsis	fucana		Salinas	Monterey	Linsdale	Apr 11 62	UCB
?	49501	Clostera	apicalis		Big Creek Reserve	Monterey	J.Powell	Apr 12 85	UCB
N	37072	Cnephasia	longana		Marina	Monterey	J.Powell	May 1 95	UCB
?	43443	Cochisea	sinuaria		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	37826	Cochylis	carmelana		Big Creek Reserve	Monterey	J.Powell	Apr 12 90	UCB
Y	37821	Cochylis	nana E11-14Ac		Big Creek Reserve	Monterey	F.Arias-Godene	Apr 26 90	UCB
?	32298	Coelopoeta	glutinosi		Arroyo Seco	Monterey	Real, Powell	May 3 75	UCB
?	32313	Coelopoeta	phaceliae		Big Cr Reserve	Monterey	J. Powell	Feb 21-22 88	UCB
?	32530	Coleophora	accordella		Big Creek Reserve	Monterey	J. Powell	Feb 28 89	UCB
?	32537	Coleophora	baccharella		Big Creek Reserve	Monterey	D.L. Wagner	Oct 3 85	UConn
?	32549	Coleophora	bistrigella		Ord Mt	Monterey			
?	32516	Coleophora	discostriata		Big Cr Reserve	Monterey	B. Landry	Jun 8 96	UCB
?	32542	Coleophora	glaucella		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	32511	Coleophora	sacramenta		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	32579	Coleophora	sp #3 (tan, wht,brn streaked)		Big Creek Reserve	Monterey	J. Powell	Jun 6 89	UCB
?	32582	Coleophora	sp #6 (small, wh, tan, brn)		Big Creek Reserve	Monterey	J. Powell	Sep 3 91	UCB
?	32584	Coleophora	sp #7 (brn & wh, long palpi)		Big Creek Reserve	Monterey	F.Arias	Sep 15 89	UCB
?	32586	Coleophora	sp #8 (small, gry brn, wh specks)		Big Creek Reserve	Monterey	J. Powell	Jun 14 91	UCB

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?	32604	Coleophora	tildeni		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
?	32551	Coleophora	viscidiflorella		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
?	33144	Coleotechnites	baccharіella		Big Creek Reserve	Monterey	J. Powell	Feb 21 88	UCB
?	35363	Comadia	bertholdi indistincta		Big Creek Reserve	Monterey	J. Powell	Jun 14 91	UCB
?	30520	Coptodisca	arbutiella		Big Creek Reserve	Monterey	J. Powell	May 12 92	UCB
?	30548	Coptodisca	powellella		Arroyo Seco Camp	Monterey	J. Powell	Feb 12 68	
?	30506	Coptodisca	saliciella		Big Creek Reserve	Monterey	J. Powell	Nov 19 90	UCB
?	46736	Coryphista	meadii		Carmel, High Mdw	Monterey	F.P. Sala	Jul 17 94	LACM
?	54082	Cosmia	calami		Big Creek Reserve	Monterey	J. Powell	May 3 91	UCB
?	39654	Crambus	sperryellus		Big Creek Reserve	Monterey	J. Powell	Apr 13 90	UCB
?	31360	Cremastobombycia	new sp (Baccharis)		Big Creek Reserve	Monterey	JFH	Jun 6 90	UCB
?	31361	Cremastobombycia	new sp (Gnaphalium, Artemisia)		Big Creek Reserve	Monterey	J. Powell	May 2 92	
N	52916	Crymodes	devastator		Big Creek Reserve	Monterey	J. Powell	Apr 11 85	UCB
?	52594	Cryphia	oaklandiae		Big Creek Reserve	Monterey	J. Powell	Sep 28 87	UCB
?	52613	Cryphia	viridata		Big Creek Reserve	Monterey	J. Powell	May 22 92	UCB
?	50362	Ctenucha	multifaria		Carmel Highlands	Monterey	R.L. Langston	Jul 14 92	CAS
?	55434	Cucullia	dorsalis		Big Creek Reserve	Monterey	J. Powell	Sep 3-5 91	UCB
?	55487	Cucullia	eulepis		Big Creek Reserve	Monterey	J.Powell	Aug 25 89	UCB
?	55401	Cucullia	serraticornis		Salinas	Monterey	R.L. Langston	Feb 2 81	RLL
?	45883	Cyclophora	dataria		Big Creek Reserve	Monterey	J.A. Powell	Sep 4 91	UCB
?	45907	Cyclophora	nanaria		Big Creek Reserve	Monterey	J.A. Powell	Oct 3 91	UCB
N	36820	Cydia	americana		Big Creek Reserve	Monterey	J.Powell	Mar 26 80	UCB
N	36788	Cydia	bracteatana		Big Creek Reserve	Monterey	J.Powell	May 2 92	UCB
N	36803	Cydia	cupressana		Big Creek Reserve	Monterey	J.Powell	May 3 91	UCB
?	36899	Cydia	latiferreanus		Big Creek Reserve	Monterey	J.Powell	Oct 3 85	UCB
N	36841	Cydia	piperana		Big Creek Reserve	Monterey	JAP, YFH	Jun 15 91	UCB
?	36813	Cydia	prosperana		Big Creek Reserve	Monterey	J.Powell	Apr 12 90	UCB
?	56160	Dargida	procinta		Big Creek Reserve	Monterey	J. Powell	Nov 6-8 88	UCB
?	32180	Decantha	stonda		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	37178	Decodes	aneuretus	M	Carmel	Monterey	A.H.Vachell	in April	AMNH
?	37200	Decodes	asaphodes	M	Salinas Riv at King City	Monterey	J.Powell & P.A.Rude	Nov 9 77	CAS
?	37100	Decodes	basiplaganus		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	37117	Decodes	fragarianus		Arroyo Seco	Monterey	J.P.Donahue	May 28-31 76	
?	37185	Decodes	horarianus	F	Hastings	Monterey	T.Davies	Mar 4 54	UCB
?	34472	Deoclona	yuccasella		Big Creek Reserve	Monterey	J. Powell	Nov 7 88	UCB
?	39544	Diastictis	fracturalis		Big Creek Reserve	Monterey	J. Powell	Aug 18 88	UCB
?	39561	Diastictis	sperryorum		Big Cr Reserve	Monterey	Powell, Prentice	Feb 28 89	UCB
?	58359	Dichagyris	variabilis		Big Creek Reserve	Monterey	J.Powell	Sep 28 87	UCB
?	34457	Dichomeris	baxa	F	Presidio of Monterey	Monterey	J.F.Clarke	Apr 18 44	USNM
?	45650	Dichorda	illustraria		2 mi S Big Sur	Monterey	R.M. Brown	May 7 76	RMB
?	38430	Dicymolomia	metalliferalis		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
?	38442	Dicymolomia	micropunctalis		Carmel Valley	Monterey	J.B. Walsh	Aug 10 75	UCD
?	42450	Digrammia	californiaria		Big Creek Reserve	Monterey	B.Scaccia	May 28 92	UCB
?	42365	Digrammia	delectata		Big Cr Reserve	Monterey	J. Powell	Sep 3-5 91	UCB

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?	42410	Digrammia	muscariata		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	42554	Digrammia	neptaria		Nacimiento Cmpgrnd	Monterey	R.M.& M.A.Brown	May 29 82	RMB
N	40633	Dioryctria	abietivorella		Big Creek Reserve	Monterey	J.A. Powell	Aug 2 92	UCB
N	40667	Dioryctria	auranticella		Cornoob Cyn	Monterey	J. & K. Donahue	Jul 29 90	LACM
?	40691	Dioryctria	zimmermani		Big Creek Reserve	Monterey	J.A. Powell	Oct 2 91	UCB
?	55598	Discestra	oaklandiae		Big Creek Reserve	Monterey	Hsu., Powell	Apr 12-13 92	UCB
Y	55552	Discestra	trifolii E11-14Ac		Big Creek Reserve	Monterey	J. Powell	Aug 25-26 89	UCB
?	55426	Dolocucullia	dentilinea		Big Creek Reserve	Monterey	B.Scaccia	Jun 6 92	UCB
?	43975	Drepanulatrix	baueraria		Big Sur	Monterey	R.M. Brown	26054	RMB
?	43778	Drepanulatrix	bifilata bifilata		Nacimiento River Cmpgr	Monterey	R.M. Brown	Apr 10 80	RMB
?	43888	Drepanulatrix	carnearia		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
?	43926	Drepanulatrix	falcataria		Big Creek Reserve	Monterey	J.Powell	Jun 14 91	UCB
?	43745	Drepanulatrix	hulstii hulstii		Big Creek Reserve	Monterey	J.Powell	Apr 13 85	UCB
?	43996	Drepanulatrix	monicaria		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	43825	Drepanulatrix	quadraria usta		Carmel	Monterey	L.S.Slevin	Mar 3 26	
?	43961	Drepanulatrix	secundaria		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	43710	Drepanulatrix	unicalcararia		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	54714	Dryotype	opina		Big Creek Reserve	Monterey	J.Powell	Oct 29-31 89	UCB
?	29852	Dyseriocrania	auricyanea		Big Creek Reserve	Monterey	J. Powell	Mar 22 89	UCB
N	46119	Dysstroma	brunneata ethela		Big Creek Reserve	Monterey	A. Zuniga	Jul 24 92	UCB
N	46047	Dysstroma	citrata		Big Creek Reserve	Monterey	J.A. Powell	Apr 28 90	UCB
?	46144	Dysstroma	mancipata hulstata		Arroyo Seco	Monterey	D. Burdick	May 23 58	UCB
?	46128	Dysstroma	mancipata mancipata		Big Creek Reserve	Monterey	J.A. Powell	Apr 12 90	UCB
?	46103	Dysstroma	rectiflavata		Arroyo Seco	Monterey	J.P. Donahue	May 26-28 78	LACM
?	29978	Ectoedemia	nr clemensella		Big Creek	Monterey			
?	56704	Egira	cognata congnata		Big Creek Reserve	Monterey	J.Powell	Jan 24 88	UCB
?	56713	Egira	cognata minorata		Carmel	Monterey	R.H. Leuschner	Feb 6 2000	KMR
?	56686	Egira	crucialis		Big Creek Reserve	Monterey	B. Scaccia	Apr 25 93	UCB
?	56735	Egira	curialis		Big Creek Reserve	Monterey	J.Powell	Apr 13 85	UCB
?	56721	Egira	februalis		Hastings Reserve	Monterey	J.Powell	Mar 9-10 2000	UCB
?	56640	Egira	hiemalis		2 mi S Bradley	Monterey	R.L. Langston	Feb 2 81	RLL
?	56793	Egira	perlubens		2 mi SE Bradley	Monterey	R.L. Langston	Feb 2 81	CAS
?	56767	Egira	rubrica		Big Creek Reserve	Monterey	J.Powell	Feb 28 89	UCB
?	56671	Egira	vanduzeei		Big Creek Reserve	Monterey	J.Powell	May 1 92	UCB
?	32410	Elachista	cucullata	M	Big Creek Reserve	Monterey	Hsu, Powell	May 17 92	UCB
?	32386	Elachista	guilinella	M	Arroyo Seco	Monterey	E. Rogers	May 8 75	UCB
?	32392	Elachista	indisella	M	Big Creek Pres.	Monterey	Y.F. Hsu	APr 9-11 94	UCB
?	30914	Elatobia	nr. carbonella		Big Creek	Monterey			UCB
N	41795	Emmelina	monodactyla		Big Creek Reserve	Monterey	J.A. Powell	Jan 24 88	UCB
?	53423	Enargia	mephisto		Carmel	Monterey	R.H. Leuschner	Jun 25 69	RHL
?	35482	Endothenia	hebesana	M	King City	Monterey	C.W.O'Brien	Apr 1 59	UCB
?	32259	Endrosis	sarcitrella		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
?	34529	Epermenia	californica		Big Creek Reserve	Monterey	J. Powell	Sep 28 87	UCB
?	34532	Epermenia	cicutaella		Big Creek Reserve	Monterey	J. Powell	Mar 27 87	UCB

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?	41200	Ephestiodes	gilvescentella		Big Creek Reserve	Monterey	J.A. Powell	May 26 87	UCB
?	36042	Epiblema	deverrae		Big Creek Reserve	Monterey	J.Powell	Jun 4-6 82	UCB
?	36296	Epinotia	albangulana		Big Creek Reserve	Monterey	J.Powell	Mar 26 80	UCB
?	36458	Epinotia	arctostaphulana		Big Creek Reserve	Monterey	JAP & BS	May 12 92	UCB
?	36543	Epinotia	biangulana		Big Creek Reserve	Monterey	J.Powell	Jun 14 91	UCB
?	36449	Epinotia	bigemina		Big Creek Reserve	Monterey	F.Arias	Nov 20 89	UCB
?	36416	Epinotia	crenana		Pacific Grove	Monterey	J.A.Chemsak	Apr 15 62	
?	36232	Epinotia	cupressi		Cypress Pt	Monterey			
?	36340	Epinotia	digitana		Big Creek Reserve	Monterey	D.L.Wagner	Jul 7 86	UConn
N	36386	Epinotia	emarginana		Big Creek Reserve	Monterey	J.Powell	Oct 30 89	UCB
?	36248	Epinotia	fumoviridana		Big Creek Reserve	Monterey	YFH	Jun 14 91	UCB
?	36222	Epinotia	hopkinsana		Big Creek Reserve	Monterey	J.Powell	Apr 12 90	UCB
?	36470	Epinotia	infuscana		Marina	Monterey	D.L.Wagner	Jan 2 84	
?	36208	Epinotia	johnsonana		Big Creek Reserve	Monterey	J.Powell	Apr 24 87	UCB
?	36511	Epinotia	kasloana		Big Creek Reserve	Monterey	J.Powell	Apr 13 85	UCB
?	36341	Epinotia	new sp nr digitana		Big Creek Preserve	Monterey			
?	36351	Epinotia	nigralbana		Big Creek Reserve	Monterey	J.Powell	Feb 22 88	UCB
?	36370	Epinotia	sagittana		Big Creek Reserve	Monterey	J.Powell	Apr 12 85	UCB
?	36553	Epinotia	signiferana		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	36186	Epinotia	siskiyouensis		Big Creek Reserve	Monterey	J.Powell	Mar 21 89	UCB
?	36179	Epinotia	solandriana		Big Creek Reserve	Monterey	J.Powell	Mar 26 80	UCB
?	36315	Epinotia	terracoctana		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	36499	Epinotia	vagana		Big Creek Reserve	Monterey	J.Powell	Mar 26 80	UCB
?	47297	Epirrhoe	plebeculata		S Big Sur	Monterey	R.L.Langston	Feb 21 65	RLL
?	35422	Episimus	argutanus	M	Fort Ord, South Rd	Monterey	J.Powell	Jul 15 76	UCB
?	52951	Eremobina	hanhami		Carmel	Monterey	R.Leuschner	Oct 22 63	LACM
?	29871	Eriocraniella	aurosparsella		N Escondido Cmpgrnd	Monterey	J. Powell	May 7-9 75	UCB
?	29899	Eriocraniella	falcata		Big Creek Reserve	Monterey	Powell, Hsu	Apr 12-13 90	UCB
?	29887	Eriocraniella	xanthocara		Fort Ord	Monterey	DSG	Mar 25 77	UCB
?	31990	Ethmia	albistrigella		S Big Sur	Monterey	R.L. Langston	May 14 66	RLL
?	31955	Ethmia	albitogata		Salinas R at King City	Monterey	J. Powell	Feb 24 75	UCB
?	32020	Ethmia	arctostaphylella		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	31945	Ethmia	brevistriga aridicola		S Arroyo Seco	Monterey	R. Wharton	May 7 75	UCB
?	31936	Ethmia	brevistriga brevistriga		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	31921	Ethmia	coquillettella		Big Creek Reserve	Monterey	J. Powell	Apr 10 89	UCB
?	32049	Ethmia	discostrigella discostrigella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	31978	Ethmia	tricula	M	Gauzas Cr	Monterey	L. Turner	Apr 3 90	UCB
Y	40370	Etiella	zinckenella E11-14Ac, Z11-14Ac		Big Creek Reserve	Monterey	J.A. Powell	Aug 17 88	UCB
?	34591	Eucalantica	polita		Big Creek Reserve	Monterey	J. Powell	Apr 23 87	UCB
?	34604	Euceratia	castella		Big Creek Reserve	Monterey	J. Powell	Jun 8 93	UCB
N	39869	Euchromius	ocelleus		Big Creek Reserve	Monterey	J. Powell	Apr 13 90	UCB
?	51374	Euclidia	ardita		Big Creek Reserve	Monterey	J.Powell	Aug 13 90	UCB
?	35783	Eucosma	avolona	M	Arroyo Seco	Monterey	R.L.Langston	Aug 26 62	UCB
?	35833	Eucosma	comatulana	M	Carmel	Monterey	L.S.Slevin	Oct 20 28	UCB

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?	35949	Eucosma	hasseanthi		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	35857	Eucosma	maculatana?		Big Creek Reserve	Monterey	J.Powell	Jun 6 92	UCB
?	35763	Eucosma	new sp nr crambitana		Seaside	Monterey	JAP, Wolf	Sep 27 66	UCB
?	35943	Eucosma	primulana		Big Creek Reserve	Monterey	J.Powell	Jun 15 91	UCB
?	35773	Eucosma	ridingsana		Marina Dunes, W Seasi	Monterey	R.L.Langston	Aug 24 62	UCB
?	35923	Eucosma	williamsi	F	10 mi S Big Sur	Monterey	C.Smith	Aug 20 48	UCB
?	38045	Eudonia	franciscalis		Carmel	Monterey	F. Sala	Aug 1 91	LACM
?	38014	Eudonia	rectilinea		Big Creek Reserve	Monterey	J. Powell	Sep 9 91	UCB
?	38103	Eudonia	sp nr bronzalis		Big Creek Reserve	Monterey	L.Turner	Jul 7 90	
?	43671	Eudrespanelatri	rectifascia		Big Creek Reserve	Monterey	B.Scaccia	May 28 92	UCB
?	46184	Eulithis	powelliata		Carmel	Monterey	R.H. Leuschner	Jun 25 69	RHL
?	52089	Eumicremma	minima		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	47333	Euphyia	implicata multilineata		Marina Dunes, W Seasi	Monterey	R.L.Langston	Aug 28 61	CIS
?	47342	Euphyia	minima		Marina Beach Dunes	Monterey	R.L.Langston	Aug 24 62	CIS
?	48250	Eupithecia	acutipennis		Big Creek Reserve	Monterey	J.A. Powell	Nov 18 90	UCB
N	48002	Eupithecia	annulata		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	47957	Eupithecia	behrensata		Big Sur	Monterey	R.M. Brown	Apr 8 80	RMB
?	47823	Eupithecia	bivittata		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	48412	Eupithecia	cestata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	48422	Eupithecia	cestatoides		Big Creek Reserve	Monterey	JAP. YFH	Apt 12 90	UCB
?	48023	Eupithecia	cognizata		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	48018	Eupithecia	cognizata		Big Creek Reserve	Monterey	J.A. Powell	Nov 7 88	UCB
?	47629	Eupithecia	columbiata		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	47907	Eupithecia	cupressata		Carmel	Monterey	R.H. Leuschner	in June	RHL
?	48205	Eupithecia	gilvipennata		Big Creek Reserve	Monterey	J.A. Powell	Feb 28 89	UCB
?	48327	Eupithecia	graefii graefii		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	48394	Eupithecia	implorata		Big Creek Reserve	Monterey	J.A. Powell	Apr 11 85	UCB
?	48047	Eupithecia	interruptofasciata		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	47626	Eupithecia	karenae	F	Carmel	Monterey	R.H. Leuschner	Apr 4 60	LACM
?	47895	Eupithecia	macdunnoughi		Big Creek Reserve	Monterey	J.A. Powell	Feb 21 88	UCB
?	47715	Eupithecia	macrocarpata		Carmel	Monterey	R.H. Leuschner	Apr 6 90	RHL
?	47642	Eupithecia	maestosa maestosa		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	47790	Eupithecia	misturata misturata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	47967	Eupithecia	multiscripta		Big Cr Reserve	Monterey	J. Powell	May 1-3 92	UCB
?	48186	Eupithecia	mystiata		Big Creek Reserve	Monterey	J.A. Powell	Apr 21 93	UCB
?	48360	Eupithecia	nevadata nevadata		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	48015	Eupithecia	olivacea		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	47986	Eupithecia	perfusca perfusca		Carmel	Monterey	L.S. Slevin	Feb 6 28	UCD
?	48176	Eupithecia	purpurissata		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	48425	Eupithecia	ravocostaliata		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	48152	Eupithecia	rindgei		Nacimiento Cmpgrnd	Monterey	R.M. Brown	May 29 82	RMB
?	47854	Eupithecia	rotundopuncta		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	47704	Eupithecia	sabulosata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	48226	Eupithecia	scabrogata		Big Creek Reserve	Monterey	J.A. Powell	Feb 21 89	UCB

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?	48096	Eupithecia	segregata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	48268	Eupithecia	subapicata		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	47835	Eupithecia	subfuscata		Carmel	Monterey	F.P. Sala	Apr 29 93	RHL
?	47670	Eupithecia	subvirens		Carmel	Monterey	R.H. Leuschner	in April	RHL
?	47841	Eupithecia	tripunctaria		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	48068	Eupithecia	zelmira		Big Creek Reserve	Monterey	J.A. Powell	Feb 28 89	UCB
?	53414	Euplexia	benesimilis		Big Creek Reserve	Monterey	J. Powell	Aug 18 88	UCB
?	44913	Eusarca	falcata		Big Creek Reserve	Monterey	J.Powell	Jun 5 90	UCB
?	33618	Euscrobipalpa	arenaceariella	M	Big Creek Reserve	Monterey	J. Powell	May 4 91	UCB
?	33602	Euscrobipalpa	artemisiella	F	Big Creek Reserve	Monterey	J. Powell reared	May 26 95	UCB
?	46233	Eustroma	semiatrata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	57908	Euxoa	aequalis alko		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	57583	Euxoa	atomeris		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	58019	Euxoa	bicollaris		Big Creek Reserve	Monterey	JAP, YFH	Jun 5 89	UCB
?	58065	Euxoa	bifasciata		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	58216	Euxoa	brevipennis		Salinas R at King City	Monterey	Powell, Rude	Nov 9 77	UCB
?	57968	Euxoa	brunneigera brunneigera		Big Creek Reserve	Monterey	J.Powell, RZ	Jun 7 89	UCB
?	57924	Euxoa	comosa lutulenta		Big Creek Reserve	Monterey	J.Powell	Jun 6 89	UCB
?	58290	Euxoa	difformis		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
?	57500	Euxoa	extranea		Big Creek Reserve	Monterey	J.Powell	Jun 7 89	UCB
?	57554	Euxoa	fuscigera		Big Creek Reserve	Monterey	J.Powell	Oct 30 89	UCB
?	57954	Euxoa	infausta		Big Creek Reserve	Monterey	JAP, YFH	Jun 5 89	UCB
?	58145	Euxoa	medialis		Big Creek Reserve	Monterey	J.Powell	Nov 18 90	UCB
N	57479	Euxoa	messoria		Big Creek Reserve	Monterey	J.Powell	Sep 27 87	UCB
N	58167	Euxoa	obeliscoides		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	58257	Euxoa	olivalis?		Big Creek Reserve	Monterey	J.Powell	Nov 18 90	UCB
N	57715	Euxoa	olivia		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
?	57863	Euxoa	punctigera		Big Creek Reserve	Monterey	J.Powell	Aug 18 88	UCB
?	57997	Euxoa	satis		Big Creek Reserve	Monterey	JAP, YFH	Jun 7 89	UCB
?	57686	Euxoa	septentrionalis		Big Creek Reserve	Monterey	J.Powell	May 2 92	UCB
?	57753	Euxoa	serricornis?		Big Creek Reserve	Monterey	J.Powell	Apr 28 90	UCB
?	57874	Euxoa	stigmatalis		Big Creek Reserve	Monterey	J.Powell	Aug 2 92	UCB
?	57735	Euxoa	terrena		Big Creek Reserve	Monterey	J.Powell	May 26 87	UCB
?	57772	Euxoa	tocoyae		Big Creek Reserve	Monterey	J.Powell	May 26 87	UCB
?	57544	Euxoa	vetusta		Carmel	Monterey	Slevin	on Jul 3	
?	58337	Euxoa	wilsoni		Carmel	Monterey	Slevin	Jun 2 to Sep 25	
?	33107	Evippe	laudatella		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	31849	Exaeretia	thoracenigraeella	M	Carmel	Monterey	A.H.Vachell	in June	USNM
?	33645	Exceptia	sisterina	M	Big Creek Reserve	Monterey	Hsu, Powell	Jun 5-8 89	UCB
?	33213	Exoteleia	californica		Big Creek Reserve	Monterey	Powell, Wagner	Jul 7 86	UCB
?	33219	Exoteleia	graphicella		6 mi W Greenfield	Monterey	J. Powell	May 3 75	UCB
?	57370	Feltia	evanidalis	M	Salinas	Monterey	G.T. York	Oct 19 43	CNC
?	57341	Feltia	subterranea		Carmel	Monterey	F.P. Sala	not given	UCB
?	54771	Feralia	februalis		Big Creek Reserve	Monterey	B.Scaccia	Apr 26 93	UCB

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?	34301	Filatima	demissae		Big Creek Reserve	Monterey	J. Powell	Dec 3-4 85	UCB
?	34321	Filatima	sp #1 RWH		Big Creek Reserve	Monterey			
?	34323	Filatima	sp #2 RWH		Big Creek Reserve	Monterey			
?	34324	Filatima	sp #3 RWH		Big Creek Reserve	Monterey			
?	34325	Filatima	sp #4 RWH		Big Creek Reserve	Monterey			
?	34318	Filatima	vaniae		King City	Monterey	J. Powell	May 3 74	UCB
?	54676	Fishia	evelina evelina	M	Big Creek Reserve	Monterey	J.Powell	Sep 27-29 87	UCB
?	49666	Furcula	scolopendrina?		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	44351	Gabriola	dyari pruina	M	Carmel	Monterey	R.H. Leuschner	Apr 4 60	AMNH
?	53922	Galgula	partita		Big Creek Reserve	Monterey	J. Powell	Apr 27 90	UCB
N	40115	Galleria	mellonella		Big Creek Reserve	Monterey	J.A. Powell	Sep 3 91	UCB
?	33438	Gelechia	bianulella		Big Creek Reserve	Monterey	J. Powell	Jan 24-26 88	UCB
?	33445	Gelechia	desiliens		Big Creek Reserve	Monterey	J. Powell	Apr 29 90	UCB
?	33458	Gelechia	monella		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	33439	Gelechia	new sp nr bianulella (Toxicodendron)		Big Creek Reserve	Monterey	Powell, Hsu	Apr 12 90	UCB
?	33468	Gelechia	panella		Big Creek Reserve	Monterey	J. Powell	Jun 14 91	UCB
?	35331	Givira	marga		Big Creek Reserve	Monterey	J. Powell	Aug 2 92	UCB
?	49622	Gluphisia	severa		Carmel River	Monterey	R.H.Leuschner	Mar 31 79	RHL
?	32451	Glyphidocera	septentrionella		Ft Ord, South Rd	Monterey	Powell, Opler	Jul 15 76	UCB
?	34543	Glyphipterix	bifasciata		Big Creek Reserve	Monterey	J. Powell	Jun 5 82	UCB
?	34576	Glyphipterix	montisella group		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	34557	Glyphipterix	unifasciata	M	Monterey	Monterey	P.A. Rude	May 23 64	UCB
?	49788	Gnophaela	latipennis		Big Creek Reserve	Monterey	J.Powell	Jun 5 82	UCB
?	33491	Gnorimoschema	baccharisella	F	Big Creek Reserve	Monterey	J. Powell	Jun 7 93	UCB
?	33503	Gnorimoschema	coquillettella		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	
?	33508	Gnorimoschema	crypticum	M	Big Creek Reserve	Monterey	J. Powell	Mar 1 89	UCB
?	33513	Gnorimoschema	ericameriae	M	Seaside	Monterey	H.H. Keifer	Jun 1 36	CAS
?	33526	Gnorimoschema	saphirinella		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
N	36681	Grapholita	caeruleana		Big Creek Reserve	Monterey	J.Powell	Apr 12 90	UCB
N	36717	Grapholita	conversana		Monterey	Monterey	Stevens, Sartwell, Koe	1977-78	CoSU or UCB
?	36756	Grapholita	edwardsiana		nr Marina	Monterey	D.L.Wagner	Jan 2 84	UConn
?	36734	Grapholita	imitativa		Marina Dunes	Monterey	R.L.Langston	Mar 27 87	CAS
N	36744	Grapholita	lunatana?		Big Creek Reserve	Monterey	J.Powell	May 5 91	UCB
?	36774	Grapholita	new sp		Arroyo Seco	Monterey			
N	36667	Grapholita	prunivora		Big Creek Reserve	Monterey	J.Powell	Jun 5 90	UCB
?	36701	Grapholita	vitrana		King City	Monterey	J.Powell	May 3 74	UCB
?	30189	Greya	obscura		1 mi S Jamesburg	Monterey	Powell, Chemsak, Sze	May 5 75	UCB
?	30224	Greya	politella		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	30204	Greya	solenobiella		Arroyo Seco	Monterey	D. Burdick	Apr 15 58	UCB
?	41815	Habrosyne	scripta		Big Creek Reserve	Monterey	J.A. Powell	Jun 5 92	UCB
?	34451	Helcystogramma	badium		Big Creek Reserve	Monterey	J. Powell	Jul 22 92	UCB
?	59244	Helicoverpa	zea		Big Creek Reserve	Monterey	J.Powell	Oct 3 85	UCB
N	59290	Heliothis	phloxiphaga		Big Creek Reserve	Monterey	J.Powell	Jul 7 92	UCB
?	59208	Heliothodes	diminutiva		Marina Dunes	Monterey	R.L.Langston	Apr 24 87	CAS

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?	41708	Hellinsia	fieldi		Big Creek Reserve	Monterey	J.A. Powell	Apr 29 90	UCB
?	41741	Hellinsia	grandis		Big Creek Reserve	Monterey	J.A. Powell	Dec 17 93	
?	41729	Hellinsia	new sp nr phoebus		Big Creek Reserve	Monterey	J.A. Powell	Jun 7 89	UCB
?	41727	Hellinsia	phoebus		Big Creek Reserve	Monterey	J.A. Powell	Jun 6 89	UCB
?	41762	Hellinsia	serenus		nr King City	Monterey	M.L. Walton	Jun 12 37	LACM
?	41756	Hellinsia	sulphureodactylus		Big Creek Reserve	Monterey	J.A. Powell	Feb 28 89	UCB
?	38366	Hellula	rogatalis	M	Salinas	Monterey	J. Powell	Aug 30 59	UCB
N	49323	Hemaris	diffinis		5 mi E Lucia	Monterey	R.L. Langston	Aug 6 56	RLL
?	49338	Hemaris	senta		Big Creek Reserve	Monterey	J.Powell	Jun 6 90	UCB
?	50775	Hemeroplanis	finitima		W Soledad	Monterey	R.M.Brown	Jun 14 97	RMB
?	58466	Hemieuxoa	rudens		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	50306	Hemihyalea	edwardsii		Big Creek Reserve	Monterey	J.Powell	Oct 29 89	UCB
?	39923	Hemiplatytes	prosenes		Carmel	Monterey	F. Sala	Sep 1 91	LACM
?	44327	Hemnypia	baueri		Carmel	Monterey	R.H. Leuschner	Jun 25 69	RHL
?	37858	Henricus	contrastanus		Arroyo Seco	Monterey	E.C.Johnston	May 17 39	UCB
?	37852	Henricus	fuscodosanus		Big Creek Reserve	Monterey	J.Powell	May 26 87	UCB
?	37843	Henricus	macrocarpanus		Pt Lobos	Monterey	J.Powell	Oct 6 86	UCB
?	37869	Henricus	umbrabasanus		Big Creek Reserve	Monterey	J.Powell	Oct 5 91	UCB
N	29942	Hepialus	californicus		Big Creek Reserve	Monterey	Y.F. Hsu	Mar 21 89	UCB
?	29961	Hepialus	hectoides		Big Creek Reserve	Monterey	B.Scaccia	May 28 92	UCB
?	42772	Hesperumia	latipennis		Big Creek Reserve	Monterey	J.Powell	May 26 87	UCB
?	42698	Hesperumia	sulphuraria		Nacimiento Cmpgrnd	Monterey	R.M. Brown	May 29 82	RMB
?	40879	Heterographis	morrisonella		Big Creek Reserve	Monterey	J.A. Powell	Jun 14 91	UCB
?	32246	Hoffmannophila	pseudospretella		Big Creek Reserve	Monterey	J. DeBenedictis	Jul 7 86	UCB
?	32466	Holcocera	gigantella		4 rd mi S Big Sur	Monterey	J. Powell	Oct 4 84	UCB
?	40950	Homoeosoma	electellum		Big Creek Reserve	Monterey	J.A. Powell	Jun 7 89	UCB
?	54440	Homoglaea	californica		Carmel	Monterey	R.H. Leuschner	Dec 31 62	RHL
?	54471	Homoglaea	carbonaria		Carmel	Monterey	R.H. Leuschner	Dec 31 62	RHL
?	54455	Homoglaea	dives		Big Cr Reserve	Monterey	J. Powell	em Sep 30 87	UCB
?	56873	Homorthodes	communis		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	56912	Homorthodes	discreta		Big Creek Reserve	Monterey	J. Powell	Sep 3-5 91	UCB
?	56898	Homorthodes	fractura mecrona		Big Creek Reserve	Monterey	J.Powell	Apr 23 87	UCB
?	56932	Homorthodes	hanhami semicarnea		Big Creek Reserve	Monterey	B.Scaccia	May 28 92	UCB
?	30616	Homosetia	marginimaculella	M	Carmel	Monterey	J.F. Lawrence	May 15 60	
?	40921	Honora	dotella		Big Creek Reserve	Monterey	J.A. Powell	Jun 6 89	UCB
?	40934	Honora	montinatatella?		Big Creek Reserve	Monterey	Hsu, Powell	Jun 5-8 89	UCB
?	47609	Horisme	incana or nr		Big Creek Reserve	Monterey	J.A. Powell	Oct 30 89	UCB
?	40900	Hulstia	undulaterlla		Big Creek Reserve	Monterey	J.A. Powell	Apr 27 90	UCB
?	43066	Hulstina	grossbecki		Arroyo Seco	Monterey	J. Donahue	May 26-28 78	LACM
?	43087	Hulstina	wrightiaria		W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	49028	Hyalophora	euryalus		Carmel	Monterey	J.Osterhaus	Jun 27 97	
?	46573	Hydriomena	albifasciata albifasciata		Big Creek Reserve	Monterey	J.A. Powell	Mar 26 87	UCB
?	46488	Hydriomena	crokeri comstocki		Carmel, High Mdw	Monterey	F.P. Sala	Jan 9 99	LACM
?	46381	Hydriomena	edenata edenata		Big Creek Reserve	Monterey	J.A. Powell	Feb 22 88	UCB

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?	46397	Hydriomena	edenata prasinata		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	46519	Hydriomena	feminata		Carmel	Monterey	R.H. Leuschner	Feb 6 2000	RHL
N	46536	Hydriomena	furcata		Big Creek Reserve	Monterey	Hsu, Powell	Jun 5-8 89	UCB
N	46539	Hydriomena	furcata		Big Creek Reserve	Monterey	J.A. Powell	Oct 3 85	UCB
?	46432	Hydriomena	johnstoni		Big Cr Preserve	Monterey	J.A. Powell	Mar 1 95	UCB
?	46648	Hydriomena	manzanita		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	46616	Hydriomena	nubilofasciata		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	46555	Hydriomena	quinquefasciata		Big Creek Reserve	Monterey	J.A. Powell	Jun 5 92	UCB
?	46600	Hydriomena	speciosata		Carmel, High Mdw	Monterey	F.P. Sala	Jul 31 99	LACM
?	49457	Hyles	lineata		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	50729	Hypena	californica		Big Creek Reserve	Monterey	F.Arias	Mar 16 90	UCB
?	50743	Hypena	decorata		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	50750	Hypena	modesta		High Mdw, Carmel	Monterey	F. Salas	Jun 9 99	LACM
?	30682	Hypoplesia	dietziella		Big Creek Reserve	Monterey	J. Powell	Jul 2 92	UCB
?	37914	Hysterosia	fulviplicana		Big Creek Reserve	Monterey	J.Powell	May 13 92	UCB
?	45833	Idaea	bonifata		W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	45851	Idaea	demissaria columbia?		Big Creek Reserve	Monterey	J.A. Powell	Aug 2 93	UCB
?	45869	Idaea	occidentaria		Arroyo Seco Rd	Monterey	R.M. Brown	Jun 14 97	RMB
N	50552	Idia	americalis		Big Creek Reserve	Monterey	J.Powell	Jul 6 92	UCB
?	50575	Idia	occidentalis		Big Creek Reserve	Monterey	J.Powell	Aug 18 88	UCB
?	43257	Iridopsis	clivinaria clivinaria		Naciemento Cmpgrnd	Monterey	R.M. Brown	Apr 10 80	RMB
?	43274	Iridopsis	clivinaria impia		Big Creek Reserve	Monterey	B. Scaccia	May 12 92	UCB
?	43305	Iridopsis	fragilaria		Big Creek Reserve	Monterey	B. Scaccia	Jun 27 92	UCB
?	43285	Iridopsis	sanctissima		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	32984	Isophrictis	sp nr magnella		Big Creek Reserve	Monterey			
N	33677	Keiferia	lycopersicella		Jamesburg	Monterey	H.H. Keifer	Jun 1 36	UCD
?	50125	Kodiosoma	fulvum		Arroyo Seco CG	Monterey	B. Villegas	Apr 30 75	UCD
?	55931	Lacinipolia	acutipennis		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
?	55988	Lacinipolia	circumcincta		Big Sur	Monterey	J. Powell	Oct 5 86	UCB
?	55879	Lacinipolia	cuneata		Carmel	Monterey	R.H. Leuschner	May 29 69	RHL
?	56115	Lacinipolia	patalis patalis		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	56090	Lacinipolia	quadrilineata		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	55978	Lacinipolia	stricta cinnabarina		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
?	41052	Laetilia	zamacrella	F	Big Creek Reserve	Monterey	J.A. Powell	Oct 24 91	UCB
?	30161	Lanpronia	nr oregonella	F	Big Creek Reserve	Monterey			
?	55281	Lepipolys	perscripta		Big Cr Reserve	Monterey	Powell, Prentice	Feb 28 89	UCB
?	49894	Leptarctia	californiae		S Big Sur	Monterey	R.L. Langston	Apr 9 68	RLL
?	56245	Leucania	farcta		Big Creek Reserve	Monterey	J.Powell	Sep 27 87	UCB
?	33229	Leucogoniella	californica		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	30931	Lindera	tessellatella		Salinas	Monterey	not given	Dec 2 32	
?	39318	Lineodes	integra		Big Creek Reserve	Monterey	J. Powell	Jan 25 88	UCB
?	41571	Lioptilodes	parvus		Corncob Cyn	Monterey	J. Donahue	Jul 29 90	LACM
?	40776	Lipographis	fenestrella		Asilomar	Monterey	G.I. Stage	May 17 59	UCB
?	33365	Lita	recens		Big Creek Reserve	Monterey	J. Powell	Oct 3-5 85	UCB

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?	33384	Lita	sironae		Big Creek Reserve	Monterey	J. Powell	Oct 3 85	UCB
?	34964	Lithariapteryx	abroniaeella		Marina Dunes	Monterey	R.L. Langston	Jul 20 87	CAS
?	34985	Lithariapteryx	elegans	F	Fort Ord coastal dunes	Monterey	J. Powell	May 18 77	UCB
?	54513	Lithophane	contenta		Big Creek Reserve	Monterey	B.Scaccia	Apr 26 93	UCB
?	54533	Lithophane	pertorrida		Carmel	Monterey	R.H. Leuschner	Dec 30 62	RHL
?	54578	Lithophane	vanduzeei	M	Carmel	Monterey	R.H. Leuschner	Apr 4 65	RHL
?	54545	Lithophane	vertina		Big Creek Reserve	Monterey	J. Powell	Feb 21-22 88	UCB
?	50246	Lophocampa	argentata argentata		Carmel Valley	Monterey	B.Walsh	Sep 27 73	
?	50272	Lophocampa	maculata		Salinas	Monterey	R.L. Langston	Jun 13 78	CAS
?	50257	Lophocampa	sobrina		High Meadow, Carmel	Monterey	F. Sala	Jul 19 99	LACM
?	34482	Lotisma	trigonana		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
?	49856	Lycomorpha	grotei		Big Creek Reserve	Monterey	J.Brown, JAP	Oct 4 85	UCB
?	39527	Lygropia	octonalis		9 mi E King City	Monterey	C.W. O'Brien	Apr 1 59	UCB
?	50522	Lymantria	dispar		Monterey, Bergin Dr	Monterey	T. Cotenas	Aug 13 96	
?	31002	Lyonetia	candida		Big Creek Reserve	Monterey	Powell, Scaccia	May 12-13 92	UCB
?	31006	Lyonetia	specuella		Big Creek Reserve	Monterey			
?	42040	Macaria	guenearia		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	42147	Macaria	lorquinaria		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	42117	Macaria	marcescaria		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	41957	Macaria	quadrilinearia		Salinas	Monterey	M.L.Walton	Jun 12 37	LACM
?	41985	Macaria	semivolata		Salinas Riv/King City	Monterey	M.L.Walton	Jun 12 37	LACM
N	48806	Malacosoma	californicum californicum		Big Creek Reserve	Monterey	JAP,YFH,DM	Jun 15 91	UCB
?	48772	Malacosoma	constrictum constrictum	M	Arroyo Seco	Monterey	J. Donahue	May 26-28 78	LACM
?	49092	Manduca	quinquemaculata		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	31343	Marmara	arbutiella		Big Creek Reserve	Monterey	J. Powell	Jan 26 88	UCB
?	39397	Mecyna	mustelinalis		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	51801	Megalographa	biloba		Big Creek Reserve	Monterey	J.Powell	May 27 87	UCB
?	51972	Meganola	fuscula		Big Creek Reserve	Monterey	J.Powell	Mar 27 87	UCB
?	43373	Melanolophia	imitata		2 mi S Big Sur	Monterey	R.M. Brown	May 7 76	RMB
?	50942	Melipotis	indomita		Big Creek Reserve	Monterey	J.Powell	Jun 6 92	UCB
?	54592	Mesogona	olivata		Big Creek Reserve	Monterey	J.Powell	Sep 28 87	UCB
?	54611	Mesogona	subcuprea?		Big Creek Reserve	Monterey	J.Powell	Oct 29 89	UCB
?	46840	Mesoleuca	gratulata		9 mi SE Big Sur	Monterey	R.M. Brown	Apr 8 80	RMB
?	50799	Metalectra	bigallis		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	35409	Miacora	perplexa		Big Creek Reserve	Monterey	J. Powell	Sep 15 93	UCB
?	53721	Micrathetis	triplex		Big Creek Reserve	Monterey	J. Powell	Apr 27 90	UCB
?	30049	Microcalpyptris	lotella		Big Creek Reserve	Monterey	Y. Hsu	Jun 7 93	UCB
?	39776	Microcrambus	copelandi		Big Creek Reserve	Monterey	J. Powell	Aug 2 92	UCB
?	38183	Microtheoris	ophionalis occidentalis		Big Creek Reserve	Monterey	J. Powell	Aug 25 89	UCB
?	31294	Micrurapteryx	salicifoliella		Big Creek Reserve	Monterey	J. Powell	Sep 5 91	UCB
?	39430	Mimorista	subcostalis		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	57134	Miodera	stigmata		Big Creek Reserve	Monterey	J.Powell	Oct 29-32 89	UCB
?	32641	Mompha	franclemonti		Big Creek Reserve	Monterey	Powell, Hsu	Mar 21-23 89	UCB
?	32645	Mompha	new sp nr powelli		Big Creek Pres.	Monterey			

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?	33002	Monochroa	harrisonella		Big Creek Reserve	Monterey	J. Powell	May 5 91	UCB
?	30905	Monopsis	mycetopilella		Big Creek Reserve	Monterey	J. Powell	Mar 28 87	UCB
?	30640	Morophagoides	berkeleyella		Big Creek Reserve	Monterey	J. Powell	May 23 92	UCB
?	30648	Morophagoides	burkerella		Big Creek Reserve	Monterey	J. Powell	May 27 87	UCB
?	30657	Morophagoides	gracilis		Big Creek Reserve	Monterey	J. Powell	Dec 17 93	UCB
?	40279	Myelopsis	alatella		Big Creek Reserve	Monterey	J.A. Powell	May 1 92	UCB
?	49556	Nadata	gibbosa		Big Creek Reserve	Monterey	BS, RZ	Jun 24 92	UCB
?	48435	Nasusina	inferior		Big Sur	Monterey	R.M. Brown	Apr 7 80	RMB
?	48469	Nasusina	mendicata		Big Creek Reserve	Monterey	J.A. Powell	Apr 27 90	UCB
?	48453	Nasusina	vaporata		Big Sur	Monterey	R.M. Brown	May 8 76	RMB
?	30564	Nemapogon	defectella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	30572	Nemapogon	geniculatella?		Big Creek Reserve	Monterey			
?	30579	Nemapogon	granella		Big Creek Reserve	Monterey	J. Powell	Oct 30 89	UCB
?	30595	Nemapogon	molybdanella		Big Creek Reserve	Monterey	J. Powell	Apr 13 85	UCB
?	45511	Nemoria	darwinata darwinata		Big Creek Reserve	Monterey	J.A. Powell	Jun 5 89	UCB
?	45539	Nemoria	darwinata punctularia		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	45614	Nemoria	glaucomarginaria		Nacimiento River Cmpg	Monterey	R.M. Brown	Apr 10 80	RMB
?	45578	Nemoria	leptalea		Big Creek Reserve	Monterey	J.A. Powell	Nov 6 88	UCB
?	45488	Nemoria	pistaciaria		Big Creek Reserve	Monterey	JAP. JWB	Jul 7 86	UCB
?	45459	Nemoria	pulcherrima		Big Creek Reserve	Monterey	J.A. Powell	Feb 21 88	UCB
?	42794	Neoalcis	californiaria		Big Creek Reserve	Monterey	J.Powell	Mar 23 89	UCB
?	29903	Neocrania	bifasciata		Big Creek Reserve	Monterey	Powell, Hsu	Apr 12 90	UCB
?	54895	Neogalea	esula		Arroyo Seco	Monterey	C.I. Smith	em Aug 28 40	UCB
?	53007	Neoligia	tonsa tonsa		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	44605	Neoterpes	edwardsata		Big Creek Reserve	Monterey	J.Powell	May 4 91	UCB
?	44551	Neoterpes	ephelidaria		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	30006	Nepticula	variella		Fort Ord	Monterey	DSG	Mar 25 77	UCB
?	44680	Nepytia	umbrosaria nigrovenaria		Big Creek Reserve	Monterey	J.Powell	Oct 2 91	UCB
?	31313	Neurobathra	bohartiella		Fort Ord	Monterey	D.Green	Mar 25 77	UCB
?	51991	Nola	minna		Carmel	Monterey	R.H. Leuschner	Feb 27 77	RHL
N	39465	Nomophila	nearctica		Big Creek Reserve	Monterey	J.DeBenedictis	Sep 28 87	UCD
?	41716	Oidaematophorus	confusus		Big Creek Reserve	Monterey	YFH & JAP	Mar 22 89	
?	41705	Oidaematophorus	gratiosus		Carmel	Monterey	R.H. Leuschner	Jun 25 69	RHL
Y	41658	Oidaematophorus	mathewianus? E11-14Ac		Big Creek Reserve	Monterey	JAP & YFH	Apr 13 90	UCB
?	41702	Oidaematophorus	meyricki		Carmel	Monterey	R.H. Leuschner	May 25 69	RHL
?	41720	Oidaematophorus	new sp nr confusus		Big Creek Reserve	Monterey	J.A. Powell	Apr 10 94	UCB
?	41687	Oidaematophorus	new sp nr griscescens?		Big Creek Reserve	Monterey	YFH	Mar 23 89	UCB
?	41673	Oidaematophorus	phaceliae?		Big Creek Reserve	Monterey	J.A. Powell	May 3 91	UCB
?	30954	Oinophila	v-flavum		Big Creek Reserve	Monterey	J. Powell	Dec 17 93	UCB
N	53042	Oligia	mactata		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
?	52977	Oligia	marina		Big Creek Reserve	Monterey	J. Powell	Jun 14 91	UCB
?	52964	Oligia	new sp nr indirecta		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB
?	55224	Oncocnemis	astrigata		Big Cr Reserve	Monterey	Zuniga, Scaccia	Jun 23-24 92	UCB
?	55273	Oncocnemis	dunbari		Big Cr Reserve	Monterey	J. Powell	Sep 3-5 91	UCB

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?	55202	Oncocnemis	ragani		Santa Lucia Mts	Monterey	J. Donahue	May 28 76	LACM
?	55154	Oncocnemis	umbrifascia		Big Cr Reserve	Monterey	J. Powell	Jul 6-8 92	UCB
?	55140	Oncocnemis	youngi		Big Cr Reserve	Monterey	J. Powell	Aug 17-19 88	UCB
?	47597	Operophtera	danybi		Prunedale	Monterey	R.H. Leuschner	Jan 1 71	RHL
?	30942	Opogona	omoscopa		Carmel	Monterey	R.H. Leuschner	Dec 30 86	RHL
?	30949	Opogona	saccharae		Carmel	Monterey	R.H. Leuschner	Apr 29 93	RHL
?	30056	Opostega	sp 1 (unmarked white)		Big Creek	Monterey	Hsu, Powell	Apr 12-13 90	UCB
N	50499	Orgyia	pseudosugata pseudosugata		1 mi N Moss Landing	Monterey	R.F. Denno	Jun 24 67	UCD
N	50441	Orgyia	vetusta		Big Creek Reserve	Monterey	J.Powell	Jun 5 89	UCB
?	47472	Orthonama	centrostrigaria?		Big Creek Reserve	Monterey	J.A. Powell	Apr 24 87	UCB
?	47442	Orthonama	obstipata		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	56557	Orthosia	arthrolita		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
?	56536	Orthosia	behrensiana		Big Creek Reserve	Monterey	J.Powell	Jan 24 88	UCB
?	56407	Orthosia	erythrolita		Big Creek Reserve	Monterey	J.Powell	Feb 28 89	UCB
?	56510	Orthosia	ferrigera		Big Creek Reserve	Monterey	J.Powell	Mar 1 89	UCB
N	56593	Orthosia	hibisci		Carmel Valley	Monterey	R.L. Langston	Dec 13 90	CAS
?	56493	Orthosia	mys mys		Big Creek Reserve	Monterey	J.Powell	Nov 6 88	UCB
?	56577	Orthosia	pacifica		Big Creek Reserve	Monterey	J.Powell	Apr 12 85	UCB
?	56474	Orthosia	praeses		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	56431	Orthosia	pulchella		Big Creek Reserve	Monterey	JAP. YFH	Feb 22 88	UCB
?	56524	Orthosia	terminata		Hastings Reserve	Monterey	J.Powell	Mar 25 98	UCB
?	56452	Orthosia	transparens		Big Creek Reserve	Monterey	J.Powell	Apr 21 93	UCB
?	43509	Paleacrita	longiciliata		Big Creek Reserve	Monterey	B.S.	Mar 13 93	UCB
?	52363	Panthea	portlandia?		Big Creek Reserve	Monterey	JAP, YFH	Jun 14 91	UCB
?	53135	Papaipema	sauzalitae		Big Creek Reserve	Monterey	J. Powell	Sep 27 87	UCB
?	59071	Parabagrotis	exertistigma		Big Creek Reserve	Monterey	J.Powell	Aug 17 88	UCB
?	59102	Parabagrotis	formalis		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	41588	Paraplatyptilia	albiciliata rubricans		Pt Lobos	Monterey			
?	41001	Patagonia	peregrina	F	Redwood Cmp Trail	Monterey	J.A. Powell	May 26-28 87	UCB
?	35995	Pelochrista	expolitana?		BIg Creek Preserve	Monterey			
?	35993	Pelochrista	new sp nr palpana?		BIg Creek Preserve	Monterey			
?	36002	Pelochrista	passerana	M	Bixby Cyn	Monterey	J.W.Tilden	Aug 1 48	UCB
?	35229	Penstemonia	clarkei		Big Creek Reserve	Monterey	J. Powell	Aug 6 93	UCB
N	58501	Peridroma	saucia		Big Creek Reserve	Monterey	J.Powell	Oct 30 89	UCB
?	56322	Perigonica	angulata		Big Creek Reserve	Monterey	B.Scaccia	Jun 6 92	UCB
?	56342	Perigonica	pectinata		Big Creek Reserve	Monterey	J.Powell	Apr 23 87	UCB
?	32817	Periploca	ceanothiella		Big Creek Reserve	Monterey	J. Powell	May 5 91	UCB
?	32330	Perittia	passula	M	17.5 mi W Jolon	Monterey	P.A. Opler	Mar 19 69	UCB
?	46938	Perizoma	costiguttata		Big Sur	Monterey	R.M.& M.A. Brown	May 27 82	RMB
?	46923	Perizoma	curvilinea curvilinea		Carmel	Monterey	R.H. Leuschner	Apr 4 60	RHL
?	46964	Perizoma	custodiata		Moss Landing	Monterey	R.M. Brown	Apr 11 70	RMB
?	44160	Pero	macdunnoughi	M	Monterey	Monterey	K. Richers	Apr 2 96	KMR
?	44130	Pero	mizon		Arroyo Seco	Monterey	D. Burdick	Jun 1 57	UCB
?	44111	Pero	morrisonaria		Salinas	Monterey	not given	Oct 1 65	UCD

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?	44230	Pero	occidentalis		Nacimiento Cmpgrnd	Monterey	R.M.& M.A.Brown	May 29 82	RMB
?	44249	Pero	occidentalis packardi		White Oaks CG	Monterey	A.H. Porter	Apr 27 85	UCD
?	44096	Pero	radiosaria		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	38159	Petrophila	confusalis		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	38132	Petrophila	jaliscalis		Big Sur	Monterey	J. Arnold	Jun 2 59	UCB
?	35641	Phaneta	amphorana		Marina Dunes	Monterey	R.L.Langston	Feb 19 87	CAS
?	35656	Phaneta	apacheana		Big Creek Reserve	Monterey	YFH	Jun 15 91	UCB
?	35684	Phaneta	argenticostana		SW Arroyo Seco G Sta	Monterey	J.Powell	May 5 75	UCB
?	35718	Phaneta	artemisiana		Bixby Cyn	Monterey	J.W.Tilden	Aug 20 48	UCB
?	35672	Phaneta	misturana	F	9 mi E King City	Monterey	C.W.O'Brien	Jun 1 59	UCB
?	35699	Phaneta	pallidarcis	M	Fort Ord, South Rd	Monterey	JAP,Opler	Jul 15 76	UCB
?	35730	Phaneta	scalana	M	Bixby Cyn	Monterey	J.W.Tilden	Jul 19 48	UCB
?	35688	Phaneta	striatana occidentalis	M	Fort Ord, South Rd	Monterey	JAP, Opler	Jul 15 76	UCB
?	35706	Phaneta	subminimana	M	Bixby Cyn	Monterey	J.W.Tilden	Aug 13 48	UCB
?	49598	Pheosia	rimosa		Big Creek Reserve	Monterey	J.Powell	Jul 7 92	UCB
?	44996	Pherne	parallelia		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	44974	Pherne	placeraria?		Big Creek Reserve	Monterey	J.Powell	Aug 18 88	UCB
?	45023	Pherne	subpunctata subpunctata		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	43472	Phigalia	plumogeraria		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	44443	Philedia	punctomacularia		Big Creek Reserve	Monterey	J.Powell	Jun 8 89	UCB
?	44452	Philedia	punctomacularia connecta		Carmel	Monterey	L.S. Slevin	on Nov 5	
?	50674	Phobolosia	anfracta		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	40546	Phobus	brucei		Big Creek Reserve	Monterey	J.A. Powell	Jun 8 93	UCB
?	40566	Phobus	curvatellus		Big Creek Reserve	Monterey	J.A. Powell	Sep 4 91	UCB
?	40554	Phobus	funerellus		Big Creek Reserve	Monterey	JAP, YFH	Jun 5 92	UCB
?	30677	Phryganeopsis	brunnea		Big Creek Reserve	Monterey	RZ	Jul 21 92	UCB
?	49760	Phryganidia	californica		Salinas	Monterey	R.L. Langston	Jun 12 81	RLL
?	37922	Phtheochroa	aegrana		Big Creek Reserve	Monterey	Powell, Hsu	Jun 5 89	UCB
N	33546	Phthorimaea	operculella		nr Castroville	Monterey	not given	in Oct 59	UCB
?	41019	Phycitodes	mucidella		Big Creek Reserve	Monterey	J.A. Powell	Apr 24 87	UCB
?	31702	Phyllocnistis	populiella?		Big Creek Reserve	Monterey	D.L. Wagner	Oct 4 85	UConn
?	48684	Phyllodesma	americana californica	M	White Oaks CG	Monterey	A.H. Porter	Apr 27 85	UCD
?	48715	Phyllodesma	coturnix coturnix		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	31379	Phyllonorycter	apicinigrella		Big Creek Reserve	Monterey	J. Powell	Oct 2 91	
?	31383	Phyllonorycter	arbutusella		Big Creek Reserve	Monterey	Hsu, Powell	Apr 12-13 90	UCB
?	31406	Phyllonorycter	felinella		Big Creek Reserve	Monterey	J. Powell	Oct 30 89	UCB
?	31431	Phyllonorycter	holodisci		Big Creek Reserve	Monterey	D.L. Wagner	Oct 4 85	UConn
?	31438	Phyllonorycter	incanella		Big Creek Reserve	Monterey	D.L. Wagner	Jul 7 86	UConn
?	31449	Phyllonorycter	inusitatella		8 mi S Jamesburg	Monterey	D.L. Wagner	May 15 83	UConn
?	31474	Phyllonorycter	manzanita		Jack's Pk Regional Park	Monterey	D.L. Wagner	Mar 11 84	UConn
?	31482	Phyllonorycter	memorabilis		Big Creek Reserve	Monterey	J. Powell	Apr 22 93	UCB
?	31502	Phyllonorycter	ribefoliae		Big Creek Reserve	Monterey	D.L. Wagner	Oct 4 85	UConn
?	31511	Phyllonorycter	sandraella		Carmel	Monterey	L.S.Slevin	Oct 2 27	
?	40405	Pima	albocostalialis albocostalialis		Big Creek Reserve	Monterey	J.A. Powell	May 26 87	UCB

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?	44858	Plataea	californiaria	F	Monterey	Monterey	not given	Jul 15 28	LACM
?	44830	Plataea	personaria		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	54698	Platypolia	contadina		Big Creek Reserve	Monterey	J.Powell	Oct 29 89	UCB
?	41501	Platyptilia	carduidactyla		Big Creek Reserve	Monterey	J.A. Powell	Mar 26 87	UCB
?	41520	Platyptilia	williamsii		Big Creek Reserve	Monterey	F.Arias	Apr 17 92	UCB
?	53943	Platysenta	albolabes		Big Creek Reserve	Monterey	J. Powell	May 1-3 92	UCB
?	54822	Pleromella	opter		Big Creek Reserve	Monterey	J.Powell	May 12 92	UCB
?	54866	Pleromelloida	bonuscula		Carmel	Monterey	R.H. Leuschner	Jan 1 71	RHL
?	54879	Pleromelloida	cinerea		Carmel Valley	Monterey	R.L. Langston	Dec 13 90	CAS
?	54846	Pleromelloida	conserta		Hastings Reserve	Monterey	J. Powell	Mar 9-10 2000	UCB
?	54858	Pleromelloida	obliquata smithi		Big Creek Reserve	Monterey	Powell, Prentice	Feb 28 89	UCB
?	32273	Pleurota	albastrigulella		Big Creek Reserve	Monterey	J. Powell	Apr 24 87	UCB
N	34699	Plutella	xylostella		Big Creek Reserve	Monterey	Y.F. Hsu	Jun 7 89	UCB
?	55759	Polia	delecta		Big Creek Reserve	Monterey	J. Powell	Apr 23-25 87	UCB
?	55753	Polia	noverca		Hastings Res	Monterey	J. Powell	May 3 58	UCB
?	32217	Polix	coloradella		Big Creek Reserve	Monterey	J. Powell	May 4 91	UCB
?	35377	Prionoxystus	robiniae	M	Arroyo Seco Camp	Monterey	R.W. Brooks	May 15 76	UCD
?	45221	Prochoerodes	forficaria catenulata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	45181	Prochoerodes	truxaliata		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	30301	Prodoxus	aenescens		Arroyo Seco	Monterey	J. Powell	Oct 7 67	UCB
?	30277	Prodoxus	marginatus		4 mi S Big Sur	Monterey	J. Powell	Oct 5 85	UCB
?	53559	Properigea	albimacula		Big Creek Reserve	Monterey	J. Powell	Sep 3 91	UCB
?	53600	Properigea	niveirena		Big Creek Reserve	Monterey	Hsu, Powell	Jun 14-16 91	UCB
?	48491	Prorella	emmedonia			Monterey	J. Doll		LACM
?	48512	Prorella	mellisa		Arroyo Seco Camp	Monterey	not given	May 15 73	UCD
?	48526	Prorella	opinata		Nacimiento Cmpgrnd	Monterey	R.M. Brown	May 29 82	RMB
?	49414	Proserpinus	clarkiae		Big Creek Reserve	Monterey	J.Powell	Mar 27 87	UCB
?	36103	Proteoteras	aesculana		Big Creek Reserve	Monterey	J.Powell	Apr 12 90	UCB
?	53707	Protoperigea	posticata		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	57011	Protorthodes	alfkeni		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	57048	Protorthodes	melanopis melanopis		Carmel	Monterey	F. Sala?	Mar 17 80	UCB
?	56984	Protorthodes	rufula		Big Creek Reserve	Monterey	J.Powell	Mar 22 89	UCB
?	53745	Proxenus	mindara		9 mi E King City	Monterey	C.W. O'Brien	Mar 29 59	UCB
?	56211	Pseudaletia	unipuncta		Big Creek Reserve	Monterey	J.Powell	Apr 24 87	UCB
?	51781	Pseudeva	palligera		Big Creek Reserve	Monterey	BS,RZ	Jun 24 92	UCB
?	36130	Pseudexentera	habrosana		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	53624	Pseudobryomima	fallax		Big Creek Reserve	Monterey	J. Powell	Apr 11 85	UCB
?	33279	Pseudochelaria	manzanitae		Big Creek Reserve	Monterey	J. Powell	Apr 29 90	UCB
?	33295	Pseudochelaria	scabrella		Hastings Reserve	Monterey	J. Powell	May 3 58	UCB
?	57077	Pseudorthodes	irrorata		Big Creek Reserve	Monterey	Powell, Hsu	Jun 14 91	UCB
?	57089	Pseudorthodes	puerilis		Big Creek Reserve	Monterey	J.Powell	Mar 21 89	UCB
?	43194	Pterotaea	albescens		Hastings Reserve	Monterey	J. Powell	Jun 9-10 2000	UCB
?	43116	Pterotaea	lamiaria lamiaria		Salinas	Monterey	M. Christie	Sep 18 53	UCD
?	37594	Ptycholoma	peritana	M	9 mi E King City	Monterey	O'Brien	Apr 1 59	UCB

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?	37622	Ptycholoma	virescana	M	Carmel	Monterey	A.H.Vachell	in Jun	
?	39963	Pyralis	cacamica?		Big Creek Reserve	Monterey	J.A. Powell	Sep 3 91	UCB
N	39938	Pyralis	farinalis		Chualar	Monterey	W.H. Lange	Jul 3 61	UCD
?	31913	Pyramidobela	angelarum		Carmel	Monterey	F. Sala	in Feb 99	RHL
?	38985	Pyrausta	dapalis		6 mi W Greenfield	Monterey	J. Powell	May 3 75	UCB
N	39159	Pyrausta	fodinalis		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	38917	Pyrausta	grotei		Big Creek Reserve	Monterey	Hsu, Powell	Jun 5-8 89	UCB
?	39139	Pyrausta	laticlavia		Big Creek Reserve	Monterey	J. Powell	May 22 92	UCB
?	38870	Pyrausta	lethalis		Big Creek Reserve	Monterey	J. Powell	Apr 24 87	UCB
?	38836	Pyrausta	napaealis		Big Creek Reserve	Monterey	JAP. YFH	May 12 92	UCB
?	38809	Pyrausta	nexalis		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	39052	Pyrausta	perrubralis perrubralis		Big Creek Reserve	Monterey	JB, JAD	May 26 87	UCB
?	39090	Pyrausta	semirubralis		S Arroyo Seco Guard St	Monterey	J. Powell	May 7 75	UCB
?	39192	Pyrausta	socialis perpallidalis		Valley Greens	Monterey	F. Sala	Jun 12 98	LACM
?	39028	Pyrausta	subsequalis petaluma	M	9 mi NW Lucia	Monterey	J.A. Powell	Aug 28 61	CAS
?	39119	Pyrausta	unifascialis		Big Creek Reserve	Monterey	J. Powell	Jun 5 90	UCB
?	40502	Quasisalebria	occidentalis		Big Creek Reserve	Monterey	J.A. Powell	Aug 2 92	UCB
?	32147	Rectiostoma	fernaldella		Big Creek Reserve	Monterey	J. Powell	May 3 91	UCB
?	33122	Recurvaria	ceanothiella		Big Creek Reserve	Monterey	D.L. Wagner	Apr 24 87	UConn
?	33133	Recurvaria	francisca		Big Creek Reserve	Monterey	Hsu, Powell	Apr 28 90	UCB
?	41102	Rhagea	stigmella		Big Creek Reserve	Monterey	J.A. Powell	May 3 91	UCB
N	35546	Rhyacionia	pasadenana		Carmel	Monterey	A.H.Vachell		
?	33418	Rifseria	fuscotaeniaella		Big Creek Reserve	Monterey	F.Arias	Oct 12 89	UCB
?	45241	Sabulodes	aegrotata		Big Sur	Monterey	R.M. Brown	Apr 2 78	RMB
?	45295	Sabulodes	spoliata lagunata?		Big Creek Reserve	Monterey	J. Powell	Apr 27 90	UCB
?	45271	Sabulodes	spoliata spoliata		Pacific Grove	Monterey	R.H .Leuschner	Apr 4 60	LACM
?	37837	Saphenista	dilutana	M	Big Sur	Monterey	J.Powell	Oct 5 86	UCB
?	37888	Saphenista	latipunctana	F	Marina dunes at Ft Ord	Monterey	J.Powell	May 18 77	UCB
?	37940	Saphenista	nomonana		Carmel	Monterey			
?	37833	Saphenista	nr parvimaculana		Big Creek Reserve	Monterey	J.Powell	Sep 27 87	UCB
?	37896	Saphenista	saxicolana	M	Big Creek Reserve	Monterey	YFH	Apr 27 90	UCB
N	59355	Schinia	sueta californica		Big Creek Reserve	Monterey	J.Powell	May 4 91	UCB
?	49711	Schizura	unicornis conspecta		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
N	34954	Schreckensteinia	festaliella		Big Creek Reserve	Monterey	J. Powell	Jun 6 82	UCB
N	50817	Scolioptreryx	libatrix		Big Creek Reserve	Monterey	J.Powell	Jun 5 92	UCB
?	45972	Scopula	junctaria johnstonaria		Nacimiento River Cmpg	Monterey	R.M.& M.A.Brown	May 29 82	RMB
?	45950	Scopula	junctaria quinquelinearia		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	46000	Scopula	sideraria		Carmel Valley area	Monterey	not given	Apr 27 55	UCB
?	33635	Scrobipalpopsis	interposita	M	Big Creek Reserve	Monterey	J. Powell	Oct 3-4 85	UCB
?	33633	Scrobipalpopsis	madiae	M	Big Creek Reserve	Monterey	Hsu, Powell	em Jun 18 91	UCB
?	33578	Scrobipalpula	psilella		Big Creek Reserve	Monterey	J. Powell	Apr 10 89	UCB
?	33568	Scrobipalpulopsis	lutescella	M	Big Creek Reserve	Monterey	F.Arias	Oct 12 89	UCB
?	32928	Scythris	interrupta		Big Creek Reserve	Monterey	J. Powell	Apr 27 90	UCB
?	43560	Sericosema	juturnaria		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB

? = Pheromone unknown N = CheckMate pheromone compounds not identified Y = CheckMate pheromone compounds Identified

942 Monterey County Moth Species

?	43637	Sericosema	simularia		Arroyo Seco	Monterey	J. Donahue	May 26-28 78	LACM
N	35054	Sesia	tibialis		Hastings Reseve	Monterey	not given	Jun 18 40	UCB
?	44726	Sicya	crocearia		Big Creek Reserve	Monterey	RZ, BS	Jul 21 92	UCB
N	44752	Sicya	macularia macularia		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	44801	Sicya	morsicaria		Big Creek Reserve	Monterey	J. Powell	Jun 7 89	UCB
N	52567	Simyra	henrici		Big Sur	Monterey	J. Powell	Oct 5 86	UCB
?	44502	Slossonia	rubrotincta		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
N	49235	Smerinthus	cerisyi		Carmel	Monterey	J.Osterhaus	May 15 96	
?	32909	Sorhagenia	nimbosa		Big Creek Reserve	Monterey	J. Powell	Jun 4 82	UCB
?	41306	Sosipatra	thurberiae		Big Creek Reserve	Monterey	J.A. Powell	Sep 4 91	UCB
N	58543	Spaelotis	clandestina		Big Creek Reserve	Monterey	J.Powell	Aug 2-4 92	UCB
?	46863	Spargania	magnoliata quadripunctata		Big Sur	Monterey	R.M.& M.A.Brown	May 27 82	RMB
?	37694	Sparganothis	senecionana		NE Arroyo Seco Grd Sta	Monterey	J.Powell	May 5 75	UCB
Y	37657	Sparganothis	tunicana E11-14Ac		Bryson	Monterey	E.VanDuzee	May 19 20	UCB
?	49165	Sphinx	perelegens		Big Creek Reserve	Monterey	J.Powell	Apr 28 90	UCB
?	50033	Spilosoma	vagans		Big Creek Reserve	Monterey	J.Powell	Feb 21 88	UCB
?	49987	Spilosoma	vestalis		Big Creek Reserve	Monterey	J.Powell	Apr 27 90	UCB
Y	53832	Spodoptera	exigua E11-14Ac		Big Creek Reserve	Monterey	J. Powell	Sep 28 87	UCB
N	53881	Spodoptera	praefica		Big Creek Reserve	Monterey	J. Powell	Jun 7 89	UCB
?	39508	Spoladea	recurvalis		Big Sur	Monterey	G.M. Prlain?	Sep 30 84	UCB
?	32683	Stagmatophora	iridella		Big Creek Reserve	Monterey	J. Powell	Oct 4 91	UCB
?	47109	Stamnoctenis	pearsalli		Big Creek Reserve	Monterey	J.A. Powell	Nov 18 90	UCB
?	47127	Stamnoctenis	ululata		Big Creek Reserve	Monterey	J.A. Powell	Oct 29 89	UCB
?	47011	Stamnodes	affiliata		Big Creek Reserve	Monterey	J.A. Powell	Oct 30 89	UCB
?	47053	Stamnodes	coenonymphata		Arroyo Seco	Monterey	not given	Mar 18 35	LACM
?	47077	Stamnodes	marinata		Big Creek Reserve	Monterey	R.Robertson	Feb 2 94	
?	47002	Stamnodes	recksecker i		Big Creek Reserve	Monterey	J. Powell	Oct 29-32 89	UCB
?	42859	Stenoporpia	pulmonaria lita	M	Pacific Grove	Monterey	A.L.Melander	Jun 19 47	AMNH
?	44049	Stergamataea	delicata delicata		Big Creek Reserve	Monterey	J.Powell	Mar 27 89	UCB
?	29983	Stigmella	ceanothi		9 mi S Blg Sur	Monterey	D.L. Wagner	Mar 10 84	UConn
?	29991	Stigmella	diffasciae?		Big Creek Reserve	Monterey	Wagner, Powell	Oct 4 85	UConn
?	30037	Stigmella	heteromelis		Big Creek Reserve	Monterey	J. Powell	Oct 30 89	
?	32854	Stilbosis	dulcedo		Nacimiento Ranger Sta	Monterey	D.L. Wagner	Mar 27 84	
?	32867	Stilbosis	extensa		Big Creek Reserve	Monterey	Powell, Hsu	Jun 14 91	UCB
?	56384	Stretchia	pacifica		Big Creek Reserve	Monterey	J.Powell	Jan 25 88	UCB
?	55324	Stylopoda	sexpunctata		Arroyo Seco Camp	Monterey	D. Whitman	Apr 30 72	UCB
?	33651	Symmetrischema	striatellum	F	Big Creek Reserve	Monterey	J. Powell	Oct 30 89	UCB
N	33664	Symmetrischema	tangolias		Big Creek Reserve	Monterey	J. Powell	Oct 30 89	UCB
N	35076	Synanthedon	albicornis		21 mi W Soledad	Monterey	R.M.Brown	Jun 14 97	RMB
N	35103	Synanthedon	bibionipennis		Carmel Valley	Monterey	B.Smith	Jun 24 73	
?	35136	Synanthedon	mellinipennis		Bixby Cr	Monterey	M. Wasbauer	Aug 12 49	UCB
?	35149	Synanthedon	polygoni		Marina Dunes	Monterey	R.L. Langston	Jul 18 86	CAS
N	35211	Synanthedon	sequoiae		Prunedale	Monterey	C.S. Koehler	in Jan 1965	UCB
?	45098	Synaxis	cervinaria		Big Creek Reserve	Monterey	JAP. YFH	Apr 13 90	UCB

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?	45148	Synaxis	hirsutaria		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
N	45048	Synaxis	jubararia jubararia		Monterey	Monterey	F.P. Sala	Nov 13 96	LACM
?	45072	Synaxis	pallulata		Pfeiffer Big Trees	Monterey	J. Powell	Dec 15 79	UCB
?	45692	Synchlora	aerata liquoraria		Big Creek Reserve	Monterey	F.Arias	Nov 7 89	UCB
?	34412	Syncopacma	nigrella		Big Creek Reserve	Monterey	J. Powell	Oct 3 91	UCB
?	37547	Syndemis	sequoiae		Big Creek Reserve	Monterey	J.Powell	May 22 92	UCB
?	51163	Synedoida	divergens		Big Creek Reserve	Monterey	J.Powell	May 12 92	UCB
?	51106	Synedoida	edwardsi		21 mi W Soledad	Monterey	R.M.Brown	Jun 14 97	RMB
?	52132	Tarachidia	fumata		9 mi E King City	Monterey	C.W. O'Brien	Apr 1 59	UCB
?	35297	Tebenna	gnaphaliella		Big Creek Reserve	Monterey	J. Powell	Apr 24 87	UCB
?	30250	Tegeticula	maculata maculata		Big Creek Reserve	Monterey	J. Powell	Nov 7 88	
N	39837	Tehama	bonifatella		Carmel	Monterey	R.H. Leuschner	Jun 25 69	LACM
?	33320	Teleiposis	baldiana		Big Creek Reserve	Monterey	J. Powell	Apr 28 90	UCB
?	40535	Telethusia	ovalis		Big Creek Reserve	Monterey	J.A. Powell	Oct 2 91	UCB
?	33253	Telphusa	sedulitella		Big Creek Reserve	Monterey	J. Powell	May 3 91	UCB
?	58729	Tesagrotis	amia		Big Creek Reserve	Monterey	J.Powell	Aug 2-4 92	UCB
?	50602	Tetanolita	palligera		Big Creek Reserve	Monterey	J.Powell	Jul 7 86	UCB
?	44487	Thallophaga	nigroseriara		Big Creek Reserve	Monterey	J.Powell	Mar 26 87	UCB
?	44461	Thallophaga	taylorata		Big Creek Reserve	Monterey	J.Powell	May 22 92	UCB
?	39808	Thaumatopsis	repanda		Big Creek Reserve	Monterey	J. Powell	Aug 2 92	UCB
?	30828	Tinea	niveocapitella		Big Creek Reserve	Monterey	J. Powell	Apr 23 87	UCB
?	30837	Tinea	occidentella		Big Creek Reserve	Monterey	J. Powell	Sep 28 87	UCB
?	30854	Tinea	pallescentella		Big Creek Reserve	Monterey	F.Arias	Sep 15 89	UCB
N	30871	Tinea	pellionella		Big Creek Reserve	Monterey	J. Powell	Dec 17 93	UCB
?	30125	Tischeria	ceanothi?		8 miS Jamesburg	Monterey	D.L. Wagner	May 15 83	UConn
?	30086	Tischeria	discreta		Nacimiento Rang Sta	Monterey	Wagner, Gold	Mar 27 84	UCB
?	30104	Tischeria	splendida		Big Creek Reserve	Monterey	J. Powell	Jul 22 92	
?	48658	Tolype	lowriei		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	40089	Toripalpus	trabalis		Hastings Res	Monterey	J.A. Powell	May 24-25 98	UCB
?	40240	Trachycera	caliginella		21 mi W Soledad	Monterey	R.M. Brown	Jun 14 97	RMB
?	47566	Trichodezia	californiata		Redwood Gulch, Hwy 1	Monterey	R.H.Leuschner	Mar 31 79	RHL
?	57153	Tricholita	fistula		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
N	51730	Trichoplusia	ni		Big Creek Reserve	Monterey	J.Powell	Sep 3 91	UCB
?	41465	Trichoptilus	californicus		Big Creek Reserve	Monterey	J.A. Powell	Apr 20 92	UCB
?	41480	Trichoptilus	pygmaeus		Big Creek Reserve	Monterey	J.A. Powell	Aug 17 88	UCB
?	46707	Triphosa	californiata		Big Sur	Monterey	R.M. Brown	May 8 76	RMB
?	46675	Triphosa	haesitata haesitata		Big Sur	Monterey	R.M. Brown	Apr 11 70	RMB
?	39231	Udea	profundalis		Big Creek Reserve	Monterey	J. Powell	May 23 92	UCB
?	39203	Udea	rubigalis		Watsonville	Monterey			LACM
?	59195	Ufeus	plicatus hulsti		Big Creek Reserve	Monterey	JAP, YFH	Jun 15 91	UCB
?	59176	Ufeus	satyricus sagittarius		Big Creek Reserve	Monterey	J.Powell	Nov 18 90	UCB
?	57058	Ulolanche	dilecta		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	38674	Uresiphita	reversalis		Lucia	Monterey	R.H. Leuschner	Apr 6 90	LACM
?	32457	Valentinia	glandulella?		Big Creek Reserve	Monterey	J. Powell	Aug 17 88	UCB

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?	47504	Venusia	duodecemlineata		Big Sur	Monterey	R.M. Brown	May 8 76	RMB
?	47546	Venusia	pearsalli		Big Sur	Monterey	R.M. Brown	Apr 8 80	RMB
?	30168	Vespina	quervicora		8 mi S Jamesburg	Monterey	D.L. Wagner	May 15 83	UConn
?	41246	Vitula	serratilineella		Big Creek Reserve	Monterey	J.A. Powell	Aug 25 89	UCB
?	32883	Walshia	misceocolorella		Big Creek Reserve	Monterey	J. Powell	Sep 4 91	UCB
?	47247	Xanthorhoe	defensaria		Big Sur	Monterey	R.M. Brown	May 27 82	RMB
?	33300	Xenolechia	aethiops		Big Creek Reserve	Monterey	JWB, JAP	Jul 7 86	
?	58649	Xestia	infimatis		Big Creek Reserve	Monterey	J.Powell	Sep 4 91	UCB
?	58638	Xestia	mustelina		Big Creek Reserve	Monterey	J.Powell	Oct 3 91	UCB
?	34744	Ypsolopha	cervella		6 mi W Greenfield	Monterey	J. Powell	May 3 75	UCB
?	34816	Ypsolopha	rubrella		Big Creek Reserve	Monterey			UCB
?	51300	Zale	lunata salicis		Big Creek Reserve	Monterey	J.Powell	Apr 23 89	UCB
?	51332	Zale	rubi		Arroyo Seco	Monterey	F. Farqua	Jun 8 47	UCD
?	51349	Zale	termina		Big Creek Reserve	Monterey	J.Powell	May 1 92	UCB
?	34853	Zelleria	gracilariella		Big Creek Reserve	Monterey	J. Powell	Jun 16 91	UCB
?	47388	Zenophleps	lignicolorata		Big Creek Reserve	Monterey	J.A. Powell	Mar 25 80	UCB
?	41111	Zophodia	grossulariella		Carmel	Monterey	R.H. Leuschner	Mar 31 79	LACM
?	57111	Zosteropoda	hirtipes		Big Creek Reserve	Monterey	J.Powell	Feb 22 88	UCB
?	54112	Zotheca	tranquilla		Big Creek Reserve	Monterey	J. Powell	Jul 6 92	UCB

? = Pheromone unknown N = CheckMate pheromone compounds not identified Y = CheckMate pheromone compounds Identified

2.01.08

Safety Review: Ingredients in Checkmate LBAM-F

www.dontspraycalifornia.org/Checkmate%20Chemicals%20Safety.htm

[DRAFT - authors' names have been removed pending final edits and review]

Checkmate LBAM-F is a biochemical pesticide designed for mating disruption of the light brown apple moth (LBAM). In early November 2007 aerial spraying of the pesticide was conducted over residential areas in Santa Cruz County as part of an ongoing ìeradicationî program. Aerial sprayings in Monterey County in September, October and November of 2007 included the use of a similar pheromone pesticide Checkmate OLR-F. Neither product is registered with the EPAís Office of Pesticides for residential use. According to a spokesperson for the product manufacturer Suterra, Checkmate OLR-F is registered for use on California vineyards, but this is the first time Checkmate LBAM-F has been used in California or elsewhere (Renner 12/5/07).

The Checkmate LBAM-F formulation includes two types of synthetic moth pheromones, as well as a variety of ìinertî ingredients. Though safety data sheets for the inert ingredients in the formulas have raised many serious health and safety concerns, materials presented by the CDFA (CDFA 2007; DPR/OEHHA 2007) have consistently focused on the safety of only the pheromone constituents, failing to address the preponderance of known toxicity data for the inerts. A 2007 CDFA Questions and Answers document on the LBAM states that ìthe ingredients in the formulation are water and biodegradable elements used to delay the release of the active ingredientî and that ìthe basic biodegradable building block is urea, a normal constituent of the human body that is derived from the breakdown of proteins that we eat.îÝ However a review of the available research data as well as the MSDS sheets (Material Safety Data Sheets) for these chemicals indicates a high level of toxicity for many of the inerts.

The word ìinertî as used on a pesticide label is commonly mistaken to mean inactive or benign. However the EPA states that ìalthough the term ìinertî may connote physical, chemical or biological inactivity, use of the word ìinertî to describe a component in a pesticide product means only that the substance is not intended to exert a pesticidal effect Ö in that product. The ìinertî ingredient may have biological activity of its own, it may be toxic to humans, and it may be chemically activeî (EPA 2002). Though typical pesticide formulations are comprised largely of inerts (a review of 100 agricultural pesticide products found that the formulations contained on average 50% inert ingredients, with many containing 90% or more ìinertsî; NCAP 2006) the majority of safety tests required to register a pesticide are performed with the active ingredient alone, not the complete formulation (Cox & Surgan 2006).Ý

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 human exposure levels to the 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 microorganisms (Cox & Surgan 2006).Ý

A comparison of potential health effects listed for the inert ingredients in the Checkmate formulas, with the actual adverse effects reported following the sprayings, indicates a remarkable consistency between the two. In fact a DPR/OEHHA (2007) consensus document provided by the CDFA states the following:

… ìThe toxicity data on the pheromone active ingredients as well as on microencapsulated pheromone product formulations suggest that exposure to a high dose of airborne Checkmate microcapsule particles could cause eye, skin, or respiratory irritation.î

… ìThe toxicological information on the Checkmate product indicates that exposure to high levels of the applied material would be consistent with many of the reported symptoms. However, because the application rate was extremely low, it is likely that exposure occurred at levels below those that would be expected to result in health effects.î

643 adverse reactions reported following the sprayings in Monterey and Santa Cruz counties (and documented by various governmental agencies and citizen groups) included the following:

v asthma attacks
v bronchial irritation
v lung congestion and soreness
v difficulty breathing and shortness of breath
v coughing or ìwheezingî
v skin rashes (sometimes severe)
v vision blurred
v eye irritation
v sore throats
v nasal congestion
v sinus bleeding
v chest pains and tightness
v heart arrhythmia and tachycardia (irregular and rapid heartbeat)
v headaches (sometimes debilitating)
v an inability to concentrate and focus
v dizziness
v muscle aches
v body tremors
v intestinal pain and diarrhea
v nausea
v swollen glands and lymph nodes in neck and under arms
v feelings of lethargy and malaise
v menstrual cramping, an interruption to menstrual cycles, and in some cases a recommencement of menstrual cycles after menopause
(HOPE 1/3/08)

The particle size of the microcapsule shell is another issue that has raised serious health concerns. A consensus document provided by the CDFA in regard to the microencapsulated spray lists the particle size as 25 micrometers (microns) or larger (DPR/OEHHA 2007), however a UC Davis study on the spray discovered a wide range of

particle sizes down to the 10 micron size (Werner et al 2007). The EPA classifies particles 10 microns in size or smaller as ìparticle pollutionî, cautioning that this size particle can get deep into the lungs and cause or aggravate a variety of health problems including coughing, difficulty breathing, asthma, and other respiratory symptoms (EPA website). The sprayings in Monterey and Santa Cruz counties were followed by numerous reports of mild to severe respiratory and asthma-like symptoms (HOPE 1/03/08). Ý

Checkmate LBAM-F

Product Description

- an aqueous suspension of pheromone containing micro-bead/dispensers (Suterra MSDS)
- a biochemical for mating disruption of the Light Brown Apple Moth (Epiphyas postvittana) (Suterra LBAM-F label)

Toxicity

As stated on Suterra MSDS Product Sheet: the toxicity of the product is determined by the toxicity of the pheromone active ingredient. The toxicity of this pheromone will be similar to the toxicity of other lepidopteran pheromones, ie:

- oral (rat), LD_{50}: >5000 mg/Kg (Suterra MSDS)
- dermal (rabbit), LD_{50}: >2000 mg/Kg (Suterra MSDS)
- acute inhalation (rat), LC_{50}: >5 mg/L (Suterra MSDS)
- primary eye irritation (rabbit): mildly irritating (Suterra MSDS)
- primary skin irritation (rabbit): moderately irritating (Suterra MSDS)

Potential Health Effects (Warnings)

- ingestion - may cause upset stomach in large doses (Suterra MSDS)
- inhalation ñ due to product form exposure not expected (Suterra MSDS)
- eye ñ may cause transient irritation (Suterra MSDS)
- skin ñ may cause transient irritation (Suterra MSDS)
- ingestion ñ may cause upset stomach in large doses (Suterra MSDS)
- chronic ñ long-term studies on the active ingredients have not been done, however, no adverse effects expected (Suterra MSDS)
- recommended exposure limits ñ none established (Suterra MSDS)
- listed as carcinogen ñ no (Suterra MSDS)
- other health effects ñ no known adverse effects expected (Suterra MSDS)
- health hazard categories ñ EPA Toxicity Category III ñ Caution (Suterra MSDS)

Ecological Toxicity

- none listed on Suterra MSDS
- Suterra product information states the following:

ENVIRONMENTAL HAZARD

For terrestrial uses: For purposes of this Section 18 use only, this product may be applied in Riparian habitats, over water that is covered or partially covered by tree canopies, or over uncovered water that is close to such water bodies. Otherwise, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters or rinsate.

(E)-11-Tetradecenyl Acetate
(E)-11-Tetradecen-1-YL Acetate (As Listed on Checkmate LBAM-F MSDS)
CAS Number - 33189-72-9

Class

- use type ñ pheromone (PAN Database)
- chem class ñ pheromone (PAN Database)

Toxicity

- no available weight-of-the-evidence summary assessment (PAN Database).

Potential Health Effects (Warnings)

- Based on low toxicity in animal testing, and expected low exposure to humans, no risk to human health is expected from the use of these pheromones. During more than 10 years of use of lepidopteran pheromones as pesticides, no adverse effects have been reported (EPA website).
- The safety record for lepidopteran pheromones has allowed the Agency to conclude that consumption of food containing residues of the pheromones presents no risk. In addition, these pheromones can be used experimentally without a permit on up to 250 acres, versus the 10-acre limit imposed on other pesticides (EPA website).
- carcinogenicity - no available weight-of-the-evidence summary assessment (PAN Database).
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database).

Ecological Toxicity

- Adverse effects on non target organisms (mammals, birds, and aquatic organisms) are not expected because these pheromones are released in very small amounts to the environment and act on a select group of insects (EPAÝ website).
- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database).

(E,E)-9,11-Tetradecadienyl Acetate

(E,E)-9,11-Tetradecadien-1-YL Acetate (As Listed on Checkmate LBAM-F MSDS)
CAS Number - 54664-98-1

Class

- use type ñ information not available
- chem class ñÝ information not available

Toxicity

- information not available

Potential Health Effects (Warnings)

- information not available

Ecological Toxicity

- information not available

Crosslinked Polyurea Polymer

(generic term - actual chemical name unknown. According to Checkmate manufacturer Suterra, polymethylene polyphenyl isocyanate is used to create the encapsulation polymer,

however they say that the PPI starter compound is used up during the reaction [Renner 12/5/07])

CAS Number ñ information not available

Crosslinked Polyurea Polymer is a component of the microcapsule shell. A DPR /OEHHA (Department of Pesticide Regulation/Office of Environmental Health Hazard Assessment) consensus document states that the polyurea shell biodegrades into urea. Research has linked urea to the occurrence of harmful algal blooms (HABís), 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 ìone of the more dramatic ones in recent memoryî, hit the Monterey Bay (Ragan 11/13/07).

Class

- use type ñ information not available
- chem class ñÝ information not available

Toxicity

- information not available

Potential Health Effects (Warnings)

- information not available

Ecological Toxicity

- A DPR /OEHHA (Department of Pesticide Regulation/Office of Environmental Health Hazard Assessment) consensus document states that the polyurea shell biodegrades into urea. A number of studies have linked urea to the occurrence of harmful algal blooms (HABís).
    - ☐ research published by scientists at San Francisco State University indicates that urea fuels the growth of potentially toxic algal blooms (SFSU 2000)
    - ☐ various studies have shown that urea increases levels of domoic acid (DA), a toxin occurring in several species of Pseudo-nitzschia algae (Cochlan et al. 2006, Howard et al. 2007)
    - ☐ Pseudo-nitzschia australis is present in the waters of the Monterey Bay (Fire & Silver 2005)
    - ☐ domoic acid has been linked to illness and mortality in a variety of species including birds, sea lions, seals, dolphins, and whales (UCSC 2001, IBRRC 2007, Cempa 2000, SFSU 2000)
    - ☐ domoic acid from Pseudo-nitzschia has also been implicated in sickness/death in humans (NWFSC website).

<u>Polymethylene Polyphenyl Isocyanate</u> (PPI)

synonym ñ polymeric MDI (PMDI)

CAS Number ñ 9016-87-9

According to a Suterra representative, PPI is used to create the encapsulation polymer but reacts into different chemicals by the time the product is ready to use. The company maintains that the PPI starter compound is used up during the reaction (Abraham 10/18/07; Renner 12/5/07). The MSDS sheet on this chemical states that ìthe product reacts with water at the interface, forming CO_2 and a solid insoluble product with high melting point (polyurea). This reaction is accelerated by surfactants (e.g. detergents) or by watersoluble solvents.î (Pagel MSDS)

Polymethylene Polyphenyl Isocyanate (PPI) is classified as harmful by inhalation, and as an irritant to the eyes, respiratory system, and skin under European classification. MSDS sheets warn against breathing the vapor or spray and caution individuals with asthma and other known respiratory problems to avoid exposure to the product. PPI is a known respiratory irritant associated with occupational asthma (Carlisle MSDS; HAZ-MAP; IRIS data sheet; Seguin et al. 1987). An EPA document from IRIS (Integrated Risk Information System) indicates that ìexposure to isocyanates is a leading cause of occupational asthma worldwideî. The document also cites a number of case reports describing occupational asthma and hypersensitivity pneumonitis, related to PMDI exposure (IRIS data sheet).

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, and lung congestion. Blurred vision, eye irritation, and skin rashes were also reported (HOPE 1/03/08).

Class

- use type ñ none listed (PAN Database)
- chem class ñ polymer (PAN Database)

European Classification

- hazard symbols ñ Xn (harmful), Xi (irritant) (EC Annex II; Gestis Database)
- risk phrases ñ R20 (harmful if inhaled), R36/37/38 (irritating to eyes, respiratory system, skin), R42/43 (inhalation/skin sensitization) (EC Annex III; Gestis Database)
- safety phrases ñ S(1/2) (keep locked up and out of reach of children), S23 (do not breathe gas/fumes/vapor/spray), S36/37 (use protective clothing and gloves), S45 (in case of accident or illness seek medical advice) (EC Annex IV; Gestis Database)

WHMIS Classification (Canada)

- D1A - very toxic material causing immediate and serious toxic effects (D1A classification applies to aerosol exposures. No LC50 values for vapor exposure were located. This chemical has a very low vapor pressure.) (CCOHS data sheet; CSST data sheet)
- D2A - very toxic material causing other toxic effects (CCOHS data sheet; CSST data sheet)
- D2B - toxic material causing other toxic effects (CCOHS data sheet; CSST data sheet)

WHMIS Health Effects Criteria Met by this Chemical (Canada)

- D1A - acute lethality - very toxic ñ immediate (CCOHS data sheet)
- D2A - chronic toxicity - very toxic ñ other (CCOHS data sheet)
- D2A - respiratory tract sensitization - very toxic ñ other (CCOHS data sheet)
- D2B - skin sensitization - toxic ñ other (CCOHS data sheet)

Toxicity

Acute toxicity - no available weight-of-the-evidence summary assessment (PAN Database).

- inhalation (rat), TC_{Lo}: 490 mg/m^3 per 4 hours (respirable aerosol) (Carlisle MSDS)
- inhalation (rat), LC_{50}: 370 mg as aerosol/m^3, 4,0 h of exposure (*Pagel Safety Data Sheet*)
- *oral* (rat), LD_{50}: >5000 mg/kg (Carlisle MSDS)
- *oral* (female rat), LD_{50}: >15000 mg/kg (*Pagel Safety Data Sheet*)

Potential Health Effects (Warnings)

- ingestion - single dose oral toxicity is considered to be extremely low. Can result in irritation and corrosive action in the mouth, stomach tissue and digestive tract (Carlisle MSDS)
- inhalation ñ irritation of upper respiratory tract and lungs, respiratory sensitization
- with asthma-like symptoms, pulmonary edema (with severe overexposure), allergic respiratory reactions; symptoms including coughing, dryness of throat, headache, nausea, breathing difficulty, tightness in the chest; impaired lung function has been associated with overexposure to isocyanates (Carlisle MSDS); persons with known respiratory or allergy problems must not be exposed to this product (Carlisle MSDS); in case of hypersensitivity of the respiratory tract (e.g. asthma, chronic bronchitis) it is inadvisable to work with the product (Mehren Kjemi MSDS); harmful by inhalation, may cause sensitization by inhalation, irritating to respiratory system (Gestis Database)
- eye ñ irritation, inflammation, damage to sensitive eye tissue; symptoms including watering or discomfort to eyes (Carlisle MSDS); irritating to eyes (Gestis Database)
- skin ñ irritation, reddening, dermatitis, sensitization (with prolonged or repeated exposure); allergic skin reactions (Carlisle MSDS); irritating to skin (Gestis Database); skin protection preparations do not protect sufficiently against the substance, isocyanates react with skin and cause contamination that is very hard to remove (Gestis Database)
- carcinogenicity ñ lung tumors observed in lab animals exposed to aerosol droplets of MDI/Polymeric MDI (6 mg/m3) for their lifetime. Tumors occurred concurrently with respiratory irritation and lung injury. (Carlisle MSDS); unclassifiable (because the data are incomplete or ambiguous) (PAN Database); Category 3 carcinogen: substances which possibly are carcinogenic for humans and thus give cause for concern (Gestis Database); classified as a Category 4 carcinogen by the German MAK-Commission: substances which are carcinogenic with no or minor genetically toxical effects (Gestis Database)
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database); classified as Pregnancy Group C, by the German MAK-Commission: there is no reason to fear risk of damage to the developing embryo or fetus when MAK or BAT values are adhered to (Gestis Database); MAK-value = 0,005 ppm EPROS Safety Data Sheet; JCP MSDS)
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database).

Ecological Toxicity

- classified as ìhazardous wasteî under the European Waste Catalogue Ordinance (AVV) (Gestis Database)
- decomposition ñ can polymerize vehemently in the warmth (Gestis Database); violent exothermic reaction, development of heat, development of hazardous gas or vapor with: water -> carbon dioxide (Gestis Database); isocyanates will react with water and generate carbon dioxide (Carlisle MSDS); hazardous decomposition products: isocyanate vapor and mist, carbon dioxide, nitrogen oxides, traces of hydrogen cyanide (Carlisle MSDS); reacts with water at the interface forming CO_2 and a solid insoluble product with a high melting point (polyurea). This reaction is accelerated by surfactants or by water soluble solvents (*Pagel Safety Data Sheet*).

- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database); may be a hazard to drinking water sources when larger quantities get into groundwater (Gestis Database)
- aquatic ecotoxicity
  - acute- fish LC_0 = > 1000 mg/l (*Pagel Safety Data Sheet*)
  - acute- bacteria EC_{50} =Ý > 100 mg/l (*Pagel Safety Data Sheet*)
  - acute- daphnia EC_{50} =Ý > 1000mg/l (*Pagel Safety Data Sheet*)

Butylated Hydroxytoluene (BHT)

synonym ñ 2,6-Di-tert-butyl-p-cresol

CAS Number ñ 128-37-0

Butylated Hydroxytoluene (BHT) is classified as irritating to the eyes, respiratory system, and skin under European classification. Allergic contact dermatitis and contact urticaria are associated with exposure to BHT (HAZ-MAP). It is currently listed as ìunclassifiableî in regard to itís carcinogenicity in humans (due to limited human test data), however a variety of in vitro and animal studies have shown it to have carcinogenic, tumorigenic, mutagenic, and teratogenic effects 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 reproductive and fetal effects (Acros MSDS).

Following the sprayings in Monterey and Santa Cruz counties, several women reported unusual menstrual symptoms including cramping, interruption of menstrual cycle, and postmenopausal recommencement of the menstrual cycle (HOPE 1/03/08). A wide variety of respiratory symptoms, as well as blurred vision and eye irritation, and skin rashes were also reported (HOPE 1/03/08).

Class

- use type ñ preservative (PAN Database)
- chem class ñ phenol (PAN Database)

European Classification

- hazard symbols ñ Xn (harmful) (EC Annex II; Chemblink data sheet)
- risk phrases ñ R22 (harmful if swallowed), R36/37/38 (irritating to eyes, respiratory system, skin) (EC Annex III; Chemblink data sheet)
- safety phrases ñS26 (in case of eye contact rinse w/ water, seek medical advice), S37/39 (use suitable gloves, eye/face protection) (EC Annex IV; Chemblink data sheet)

WHMIS Classification (Canada)

- has not yet been classified by the Service du repertoire toxicologique (Science Lab MSDS)

Toxicity

Acute toxicity ñ slight (PAN Database)

- acute oral (rat), $LD_{50:}$ 890 mg/kgÝ (Science Lab MSDS)
- acute oral (mouse), $LD_{50:}$ 650 mg/kgÝ (Science Lab MSDS)
- acute oral (guinea pig), $LD_{50:}$ 10700 mg/kgÝ (Science Lab MSDS)

Potential Health Effects (Warnings)

- ingestion ñ acute symptoms include abdominal pain, confusion, dizziness, nausea, vomiting (NIOSH - ICSC 0841)

- inhalation ñ lung and respiratory tract irritant (Science Lab MSDS); acute symptoms include cough, sore throat (NIOSH - ICSC 0841; PAN Database)
- eye ñ irritantÝ (Science Lab MSDS); redness, pain (PAN Database)
- skin ñ irritantÝ (Science Lab MSDS); contact dermatitis, contact urticaria (diseases associated with exposure to this agent) (Haz-Map.com); redness (PAN database)
- exposure limits
    - ☐ TWA: 10 (mg/m3) from OSHA (PEL) [United States] Inhalation
    - ☐ TWA: 10 (mg/m3) from ACGIH (TLV) [United States] Inhalation
    - ☐ TWA: 10 (mg/m3) from NIOSH [United States] Inhalation
- carcinogenicity ñ not classifiable for human; may cause cancer based on animal test data (Science Lab MSDS); unclassifiable (because the data are incomplete or ambiguous) (PAN Database); classified as a Category 4 carcinogen by the German MAK-Commission: substances which are carcinogenic with no or minor genetically toxical effects (Gestis Database)
- mutagenicity ñ may affect genetic material (mutagenic); mutagenic for mammalian somatic cells; mutagenic for bacteria and/or yeast (Science Lab MSDS); mutagenic effects have occurred in humans (Acros MSDS);
- teratogenicity ñ may cause adverse reproductive effects and birth defects (Science Lab MSDS)
- general ñ may be toxic to blood, liver, central nervous system (CNS). Repeated or prolonged exposure can produce target organs damage (Science Lab MSDS)
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database); classified as Pregnancy Group C, by the German MAK-Commission: there is no reason to fear risk of damage to the developing embryo or fetus when MAK or BAT values are adhered to (Gestis Database); MAK-value = 0,005 ppm EPROS Safety Data Sheet; JCP MSDS); chronic exposure may cause reproductive and fetal effects (Acros MSDS)
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database); studies have shown BHT to have estrogenic activity (Miller et al. 2001).

Ecological Toxicity

- classified as a hazardous substance on California Director's List of Hazardous Substances (Science Lab MSDS)
- classified as hazardous by OSHA (Science Lab MSDS)
- harmful to aquatic organisms (NIOSH - ICSC 0841)
- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database); may be a hazard to drinking water sources when larger quantities get into groundwater (Gestis Database)
- aquatic ecotoxicity
    - ☐ fish ñ effects noted: accumulation, growth, histology, morphology, mortalityÝ (PAN Database)
    - ☐ mollusks ñ effects noted: behavior (PAN Database)
    - ☐ zooplankton ñ effects noted: growth, intoxication (PAN Database)

Polyvinyl Alcohol (PVA)

CAS Number ñ 9002-89-5

Polyvinyl Alcohol is currently listed as ìunclassifiableî in regard to itís carcinogenicity in

humans (due to limited human test data), however animal test data has shown it to be tumorigenic (Science Lab MSDS). Inhalation or ingestion of PVA for a prolonged period of time may affect blood and metabolism, and behavior (Science Lab MSDS). Symptoms of PVA exposure include digestive tract irritation, respiratory irritation or cough, and red/irritated eyes.

Following the sprayings in Monterey and Santa Cruz counties there were numerous adverse effects reported, including nausea, diarrhea, coughing, wheezing, and eye irritation (HOPE 1/03/08).

Class

- use type ñ none listed (PAN Database)
- chem class ñ polymer (PAN Database)

European Classification

- hazard symbols ñ none listed
- risk phrases ñ none listed
- safety phrases ñS24/25 (avoid contact with skin and eyes) (EC Annex IV; Chemblink data sheet)

WHMIS Classification (Canada)

- not controlled under WHMIS (Science Lab MSDS)

Toxicity

Acute toxicity ñ not acutely toxic (PAN Database)

- acute oral (mouse), LD_{50}: 14700 mg/kg (Science Lab MSDS)
- acute oral (rat), LD_{50}: 20000 mg/kg (Science Lab MSDS)

Potential Health Effects (Warnings)

- ingestion - may cause gastrointestinal (digestive) tract irritation; may affect behavior/central nervous system (symptoms may include general depressed activity, altered sleep time, muscle weakness); may also affect blood and metabolism (Science Lab MSDS)
- inhalation ñ cough (NIOSH - ICSC 1489); respiratory tract irritation (Science Lab MSDS)
- eye ñ redness (NIOSH - ICSC 1489); irritant (Science Lab MSDS)
- skin ñ irritant (Science Lab MSDS)
- carcinogenicity - not classifiable for human (Science Lab MSDS); may cause cancer (tumorigenic) based on animal studies (Science Lab MSDS); unclassifiable (because the data are incomplete or ambiguous) (PAN Database).
- general ñ inhalation or ingestion for prolonged periods of time may affect blood and metabolism, and behavior (Science Lab MSDS); animal studies showed a drop in hemoglobin and erythrocyte number with eventual complete coagulation inhibition (with chronic exposure) (JT Baker MSDS)
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database).

Ecological Toxicity

- may be hazardous in the environment, special attention should be given to fish (NIOSH -ICSC 1489)

- ecotoxicity in water (LC_{50}):
  - bluegill -10000 mg/l 96 hours (Science Lab MSDS).
  - fathead minnow - >40000 mg/l 96 hours (Science Lab MSDS).
- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database); may be a hazard to drinking water sources when larger quantities get into groundwater (Gestis Database)
- aquatic ecotoxicity
  - fish ñ effects noted: mortalityÝ (PAN Database)

Tricapryl Methyl Ammonium Chloride

Tricaprylyl Methyl Ammonium Chloride (as reported by CDFA)
synonym ñ methyl trioctyl ammonium chloride
CAS Number - 5137-55-3
Tricapryl Methyl Ammonium Chloride is classified as irritating to the skin and risk of serious damage to eyes under European classification. Under Canadian classification it is listed as ìmaterial causing immediate and serious toxic effectsî. MSDS sheets warn that the substance is extremely hazardous in case of ingestion, inhalation, skin contact, and eye contact and that it causes severe skin and eye burns. Symptoms of inhalation exposure include irritation of the respiratory tract, burning pain in the nose and throat, coughing, wheezing, shortness of breath, and pulmonary edema. Symptoms of eye exposure include redness, watering, itching, eye burns, and possible corneal injury. Symptoms of skin exposure include inflammation characterized by itching, scaling, reddening, and occasionally blistering.

Respiratory symptoms reported following the sprayings in Monterey and Santa Cruz counties included asthma, bronchial irritation, difficulty breathing, shortness of breath, coughing and wheezing, sore throat, nasal congestion, sinus bleeding, lung soreness, lung congestion, and chest pain and tightness. Intestinal pain, diarrhea, nausea, blurred vision, eye irritation, and mild to severe skin rashes were also reported (HOPE 1/03/08).

Tricapryl Methyl Ammonium Chloride is classified as dangerous to the environment, and very toxic to aquatic organisms under European classification. European labeling warns against releasing the substance into the environment, cautioning that it may cause long-term adverse effects in the aquatic environment. Also known by the trade name Aliquat 336 (Acros MSDS; de Oliveira & Bertazzoli 2007; Sigma-Aldrich MSDS) tricapryl methyl ammonium chloride is a surfactant (de Oliveira & Bertazzoli 2007; Gyenge & Oloman 2001) which could change the surface tension of water and affect zooplankton (Abraham 10/25/07).

Following the sprayings in Monterey and Santa Cruz counties, hundreds of seabirds found dead or dying in the Monterey Bay were found to be covered with a waxy substance, which was determined by testing to be a surfactant protein. According to SIMoN (Sanctuary Integrated Monitoring Network for the Monterey Bay) surfactants act like a detergent to reduce the waterproofing ability of feathers. This same protein has also been associated with the recent red tide in the Monterey Bay (SIMoN website).
Class

- use type ñ adjuvant (used in pesticide products to increase the effectiveness of the active ingredients, make the product easier to apply, or to allow several active ingredients to mix in one solution. Solvents, emulsifiers, and spreaders fall in this category.) (PAN Database)
- chem class ñ quaternary ammonium compound (ammonium salts with four alkyl or aryl groups, typically used as microbiocides or algaecides) (PAN Database)

European Classification

- hazard symbols ñ Xn (harmful), N (dangerous for the environment) (EC Annex II; Chemblink data sheet)
- risk phrases ñ R22 (harmful if swallowed), R38 (irritating to skin), R41 (risk of serious damage to the eyes), R50/53 (very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment) (EC Annex III; Chemblink data sheet)
- safety phrases ñ S26 (in case of eye contact rinse w/ water, seek medical advice), S39 (use eye/face protection), S60 (this material and its container must be disposed of as hazardous waste), S61 (avoid release to the environment) (EC Annex IV; Chemblink data sheet)

WHMIS Classification (Canada)

- D1B: material causing immediate and serious toxic effects (TOXIC) (Science Lab MSDS)

Toxicity

- acute oral (rat), LD_{50} ñ 223 mg/kg (Science Lab MSDS)
- acute oral (mouse), LD_{50} ñ 280 mg/kgÝ (Science Lab MSDS)
- no available weight-of-the-evidence summary assessment (PAN Database)

Potential Health Effects (Warnings)

- ingestion - extremely hazardous in case of ingestion (Science Lab MSDS); harmful if swallowed; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; may cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns (Acros MSDS)
- inhalation ñ lung irritant, extremely hazardous in case of inhalation (Science Lab MSDS); may cause respiratory tract irritation; may cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema; causes chemical burns to the respiratory tract (Acros MSDS)
- eye ñ extremely hazardous in case of eye contact (Science Lab MSDS);Ý irritant, inflammation characterized by redness, watering, itching (Science Lab MSDS); risk of serious damage to eyes (Science Lab MSDS); causes severe eye burns (JT Baker MSDS); causes eye burns, may result in corneal injury (Acros MSDS)
- skin ñ irritant, extremely hazardous (corrosive, permeator); inflammation characterized by itching, scaling, reddening, occasionally blistering (Science Lab MSDS); causes severe skin burns (JT Baker MSDS); causes skin burns; may cause severe irritation and possible burns (Acros MSDS)
- carcinogenicity- no available weight-of-the-evidence summary assessment (PAN Database).
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database).

Ecological Toxicity

- classified as hazardous by OSHA (Science Lab MSDS)
- dangerous for the environment (Sigma-Aldrich MSDS)
- long term degradation products may arise, products of degradation more toxic (Science Lab MSDS)
- Hazardous decomposition products: carbon dioxide, carbon dioxide, oxides of nitrogen, hydrogen chloride gas (JT Baker MSDS)
- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database).
- aquatic ecotoxicity
    - ☐ fish ñ effects noted: mortalityÝ (PAN Database)
    - ☐ insects ñ effects noted: mortality (PAN Database)
    - ☐ phytoplankton - effects noted: growth, physiology, population (PAN Database)
    - ☐ zooplankton ñ effects noted: intoxication, mortality (PAN Database)

Sodium Phosphate

(type of sodium phosphate not specified, PAN database lists 7 compounds with sodium phosphate in the name, could be any of the following or others)
Sodium Phosphate (Disodium Phosphate): CAS Number - 7558-79-4
Sodium Acid Phosphate (Monosodium Phosphate): CAS Number ñ 7558-80-7
Trisodium Phosphate (Sodium Phosphate): CAS Number ñ 7601-54-9
Sodium Phosphate (various types) -The exact type of sodium phosphate used in the Checkmate formulas is currently unspecified, and therefore itís not possible to give a precise description of potential adverse effects. However, 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 [later 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), depending on the specific type of sodium phosphate to which an individual was exposed.

Sodium Phosphate is a pH buffer, which could lead to algal blooms if runoff concentrations are high enough (Abraham 10/25/07). Increased phosphate levels are known to be a contributing factor in the occurrence of red tides (Feyzioglu & Ogut 2006; Wikipedia).

Following the sprayings in Monterey and Santa Cruz counties, a harmful algal bloom (red tide) described by a water specialist with the Santa Cruz County Environmental Health Services as ìone of the more dramatic ones in recent memoryî, hit the Monterey Bay (Ragan 11/13/07).

Class

- use type (same for all three) ñ pH adjustment, fungicide, herbicide, microbiocide (PAN Database)
- chem class (same for all three) ñ inorganic (any chemical compound not containing hydrocarbon moieties *and* not one of the toxic metals) (PAN Database)

European Classification

- hazard symbolsÝ
  - ☐ SP: none listed
  - ☐ SAP: none listed
  - ☐ TSP: Xi (irritant) (EC Annex II; Gestis Database); C (corrosive) (EC Annex II; Chemblink data sheet)
- risk phrasesÝÝ
  - ☐ SP: none listed
  - ☐ SAP: none listed
  - ☐ TSP: R36/37/38 (irritating to eyes, respiratory system, skin) (EC Annex III; Gestis Database); R34 (causes burns) (EC Annex III; Chemblink data sheet)
- safety phrases
  - ☐ SP: none listed
  - ☐ SAP: none listed
  - ☐ TSP: S26 (in case of eye contact rinse w/ water, seek medical advice) (EC Annex IV; Gestis Database); S36/37/39 (use suitable protective clothing, gloves and eye/face protection); S45 (in case of accident or illness, seek medical advice immediately) (EC Annex IV; Chemblink data sheet)

WHMIS Classification (Canada)

- SP: not controlled under WHMIS (Science Lab MSDS)
- SAP: not controlled under WHMIS (Science Lab MSDS)
- TSP: E: corrosive material (Science Lab MSDS; CSST data sheet)

Toxicity

- SP: slight (PAN Database)
  - ☐ acute oral (rat), LD_{50}: 17000 mg/kg (Science Lab MSDS)
- SAP: no available weight-of-the-evidence summary assessment (PAN Database)
  - ☐ acute oral (rat), LD_{50}: 8290 mg/kg (Science Lab MSDS)
- TSP: no available weight-of-the-evidence summary assessment (PAN Database)
  - ☐ acute oral (rat), LD_{50}: 4150 mg/kg (Science Lab MSDS)
  - ☐ acute dermal (rabbit), LD_{50}: 300 mg/kg (Science Lab MSDS)

Potential Health Effects (Warnings)

- ingestion
  - ☐ SP: 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)

- 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 see effect is gastrointestinal irritation with abdominal pain and cramping, vomiting, diarrhea. If a significant amount of phosphate is absorbed, the following may occur: mineral imbalance in the body, adversely affecting the osmotic pressure of body fluids resulting in hyperphosphatemia, hypocalcemia, hypomagnesemia. The estimated fatal dose is 50 grams (Science Lab MSDS)
- TSP: may be harmful if swallowed. 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 oropharnyx, esophagus, or gastrointestinal tractÝ

- inhalation
  - SP: throat irritation(PAN Database)
  - SAP: none listed (PAN Database); dust may cause respiratory tract irritation and may affect respiration (Science Lab MSDS)
  - TSP: extremely hazardous in case of inhalation (lung corrosive) (Science Lab MSDS); repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage (Science Lab MSDS); may be harmful if inhaled; inhalation of dust may cause respiratory tract and mucous membrane irritation with coughing, sneezing, choking, difficulty breathing, and pulmonary edema (Science Lab MSDS); burning sensation, cough, shortness of breath, sore throat (PAN Database)
- eye
  - SP: eye contact with concentrated alkali causes conjuctival edema and cornea destruction (PAN Database)
  - SAP: none listed (PAN Database); dust may cause eye irritation (Science Lab MSDS)
  - TSP: extremely hazardous in case of eye contact (corrosive) (Science Lab MSDS); repeated exposure of the eyes to a low level of dust can produce eye irritation (Science Lab MSDS); causes eye irritation; causes immediate and severe pain followed by conjunctival edema and corneal clouding; later cataract formation may occur; may cause eye burns (Science Lab MSDS);Ý redness, pain, severe deep burns (PAN Database)
- skin
  - SP: skin and mucous membrane irritation (PAN Database); causes mild skin irritation, may cause dermatitis (Science Lab MSDS)
  - SAP: none listed (PAN Database); may cause skin irritation (Science Lab MSDS)
  - TSP: extremely hazardous in case of skin contact (corrosive) (Science Lab MSDS); repeated skin exposure can produce local skin destruction, or dermatitis (Science Lab MSDS); causes skin irritation with possible burning pain and corrosive damage. may be absorbed through the skin (Science Lab MSDS); skin burns, pain, blisters (PAN Database)

- **exposure limits**
  - SP: not available (Science Lab MSDS)
  - SAP: not available (Science Lab MSDS)
  - TSP:
    - TWA: 15 (mg/m3) from OSHA (PEL) (inhalation, total) (Science Lab MSDS)
    - TWA: 5 (mg/m3) from OSHA (PEL) (inhalation, respirable) (Science Lab MSDS)
    - TWA: 5 STEL: 5 (mg/m3) from AIHA Inhalation. Consult local authorities for acceptable exposure limits (Science Lab MSDS)
- carcinogenicity (same for all three) - no available weight-of-the-evidence summaryÝ assessment (PAN Database)
- mutagenicity ñ
  - TSP: may affect genetic material (Science Lab MSDS)
- developmental or reproductive toxin (same for all three) - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor (same for all three) - no available weight-of-the-evidence summary assessment (PAN Database)

Ecological Toxicity

- SP: classified as a hazardous substance on California Director's List of Hazardous Substances & CERCLA (Science Lab MSDS)
- SAP: none listed (Science Lab MSDS)
- TSP: classified as ìhazardous wasteî under the European Waste Catalogue Ordinance (AVV) (Gestis Database); classified as a hazardous substance on California Director's List of Hazardous Substances, CERCLA, & OSHA (Science Lab MSDS)
- ground water contaminant - no available weight-of-the-evidence summary assessment (PAN Database); may be a hazard to drinking water sources when larger quantities get into groundwater (Gestis Database)
- aquatic ecotoxicity
  - bluegill sunfish
    - TSP: LC_{50}: 220 mg/l 96 hours (Science Lab MSDS)
  - rainbow trout
    - TSP: LC_{50}: 120 mg/l 96 hours (Science Lab MSDS)
  - daphnia
    - TSP: LC_{50}: 177 mg/l50 hours (Science Lab MSDS)
  - crustaceans ñ effects noted:
    - SP: none listed (PAN Database)
    - SAP: mortality (PAN Database)
    - TSP: none listed (PAN Database)
  - fish ñ effects noted:Ý
    - SP: biochemistry, feeding behavior, growth, mortality (PAN Database)
    - SAP: biochemistry, feeding behavior, growth, mortality (PAN Database)
    - TSP: mortality (PAN Database)
  - mollusks ñ effects noted

        - SP: none listed (PAN Database)
        - SAP: development, mortality, physiology (PAN Database)
        - TSP: none listed (PAN Database)
    - phytoplankton - effects noted:
        - SP: biochemistry, population (PAN Database)
        - SAP: biochemistry, population (PAN Database)
        - TSP: biochemistry, population (PAN Database)
    - zooplankton ñ effects noted: (PAN Database)
        - SP: intoxication, mortality (PAN Database)
        - SAP: intoxication (PAN Database)
        - TSP: intoxication (PAN Database)
- increased phosphate levels are known to be a contributing factor in the occurrence of red tides (Feyzioglu & Ogut 2006; Wikipedia)

Ammonium Phosphate

(type of ammonium phosphate not specified, could be either of the following)
Monoammonium Phosphate: CAS Number ñ 7722-76-1
Diammonium Phosphate: CAS Number ñ 7783-28-0
Ammonium 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 is not listed under European classification however diammonium is classified as irritating to the eyes, respiratory system, & skin.
Symptoms of inhalation exposure include:

- monoammonium - mild respiratory tract irritation, nausea, vomiting (after inhalation of high concentrations of dust), coughing, shortness of breath
- diammonium - toxic to lungs and mucous membranes; irritation to the respiratory tract, coughing, shortness of breath

Symptoms of eye exposure include:

- monoammonium - mild irritation, redness, pain
- diammonium - inflammation characterized by redness, watering, itching, pain

Symptoms of skin exposure include:

- monoammonium - irritation, redness, itching, pain
- diammonium - hazardous in case of skin contact; irritation, redness, itching, and pain

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 1/03/08).

Ammonium Phosphate is a pH buffer, which could lead to algal blooms if runoff concentrations are high enough (Abraham 10/25/07). Increased phosphate levels are known to be a contributing factor in the occurrence of red tides (Feyzioglu & Ogut 2006; Wikipedia). Ammonium phosphate has also been implicated in fish die-offs, including one that killed 20,000 fish following the accidental dropping of an ammonium phosphate based fire retardant in an Oregon river (Barnard 2007).

Following the sprayings in Monterey and Santa Cruz counties, a harmful algal bloom (red

tide) described by a water specialist with the Santa Cruz County Environmental Health Services as ìone of the more dramatic ones in recent memoryî, hit the Monterey Bay (Ragan 11/13/07).Ý

Class

- use type ñ
  - Mono: not listed (PAN Database)
  - Di: fungicide, herbicide, insecticide, microbiocide, pH adjustment (PAN Database)
- chem class ñ
  - Mono: inorganic (any chemical compound not containing hydrocarbon moieties *and* not one of the toxic metals) (PAN Database)
  - Di: inorganic (any chemical compound not containing hydrocarbon moieties *and* not one of the toxic metals) (PAN Database)

European Classification

- hazard symbolsÝ
  - Mono:Ý none listed (EC Annex II; Chemblink data sheet)
  - Di: : Xi (irritant) (EC Annex II; Chemblink data sheet)
- risk phrases
  - Mono: none listed (EC Annex III; Chemblink data sheet)
  - Di: R36/37/38 (irritating to eyes, respiratory system and skin) (EC Annex III; Chemblink data sheet)
- safety phrases
  - Mono: S24/25 (avoid contact with skin and eyes) (EC Annex IV; Chemblink data sheet)
  - Di: S26 (in case of eye contact rinse w/ water, seek medical advice), S36 (use suitable protective clothing) (EC Annex IV; Chemblink data sheet)

WHMIS Classification (Canada)

- Mono: not controlled under WHMIS (Science Lab MSDS)
- Di: D2A: material causing other toxic effects (VERY TOXIC) (Science Lab MSDS)

Toxicity

Acute toxicity ñ

- Mono: no available weight-of-the-evidence summary assessment (PAN Database)
- Di: no available weight-of-the-evidence summary assessment (PAN Database)

Acute oral toxicity LD_{50}

- Mono: not available (Science Lab MSDS)
- Di: acute oral (rat), LD_{50} ñ 3000 mg/kg (Science Lab MSDS)

Potential Health Effects (Warnings)

- ingestion
  - Mono: may cause gastrointestinal tract irritation with abdominal cramps, nausea, vomiting and diarrhea if large amounts are ingested (Science Lab MSDS)
  - Di: hazardous in case of ingestion (Science Lab MSDS); causes irritation to the gastrointestinal tract; symptoms may include nausea, vomiting and diarrhea (Vinquiry MSDS)
- Inhalation

- Mono: mild respiratory tract irritation (irritation of the mucosa of nose andthroat), nausea, vomiting (after inhalation of high concentrations of dust) (Science Lab MSDS); causes irritation to the respiratory tract, symptoms may include coughing, shortness of breath (JT Baker MSDS)
- Di: toxic to lungs, mucous membranes (Science Lab MSDS); causes irritation to the respiratory tract; symptoms may include coughing, shortness of breath (Vinquiry MSDS)

- eye
  - Mono: mild eye irritation (Science Lab MSDS); causes irritation, redness, and pain (JT Baker MSDS)
  - Di: very hazardous in case of eye contact (irritant); inflammation of the eye is characterized by redness, watering, and itching. (Science Lab MSDS); DSCL (EEC), R41 ñ risk of serious damage to eyes (Science Lab MSDS); redness, pain (NIOSH - ICSC 0217; PAN Database); causes irritation, redness, and pain (Vinquiry MSDS)
- skin
  - Mono: skin irritation (Science Lab MSDS); causes irritation to skin, symptoms include redness, itching and pain (JT Baker MSDS)
  - Di: hazardous in case of skin contact (irritant); permeator (Science Lab MSDS); causes irritation to skin; symptoms include redness, itching, and pain (Vinquiry MSDS)
- carcinogenicity (same for both) - no available weight-of-the-evidence summary assessment (PAN Database).
- developmental or reproductive toxin (same for both) - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor (same for both) - no available weight-of-the-evidence summary assessment (PAN Database).
- general
  - Di: repeated or prolonged exposure can produce target organ damage (Science Lab MSDS); cause damage to lungs, mucous membranes (Science Lab MSDS)
  - Di: a nuisance causing concentration of airborne particles can be quickly reached when dispersed, especially if powdered (NIOSH - ICSC 0217)

Ecological Toxicity

- Mono: classified as hazardous by OSHA (Science Lab MSDS)
- Di: classified as hazardous by OSHA; long term degradation products may arise, products of degradation more toxic (Science Lab MSDS)
- aquatic ecotoxocity:
  - Mono:
    - none listed (PAN Database)
  - Di:
    - fish ñ effects noted: biochemistry, cells, enzymes, feeding behavior, mortality (PAN Database)
- ground water contaminant (same for both) - no available weight-of-the-evidence summary assessment (PAN Database); may be a hazard to drinking water sources when larger quantities get into groundwater (Gestis Database)

1,2-benzisothiazolin-3-one

1,2-benzisothiozoli-3-one (as reported by CDFA)
synonym ñ BIT (trade name)
CAS Number -2634-33-5

1,2-benzisothiazolin-3-one is a preservative associated with occupational asthma. Multiple accounts of occupational dermatitis have also been reported with exposure to the chemical. Under European classification it is classified as irritating to the skin and risk of serious eye damage. Canadian classification lists it as causing skin sensitization in humans. BIT is a known irritant at the 1% level, and studies have confirmed the irritant effect even down to the 0.1% level. Individuals with chronic pulmonary or asthmatic conditions or chronic skin conditions are warned to avoid repetitive exposure to the chemical. According to data compiled by OSHA it has been shown to cause genetic damage in human cells. Symptoms of exposure include respiratory tract and mucous membrane irritation, severe eye irritation, skin irritation, and dermatitis.

Following the sprayings in Monterey and Santa Cruz counties a wide variety of mild to serious respiratory symptoms, as well as eye irritation and skin rashes were reported (HOPE 1/03/08).

1,2-benzisothiazolin-3-one is classified as dangerous to the environment and very toxic to aquatic organisms under European classification. European labeling warns against releasing the substance into the environment. It is classified as ìhazardous wasteî under the European Waste Catalogue Ordinance. It is classified as a ìhazard to watersî under the European Administrative Regulation of Substances Hazardous to Water, and MSDS sheets for the chemical warn that water polluted with the substance should not be discharged into sewage or natural areas. EPA documents on the chemical 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 & 9th were followed by a significant rainfall event on November 10th & 11th (Weather Underground website).

Class

- use type ñ microbiocide (kills microbes such as bacteria, viruses, and fungi and used in disinfectant or antibacterial products) (PAN Database)
- chem class ñ isothiazolone (PAN Database)

European Classification

- hazard symbols ñ Xn (harmful), Xi (irritant), N (dangerous for the environment) (EC Annex II; Gestis Database)
- risk phrases ñ R22 (harmful if swallowed), R38 (irritating to skin), R41 (risk of serious eye damage), R43 (skin sensitization), R50 (very toxic to aquatic organisms) (EC Annex III; Gestis Database)
- safety phrases ñ S(2) (keep out of reach of children), S24 (avoid skin contact), S26 (in case of eye contact rinse w/ water, seek medical advice), S37/39 (use gloves, eye, face protection), S61 (avoid release into the environment) (EC Annex IV; Gestis Database)

WHMIS Classification (Canada)

- D2B: toxic material causing other toxic effects - skin sensitization in humans (CSST data sheet)

Toxicity

Acute toxicity - no available weight-of-the-evidence summary assessment (PAN Database).

- acute oral (male rat), LD_{50}: 2.1 mg/kg w/ 95% confidence limits of 5.029 mg/kg (upper) and 877 mg/kg (lower) (SCCNFP 2004)

- acute dermal (rat), LD_{50}: > 5000 mg/kg (SCCNFP 2004)

- acute inhalation: no data (SCCNFP 2004)
- repeated dose oral (rat): NOAEL = 15 mg/kg/day bw (12.63 mg a.i./kg/day) (SCCNFP 2004)
- repeated dose dermal: no data (SCCNFP 2004)
- repeated dose inhalation: no data (SCCNFP 2004)
- sub-chronic oral (rat): NOAEL = 10 mg/kg/day bw (8.42 mg a.i./kg/day) (SCCNFP 2004)
- sub-chronic dermal: no data (SCCNFP 2004)
- sub-chronic inhalation: no data (SCCNFP 2004)
- chronic toxicity: no data (SCCNFP 2004)
- skin irritation (rabbit): well-defined moderate erythema and edema noted at all treated sites. Conclusion: moderately skin irritating (SCCNFP 2004)
- mucous membrane irritation (rabbit) : all treated eyes exhibited severe to maximal irritation including corneal opacity, iritis and conjunctivitis. Overall severity of irritation increased with time. Due to irreversible nature of the irritation, test was terminated after 48 hrs. Conclusion: severely irritating to the rabbit eye (SCCNFP 2004)
- cytotoxicity (mammalian cell lines): BIT (benzisothiazolinone) is less cytotoxic than CIT/MIT (chloromethylisothiazolinone/methylisothiazolinone), but more cytotoxic than other commonly used preservatives (parabens etc.) (SCCNFP 2004)
- dermal sensitization (guinea pigs): BIT is a moderate contact sensitizer (SCCNFP 2004)
- mutagenicity/genotoxicity in vitro(bacterial reverse mutation assay):
  - toxicity ñ in a preliminary study with a series of concentrations up to 5000 µg/plate, there was a decrease in the mean number of revertants from the concentrations up to 160 µg/plate(SCCNFP 2004)
  - this study could not be used for evaluation due to the high toxicity of the test item towards the bacterial cells (SCCNFP 2004)
- mutagenicity/genotoxicity in vitro (mammalian cell gene mutation test):
  - toxicity - in the presence of metabolic activation a toxic effect produced by the test item between 4 and 6 µg/ml was observed; in the absence of metabolic activation a toxic effect produced by the test item was observed between 2 and 4 µg/ml. The toxic doses reduced the survival to less than 50% of the untreated cells (SCCNFP 2004)
- mutagenicity/genotoxicity in vitro (mammalian chromosome aberration test):
  - toxicity ñ the test item was toxic at concentrations between 75 and 5000 µg/ml and between 14 and 58.94 µg/ml (SCCNFP 2004)

- clastogenicity ñ the test item induced chromosome aberrations at the maximum tested dose in the presence of a metabolic activation, and at all concentrations in the absence of a metabolic activation system. The test item is clastogenic on CHO mammalian cells. (SCCNFP 2004)

- mutagenicity/genotoxicity in vivo (mammalian erythrocyte micronucleus test):
  - toxicity ñ a 250 mg/kg dose was found not toxic, while 450 and 900 mg/kg doses were toxic (SCCNFP 2004)
  - clastogenicity ñ the test item is not clastogenic in mice treated in vivo (SCCNFP 2004)

- mutagenicity/genotoxicity in vivo (unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo):
  - toxicity ñ doses of 1200 and 100 mg a.i./kg bw were found toxic to the animals (SCCNFP 2004)
  - DNA repair ñ the test item did not induce UDS in rat hepatocytes in in vivo treatment (SCCNFP 2004)

Potential Health Effects (Warnings)

- ingestion ñ harmful if swallowed (Gestis Database; Sigma-Aldrich MSDS)
- inhalation ñ none listed (PAN Database); occupational asthma reported (Moscato et al.1997); people with chronic pulmonary or asthmatic conditions should be prevented from repetitive exposure to the chemical (INRS 2002); may be harmful if inhaled; material may be irritating to mucous membranes and upper respiratory tract (Sigma-Aldrich MSDS)
- eye ñ none listed (PAN Database); risk of serious damage to eyes (Gestis Database); causes severe eye irritation (Sigma-Aldrich MSDS)
- skin ñ multiple accounts of occupational allergic contact dermatitis reported (Damstra et al. 1992; Muhn & Sasseville 2003; Roberts et al. 1981; Taran & Delaney 1997; etc.). BIT (synonym for 1,2-benzisothiazolin-3-one) is a known irritant at the 1% level, and test results confirm the irritation reaction all the way down to the 0.1% level (Chew & Maibach 1997; Muhn & Sasseville 2003); irritating to skin (Gestis Database); may cause sensitization by skin contact (Gestis Database); people with chronic skin conditions should be prevented from repetitive exposure to the chemical (INRS 2002); skin patch tests confirm a cause/effect link between exposure to the chemical and contact dermatitis (eczema) (INRS 2002); causes skin irritation (Sigma-Aldrich MSDS); may be harmful if absorbed through the skin (Sigma-Aldrich MSDS); may cause allergic skin reaction (Sigma-Aldrich MSDS)
- carcinogenicity - no available weight-of-the-evidence summary assessment (PAN Database)
- genotoxicity ñ shown to cause genetic damage in human cells, according to data compiled by OSHA (Cox 2005); see toxicity section above for specific studies
- mutagenicity ñ see toxicity section above for specific studies
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database).

Ecological Toxicity

- classified as ìdangerous for the environmentî under European labeling (Gestis Database)
- classified as ìhazardous wasteî under the European Waste Catalogue Ordinance (AVV) (Gestis Database)
- may be a hazard to the surrounding atmosphere at larger quantities (Gestis Database)
- ground water contaminantÝ - no available weight-of-the-evidence summary assessment (PAN Database); avoid escape into water, drainage, sewer, or ground (Gestis Database); hazard for drinking water sources when larger quantities get into groundwater (Gestis Database); water polluted with this chemical should not be discharged into sewage or natural areas (INRS 2002); classified as WGK 2 ìhazard to watersî under the European Administrative Regulation of Substances Hazardous to Water (VwVwS) (Gestis Database)
- aquatic ecotoxicity
    - very toxic to aquatic organisms (Gestis Database)
    - fish ñ effects noted: mortality (PAN Database)
    - mollusks ñ effects noted: intoxication (PAN Database)
    - zooplankton ñ effects noted: intoxication, mortality, reproduction (PAN Database)
- BIT is known to have strong antimicrobial activity even at low concentrations (Muhn & Sasseville 2003).
- according to the EPA reregistration document for this chemical:
    - the high toxicity of BIT to green algae and invertebrate species suggests that potential adverse acute effects could occur to some species if environmental contamination from BIT-treated oil recovery fluids occurs (EPA 2005)
    - birds & mammals ñ low to moderate toxicity (EPA 2005)
    - freshwater fish & invertebrates ñ moderate toxicity (EPA 2005)
    - marine/estuarine fish ñ slight toxicity (EPA 2005)
    - marine/estuarine invertebrates ñ high toxicity (EPA 2005)
    - if used outdoors, BIT may possibly move with soil during rainfall events and potentially reach surface waters (EPA 2005)

2-hydroxy-4-n-octyl benzophenone

2-hydroxy-4-n-octyloxybenzophenone (as reported by CDFA)
synonym ñ benzophenone 12
CAS Number ñ 1843-05-6
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). Under European classification it is classified as irritant, as may cause sensitization by skin contact, and as irritating to 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.

Following the sprayings in Monterey and Santa Cruz counties, several women reported unusual menstrual symptoms including cramping, interruption of menstrual cycle, and

postmenopausal recommencement of the menstrual cycle (HOPE 1/03/08), which would be consistent with exposure to endocrine disrupting/estrogenic compounds. A wide variety of mild to serious respiratory symptoms, as well as eye irritation and skin rashes were also reported.

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

Class

- use type ñ not listed (PAN Database); polymer stabilizer (Chemtura MSDS); light absorber (Cytec MSDS)
- chem class ñ unclassified (PAN Database)

European Classification

- hazard symbols ñ Xi (irritant) (EC Annex II; Great Lakes safety data sheet; Chemblink data sheet)
- risk phrases ñ R-43 (may cause sensitization by skin contact), R-52/53 harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment (EC Annex III; Great Lakes safety data sheet); R36/37/38 (irritating to eyes, respiratory system and skin) (EC Annex III; Chemblink data sheet)
- safety phrases ñ S24 (avoid skin contact), S61 (avoid release into the environment) (EC Annex IV; Great Lakes safety data sheet); S26 (in case of eye contact rinse w/ water, seek medical advice), S36 (use suitable protective clothing) (EC Annex IV; Chemblink data sheet)

Canadian WHMIS Classification

- D2B (toxic materials) (Ferro MSDS)

Toxicity

Acute toxicity - no available weight-of-the-evidence summary assessment (PAN Database).

- acute oral (rat), LD_{50}: > 10.0 g/kg (Cytec MSDS)
- acute dermal (rabbit), LD_{50}: > 10.0 g/kg (Cytec MSDS)
- 4-hour LC_{50} value (rat): estimated to be greater than 20 mg/L (Cytec MSDS)

Mammalian toxicity

- acute toxicity
  - ratsÝ > 10 g/kg (Cytec/Ciba 2001)
- repeated dose toxicity
  - rat 90-day dietary: NOEL = 0.6% (6000 ppm) (Cytec/Ciba 2001)
  - dog 120-day dietary: NOEL = 0.6% (6000 ppm) (Cytec/Ciba 2001)
  - rat 90-day dietary: NOEL = 0.15% (1500 ppm) (Cytec/Ciba 2001)
  - rats 90-day dietary: NOEL = 1000 ppm (Cytec/Ciba 2001)
- reproductive/developmental toxicity
  - rats NOEL = 0.6% (6000 ppm) for 4 successive generations (Cytec/Ciba 2001)
- skin sensitization (guinea pigs) - strong sensitizer in maximization test, with 60-78% positive for animals sensitized (NPA MSDS)

Potential Health Effects (Warnings)

- ingestion - may irritate digestive tract (Ferro MSDS)

- inhalation - over-exposure by inhalation may cause respiratory irritation (Ferro MSDS); mucous membrane and upper respiratory tract irritation (Chemtura MSDS)
- eye ñ none listed (PAN Database); may cause slight irritation (Ferro MSDS); reddening and irritation to eyes; may cause allergic skin reaction (Chemtura MSDS)
- skin - none listed (PAN Database); may cause sensitization by skin contact (Great Lakes safety data sheet); prolonged skin contact may cause skin irritation and/or dermatitis, may cause allergic skin reaction (Ferro MSDS); reddening and irritation to skin (Chemtura MSDS)
- exposure limits
  - TWA: 15 (mg/m3) from OSHA (PEL) (Chemtura MSDS)
  - TWA: 10 (mg/m3) from ACGIH (TLV) (Chemtura MSDS)
- **respirable dust level**
  - 5 mg/m3 (OSHA) (Chemtura MSDS)
  - 3 mg/m3 (ACGIH) (Chemtura MSDS)
- carcinogenicity - no available weight-of-the-evidence summary assessment (PAN Database).
- developmental or reproductive toxin - no available weight-of-the-evidence summary assessment (PAN Database).
- endocrine disruptor - no available weight-of-the-evidence summary assessment (PAN Database); compounds in the benzophenone family have been shown to form estrogenic photoproducts, upon exposure to UV or sunlight (Hayashi et al. 2006)
- chronic toxicity - kidney injury may occur (Ferro MSDS)

Ecological Toxicity

- classified as hazardous by OSHA (NPA MSDS)
- harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment (Great Lakes safety data sheet);
- not readily biodegradable (Great Lakes safety data sheet)
- ground water contaminantÝ - no available weight-of-the-evidence summary assessment (PAN Database)
- aquatic ecotoxicity
  - zebra fish ñ LC_{50} (96 h) > 100mg/L (Cytec/Ciba 2001)
  - green algae ñ EC_{50} (0-72 h) > 100 mg/L (Cytec/Ciba 2001)
  - Daphne magna
    - EC_0 (24 h) > 10 mg/L (Cytec/Ciba 2001)
    - EC_{50} (24 h) > 52 mg/L (Cytec/Ciba 2001)
  - Scenedesmus subspicatus - EC_{50} (72 Hr) >100 mg/L (*Ferro MSDS*)
  - Brachydanio rerio - LC_{50} (96 Hr) >100 mg/L (*Ferro MSDS*)

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NTEU CHAPTER 280 - U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL HEADQUARTERS
BEN FRANKLIN STATION, BOX 7672, WASHINGTON D.C. 20044 - PHONE 202-566-2788
INTERNET http://www.nteu280.org **E MAIL** Hirzy.John@epa.gov

WHY WE NEED A CODE OF PROFESSIONAL ETHICS

www.nteu280.org/Issues/NTEU-%20Professional%20Ethics.htm

This document is intended to explain why a code of professional ethics is needed in the EPA workplace.

8/25/99

Management Practices and Workplace Conditions of Concern Because They Create Pressure To Violate the Code of Ethics For Professionals at EPA

There are current management practices and workplace conditions at EPA condoned by some elements of management which place strong pressure on EPA professionals to violate ethical principles and practices. Several examples follow:

1. Fear by some EPA managers of political retribution from economically powerful industries that are doing things harmful to the environment is one negative condition we as professionals must deal with at EPA. Some managers fear being punished if they tell the truth and/or "do the right thing" with regard to controlling the environmental problem which that particular industry is causing. This is especially problematic when the fearful manager is at the top of an organization's chain of command. The fearful manager "chickens out," because its easier to deal with the dismay and anger of the professionals that work for him or her than to deal with the dismay and anger of higher echelon managers or of an industry with lots of money to contribute to the re-election campaigns of members of Congress and with plenty of access to those members and their staffs, and with the certainty of a sympathetic hearing.

2. It is this condition - political pressure down the chain of command - that is the source of the problem for most unethical behavior by professionals at EPA: Frightened managers pressure professionals to write assessments and analyses that appear to justify a control action which is well less than that which the real risks and real costs suggest are actually warranted.

3. There is a lack of a management process for dealing with a conflict between a professionals's analysis of an issue and Agency policy on that issue. This is a problem: 1) when facts elicited in an analysis do not support the Agency policy and the analysis is then ignored, altered or otherwise subverted by management; or 2)when the professional refuses to remain silent on the issue, and is then subjected to disciplinary sanctions.

4. Tracking and assessment of professional performance should be based on the number of assessments or analyses prepared and their quality, as judged in light of applicable professional standards, and not exclusively on the number of assessments or analyses that

produced a certain prescribed result. (E.g., the performance standard should not be "number of new pesticides registered" but "number of proposed new pesticides assessed.")

5. When work is initially assigned to a professional, the assignment must be made in such a way that it is clear that the work product is to be a complete, unconstrained analysis or assessment of the matter at issue.

6. The amount of work time and calendar time allotted to the professional assigned to do the work by the manager assigning the work must be appropriate to the importance of the results. Consideration must be given to the health and environmental risks involved, control and other costs, the complexity of the subject matter, the size of the relevant literature, and the number of experts on that subject within and outside EPA who must be consulted for a complete and balanced work product to be produced.

7. As civil servants serving the public interest, U.S. Environmental Protection Agency employees are entrusted with the responsibility of acting conscientiously to fulfill EPA's assigned mission to protect human health and the environment:

o Those in our trust include:
– The American public, including dependent minors and others not yet of voting age
– Other people throughout the world who are affected by the actions of Americans both here and abroad
– Future generations
– Other living things
– The Earth itself and its ability to sustain life.

o Those affected by our actions also include:
– Those who release pollutants into our environment
– Producers and users of toxic substances
– Those who generate, transport and dispose of hazardous wastes and other wastes and discards.

Those in this latter group are members of the "regulated community"; they are ***not*** our "customers". They are those whose behavior we must monitor, assess and enforce against environmental standards and the law.

We accept the usefulness of obtaining feedback from those in the first group regarding their satisfaction with our performance. Although some in the latter group appreciate our efforts and do their best to cooperate, many others do not. We reject the validity of assessing how "satisfied" those in the latter group are with our performance.
Every person we deal with, including those in the "the regulated community", deserve to be treated with dignity and respect. But they also need to be handled with candor as to the seriousness of any violations and their impact on the public interest. They need to be handled with firmness when they violate the law.

8. In working to fulfill its mission, EPA managers and staff rarely interact directly with the general public or with regulated firms. Instead, for most programs, EPA managers and staff work with and through State and local agencies. While in some cases the relationship

between EPA and the State or Local agency is one of true partnership, more often it is not. Further, with the current focus within EPA on identifying customers and getting customer feedback, there is also a tendency to view State and local environmental agencies as our

"customers." Neither is an accurate description of the nature of the relationship in most cases. Treating State and local environmental agencies and officials as "customers" is therefore inappropriate. They are not our customers; they are at best our partners, but more often they are an additional class of entities and individuals that we - to all intents and purposes - regulate.

(6)

Lepidopteran Pheromones: Tolerance Exemption

www.epa.gov/fedrgstr/EPA-PEST/1995/August/Day-30/pr-388.html 10-30-07

[Federal Register: August 30, 1995 (Volume 60, Number 168)]
[Rules and Regulations]
[Page 45060-45062]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr30au95-14]

ENVIRONMENTAL PROTECTION AGENCY
[OPP-300396; FRL-4971-8]
40 CFR Part 180

Lepidopteran Pheromones: Tolerance Exemption

AGENCY: Environmental Protection Agency (EPA).
ACTION: Final rule.

SUMMARY: This document establishes an exemption from the requirement of a food tolerance for residues of certain Lepidopteran pheromones resulting from the use of these substances independent of formulation, mode of application or physical form or shape with an annual application limitation of 150 grams active ingredient per acre (gm AI/acre) for pest control in or on all raw agricultural commodities. This exemption pertains only to the pheromone active ingredient. Any encapsulating material needs to be a cleared inert for pesticidal uses on food crops.1 EPA is establishing this regulation on its own initiative.

EFFECTIVE DATE: This regulation becomes effective August 30, 1995.

ADDRESSES: Written objections and hearing requests, identified by the docket control number, OPP-300396, may be submitted to: Hearing Clerk (1900), Environmental Protection Agency, Rm. M3708, 401 M St., SW., Washington, DC 20460. A copy of any objections and hearing requests filed with the Hearing Clerk should be identified by the docket control number and submitted to: Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs, Environmental Protection Agency, 401 M St., SW., Washington, DC 20460. In person, bring a copy of objections and hearing requests to: Public Docket, Rm. 1132, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA.

A copy of objections and hearing requests filed with the Hearing Clerk may also be submitted electronically by sending electronic mail (e-mail) to: opp-docket@epamail.epa.gov. Copies of objections and hearing requests must be submitted as an ASCII file avoiding the use of special characters and any form of encryption. Copies of objections and hearing requests will also be accepted on disks in WordPerfect in 5.1 file format or ASCII file format. All copies of objections and hearing requests in electronic form must be identified by the docket number ``OPP-300396.'' No Confidential Business Information (CBI) should be submitted through e-mail. Electronic copies of objections and hearing requests on this rule may be filed online at many Federal Depository Libraries. Additional information on electronic submissions can be found in Unit IV. of this document.

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FOR FURTHER INFORMATION CONTACT: By mail: Phil Hutton, Product Manager (PM-90), Biopesticides and Pollution Prevention Division (7501W), Office of Pesticide Programs, Environmental Protection Agency, 401 M St., SW., Washington, DC 20460. Office location, telephone number, and e-mail address: 5th Floor, Crystal Station 1, 2805 Crystal Drive, Arlington, VA, (703) 308-8260, e-mail: hutton.phil@epamail.epa.gov.

SUPPLEMENTARY INFORMATION: In the Federal Register of March 29, 1995 (60 FR 16128), EPA issued a notice of filings and invited comments on a pesticide petition to propose amending 40 CFR part 180 by establishing an exemption from the requirement of a food tolerance for certain Lepidopteran pheromones regardless of mode of application when used at rates less than or equal to 150 grams ai/acre/year. The Agency received no comments in response to its notice. In this document, EPA sets forth its reasons for determining that a tolerance for these pheromone products is not necessary to protect public health.

For the purposes of this exemption, a Lepidopteran pheromone is defined as a naturally occurring compound, or identical or substantially similar synthetic compound, designated by the unbranched aliphatics (with a chain between 9 and 18 carbons) ending in an alcohol, aldehyde or acetate functional group and containing up to 3 double bonds in the aliphatic backbone. This definition encompasses the majority of Lepidopteran pheromones. While other types of chemical compounds have been demonstrated to be Lepidopteran pheromones and other arthropod pheromones have been recommended for tolerance exemptions, there is limitied toxicity data and exposure information available. The Agency believes the type described here represents not only the majority of Lepidopteran pheromones but also those with the most complete toxicological data base. Synthetically produced compounds that are identical to a known aliphatic Lepidopteran pheromone as described above, and those that differ only in that their molecular structures are stereochemical isomers (or ratios of such isomers) are also included in this tolerance exemption. Other Lepidopteran pheromones and other pheromones not included within the described scope will still require mammalian toxicity testing (40 CFR 158.690) if used on food crops and are not otherwise exempt from the requirement of a tolerance.

I. Background

A pheromone (including an identical synthetic compound) is defined by EPA as a compound produced by an arthropod (insect, arachnid, or crustacean) that modifies the behavior of other individuals of the same species (40 CFR 152.25(b)). Lepidopteran pheromones are those produced by a member of the order Lepidoptera, which includes butterflies and moths. One physical-chemical feature common to all these compounds is their volatility which is the basis for the signalling and homing mechanism. The Agency has registered 17 arthropod pheromones active ingredients, 11 of which are Lepidopteran pheromones.

The Agency has assumed that pheromones and other similar semiochemicals are different from conventional synthetic pesticides, and has attempted to facilitate their registration with reduced data requirements and regulatory relief efforts. Most recently the Agency has recognized that a special category of pheromone products dispensed from larger sized polymeric matrices with low annual use rates represent minimal risk for dietary and environmental exposure and has greatly eased the burden to register these items. Broadcast methods of application were not included because the Agency did not have sufficient information on the levels of exposure from pheromones applied in this manner. The Agency has since received data in this area. In addition to submitted data, the Agency utilized in its decision an internal document of the toxicology of certain Lepidopteran pheromones related by their chemical structure.

For pheromone products, especially those directly applied to food,

one problem has been a lack of subchronic toxicity studies and an estimate of the actual pheromone residues occurring with use. Some pheromone uses in solid matrix dispensers have been registered based on the low probability of exposure justifying the waiver of the subchronic toxicity studies, namely the 90-day feeding, the developmental toxicity and immunotoxicity studies. However, the Agency has held that sprayable formulations or other modes of application that may increase the likelihood of human exposure would still require the subchronic toxicology studies.

II. Human Health

Data has been submitted on subchronic toxicology studies done to date on compounds similar in structure to the Lepidopteran pheromones and published in the peer reviewed, public literature. The information submitted covered compounds that were from six to sixteen carbon unbranched alcohols, acetates and aldehydes. Since the Agency is basing this tolerance exemption on chemical structure, it is relevant to consider the available subchronic toxicology data for this group. The results given in these literature reports indicate that there is no significant acute toxicity associated with the primary alcohols, acetates or aldehydes mentioned (C_8 to C_{16} unbranched aliphatics). In addition, the subchronic toxicity of an isomeric mixture of tridecenyl acetate indicated no significant signs of toxicity other than those expected with longer term exposure to high doses of a hydrocarbon. The findings of the published studies indicate that there were no significant health effects from subchronic exposures to this group of chemicals.

Studies examining the volatilization of a pheromone from a microcapsule indicates that about 70 percent of the pheromone remains after 30 days. These results indicate the pheromone is released at a slower rate than anticipated. The studies show that only a small proportion of the microcapsules actually release any pheromone or only a portion of the total pheromone loaded into the capsule is capable of ever being released. These laboratory studies indicate a potential for pheromone residues to occur in the absence of any biological or environmental factors.

In a submitted field study, however, residue analyses from field treated plants indicate no significant amounts of pheromone can be detected on the resulting fruit. The detectable residues on unwashed fruit of tomato pinworm pheromone ranged from 21-72 ppb on the day of application, decreased to 0.9-6.8 ppb on day 15, and was recorded at 0.29-1.2 ppb on day 30. Washing the tomatoes brought all the residues below the level of detection. This study demonstrates that the expected pheromone residue levels found in tomato fruit are several orders of magnitude lower than previously calculated estimates. The process of application, weathering, and other environmental degradation leads to a reduction in the active ingredient that approaches the system limit of detection in the expected 3-week lifetime of the raw agricultural product.

III. Conclusion

The Agency believes that the potential for pheromone residues is not a dietary hazard. This conclusion is based on: (1) The low acute toxicity seen in the data

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review of the Lepidopteran pheromones registered to date; (2) the known metabolism of long-chain fatty acids that predicts these compounds would be metabolized either by -oxidation yielding a series of paired carbon losses or by complexing with glucuronide and excretion by the kidneys; and (3) low exposure subsequent to application from product aging, volatilization, and the results of the field residue studies.

EPA has determined that, when used in accordance with good agricultural practices, a food tolerance for the defined subset of Lepidopteran pheromones is not necessary to protect the public health. A generic exemption for this low-risk, low-exposure group of substances will facilitate the use of semiochemicals as alternatives to conventional synthetic pesticides. Therefore, EPA is establishing an exemption from the requirement of a tolerance as set forth below for the defined group of compounds with from 9 to 18 carbon atoms, regardless of formulation or mode of application, at use rates of less than 150 grams active ingredient/acre/year. It is important to note that any encapsulating material needs to be a cleared inert for pesticidal uses on food crops. To the extent that other straight chained, or non-straight chained chemicals within this group may be naturally occurring and sufficiently similar to these Lepidopteran compounds in use, they may also meet the exemption from the requirement for a food tolerance upon review by the Agency.

Any person adversely affected by this regulation may, within 30 days, file written objections and/or request a hearing with the Hearing Clerk and a copy submitted to the OPP docket for this rulemaking at the addresses given above.

IV. Rulemaking Record

A record has been established for this rulemaking under docket number ``OPP-300396'' (including objections and hearing requests submitted electronically as described below). A public version of this record, including printed, paper versions of electronic comments, which does not include any information claimed as CBI, is available for inspection from 8 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The public record is located in Room 1132 of the Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs, Environmental Protection Agency, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA.

Written objections and hearing requests, identified by the document control number ``OPP-300396'', may be submitted to the Hearing Clerk (1900), Environmental Protection Agency, Rm. 3708, 401 M St., SW., Washington, DC 20460.

A copy of electronic objections and hearing requests filed with the Hearing Clerk can be sent directly to EPA at:

opp-docket@epamail.epa.gov

A copy of electronic objections and hearing requests filed with the Hearing Clerk must be submitted as an ASCII file avoiding the use of special characters and any form of encryption.

The official record for this rulemaking, as well as the public version, as described above will be kept in paper form. Accordingly, EPA will transfer any objections and hearing requests received electronically into printed, paper form as they are received and will place the paper copies in the official rulemaking record which will also include all objections and hearing requests submitted directly in writing. The official rulemaking record is the paper record maintained at the address in ``ADDRESSES'' at the beginning of this document.

V. Regulatory Assessments

The Office of Management and Budget has exempted this notice from the requirement of section 3 of Executive Order 12866.

Pursuant to the requirements of the Regulatory Flexibility Act (Pub. L. 96354, 94 Stat. 1164, 5 U.S.C. 601-612), the Administrator has determined that regulations establishing new tolerances or raising tolerance levels or establishing exemptions from tolerance requirements do not have a significant economic impact on a substantial number of small entities. A certification statement to this effect was published in the Federal Register of May 4, 1981 (46 FR 24950).

Dated: August 18, 1995.
Janet L. Andersen,
Acting Director, Biopesticides and Pollution Prevention Division Office of Pesticide Programs.

Therefore, it is proposed that 40 CFR part 180 be amended as follows:

PART 180--[AMENDED]

1. The authority citation for part 180 continues to read as follows:

Authority: 21 U.S.C. 346a and 371.

2. By adding Sec. 180.1153 to subpart D to read as follows:

Sec. 180.1153 Lepidopteran pheromones; exemption from the requirement of a tolerance.

Lepidopteran pheromones that are naturally occurring compounds, or identical or substantially similar synthetic compounds, designated by an unbranched aliphatic chain (between 9 and 18 carbons) ending in an alcohol, aldehyde or acetate functional group and containing up to 3 double bonds in the aliphatic backbone, are exempt from the requirement of a tolerance in or on all raw agricultural commodities. This exemption pertains to only those situations when the pheromone is applied to growing crops at a rate not to exceed 150 grams active ingredient/acre/year in accordance with good agricultural practices.

[FR Doc. 95-21037 Filed 8-29-95; 8:45 am]
BILLING CODE 6560-50-F

Lepidopteran Pheromones; Exemption from the Requirement of a Tolerance

www.epa.gov/fedrgstr/EPA-PEST/2006/August/Day-09/p12971.htm

[Federal Register: August 9, 2006 (Volume 71, Number 153)]
[Rules and Regulations]
[Page 45395-45400]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr09au06-16]

ENVIRONMENTAL PROTECTION AGENCY
40 CFR Part 180
[EPA-HQ-OPP-2006-0529; FRL-8083-8]

Lepidopteran Pheromones; Exemption from the Requirement of a Tolerance

AGENCY: Environmental Protection Agency (EPA).
ACTION: Final rule.

SUMMARY: This regulation amends the existing exemption from the requirement of a tolerance for residues of the biochemicals classified as lepidopteran pheromones, which are naturally occurring compounds, or identical or substantially similar synthetic compounds to include use as a ``post-harvest treatment'' on all stored food commodities. Bedoukian Research, Inc. submitted a petition to EPA under the Federal Food, Drug, and Cosmetic Act (FFDCA), as amended by the Food Quality Protection Act of 1996 (FQPA), requesting an exemption from the requirement of a tolerance. This regulation eliminates the need to establish a maximum permissible level for residues of biochemicals classified as lepidopteran pheromones.

DATES: This regulation is effective August 9, 2006. Objections and requests for hearings must be received on or before October 10, 2006, and must be filed in accordance with the instructions provided in 40 CFR part 178 (see also Unit I.C. of the SUPPLEMENTARY INFORMATION).

ADDRESSES: EPA has established a docket for this action under docket identification (ID) number EPA-HQ-OPP-2006-0529. All documents in the docket are listed in the index for the docket. Although listed in the index, some information is not publicly available, e.g., Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available in the electronic docket at http://www.regulations.gov, or, if only available in hard copy, at the OPP Regulatory Public Docket in Rm. S-

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4400, One Potomac Yard (South Building), 2777 S. Crystal Drive, Arlington, VA. The Docket Facility is open from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The Docket telephone number is (703) 305-5805.

FOR FURTHER INFORMATION CONTACT: Andrew Bryceland, Biopesticides and Pollution Prevention Division (7511P), Environmental Protection Agency,

1200 Pennsylvania Ave., NW., Washington, DC 20460-0001; telephone number: (703) 305-6928; e-mail address: bryceland.andrew@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

You may be potentially affected by this action if you are an agricultural producer, food manufacturer, or pesticide manufacturer. Potentially affected entities may include, but are not limited to:

? Crop production (NAICS code 111).
? Animal production (NAICS code 112).
? Food manufacturing (NAICS code 311).
? Pesticide manufacturing (NAICS code 32532).

This listing is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action. Other types of entities not listed in this unit could also be affected. The North American Industrial Classification System (NAICS) codes have been provided to assist you and others in determining whether this action might apply to certain entities. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed under FOR FURTHER INFORMATION CONTACT.

B. How Can I Access Electronic Copies of this Document?

In addition to accessing an electronic copy of this Federal Register document through the electronic docket at http://www.regulations.gov, you may access this ``Federal Register'' document electronically through the EPA Internet under the ``Federal Register'' listings at http://www.epa.gov/fedrgstr. You may also access a frequently updated electronic version of 40 CFR part 180 through the Government Printing Office's pilot e-CFR site at http://www.gpoaccess.gov/ecfr. To access OPPTS Harmonized Guidelines referenced in this document, go directly to the guidelines at http://www.epa.gov/opptsfrs/home/guidelin.htm.

C. Can I File an Objection or Hearing Request?

Under section 408(g) of the FFDCA, as amended by the FQPA, any person may file an objection to any aspect of this regulation and may also request a hearing on those objections. The EPA procedural regulations which govern the submission of objections and requests for hearings appear in 40 CFR part 178. You must file your objection or request a hearing on this regulation in accordance with the instructions provided in 40 CFR part 178. To ensure proper receipt by EPA, you must identify docket ID number EPA-HQ-OPP-2006-0529 in the subject line on the first page of your submission. All requests must be in writing, and must be mailed or delivered to the Hearing Clerk on or before October 10, 2006.

In addition to filing an objection or hearing request with the Hearing Clerk as described in 40 CFR part 178, please submit a copy of the filing that does not contain any CBI for inclusion in the public docket that is described in ADDRESSES. Information not marked confidential pursuant to 40 CFR part 2 may be disclosed publicly by EPA without prior notice. Submit your copies, identified by docket ID number EPA-HQ-OPP-2006-0529, by one of the following methods.

? Federal eRulemaking Portal: http://www.regulations.gov. Follow the on-line instructions for submitting comments.
? Mail: Office of Pesticide Programs (OPP) Regulatory Public Docket (7502P), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460-0001.
? Delivery: OPP Regulatory Public Docket (7502P), Environmental Protection Agency, Rm. S-4400, One Potomac Yard (South Building), 2777 S. Crystal Drive, Arlington, VA. Deliveries are only accepted during the Docket's normal hours of operation (8:30 a.m. to 4

p.m., Monday through Friday, excluding legal holidays). Special arrangements should be made for deliveries of boxed information. The Docket telephone number is (703) 305-5805.

II. Background and Statutory Findings

In the Federal Register of April 12, 2006 (71 FR 18735-18736) (FRL-7773-8), EPA issued a notice pursuant to section 408(d)(3) of the FFDCA, 21 U.S.C. 346a(d)(3), announcing the filing of a pesticide tolerance petition (PP 6F7044) by Bedoukian Research, Inc., 21 Finance Drive, Danbury, CT 06810-4192. The petition requested that 40 CFR part 180 be amended by establishing an exemption from the requirement of a tolerance for residues of biochemicals classified as lepidopteran pheromones, which are naturally occurring compounds, or identical or substantially similar synthetic compounds, designated by an unbranched aliphatic chain (between 9 and 18 carbons) ending in an alcohol, aldehyde, or acetate functional group and containing up to 3 double bonds in the aliphatic backbone. This notice included a summary of the petition prepared by the petitioner Bedoukian Research, Inc.. There were no comments received in response to the notice of filing.

Section 408(c)(2)(A)(i) of the FFDCA allows EPA to establish an exemption from the requirement for a tolerance (the legal limit for a pesticide chemical residue in or on a food) only if EPA determines that the exemption is ``safe.'' Section 408(c)(2)(A)(ii) of the FFDCA defines ``safe'' to mean that ``there is a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information.'' This includes exposure through drinking water and in residential settings, but does not include occupational exposure. Pursuant to section 408(c)(2)(B), in establishing or maintaining in effect an exemption from the requirement of a tolerance, EPA must take into account the factors set forth in section 408(b)(2)(C), which require EPA to give special consideration to exposure of infants and children to the pesticide chemical residue in establishing a tolerance and to ``ensure that there is a reasonable certainty that no harm will result to infants and children from aggregate exposure to the pesticide chemical residue.... '' Additionally, section 408(b)(2)(D) of the FFDCA requires that the Agency consider ``available information concerning the cumulative effects of a particular pesticide's residues '' and ``other substances that have a common mechanism of toxicity.''

EPA performs a number of analyses to determine the risks from aggregate exposure to pesticide residues. First, EPA determines the toxicity of pesticides. Second, EPA examines exposure to the pesticide through food, drinking water, and through other exposures that occur as a result of pesticide use in residential settings.

III. Toxicological Profile

Consistent with section 408(b)(2)(D) of the FFDCA, EPA has reviewed the available scientific data and other relevant information in support of this action and considered its validity,

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completeness, and reliability and the relationship of this information to human risk. EPA has also considered available information concerning the variability of the sensitivities of major identifiable subgroups of consumers, including infants and children.

A pheromone (including identical or substantially similar synthetic compounds) as defined by the Agency is a compound produced by an arthropod which, alone or in combination with other compounds, modifies the behavior of other individuals of the same species. Straight Chain Lepidopteran Pheromones (SCLPs) are those produced by a member of the order Lepidoptera, which includes butterflies and moths.

The toxicity profile of SCLPs has already been assessed for their pesticidal use by the Agency and published in support of the tolerance exemption in or on all raw agricultural commodities for all straight chain lepidopteran pheromones (SCLPs) that are naturally occurring compounds, or identical or substantially similar synthetic compounds, designated by an unbranched aliphatic chain (between 9 and 18 carbons) ending in an alcohol, aldehyde or acetate functional group and containing up to 3 double bonds in the aliphatic backbone, when the pheromone is applied to growing crops at a rate not to exceed 150 grams active ingredient/acre/year in accordance with good agricultural practices. (See Sec. 180.1153, 60 FR 45060, August 30, 1995). This final rule is amending the current Lepidopteran pheromone tolerance exemption, 40 CFR 180.1153, to include indoor post-harvest treatment in or on all stored food commodities at a rate not to exceed 3.5 grams active ingredient/1,000 square feet/year (3.5 g a.i./1,000/ ft2/year) (equivalent to 150 grams active ingredient/acre/ year) in accordance with good agricultural practices. The toxicity profile and use pattern of SCLPs, as mentioned above, have been fully characterized by the Agency. SCLPs are lowly toxic, are released in very small quantities in the environment, and act on a select group of insects. They are biodegradable by enzyme systems present in most living organisms and therefore, there is a reasonable certainty that no harm will result from their use as pesticides on food. For the purposes of this tolerance exemption amendment, the Agency has relied on the data and/or information previously submitted, in addition to comprehensive reviews and risk assessments already conducted by the Agency, and has reassessed that data in order to evaluate the request to add post harvest uses to the tolerance exemption. The Agency believes that in combination, the data and other information relied upon for this tolerance exemption supports its conclusion that there is reasonable certainty of no harm from the use of SCLPs as a post-harvest treatment in or on all stored food commodities at a rate not to exceed 3.5 grams active ingredient (a.i.)/1,000 ft2/year (equivalent of 150 grams a.i./acre/year in accordance with good agricultural practices.

The registrant did not submit any toxicity data testing the technical grade of the active ingredient. Data waivers were requested by the registrant and granted by the Agency based on the body of extensive knowledge from the public literature and comprehensive reviews and risk assessments conducted by the Agency on SCLPs. The toxicity of the SCLPs via the oral, dermal, inhalation, eye, skin, and genotoxicity routes of exposure have been assessed by the Agency (Refs. 1 and 5) and reassessed in light of the request to add indoor post harvest treatment. The toxicity profile of SCLPs when used as a post-harvest treatment in or on all stored food commodities does not change, and SCLPs when used in this manner are lowly toxic. EPA therefore concludes that there is a reasonable certainty of no harm resulting from the use of SCLPs as indoor post-harvest treatment in or on all stored food commodities. The data waivers that were granted are as follows:

1. OPPTS 870.1100 Acute oral toxicity (rat) (Ref 2)--LD50 £ 5,000 milligrams/kilogram (mg/kg). The test material is classified as a Toxicity Category IV for acute oral toxicity and demonstrates that there is little potential of the active ingredient to cause acute toxic effects. There were no adverse effects reported at 5,000 mg/kg.

2. OPPTS 870.1200 Acute dermal toxicity (rat) (Ref 2)--LD50 £ 2,000 mg/kg. The test material is classified as a Toxicity Category III for acute dermal toxicity and demonstrates that there is little potential for toxic effects. There were no adverse effects reported at 2,000 mg/kg.

3. OPPTS 870.5100, 870.5300, and 870.5375 Genotoxicity (Ref. 2). No evidence of mutageniticity.

4. OPPTS 870.3700 Teratogenicity (Ref. 7). A developmental toxicity study (rats), involving inhalation exposure to unbranched, primary

alcohols with chain length C_8 to C_{10}, indicated no detectable developmental toxicity (Ref. 7).

Published mammalian toxicity data on SCLPs indicate no significant acute toxicity to humans (Ref. 6). A 90-day feeding study (870.3100) (rats) was conducted at doses up to 1 g/kg, of a commercial blend of branched acetates with an aliphatic chain length between C_{10} to C_{14}. The results indicated no significant signs of toxicity other than those expected with longer term exposure to high doses of a hydrocarbon, namely, histopathologic evidence of nephropathy in males and increased liver and kidney weights in both sexes (Ref. 8).

IV. Aggregate Exposures

In examining aggregate exposure, section 408 of the FFDCA directs EPA to consider available information concerning exposures from the pesticide residue in food and all other non-occupational exposures, including drinking water from ground water or surface water and exposure through pesticide use in gardens, lawns, or buildings (residential and other indoor uses).

A. Dietary Exposure

The Agency clculated an estimate of total dietary exposure, for adults and children, to pheromones used in agricultural and food commodity storage areas. This estimate was calculated assuming an application rate of 3.5 g a.i./1,000 ft2/year (the maximum application rate for SCLPs), assuming 100% of commodities (fruits, vegetables, and grains) are treated, and assuming that stored commodities absorb 100% of the pheromone and that 100% of the population eats all three commodity types each day. This scenario produces a dietary exposure of 0.1 to 1 mg/kg/day. This calculation demonstrates that there is an unlikely potential for significant dietary exposure to SCLPs. As a result of the risk assessment the Agency concludes that the use of SCLPs as a indoor post-harvest treatment in or on all stored food commodities at the maximum use rate of 3.5 g a.i./1,000 ft2/year will not add any new exposures or risks and is considered safe.

1. Food. The Agency has determined that post harvest treatment of SCLPs to stored food commodities at the maximum application rate of 3.5 g a.i./1,000 ft2/year may reduce any new anticipated exposure of SCLPs due to their indoor use. However, even if dietary exposure to SCLPs are not reduced due to their use as pesticides, the acute toxicity information demonstrating relatively low mammalian toxicity (Refs 1, 2, 5, 6, 7, and 8) and biodegradability of SCLPs (Refs 1 and 5) indicate that any possible risk associated with acute exposures by the oral route would be low to non-existent.

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2. Drinking water exposure. No significant drinking water exposure is expected to result from the use of SCLPs when applied as a post-harvest treatment in or on all stored food commodities because they are applied in storage facilities, biodegradable, and are lowly toxic.

B. Other Non-Occupational Exposure

There are no residential, school or day care uses proposed for this product. Since this use pattern is for agricultural food crops and indoor post-harvest treatment in or on all stored food commodities, the potential for non-occupational, non-dietary exposures to SCLPs by the general population, including infants and children, is highly unlikely.

1. Dermal exposure. Non-occupational dermal exposures to SCLP when used as a post-harvest treatment to stored food commodities are expected to be negligible because it is limited to agricultural use.

2. Inhalation exposure. Non-occupational inhalation exposures to

SCLPs silicate when used as a post-harvest treatment to stored food commodities are expected to be negligible because they are limited to agricultural use.

V. Cumulative Effects

Section 408(b)(2)(D)(v) of FFDCA requires that, when considering whether to establish, modify, or revoke a tolerance, the Agency consider available information concerning the cumulative effects of a particular pesticide's residues and other substances that have a common mechanism of toxicity. The information available at this time indicates that SCLPs, when applied at a rate not greater than 3.5 g a.i./1,000 ft2/year, do not have a toxic effect. Therefore accumulative effects form residues of SCLPs are not anticipated.

VI. Determination of Safety for U.S. Population, Infants and Children

1. U.S. population. The Agency has determined that there is a reasonable certainty that no harm will result to the U.S. population from aggregate exposure to residues of SCLPs when used for post harvest treatment in or on all stored food commodities at a rate not to exceed 3.5 g a.i./1,000 ft2/year. This includes all anticipated dietary exposures and other non-occupational exposures for which there is reliable information. The Agency arrived at this conclusion based on the low acute and subchronic toxicity of these pheromones, the metabolic pathways for long-chain fatty acids derived from straight chain alcohols, aldehydes and acetates are well understood, the low exposure to these pheromones subsequent to application from aging, volatilization, and the new use will be indoors, found that there is a reasonable certainty of no harm that will result form the use of SCLP and as a post-harvest treatment in or on all stored food commodities.

2. Infants and children. FFDCA section 408 provides that EPA shall apply an additional tenfold margin of exposure for infants and children in the case of threshold effects. Margins of exposure are often referred to as uncertainty or safety factors, and are used to account for potential prenatal and postnatal toxicity and any lack of completeness of the data base. Based on available data and other information, EPA may determine that a different margin of exposure will define a level of concern for infants and children or that a margin of exposure approach is not appropriate. Based on all the available information the Agency reviewed on SCLPs, including a lack of threshold effects, the Agency concluded that SCLPs are practically non-toxic to mammals, including infants and children. Since there are no effects of concern, the provision requiring an additional margin of safety does not apply

VII. Other Considerations

A. Endocrine Disruptors

EPA is required under section 408(p) of FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) ``may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate.'' Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there were scientific bases for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA has authority to require the wildlife

evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP).

At this time, the Agency is not requiring information on the endocrine effects of SCLPs. Based on the weight of the evidence of the available data and the absence of any reports to the Agency of sensitivity or other adverse effects, no endocrine system related effects are identified for SCLPs and none are expected because of their use. To date there is no evidence that SCLPs affect the immune system, functions in a manner similar to any known hormones, or that they act as endocrine disruptors. Thus, there is no impact via endocrine-related effects on the Agency's safety finding set forth in this final rule amending the SCLPs exemption from the requirement of a tolerance.

B. Analytical Method(s)

An enforcement analytical method (OPPTS Harmonized Guideline 830.1800) was provided by the petitioner. The method is gas chromatography with flame ionization detection. The method may be requested from: Chief, Analytical Chemistry Branch, Environmental Sciece Center, 701 Mapes Rd., Ft. Mead, MD 20755-5350; telephone number: (410) 305-2905; e-mail address: residuemethods@epa.gov.

C. Codex Maximum Residue Level

There are no CODEX maximum residue levels for residues for any SCLPs for indoor post-harvest treatment in or on all stored food commodities.

VIII. Conclusions

The Agency concludes that if products containing SCLPs as active ingredients are applied for post harvest treatment in or on all stored food commodities at a rate not to exceed 3.5 g a.i./1,000 ft2/year, there is a reasonable certainty that no harm to the U.S. population, including infants and children, will result from aggregate exposure to residue of SCLPs, when used in or on all stored food commodities.

IX. References

1. Toughey, J.G. (ca 1990). ``White Paper - A review of the current bases for the United States Environmental Protection Agency's policies for the regulation of pheromones and other semiochemicals, together with the review of the available relevant data which may impact the assessment of risk for these classes of chemicals. Part No.1, Straight Chain Alcohols, Acetate Esters, and Aldehydes.'' (unpublished report, 474 pp.)

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2. Federal Register. 59 FR 3687-3684, Jan. 26, 1994. EPA Notice: Arthropod pheromones in solid matrix dispensers; Experimental Use Permits.

3. Federal Register. 59 FR 34812-34814, Jul. 7, 1994. EPA Notice: Arthropod pheromones; Experimental Use Permits.

4. Federal Register. 60 FR 45060-45062, Aug. 30,1995. EPA Rule: Lepidopteran pheromones; Tolerance Exemption.

5. EPA Final Rule: Lepidopteran Pheromones: Tolerance Exemption.Environmental Directorate, 26 February, 2002, OECD Series on Pesticides No. 12. Guidance for Registration Requirements for Pheromones and Other Semiochemicals Used for Arthropod Pest Control. ENV/JM/MONO(2001)12, Organization of Economic Co-operation and Development. Paris, France. (http://www.epa.gov/pesticides/biopesticides/regtools/index.htm).

6. Inscoe & Ridgway. 1992.

7. Nelson et al. 1990.

8. Daughtrey et al. 1990.

IX. Statutory and Executive Order Reviews

This final rule establishes an exemption from the requirement of a tolerance under section 408(d) of the FFDCA in response to a petition submitted to the Agency. The Office of Management and Budget (OMB) has exempted these types of actions from review under Executive Order 12866, entitled Regulatory Planning and Review (58 FR 51735, October 4, 1993). Because this rule has been exempted from review under Executive Order 12866 due to its lack of significance, this rule is not subject to Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use (66 FR 28355, May 22, 2001). This final rule does not contain any information collections subject to OMB approval under the Paperwork Reduction Act (PRA), 44 U.S.C. 3501 et seq., or impose any enforceable duty or contain any unfunded mandate as described under Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) (Public Law 104-4). Nor does it require any special considerations under Executive Order 12898, entitled Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629, February 16, 1994); or OMB review or any Agency action under Executive Order 13045, entitled Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885, April 23, 1997). This action does not involve any technical standards that would require Agency consideration of voluntary consensus standards pursuant to section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104-113, section 12(d) (15 U.S.C. 272 note). Since tolerances and exemptions that are established on the basis of a petition under section 408(d) of the FFDCA, such as the exemption from the requirement of a tolerance in this final rule, do not require the issuance of a proposed rule, the requirements of the Regulatory Flexibility Act (RFA) (5 U.S.C. 601 et seq.) do not apply. In addition, the Agency has determined that this action will not have a substantial direct effect on States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132, entitled Federalism (64 FR 43255, August 10, 1999). Executive Order 13132 requires EPA to develop an accountable process to ensure ``meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ``Policies that have federalism implications'' is defined in the Executive order to include regulations that have ``substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' This final rule directly regulates growers, food processors, food handlers and food retailers, not States. This action does not alter the relationships or distribution of power and responsibilities established by Congress in the preemption provisions of section 408(n)(4) of the FFDCA. For these same reasons, the Agency has determined that this rule does not have any ``tribal implications'' as described in Executive Order 13175, entitled Consultation and Coordination with Indian Tribal Governments (59 FR 22951, November 6, 2000). Executive Order 13175, requires EPA to develop an accountable process to ensure ``meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.'' ``Policies that have tribal implications'' is defined in the Executive order to include regulations that have ``substantial direct effects on one or more Indian tribes, on the relationship between the Federal Government and the Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes.'' This rule will not have substantial direct effects on tribal governments, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities

between the Federal Government and Indian tribes, as specified in Executive Order 13175. Thus, Executive Order 13175 does not apply to this rule

X. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of this final rule in the Federal Register. This final rule is not a ``major rule'' as defined by 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 180

Environmental protection, Administrative practice and procedure, Agricultural commodities, Pesticides and pests, Reporting and recordkeeping requirements.

Dated: July 26, 2006.
Phil Hutton,
Acting Director, Biopesticides and Pollution Prevention Division,
Office of Pesticide Programs.

? Therefore, 40 CFR chapter I is amended as follows:

PART 180--[AMENDED]

? 1. The authority citation for part 180 continues to read as follows:

Authority: 21 U.S.C. 321(q), 346a and 371.

? 2. Section 180.1153 is revised to read as follows:

Sec. 180.1153 Lepidopteran pheromones; exemption from the requirement of a tolerance.

Lepidopteran pheromones that are naturally occurring compounds, or identical or substantially similar synthetic compounds, designated by an unbranched aliphatic chain (between 9 and 18 carbons) ending in an alcohol, aldehyde or acetate functional group and containing up to 3 double bonds in the aliphatic backbone, are exempt from the requirement of a tolerance in or on

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all raw agricultural commodities. This exemption only pertains to those situations when the pheromone is: Applied to growing crops at a rate not to exceed 150 grams active ingredient/acre/year in accordance with good agricultural practices; and applied as a post-harvest treatment to stored food commodities at a rate not to exceed 3.5 grams active ingredient/1,000 ft2/year (equivalent to 150 grams active ingredient/acre/year) in accordance with good agricultural practices.

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 Basic & Clinical Pharmacology & Toxicology
Doi: 10.1111/j.1742-7843.2007.00114.x

The Faroes Statement: Human Health Effects of Developmental Exposure to Chemicals in Our Environment

Philippe Grandjean[1,2], David Bellinger[2], Åke Bergman[3], Sylvaine Cordier[4], George Davey-Smith[5], Brenda Eskenazi[6], David Gee[7], Kimberly Gray[8], Mark Hanson[9], Peter van den Hazel[10], Jerrold J. Heindel[8], Birger Heinzow[11], Irva Hertz-Picciotto[12], Howard Hu[13], Terry T-K Huang[14], Tina Kold Jensen[1], Philip J. Landrigan[15], I. Caroline McMillen[16], Katsuyuki Murata[17], Beate Ritz[18], Greet Schoeters[19], Niels Erik Skakkebæk[20], Staffan Skerfving[21] and Pal Weihe[22]

[1]Department of Environmental Medicine, Institute of Public Health, University of Southern Denmark, Odense, Denmark; [2]Department of Environmental Health, Harvard School of Public Health, Boston, MA, USA; [3]Department of Environmental Chemistry, Stockholm University, Stockholm, Sweden; [4]Inserm U625, Campus de Beaulieu, Université de Rennes I, Rennes, France; [5]University of Bristol, Department of Social Medicine, Bristol, UK; [6]School of Public Health, University of California, Berkeley, CA, USA; [7]European Environment Agency, Copenhagen, Denmark; [8]National Institute of Environmental Health Sciences, National Institutes of Health/ Department of Health and Human Services, Durham, NC, USA; [9]University of Southampton, Princess Anne Hospital, Southampton, UK; [10]Public Health Services Gelderland Midden, Arnhem, the Netherlands; [11]State Agency for Health and Occupational Safety of Land Schleswig-Holstein, Kiel, Germany; [12]Department of Public Health Sciences, University of California, Davis, CA, USA; [13]Department of Environmental Health Sciences, University of Michigan School of Public Health, Ann Arbor, MI, USA; [14]National Institute of Child Health and Human Development, National Institutes of Health/Department of Health and Human Services, Bethesda, MD, USA; [15]Department of Community & Preventive Medicine, Mount Sinai School of Medicine, New York, NY, USA; [16]Sansom Research Institute, University of South Australia, Adelaide, SA, Australia; [17]Division of Environmental Health Sciences, Akita University School of Medicine, Akita, Japan; [18]Department of Epidemiology, University of California, Los Angeles, School of Public Health, Los Angeles, CA, USA; [19]Flemish Institute of Technological Research, Mol, Belgium; [20]Department of Growth and Reproduction, National University Hospital, Copenhagen, Denmark; [21]Department of Occupational and Environmental Medicine, Lund University Hospital, Lund, Sweden; and [22]Department of Occupational Medicine and Public Health, The Faroese Hospital System, Tórshavn, The Faroe Islands

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The periods of embryonic, foetal and infant development are remarkably susceptible to environmental hazards. Toxic exposures to chemical pollutants during these windows of increased susceptibility can cause disease and disability in infants, children and across the entire span of human life. Among the effects of toxic exposures recognized in the past have been spontaneous abortion, congenital malformations, lowered birthweight and other adverse effects. These outcomes may be readily apparent. However, even subtle changes caused by chemical exposures during early development may lead to important functional deficits and increased risks of disease later in life. The timing of exposure during early life has therefore become a crucial factor to be considered in toxicological assessments.

During 20–24 May 2007, researchers in the fields of environmental health, environmental chemistry, developmental biology, toxicology, epidemiology, nutrition and paediatrics gathered at the International Conference on Fetal Programming and Developmental Toxicity, in Tórshavn, Faroe Islands. The conference goal was to highlight new insights into the effects of prenatal and early postnatal exposure to chemical agents, and their sustained effects on the individual throughout the lifespan. The conference brought together researchers to focus on human data and the translation of laboratory results to elucidate the environmental risks to human health.

Author for correspondence: Philippe Grandjean, Department of Environmental Medicine, Institute of Public Health, University of Southern Denmark, Winsloewsparken 17, 5000 Odense C, Denmark; Department of Environmental Health, Harvard School of Public Health, Landmark 3E-110, 401 Park Drive, Boston, MA 02115, USA (fax +1 617 384-8994, e-mail pgrand@hsph.harvard.edu).

Research State of the Art

The developing embryo and foetus are extraordinarily susceptible to perturbation of the intrauterine environment. Chemical exposures during prenatal and early postnatal life can bring about important effects on gene expression, which may predispose to disease during adolescence and adult life. Some environmental chemicals can alter gene expression by DNA methylation and chromatin remodelling. These epigenetic changes can cause lasting functional changes in specific organs and tissues and increased susceptibility to disease that may even affect successive generations.

New research on rodent models shows that developmental exposures to environmental chemicals, such as hormonally active substances (endocrine disruptors), may increase the incidence of reproductive abnormalities, metabolic disorders such as diabetes, and cancer, presumably through epigenetic mechanisms that do not involve changes to DNA sequences but which may, nevertheless, be heritable.

Prenatal exposure to diethylstilboestrol, an oestrogenic drug no longer used during pregnancy, has been shown to cause an increased risk of vaginal, uterine and breast cancer

in human beings and animal models. In animal models, low-level developmental exposure to a plastics ingredient, bisphenol A, may increase the susceptibility to breast or prostate cancer, and prenatal exposure to vinclozoline, a common fungicide, may also promote later development of cancer. These substances are only weak carcinogens, if at all, in the adult organism but are nonetheless hazardous to the growing foetus. In addition, when exposure to a carcinogenic substance occurs during early development, the expected lifespan will exceed the normal latency period for development of the disease.

The human reproductive system is highly vulnerable to changes in the intrauterine hormonal environment. In men, there is an increase in the occurrence of testicular cancer, poor semen quality and cryptorchidism, jointly termed the testicular dysgenesis syndrome. In animals, a similar combination of outcomes is replicated by developmental exposure to certain phthalate esters. However, links between environmental chemicals and the testicular dysgenesis syndrome in human beings are still unclear, although suggestive associations have been found with maternal smoking, fertility treatment of the mother, phthalate exposure and occupational exposure to pesticides with suspected oestrogenic and anti-androgenic activity. Perinatal exposure to endocrine-disrupting chemicals, such as polychlorinated or polybrominated biphenyls or dichlorodiphenyltrichloroethane compounds, may affect puberty development and sexual maturation at adolescence. Many other environmental chemicals can cause such effects in animal models. Expression of some of these effects may be promoted by predisposing genetic traits.

The brain is particularly sensitive to toxic exposures during development, which involves a complex series of steps that must be completed in the right sequence and at the right time. Slight decrements in brain function may have serious implications for future social functioning and economic activities, even in the absence of mental retardation or obvious disease. Each neurotoxic contaminant may perhaps cause only a negligible effect, but the combination of several toxic chemicals, along with other adverse factors, such as poor nutrition, may trigger substantial decrements in brain function.

The immune system also undergoes crucial developmental maturation both before and after birth. New evidence suggests that a number of persistent and non-persistent environmental pollutants may alter the development of the immune system. Studies in a variety of species of experimental animals indicate polychlorinated biphenyls to be highly immunotoxic. While exposures of human adults show little indication of such effects, early life exposures appear capable of inducing similar aberrations in children as seen in other species. Asthma, allergic sensitization or greater susceptibility to infections may be linked to prenatal or early postnatal chemical exposures. In addition, because of multiple interactions between the immune and nervous systems, abnormal maturation of immune responsiveness may also be implicated in some neurodevelopmental disorders.

While the research on developmental toxic effects has, to date, emphasized maternal exposures and the infant environment, the possibility exists that paternal exposures may also affect the child's development. Experimental studies suggest that ionizing radiation, smoking and certain environmental chemicals may be of importance, and that some exposures may affect the health and development of children, as well as the sex ratio of the offspring.

Conclusions

Three aspects of children's health are important in conjunction with developmental toxicity risks. First, the mother's chemical body burden will be shared with her foetus or neonate, and the child may, in some instances, be exposed to larger doses relative to the body weight. Second, susceptibility to a wide range of adverse effects is increased during development, from preconception through adolescence, depending on the organ system. Third, developmental exposures to environmental chemicals can lead to life-long functional deficits and disease.

Research into the environmental influence on developmental programming of health and disease has, therefore, led to a new paradigm of toxicologic understanding. The old paradigm, developed over four centuries ago by Paracelsus, was that 'the dose makes the poison'. However, for exposures sustained during early development, another critical, but largely ignored, issue is that 'the timing makes the poison'. This extended paradigm deserves wide attention to protect the foetus and child against preventable hazards.

These insights derive in part from numerous animal studies indicating that events during the foetal and early postnatal period may be responsible for reproductive, immunological, neurobehavioural, cardiovascular and endocrine dysfunctions and diseases, including certain cancers and obesity. Some of these adverse effects have been linked to environmental chemicals at realistic human exposure levels (i.e. levels similar to those occurring from environmental sources).

Among the mechanisms involved, particular concern is raised about changes in gene expression due to altered epigenetic marking, which not only may lead to increased susceptibility to diseases later in life, but may, in some cases, also affect subsequent generations.

Most chronic disease processes are characterized by multicausality and complexity. Understanding such processes requires a broad systems approach that focuses on integrative biology within socio-environmental contexts.

Recommendations

Studies on the aetiology of human disease need to incorporate early development and characterize appropriately the factors that determine organ functions and subsequent disease risks. Such associations can best be examined in long-term prospective studies, and existing and planned pregnancy or birth cohorts should be utilized for this purpose.

The aetiology of human disease can be better understood through cross-disciplinary approaches, translation of animal data, better exposure biomarkers and understanding individual susceptibility. Improved communication needs to be

stimulated among the scientific disciplines involved and between scientists and policy-makers.

Environmental chemical exposure assessment should emphasize the time period of early development. Exposure data already routinely collected should be applied, when feasible, in epidemiological studies. In addition, cord blood, cord tissue, human milk and other biological samples should be collected for assessment of exposure biomarkers and for determination of gene expression changes.

Because human beings are exposed to numerous chemicals during development and throughout life, mixed exposures need to be considered in a life-course approach to disease. Other factors, such as nutrition, other lifestyle factors and societal environment, need to be considered for additive or interactive effects. This research should also capitalize on the ability of genetic variation and gene–environment interaction to explore the causal nature of environmental exposures with respect to health outcomes.

Risk assessment of environmental chemicals needs to take into account the susceptibility of early development and the long-term implications of adverse programming in a variety of organ systems. Although test protocols exist to assess reproductive toxicity, neurodevelopmental toxicity and immune toxicity, such tests are not routinely used, and the potential for such effects is, therefore, not necessarily considered in decisions on safety levels of environmental exposures.

The accumulated research evidence suggests that prevention efforts against toxic exposures to environmental chemicals should focus on protecting the embryo, foetus and small child as highly vulnerable populations. Given the ubiquitous exposure to many environmental chemicals, there needs to be renewed efforts to prevent harm. Healthier solutions should be researched and proposed in future work. Prevention should not await definitive evidence of causality when delays in decision-making would lead to the propagation of toxic exposures and their long-term, harmful consequences. Current procedures, therefore, need to be revised to address the need to protect the most vulnerable life stages through greater use of precautionary approaches to exposure reduction.

Acknowledgements

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Relative Toxicity of Candidate Mothproofing Uniform Impregnant Methyl Tricaprylyl Ammonium Chloride Aliquat 336

The following information was generated from the
Toxicology Bibliographic Information (TOXLINE),
a database of the National Library of Medicine's TOXNET system
(http://toxnet.nlm.nih.gov) on October 24, 2007.

Query: The word tricaprylyl (All Fields).
Singular and plural forms were searched.

The chemical name methyl was identified.
The following terms were added from ChemIDplus:
CAS Registry Number: 2229-07-4
The chemical name ammonium chloride was identified.
The following terms were added from ChemIDplus:
sal ammoniac
ammonium muriate
salmiac
salammonite
sal ammonia
darammon
chlorid amonny
chlorammonic
ammoniumchlorid
ammoneric
amchlor
CAS Registry Number: 12125-02-9

1
TITLE:
Relative Toxicity of Candidate Mothproofing Uniform Impregnant Methyl Tricaprylyl Ammonium Chloride Aliquat 336

AUTHORS:
Anonymous

SOURCE:
U.S. Army Environmental Hygiene Agency, Edgewood Arsenal, Maryland, Special Study No. 33-3-68/71, 68 pages, 2 references, 19691969

ABSTRACT:
The relative toxicity of a candidate uniform mothproofing impregnant methyl-tricaprylyl-ammonium-chloride (5137553) (Aliquat-336) was investigated using experimental mice, rats, guinea-pigs, rabbits, and humans. The technical grade compound and aqueous solutions of 1.0 percent concentration (w/v) or greater caused primary skin irritation in rabbits. Eye irritation in rabbits resulted from single 24 hour application of a 0.1 percent aqueous solution but no irritation resulted from a 0.01 percent solution. The skin irritating properties of Aliquat-336 in guinea-pigs prevented the determination of the sensitization potential of this compound in comparison with dinitrochlorobenzene (97007). Chronic ingestion ad libitum of diets containing 300ppm Aliquat-336 for 90 days caused minimal changes in rats. Cloth impregnated with 0.1, 0.25, and 0.5 percent (w/w) Aliquat 336 and applied continuously to the shaved skin of rabbits for 90 days produced no remarkable degree of skin irritation or evidence of potential toxic hazard. A prophetic patch test on humans of wool fabric impregnated with Aliquat-336 at a concentration of 0.5 percent by weight produced no evidence of skin irritation or sensitization.

Keywords:

DCN-174229
Toxic substances list
Chlorinated benzenes
Insecticides

CAS Registry Numbers:
5137-55-3
5137-55-3
97-00-7

Entry Month: March, 1990

Year of Publication: 1969

Secondary Source ID: NIOSH/00065012

Document Number: NIOSH/00065012

Relative Toxicity of Candidate Mothproofing Uniform Impregnant ...

Abstract : The **relative toxicity** of a **candidate uniform mothproofing impregnant methyl** tricaprylyl ammonium chloride (Aliquat 336) was investigated using **...**
stinet.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=AD0879138

Accession Number:
AD0879138
Citation Status:
ACTIVE
Title:
Relative Toxicity of Candidate Mothproofing Uniform Impregnant Methyl Tricaprylyl Ammonium Chloride Aliquat 336 (Trade Name).
Fields and Groups :
061100 - TOXICOLOGY
110500 - TEXTILES
Corporate Author:
ARMY ENVIRONMENTAL HYGIENE AGENCY ABERDEEN PROVING GROUND MD
Personal Author(s):
Weeks, Maurice
Rowe, Stephen E.
Godke, Robert A., Jr.
Boldt, Roger E.
Steinberg, Marshall
Report Date:
29 OCT 1970
Media Count:
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Organization Type:
A - ARMY
Report Number(s):
USAEHA-Study-33-3-68/71 *(USAEHAStudy3336871)*

DescriptiveNote:
Final rept. Oct 67-Dec 69,
Descriptors:
, (*CLOTHING, MOTHPROOFING), (*MOTHPROOFING, TOXICITY), WOOLEN TEXTILES, AMMONIUM COMPOUNDS, CHLORIDES, IMPREGNATION, INGESTION(PHYSIOLOGY), SKIN(ANATOMY), GUINEA PIGS, MICE, RATS, RABBITS, HUMANS, SOLUTIONS(MIXTURES), CONCENTRATION(CHEMISTRY), SENSITIVITY, EYE, DOSAGE, BLOOD ANALYSIS, INFRARED SPECTRA.ZCLOTHING, MOTHPROOFING), (*MOTHPROOFING, TOXICITY), WOOLEN TEXTILES, AMMONIUM COMPOUNDS, CHLORIDES, IMPREGNATION, INGESTION(PHYSIOLOGY), SKIN(ANATOMY), GUINEA PIGS, MICE, RATS, RABBITS, HUMANS, SOLUTIONS(MIXTURES), CONCENTRATION(CHEMISTRY), SENSITIVITY, EYE, DOSAGE, BLOOD ANALYSIS, INFRARED SPECTRA.Z
Abstract:
The relative toxicity of a candidate uniform mothproofing impregnant methyl tricaprylyl ammonium chloride (Aliquat 336) was investigated using mice, rats, guinea pigs, rabbits and humans.
Distribution Limitation(s):
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Source Code:
038150
Document Location:
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Geopolitical Code:
2402

Endocrine Disruptor Screening Program (EDSP)

www.epa.gov/endo/

FOR FURTHER INFORMATION CONTACT:
William Wooge, Office of Science Coordination and Policy (OSCP) Mailcode 7201M, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460–0001
telephone number: (202) 564–8476
fax number: (202) 564–8482
email: *wooge.william@epa.gov.*

EPA ‘‘shall provide for the testing of all pesticide chemicals.’’ “including all active and inert ingredients of such pesticide.’’

Pesticide Screening
FFDCA section 408(p)(3) specifically requires that EPA ‘‘shall provide for the testing of all pesticide chemicals.’’ Section 201 of FFDCA defines ‘‘pesticide chemical’’ as ‘‘any substance that is a pesticide within the meaning of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), including all active and inert ingredients of such pesticide.’’ [FFDCA section 201(q)(1), 21 U.S.C. 231(q)(1)]. Active ingredients are the substances that suppress, control or kill the target pests. Inert ingredients generally have no direct effect on the target pests although they may have some degree of toxicity. Inert ingredients may simply dilute the active ingredient or they may perform some function such as allowing the product to adhere better to leaves or other surfaces to improve contact with the pests. Inert ingredients also include fragrances, which may mask the smell of residential pesticides, and odorizers, which may act as warning agents. Many of these chemicals, including both active and inert ingredients, also have other, nonpesticidal uses.

Determination
In general, EPA will use data collected under the EDSP, along with other information, to determine if a pesticide chemical, or other substance that may be found in sources of drinking water, may pose a risk to human health or the environment due to disruption of the endocrine system. Under the tiered approach, Tier 1 screening data will be used to identify substances that have the potential to interact with the endocrine system. Chemicals that go through Tier 1 screening and are found to exhibit the potential to interact with the estrogen, androgen, or thyroid hormone systems will proceed to Tier 2 for testing. Tier 2 testing data will identify any adverse endocrine-related effects caused by the substance, and establish a quantitative relationship between the dose and that adverse effect. As the EDSP screening and testing requirements mature into routine evaluations, the Agency intends to utilize the pesticide registration review process as the framework for managing its responsibilities regarding the endocrine screening of pesticides, and intends to eventually incorporate these requirements into the pesticide registration review process. At that point, EPA will regard the endocrine disruptor screening and testing required under FFDCA as part of the risk characterization of the pesticide that is intrinsic to the FIFRA decision. While EPA has discretionary authority to issue, at any time, testing orders requiring manufacturers to conduct Tier 1 assays, the Agency plans to assess the performance of the Tier 1 battery based on the test data received for the initial list of chemicals before beginning to routinely issue orders to test additional chemicals. If EDSP data exist at the time of a pesticide’s registration review, the Agency will consider the data when it makes its FIFRA (3)(c)(5) finding under registration review.

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EDITORIAL

Endocrine Disrupters: The Need for a Refocused Vision

Over the last two decades, concerns about the potential health and ecological impacts of exposure to endocrine disrupting chemicals (EDCs) have led to the establishment of new, multi-stakeholder research and testing initiatives, committees, expert groups, newsletters, databases, etc., throughout the world. In addition to generating an influx of new data, these activities have catalyzed a number of scientific controversies. Controversies range from how to spell, define, and detect "endocrine disrupters" to whether adverse effects observed in wildlife and humans are due to EDC exposures (at levels found in general populations) or other causes. Despite a lack of scientific consensus, this tidal wave of activity has significantly advanced our understanding of the scope and magnitude of risks posed by EDCs. Nevertheless, as the perceptive article by Daston *et al.* (2003; this issue) indicates, many genuine uncertainties remain and key questions continue to go unanswered.

The recent "Global Assessment of the State-of-the-Science of Endocrine Disruptors" (Damstra *et al.*, 2002), published (with input from over 60 independent, international scientific experts) by the WHO/UNEP/ILO International Programme on Chemical Safety (IPCS), concluded that:

> Overall the biological plausibility of possible damage to certain human functions; (particularly reproductive and developing systems) from exposure to EDCs seems strong when viewed against the background of known influences of endogenous and exogenous hormones on many of these processes. Furthermore, the evidence of adverse outcomes in wildlife and laboratory animals exposed to EDCs substantiates human concerns. The changes in human health trends in some areas for some outcomes are also sufficient to warrant concern and make this area a high research priority, but non-EDC mechanisms also need to be explored. (Damstra *et al.*, 2002, p. 3)

In addition to its global perspective, the WHO assessment was unique in that it developed a weight-of-evidence framework utilizing objective criteria to evaluate causality between exposure to EDCs and particular health outcomes.

Why then, despite a wealth of scientific expertise and enthusiasm, and an estimated 150 million U.S. dollars devoted annually to EDC-related research and testing programs globally, is there continuing uncertainty, controversy, and lack of scientific consensus? My personal view is that in a number of cases, past EDC-related research suffered from "blurred" vision, which can lead to distorted interpretations of the data. Now is an opportune time for a vision check and a new pair of lenses. I propose that, at minimum, our refocused vision needs the following characteristics:

1. *Far-sighted focus.* There is a need to be patient and to avoid overinterpretation of the data. Given the complex, interactive nature of the endocrine system, it is extremely unlikely that a single set of studies, research strategy, or test battery will provide definitive answers. Uncertainty in data from studies on complex phenomena does not imply poor quality of data. Some questions may only be answered by complex, expensive, large population-based studies, and it may take a long time to get adequate data.
2. *Sharpened focus on exposure issues.* Worldwide—despite large expenditures of money, time, and effort—lack of adequate exposure data on EDCs continues to be the weakest link in assessing exposure-response effects. Of particular concern is the lack of exposure data on levels, timing, and duration of exposure relative to the developmental stage of the organism. Focusing on the "timing of the dose" may be more important than the "level of the dose." Until global, coordinated, and comparable exposure data sets, specifically designed to address EDCs at different life stages, become available, credible risk assessments of EDCs cannot be performed.
3. *Increased depth perception.* The need for far-sighted vision does not negate the fact that much useful data can be obtained by taking a complex system apart and analyzing its individual components. EDCs are known to act at multiple sites through multiple modes of action, but for most putative exposure-response relationships, the mechanisms of action are poorly understood. Mechanistic data on all components of endocrine-mediated pathways are critical for establishing causal associations and developing adequate test methods for EDCs.
4. *Multifocal, progressive vision.* In order to see the complete picture, data is needed to fill the huge gaps in our knowledge of the biological processes and tissue responses that occur between early molecular events (e.g., gene expression) and the ultimate health outcome. These processes are not driven by the independent actions of a few causal factors, but are multifactorial and interconnected. There are likely no clear

demarcation lines, which will make causal relationships far from direct or linear.

In summary, studies on EDCs need to focus on many components at many different levels. Multilevel, multidisciplinary approaches can lead to insights not possible from narrow viewpoints. Only through a weight-of-evidence approach will we be able to address causal associations of exposure to complex mixtures of contaminants to health outcomes (which are often subtle, and may take years to develop). The challenges facing the international research, industry, and regulatory community in assessing risks posed by EDCs are enormous and require the commitment, expertise, and resources available throughout the world.

The WHO/UNEP/ILO IPCS is committed to a continuing evaluation of scientific developments in this field, to addressing the global implications of the data, and to promoting international collaboration and coordination.

Terri Damstra, Ph.D.
World Health Organization
WHO/UNEP/ILO International Programme on Chemical Safety

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SCIENTIFIC INTEGRITY IN POLICY MAKING

Further Investigation of the Bush Administration's Misuse of Science

By
The Union of Concerned Scientists

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The Union of Concerned Scientists is a nonprofit partnership of scientists and citizens combining rigorous scientific analysis, innovative policy development, and effective citizen advocacy to achieve practical environmental solutions.

More information about UCS and the full text of this report are available at www.ucsusa.org.

Union of Concerned Scientists
Two Brattle Square
Cambridge, MA 02238-9105

Phone: 617-547-5552
Fax: 617-864-9405
Email: ucs@ucsusa.org

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Introduction

On February 18, 2004, 62 preeminent scientists including Nobel laureates, National Medal of Science recipients, former senior advisers to administrations of both parties, numerous members of the National Academy of Sciences, and other well-known researchers released a statement titled *Restoring Scientific Integrity in Policy Making.* In this statement, the scientists charged the Bush administration with widespread and unprecedented "manipulation of the process through which science enters into its decisions." The scientists' statement made brief reference to specific cases that illustrate this pattern of behavior. In conjunction with the statement, the Union of Concerned Scientists (UCS) released detailed documentation backing up the scientists' charges in its report, *Scientific Integrity in Policy Making*.[1]

On April 2, the White House Office of Science and Technology Policy issued a statement by Director John H. Marburger III that dismissed the scientists' concerns and attempted to debunk the specific charges. In a detailed analysis released April 19, UCS reviewed each charge again, and directly addressed the administration's responses, concluding, "UCS stands by the findings and conclusions of our report." The UCS analysis found that the White House response failed to offer substantive evidence to support its claims. Instead, the White House document was filled with largely irrelevant information and arguments unrelated to the scientists' charges.

"The administration is dismissive of the concerns of leading scientists across the country," said Kurt Gottfried, UCS board chair and emeritus professor of physics at Cornell University. "The absence of a candid and constructive response from the White House is troubling, as these issues—from childhood lead poisoning and mercury emissions to climate change and nuclear weapons—have serious consequences for public health, well-being, and national security."

Since the release of the UCS report in February, the administration has continued to undermine the integrity of science in policy making seemingly unchecked. Many scientists have spoken out about their frustration with an administration that has undermined the quality of the science that informs policy making by suppressing, distorting, or manipulating the work done by scientists at federal agencies and on scientific advisory panels. For instance, Michael Kelly, a biologist who had served at the National Oceanic and Atmospheric Administration's National Marine Fisheries Service for nine years, recently resigned his position and issued an indictment of Bush administration practices. As Kelly wrote, "I speak for many of my fellow biologists who are embarrassed and disgusted by the agency's apparent misuse of science."[2]

This document investigates several new incidents that have surfaced since the February 2004 UCS report. These new incidents have been corroborated through in-depth interviews and internal government documents, including some documents released through the Freedom of Information Act. The cases that follow include:

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[1] Both documents are available online at *http://www.ucsusa.org/rsi*. An updated report with supplemental information was posted on the UCS website on March 31, 2004.
[2] Michael Kelly's resignation letter is available online at *http://www.peer.org/california/kellyresignation.html.*

- egregious disregard of scientific study, across several agencies, regarding the environmental impacts of mountaintop removal mining;
- censorship and distortion of scientific analysis, and manipulation of the scientific process, across several issues and agencies in regard to the Endangered Species Act;
- distortion of scientific knowledge in decisions about emergency contraception;
- new evidence about the use of political litmus tests for scientific advisory panel appointees. These new revelations put to rest any arguments offered by the administration that the cases to date have been isolated incidents involving a few bad actors.

Concern in the scientific community has continued to grow. In the months since the original UCS report, more than 4,000 scientists have signed onto the scientists' statement. Signers include 48 Nobel laureates, 62 National Medal of Science recipients, and 127 members of the National Academy of Sciences. A number of these scientists have served in multiple administrations, both Democratic and Republican, underscoring the unprecedented nature of this administration's practices and demonstrating that the issues of scientific integrity transcend partisan politics.

The United States has an impressive history of investing in and reaping the benefits of scientific research. The actions by the Bush administration threaten to undermine the morale and compromise the integrity of scientists working for and advising America's world-class governmental research institutions and agencies. Not only does the public expect and deserve government to provide it with accurate information, the government has a responsibility to ensure that policy decisions are not based on intentionally or knowingly flawed science. To do so carries serious implications for the health, safety, and environment of all Americans.

Given the lack of serious consideration and response by the administration to concerns raised by scores of prominent scientists, UCS is committed to continuing to investigate and publicize cases—corroborated by witnesses and documentation—in which politics is allowed to stifle or distort the integrity of the scientific process in governmental policy making. UCS—working with scientists across many disciplines, other organizations, and elected officials—will also seek to develop and implement solutions that will protect government scientists from retribution when they bring scientific abuse to light, provide better scientific advice to Congress, strengthen the role of the Office of Science and Technology Policy, strengthen and ensure adherence to conflict of interest guidelines for federal advisory panels, and ensure full access to government scientific analysis that has not been legitimately classified for national security reasons.

Section I: Undermining the Integrity of Scientific Analysis at Federal Agencies

Numerous cases of suppression and distortion of scientific analysis at federal agencies have already been documented in the press and in *Scientific Integrity in Policy Making*, a report released by the Union of Concerned Scientists in February 2004. As illustrated below, this continuing misconduct not only compromises the integrity of the scientists involved in these analyses, it undermines the mission and credibility of the agencies who are charged with protecting Americans' health, environment, and natural resources.

Leveling a Mountain of Research on Mountaintop Removal Strip Mining

Internal government documents initially obtained under the Freedom of Information Act reveal that senior Bush administration officials at the U.S. Department of the Interior intentionally disregarded extensive scientific studies conducted by five separate federal and state agencies over four years in preparation of an environmental impact statement (EIS) on mountaintop removal mining in Appalachia. The agencies had agreed to conduct the EIS as part of a settlement of an environmental lawsuit by residents of coalfield communities.[3]

According to the National Environmental Policy Act (NEPA) of 1969, an explicit purpose of an EIS is to list alternative possibilities, with a specific technical assessment of their environmental implications, for practices being reviewed.[4] The stated purpose of the mountaintop removal EIS was even more specific; the federal agencies agreed that the EIS would recommend policies and procedures to "minimize, to the maximum extent practicable, the adverse environmental effects to waters of the United States and to fish and wildlife resources from mountaintop [removal] mining operations, and to environmental resources that could be affected by the size and location of fill material in valley fill sites."[5]

However, government documents and UCS interviews confirm that J. Stephen Griles, deputy secretary of the Department of the Interior and a former lobbyist for the National Mining Association,[6] instructed agency scientists and staff to change the focus

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[3] Documents relating to this lawsuit were released through a series of Freedom of Information Act requests by the nonprofit Trial Lawyers for Public Justice. Available online at *http://www.tlpj.org*.

[4] The National Environmental Policy Act of 1969, as amended (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982). Available at *http://ceq.eh.doe.gov/nepa/regs/nepa/nepaeqia.htm.*

[5] Environmental Protection Agency (EPA) et al. 1999. "Intent To Prepare an Environmental Impact Statement To Consider Policies, Guidance, and Processes to Minimize the Environmental Impacts of Mountaintop Mining and Valley Fills in the Appalachian Coalfields." *Federal Register* 64(24):5830. February 9.

[6] James Stephen Griles' biographical information is available at *http://www.doi.gov/bio/griles.html.*

of the EIS. A memo from Griles to the White House Council on Environmental Quality and other federal agencies involved in the EIS states that a new draft EIS should "focus on centralizing and streamlining coal-mining permitting."[7]

Under Griles' direction, agencies were directed to drop consideration of any options for more environmentally benign alternatives to current practices despite overwhelming scientific evidence of environmental destruction from the technique.[8]

During the past decade, the practice of mountaintop removal strip mining has been widely used to extract coal in central Appalachia. In the technique, huge machines known as "draglines"[9] remove mountain ridges to expose coal seams. In the process, coal companies dump millions of tons of waste rock and dirt into nearby hollows, burying mountain headwater streams under enormous "valley fills." As part of a 1998 court settlement,[10] the federal government agreed to produce an EIS analyzing the effects of this practice and finding ways to limit the environmental damage it causes, especially to streams in the region.[11]

Scientists working for various federal agencies have documented a wide range of enormously destructive environmental impacts from this mining technique. More than 7 percent of Appalachian forests have been cut down and more than 1,200 miles of streams across the region have been buried or polluted between 1985 and 2001.[12] According to the federal government's scientific analysis, mountaintop removal mining, if it continues unabated, will cause a projected loss of more than 1.4 million acres by the end of the next decade[13]—an area the size of Delaware—with a concomitant, severe impact on fish,

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[7] Griles, J.S. 2001. Memo to James L. Connaughton, Chairman Council on Environmental Quality, Marcus Peacock, Associate Director Office of Management and Budget, et al. FOIA request by Trial Lawyers for Public Justice. October 5. Online at *http://www.tlpj.org/briefs/mtm_vf_deis_comments.pdf.*

[8] See FOIA documents available online at *http://www.tlpj.org*. See also Shogren, E. 2004. "Federal Coal-Mining Policy Comes Under Fire: Fish and Wildlife Service says the administration ignored its protection plan," *Los Angeles Times.* January 7. See also Ward, K. 2003. "Mountaintop removal damage proved: Bush proposes no concrete limits on new mining permits," *Charleston Gazette.* May 30. Available online at *http://www.wvgazette.com/static/series/mining/.*

[9] Draglines are $100 million machines that weigh about eight million pounds and are the size of a city block. The dragline's bucket can take a bite of earth equal to the size of about 26 Ford Escorts in one scoop. See Loeb, P. 1997. "Shear Madness," *U.S. News and World Report*, August 11.

[10] See U.S. District Court, West Virginia. 1998. *Bragg v. Robertson*. Settlement agreement. Case history available online at *http://www.tlpj.org/key_current_cases.htm.*

[11] Ibid.

[12] EPA. 2003. *Draft Programmatic Environmental Impact Statement (EIS) on Mountaintop Mining.* May. Available online at *http://www.epa.gov/region3/mtntop/index.htm.* See also Ward, K. 2003. "Mountaintop removal damage proved: Bush proposes no concrete limits on new mining permits," *Charleston Gazette.* May 30.

[13] EPA. 2003. *Draft Programmatic Environmental Impact Statement (EIS) on Mountaintop Mining.* May. Available online at *http://www.epa.gov/region3/mtntop/index.htm.*

wildlife, and bird species, not to mention a devastating effect on many neighboring communities.[14]

While the EIS produced by the Bush administration included some 5,000 pages of analysis documenting this destruction, there are instances where administration officials sought to soften the overwhelmingly negative findings. For example, a U.S. Fish and Wildlife Service (FWS) scientist says the Bush administration team ordered technical language rating the environmental impacts as "significant" or "severe" be stripped away in the editing process.[15] In addition, a Bush administration "steering committee" of the interagency EIS process initially removed an economic analysis prepared by an independent contractor that showed that limits on the size of individual valley fills would not have negative economic impacts on the region's electric costs. The steering committee discredited the analysis for what it called a "fatally flawed" methodology. [16] A revised analysis, which took into account the comments and concerns of dozens of coal industry officials, was included in the draft EIS. However, this analysis still found that the economic costs of limiting the size of valley fills would have a negligible effect on the price of coal.[17]

While administration officials included extensive scientific documentation of the negative consequences of the mining practice in the EIS, they violated a central tenet of an EIS[18] by offering no proposed alternatives to mitigate the worst environmental consequences of mountaintop removal mining.

"We were flabbergasted and outraged," says one high-ranking staff scientist at the FWS who had worked extensively on the preparation of the technical analysis for the EIS.[19] This official, whose name is withheld on request, explains that, in response to Griles' directive, the Bush administration steering committee called a meeting in October 2001 at which agency scientists and administrators were told that the draft EIS "was going to be taken in a different direction."[20]

Cindy Tibbot, an FWS biologist involved in the EIS process, was one of many agency scientists who expressed outrage about Griles' directive, stating in an internal memo: "It's hard to stay quiet about this when I really believe we're doing the public and

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[14] Ibid.
[15] Author interview with U.S. Fish and Wildlife Service scientist, name withheld on request, May 2004.
[16] Ibid.
[17] U.S. Environmental Protection Agency. 2003. *Draft Programmatic Environmental Impact Statement (EIS) on Mountaintop Mining.* May. Available online at *http://www.epa.gov/region3/mtntop/eis.htm*.
[18] The analysis of alternatives is "the heart of the environmental impact statement"; this analysis, based in large part upon the environmental consequences section of the EIS, should "[d]evote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits." See NEPA implementing regulations at 40 CFR 1502.14, available online at *http://ceq.eh.doe.gov/nepa/regs/ceq/1502.htm.*
[19] Author interview with U.S. Fish and Wildlife Service scientist, name withheld on request, May 2004.
[20] Ibid.

the heart of the Clean Water Act a great disservice."[21] As Tibbot put it, the only alternatives offered in Griles' proposed EIS would be "alternative locations to house the rubber stamp that issues the [mining] permits."[22]

Tibbot was not alone. An internal memo from FWS staff reviewing the draft EIS prior to its release assessed the situation this way:

> The EIS technical studies carried out by the agencies—at considerable taxpayer expense—have documented adverse impacts to aquatic and terrestrial ecosystems, yet the proposed alternatives presented offer no substantive means of addressing these impacts. The alternatives and actions, as currently written, belie four years of work and the accumulated evidence of environmental harms, and would substitute permit process tinkering for meaningful and measurable change. Publication of a draft EIS with this approach, especially when the public has seen earlier drafts, will further damage the credibility of the agencies involved.[23]

Recently obtained documents reveal that staff at other agencies involved in the EIS process were equally concerned with the administration's approach to the EIS. Ray George, an Environmental Protection Agency (EPA) official from West Virginia's Region 3, expressed concern that his agency's "science findings are not reflected in [the draft EIS's] conclusions/recommendations."[24] Another EPA official, John Forren, underscored the severity of the problem. "It's one thing," Forren wrote, "to include such alternatives in the [draft] EIS and not choose one as a preferred alternative or not choose one as the selected action in the Record of Decision." As Forren continued, however, it is quite another thing to offer no meaningful alternatives at all. Such a tactic, he warned, would "give the appearance we're obscuring and de-emphasizing the [alternatives] that address directly environmental impacts," leaving the entire EIS process open to legal challenge and public outcry.[25]

"In this case, the administration eliminated all environmental protective alternatives from consideration," says Jim Hecker, environmental enforcement director at Trial Lawyers for Public Justice, who filed the Freedom of Information Act request for the internal documents in this case. As Hecker puts it, "The simple fact is, that is scientifically and intellectually dishonest."[26]

The lack of scientific integrity in the preparation of the mountaintop removal mining EIS played out against the backdrop of an administration with close financial ties to the energy industry as well as an apparent conflict of interest presented by Griles'

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[21] Tibbot, C., U.S. Fish and Wildlife Service. 2002. Email correspondence circulated internally. October 30. Part of FOIA request documents available online at *http://www.tlpj.org*.
[22] Ibid.
[23] Densmore, D., Supervisor, Pennsylvania Field Office, U.S. Fish and Wildlife Service. 2002. "FWS Comments on 9/20/02 Draft of Chapter IV (Alternatives)." Comments circulated internally. September 30. Part of FOIA request documents available online at *http://www.tlpj.org.*
[24] George, R., EPA Region 3. 2002. Email correspondence. December 30. Available online at *http://www.tlpj.org.*
[25] Forren, J., EPA Region 3. Memo. October 4, 2002. Available online at *http://www.tlpj.org.*
[26] Author interview with Jim Hecker, May 2004.

close involvement in the EIS process. Aware of Griles' longstanding association with the mining industry, the Senate requested that he sign a "statement of disqualification" on August 1, 2001, in which he made a commitment to avoid issues affecting his former clients. Documents obtained under the Freedom of Information Act show that Griles met no fewer than 12 times with top Bush administration officials and coal industry representatives on the EIS and mountaintop removal mining matters between September and December 2001, precisely the time the team issued its order to change direction on the EIS process.[27]

During the EIS official comment period, representatives from 50 environmental groups across the country wrote a letter charging that the draft EIS fails to comply with the NEPA, stating: "We find the draft EIS' failure to provide an alternative proposal that would provide better regulation of mountaintop removal mining to protect the environment unacceptable and inappropriate."[28] Former Maryland State Senator Gerald Winegrad, vice president of the American Bird Conservancy and co-author of the letter, contends the political process cannot function without an honest scientific assessment of the problem. "But in this case," he says, "the EIS process has been usurped and its scientific underpinnings destroyed."[29]

Science Overruled on Emergency Contraception

An official at the Food and Drug Administration (FDA) overruled the advice of the agency's staff and two independent scientific advisory panels when he decided recently to deny women over-the-counter access to the emergency contraceptive levonorgestrel (sold under the brand name "Plan B"). Numerous FDA officials and medical advisers to FDA involved in and familiar with the approval process call the move an almost unprecedented repudiation of government scientific expertise. By law, the FDA is required to approve drugs that are found to be safe and effective.

In the case, Steven Galson, acting director of the FDA's Center for Drug Evaluation and Research, acknowledged to reporters recently that he overturned the recommendations of his own staff and two FDA advisory panels in declaring the drug "not approvable" for nonprescription status.[30] A joint meeting of two independent FDA scientific advisory committees voted 23 to 4 in December 2003 to recommend the emergency contraceptive as an over-the-counter drug. The panel also voted unanimously that the drug could be safely sold over the counter.[31]

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[27] See list prepared by the Ohio Valley Environmental Coalition, available online at *http://www.ohvec.org/action_alerts/2002/09_28/GrilesMTRMeetings.pdf.*

[28] Winegrad, G.W., Vice President for Policy, American Bird Conservancy, and 50 representatives from environmental organizations. 2004. Letters to President Bush and John Forren, EPA. January 2. Available online at *http://www.ohvec.org/issues/mountaintop_removal/articles/EIS_am_bird.pdf.*

[29] Author interview with Gerald Winegrad, March 2004.

[30] Galson, S. 2004. Comments presented at a U.S. Food and Drug Administration (FDA) press conference. May 7.

[31] FDA. 2003. "Transcript of the December 16, 2003 meeting of the FDA Nonprescription Drugs Advisory Committee in Joint Session with the Advisory Committee for Reproductive Health

Plan B, the drug in question, consists of two high-dose contraceptive pills that either interfere with ovulation or fertilization, or prevent implantation of a fertilized egg. Emergency contraception can be taken up to 72 hours after unprotected sexual intercourse to prevent pregnancy, but is more effective the sooner it is taken. Manufactured by New York-based Barr Pharmaceuticals, Inc., Plan B was approved as a prescription drug in 1999; another emergency contraceptive, Preven, was approved in 1998. Since then, millions of women in the United States have used such drugs to prevent pregnancy. Public health officials and researchers around the world widely agree that Plan B is a safe and effective means to prevent an unplanned pregnancy and to reduce the frequency of abortions. The drug is available without a prescription in 33 countries around the world. Its switch to nonprescription status in the United States was also endorsed by some 70 scientific organizations, including the American Medical Association, the American College of Obstetricians and Gynecologists, and the American Academy of Pediatrics.[32]

In the "not approvable" letter to Barr Pharmaceuticals, Galson notes that only 29 of the 585 women in the data submitted by the company about Plan B were 14 to 16 years of age and none was under 14 years of age. While Galson does not cite any particular safety concern for this age group, he writes "we have concluded that you have not provided adequate data to support a conclusion that Plan B can be used safely by young adolescent women for emergency contraception without the professional supervision of a practitioner licensed by law to administer the drug."[33]

James Trussell, director of the Office of Population Research at Princeton University and a member of one of the FDA advisory committees that recommended the drug's approval for over-the-counter sale, says that after hearing many hours of testimony and reviewing thousands of pages of medical literature, "[O]ur committee had absolutely no concern about the use of this drug by young girls." Advisory committee member Dr. Julie Johnson, a professor of pharmacy in Gainesville, Florida, touted Plan B to be the safest product the committee had reviewed in several years.[34]

Advisory committee members also underscored the importance of making recommendations based on a risk-benefit analysis, particularly with regard to young people. Pediatrician Dr. Leslie Clapp from Buffalo, New York, spoke about her own clinical practice and acknowledged that, while abstinence is the best option for teens, "[I]f you are a sexually active teen…or eleven year old, it's certainly a bad situation…I

Drugs." December 16. Available online at *http://www.fda.gov/ohrms/dockets/ac/03/transcripts/4015T1.DOC*.

[32] Barr Pharmaceuticals, Inc. 2004. "Barr Receives Not Approvable Letter for Over-the-Counter Emergency Contraceptive." Press release. May 6. Available online at *http://www.barrlabs.com/pages/nprpr.html*.

[33] Galson, S., acting director of the FDA Center for Drug Evaluation. 2004. Letter to Barr Pharmaceuticals, Inc. NDA 21-045/S-011. May 6. Available online at *http://www.fda.gov/cder/drug/infopage/planB/planB_NALetter.pdf.*

[34] FDA. 2003. "Transcript of the December 16, 2003 meeting of the FDA Nonprescription Drugs Advisory Committee in Joint Session with the Advisory Committee for Reproductive Health Drugs." December 16. Available online at *http://www.fda.gov/ohrms/dockets/ac/03/transcripts/4015T1.DOC*.

think their families and they would have far preferred this option than pregnancy, and it would have been safer." [35] Dr. Abby Berenson, a gynecologist from Galveston, Texas, who treats adolescents, echoed the sentiment, arguing further that, "Barriers to use," such as a prescription requirement for Plan B, "will ultimately…result in unintended pregnancies,"[36] which pose disproportionate health risks to adolescent women, including premature labor, anemia, and high blood pressure.[37]

Medical professionals, including several other prominent members of the advisory committees, take issue with Galson's claim of lack of data on young women. The American Academy of Pediatrics and the Society of Adolescent Medicine noted in a May 27, 2004 statement that approximately one-fifth of the participants in the Barr trials were between the ages of 14 and 16, which represents ages below or consistent with the average age of first intercourse.[38] In a recent editorial letter to *The New England Journal of Medicine*, three physicians noted that the advisory panels considered data that showed adolescents understood 60 percent to 97 percent of the key communication objectives of the Plan B label without help from a health care professional. These results are comparable to those for the group as a whole and well within the standards for the approval of other over-the-counter drugs.[39] As Dr. Trussell puts it, "The objection the FDA is offering in denying the switch to a nonprescription status is nothing more than a made-up reason intended to sound plausible. From a scientific standpoint, it is complete and utter nonsense."[40]

Dr. Trussell says that he has no doubt that politics trumped science in the FDA's bureaucratic process in this case.[41] In an internal FDA memo obtained by the Associated Press, Galson apparently tried to quell similar questions from his own staff about the role political considerations may have played in the decision, noting that "Some staff have expressed the concern that this decision is based on non-medical implications of teen sexual behavior, or judgments about the propriety of this activity."[42] Galson responded by claiming that politics did not influence his decision. In a press conference following his decision, Galson denied meeting personally with White House officials in the decision-

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[35] Ibid.
[36] Ibid.
[37] March of Dimes. 2002. "Facts You Should Know About Teenage Pregnancy." March. Available online at *www.marchofdimes.com/professionals/681_1159.asp.*
[38] American Academy of Pediatrics. 2004. "Plan B Should Be Over-the-Counter for Adolescents." Press release. May 27. Available at *http://www.aap.org/advocacy/washing/Plan_B.htm.*
[39] Drazen, J.M. et al. 2004. "The FDA, Politics, and Plan B," *The New England Journal of Medicine* 350(23):2413-2414. Correspondence. June 3. Excerpt available online at *http://content.nejm.org/cgi/content/short/350/23/2413.*
[40] Author interview with James Trussell, May 2004.
[41] Ibid.
[42] As quoted in Neergaard, L. 2004. "FDA rejects OTC morning-after pill sales," Associated Press. May 6.

making process and claimed to have "no knowledge" that any meetings between FDA and White House officials on the Plan B decision took place.[43]

Nonetheless, Dr. Galson broke with agency protocol by overruling FDA staff scientists who had concluded that this drug met FDA criteria for nonprescription status and overwhelmingly recommended the switch. In overruling his staff and the advisory committee, Galson offered no substantial new evidence, and took the unusual step of writing the official response to the drug company himself.[44]

FDA insiders also note that after the hearings on the matter late last year, conservative groups had mounted a political campaign to try to block the drug's approval. Conservative lawmakers began efforts to undermine the application in December 2003 when members of the House of Representatives sent a letter to the FDA Commissioner decrying purported risks of nonprescription Plan B to teens. The advisory committees addressed these claims and implicitly rejected many—if not all—in their evaluation of the drug's risk-benefit profile. After the overwhelmingly positive recommendation by the advisory committees, 49 members of Congress wrote to President Bush urging White House involvement, a move intended to supersede the FDA's authority on this matter.[45] Shortly thereafter, on February 13, FDA officials notified Barr Pharmaceuticals that the agency would extend by 90 days its deadline for considering the switch to over-the-counter status.[46]

At this point in the process, three prominent doctors, including Alastair Wood, a professor of medicine and pharmacology at Vanderbilt University who also serves as an FDA advisory panel member, published an article in *The New England Journal of Medicine,* stating that, "FDA's decision-making process is being influenced by political considerations." As the authors noted, such political considerations have normally been kept out of the decision-making process at the FDA. Prior to this case, they write, approval has always been "based on scientific evidence from well-designed clinical trials with adequate power to establish efficacy and rule out toxicity at some reasonable level of confidence," adding that the agency has an obligation under U.S. law "to approve drugs for sale once their efficacy and safety have been demonstrated." In this case, they write, "there is no medical dispute" on these issues.[47]

Echoing these findings, Dr. Paul Blumenthal, a respected obstetrician-gynecologist at The Johns Hopkins Hospital in Baltimore, says Plan B meets all the scientific criteria for an over-the-counter drug: it is not toxic, there is no potential for

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[43] Galson, S. 2004. Comments presented at a U.S. Food and Drug Administration (FDA) press conference. May 7.
[44] See Kaufman, M. 2004. "FDA rejects over-the-counter 'Plan B'," *The Washington Post.* May 7.
[45] See Kaufman, M. "Debate Intensifies Over 'Morning After' Pill," *The Washington Post.* February 13.
[46] See Barr Laboratories, Inc. 2004. "Barr Says FDA Extends Plan B Emergency Contraceptive PDUFA Date." Press release. February 13. Available online at *http://www.barrlabs.com/pages/nprpr.html.*
[47] Drazen, J.M. et al. 2004. "The FDA, Politics, and Plan B," *New England Journal of Medicine* 350(15):1561-1562. Editorial. April 8. Excerpt available online at *http://content.nejm.org/cgi/content/short/350/15/1561.*

addiction or abuse, and there is no need for medical screening. Commenting on Galson's "not approvable" decision, Blumenthal says, "What the FDA has just done is deny access to an important pregnancy preventive agent to millions of women." As he puts it: "This is nothing but politics trumping science." [48]

Former FDA officials told *The New York Times* that they could not remember a single instance when someone in Dr. Galson's position had overruled both an advisory committee and staff recommendations. Dr. Robert R. Fenichel, who left the agency in 2000 after 12 years, for instance, called the action "simply unheard of."[49]

As FDA advisory panel member Trussell charges, "Unfortunately, for the first time in history, the FDA is not acting as an independent agency but rather as a tool of the White House." Trussell adds, it is "a very sad day when politicians start making medical decisions." [50]

Deleting Scientific Advice on Endangered Salmon

Six leading ecologists who were appointed to a scientific advisory panel by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) claim that they were asked to remove science-based recommendations from an official report.[51] Further, scientists contend that the Bush administration's new policy on endangered fish stocks put forth by the NMFS distorts the scientific evidence regarding the role of hatchery fish in maintaining viable populations of salmon in the Northwest. The new policy refers to old or discredited information in contradiction to current scientific information provided by the scientific advisory panel.

According to the advisory panel's lead scientist, Robert Paine, a world-renowned ecologist at the University of Washington,[52] the panel's science-based recommendations were suppressed by the NMFS. As Paine explains, "The members of the panel were told to either strip out our recommendations or see our report end up in a drawer."[53]

The controversy began in 2001 with a federal district court ruling about whether coastal Coho salmon in Oregon should be listed under the Endangered Species Act (ESA).[54] Prior to this ruling, the NMFS had determined protection policies based on the numbers of wild fish in salmon and steelhead trout populations, without counting

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[48] As quoted in Graham, J. 2004. "'Morning after' pill restricted by FDA," *Chicago Tribune*. May 7.
[49] See Harris, G. "Morning-after-pill ruling defies norm," *The New York Times*. May 8.
[50] Author interview with James Trussell, May 2004. See also Kemper, V. 2004. "FDA: Doctor must still OK 'morning-after' pill," *Los Angeles Times*. May 7.
[51] See Weiss, K. 2004. "Action to Protect Salmon Urged: Scientists say their advice was dropped from a report to the U.S. fisheries service," *Los Angeles Times*. March 26.
[52] The panel also included Ransom Myers of Dalhousie University; Russell Lande of the University of California at San Diego; William Murdock of the University of California at Santa Barbara; Frances James of Florida State University; and Simon Levin of Princeton University (for profiles, see "members of the panel" online at *www.nwfsc.noaa.gov/trt/rsrp.htm*).
[53] Author interview with Robert Paine, April 2004.
[54] National Oceanic and Atmospheric Administration (NOAA). Alsea Valley Decision. Fact sheet. Available online at *http://www.nwr.noaa.gov/occd/110901_2.pdf*.

hatchery-bred fish.[55] The NMFS made this distinction even though they had included hatchery fish with wild fish in their designation of distinct salmon populations (described as evolutionarily significant units, or ESUs).

However, the court ruled that, under the Endangered Species Act, an ESU is a single unit that cannot be divided. As such, the court held that once NMFS made a decision to count wild and hatchery fish within a single ESU, it must count all fish within an ESU when determining protection policies. The court *did not* rule that hatchery fish should be included within an ESU with wild fish.

The Salmon Recovery Science Review Panel, with membership approved by the National Research Council, decided to study the situation. The panel found that there was a strong scientific basis for distinguishing between wild salmon and hatchery-raised fish of similar genetic stock. Providing extensive scientific documentation, the panel recommended that ESUs be specifically defined to include only wild, naturally spawning fish. This central recommendation was deleted from the final report by the NMFS on the grounds that it was policy, not science.

Panel member Ransom Myers, a marine biologist at Dalhousie University in Halifax, Nova Scotia, explains that the panel reviewed what he calls "a massive amount of research that shows that domestication occurs rapidly in hatchery fish. Within a few generations, these fish quickly evolve into something different, and lose their ability to survive in the wild."[56] The protected status of some wild salmon and steelhead trout populations has been challenged by developers, farmers, ranchers, timber interests, and private property advocates who want to end government restrictions to protect wild fish habitat.

According to the NMFS, the review panel's purpose is "to guide the scientific and technical aspects of recovery planning for listed salmon and steelhead species throughout the West Coast." In particular, the panel was instructed to "ensure that well accepted and consistent ecological and evolutionary principles form the basis for all [salmon and steelhead trout] recovery efforts."[57]

The development of a new Bush administration policy on hatchery fish was overseen by Mark Rutzick, who early in 2003 was appointed by President Bush as special adviser to the NOAA General Counsel. Previously, Rutzick served as a lawyer for the timber industry and was a strong opponent of fish and wildlife protections that logging companies viewed as overly restrictive. Rutzick first proposed the strategy of including hatchery fish in population counts for endangered salmon while he worked on behalf of timber interests.[58]

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[55] Myers, R.A. et al. 2004. "Hatcheries and endangered salmon," *Science* 303:1980. March 26.
[56] Author interview with Ransom Myers, April 2004.
[57] See National Marine Fisheries Service. 2003. "Salmon Recovery Science Review Panel." Report for meeting held July 21–23 in Seattle, WA. Available online at *http://www.nwfsc.noaa.gov/trt/rsrp_docs/Hatchery_Experiments_Final_Report.pdf.*
[58] Egan, T. 2004. "Shift on Salmon Reignites Fight on Species Law," *The New York Times,* p. A1. May 9.

This apparent conflict of interest was brought to light with a great deal of media attention in April and May 2004.[59] At that time, a copy of the draft policy leaked to *The Washington Post* suggested that all 26 listed populations of Northwest salmon and steelhead trout would be susceptible to delisting under the ESA once hatchery fish were included in their population assessments.[60] The negative media coverage and public outcry subsequently led NOAA Administrator Conrad Lautenbacher to send a letter to senators and representatives from the northwest region, assuring them that the new hatchery fish policy would not lead to delisting and would maintain protections for at least 25 of the 26 listed salmon and steelhead trout populations.[61]

On May 28, 2004, the Bush administration's proposed new hatchery policy for the NMFS was published in the Federal Register along with a proposal for redefining and relisting 27 ESUs[62] of salmon and steelhead trout in the Northwest.[63] The new policy continues to include many hatchery and wild fish within the same ESUs,[64] thus inflating the population counts of several endangered or threatened naturally spawning fish. While the policy acknowledges that some hatchery fish should be distinguished from wild populations, the new policy fails to provide measurable scientific criteria for distinguishing which hatchery fish may contribute to wild fish survival.[65] According to Jim Lichatowich, salmon expert and former chief of fisheries research for the Oregon Department of Fish and Wildlife, the policy is "not a new approach. It is a return to the past when hatcheries were exchanged for habitat and hatchery salmon were considered the same as wild. The vague criteria for separating hatchery and wild salmon will either cause mass confusion or send salmon recovery back to the failed practices of 100 years ago."[66]

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[59] See for example, Harden, B. "Hatchery Salmon to Count as Wildlife," *The Washington Post*, p. A1. April 29. See also Egan, T. 2004 (cited above).

[60] Official statements from NOAA National Marine Fisheries Service (NMFS) claimed that the new policy is required by the 2001 Coho salmon court decision. Although the NOAA interpretation of this court decision leads to an across-the-board policy that hatchery fish be considered indistinguishable from wild fish in defining evolutionarily significant units (ESUs), other viable interpretations could lead to a policy of excluding all hatchery fish from ESU designation (as recommended by the scientific panel) or that hatcheries be closed or seriously modified to prevent deleterious effects on the protected ESUs (e.g., see Lichatowich, J. 1999. *Salmon Without Rivers.* Island Press).

[61] Rojas-Burke, J. 2004. "U.S. backs protecting wild runs of salmon," *Portland Oregonian*. May 15.

[62] The original 26 retained their listing and one new ESU was added.

[63] NOAA NMFS, Northwest Region. 2004. *Federal Register Notice* Language. May 28; and NOAA Fisheries' Response to the Alsea Valley Alliance v. Evans U.S. District Court Ruling. May 28. Available online at *http://www.nwr.noaa.gov/AlseaResponse/20040528/index.html.*

[64] Ibid.

[65] Ibid. See also Myers, R.A. et al. 2004. "Hatcheries and endangered salmon," *Science* 303:1980. March 26. The authors state that some conservation hatcheries may contribute to salmon recovery, but their effectiveness has never been shown. However, much evidence exists that hatcheries cannot maintain wild salmon populations indefinitely and that hatchery fish compete with naturally spawning fish.

[66] Author interview with James Lichatowich, June 2004.

While there appears to be scientific documentation in the new policy and there are a number of supporting documents included with the proposals, much of the science is out of date and disregards the extensive, up-to-date scientific record compiled by the Salmon Recovery Science Review Panel's report, which is not included among the background reports featured in the policy.[67] Thus, while the new policy and ESU proposals do not call for delistings, they provide little protection against legal challenges to delist populations that are currently threatened or endangered.

In response to the suppression of the advisory panel's recommendations, the scientists published their findings independently in the journal *Science*.[68] Describing the six scientists as "top-notch," Donald Kennedy, editor of *Science*, noted publicly that the article easily withstood review by scientific peers before publication. "Differences on scientific issues should be argued on the merits," Kennedy noted about this incident, "and censorship isn't the way to conduct an honest debate."[69]

Science Undermined at the U.S. Fish and Wildlife Service

In several recent cases at the U.S. Fish and Wildlife Service (FWS), a branch of the Department of the Interior, Bush administration officials have demonstrated a serious disregard for scientific integrity by suppressing or distorting research by government scientists or contractors.

Distorting Scientific Knowledge on Florida Panthers[70]

According to an FWS biologist, officials at the agency have knowingly used flawed science in the agency's assessment of the endangered Florida panther's habitat and viability in order to facilitate proposed development in southwest Florida.

Andrew Eller, Jr., a biologist who has worked at the FWS for 17 years, charges that agency officials have knowingly inflated data about panther population viability and minimized assessments of the panthers' habitat needs[71] and, under the Bush administration, have been unwilling to correct inaccurate science that underlies habitat assessment practices. In frustration over the situation, Eller has recently filed a legal complaint against the government. Eller, who has worked for the past decade in Florida's Panther Recovery Program, stated recently, "I could no longer tolerate the scientific charade in which U.S. Fish and Wildlife Service officials are trying to pretend that the Florida panther is not in jeopardy." [72]

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[67] NOAA NMFS, Northwest Region. 2004. *Federal Register Notice* Language. May 28. Available online at *http://www.nwr.noaa.gov/AlseaResponse/20040528/index.html.*
[68] Myers, R.A. et al. 2004. "Hatcheries and endangered salmon," *Science* 303:1980. March 26.
[69] As quoted in Weiss, 2004. "Action to Protect Salmon Urged," *Los Angeles Times.*
[70] This section was updated after further consultation with Jane Comiskey on July 16, 2004. Original text is available by request from *rsi@ucsusa.org*.
[71] Public Employees for Environmental Responsibility (PEER). 2004. *Andrew J. Eller and Public Employees for Environmental Responsibility v. Department of Interior.* May 4. Available online at *http://www.peer.org/florida/pantherDQchallenge.htm.*
[72] Author interview with Andrew Eller, May 2004.

Among the charges in Eller's complaint is the fact that FWS assessments have inflated estimates of Florida panther populations by erroneously assuming that all known panthers are breeding adults, discounting juvenile, aged, and ill animals. In addition, Eller charges, the FWS has knowingly minimized assessments of the panther's habitat needs by equating daytime habitat use patterns (when the panther is at rest) with nighttime habitat use patterns (when the panther is most active).[73]

These serious errors in the science that guided agency actions were identified by members of a science advisory subteam impaneled by the FWS in 1999 to help develop a habitat conservation strategy for the panther. The 2002 Draft Landscape Conservation Strategy,[74] based on the subteam's work, contains contradictory material due to disagreements about the validity of existing panther literature.[75] Notably in this case, an independent four-member Scientific Review Team (SRT), convened by FWS in conjunction with the Florida Fish and Wildlife Conservation Commission, unanimously confirmed and documented these and other serious errors in panther literature used by the agency and urged that they be corrected. [76]

Jane Comiskey, a researcher at the University of Tennessee and one of eight outside experts on the subteam, is concerned that FWS has not yet allowed the subteam to incorporate peer-review and SRT comments that would resolve the contradictions in the Draft Landscape Conservation Strategy. "We were convened to deliver a peer-reviewed document to FWS, and until we are allowed to incorporate review comments," Comiskey contends, "we will not have done the job we were called upon to do by the federal government."[77]

Meanwhile, Eller asserts, the FWS has knowingly continued to disseminate the inaccurate information. As stated in Eller's legal complaint, "The U.S. Fish and Wildlife Service's policy contends that no development project in southwest Florida constitutes jeopardy for the panther; the agency is simply relying on science that they know has been discredited." [78]

As Comiskey notes, "An agency charged with using the best available science to protect panthers should not object to correcting known errors. Panther recovery is a well-funded program with a world-class capture team, dedicated field biologists, a wealth of accumulated data, and strong public support. There's no reason not to get the science right. There are legitimate interests that conflict with those of panthers, but policy channels are provided to resolve those conflicts, outside the context of science."[79]

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[73] PEER 2004. Available online at *http://www.peer.org/florida/pantherDQchallenge.htm*.
[74] U.S. Fish and Wildlife Service, South Florida Ecosystem Office. 2002. "Draft Florida Panther Landscape Conservation Strategy." Vero Beach, Florida.
[75] Author communication with Jane Comiskey via email, July 2004.
[76] For review panel assessment, see Beier, P., M. R. Vaughan, M. J. Conroy, and H. Quigley. 2003. "An Analysis of Scientific Literature Related to the Florida Panther." Final Report. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. Available online at *http://www.wildflorida.org/critters/panther/Beier-Panther-SRT.pdf.*
[77] Author communication with Jane Comiskey via email, July 2004.
[78] Author interview with Andrew Eller, May 2004. Also see PEER 2004. Available online at *http://www.peer.org/florida/pantherDQchallenge.htm*.
[79] Author communication with Jane Comiskey via email, July 2004.

Suppressing Analyses on Bull Trout Habitat

Officials at the U.S. Fish and Wildlife Service censored an analysis of the economics of protecting the bull trout, a threatened trout species in the Pacific Northwest, publishing only the costs associated with protecting the species and deleting the report's section analyzing the economic benefits. Furthermore, while the benefits of protecting the bull trout were deleted from the economic analysis, the costs associated with this species' protection were inflated.[80] An exaggerated cost analysis and a deleted benefits analysis essentially give the FWS the economic justification, under the ESA, to disregard scientific information when designating critical habitat for the endangered bull trout. [81]

As part of a 2003 court settlement, the FWS was ordered to develop a plan designating critical habitat in the Pacific Northwest for bull trout,[82] which has been listed as a threatened species under the ESA since 1998. In conjunction with this effort, the FWS contracted Bioeconomics Inc., a Missoula, Montana-based consulting firm, to conduct a cost-benefit analysis of bull trout recovery in Oregon, Washington, Idaho, and Montana.

The firm's peer-reviewed research determined that protecting bull trout and its habitat in the Columbia and Klamath river basins will cost $230 million to $300 million over the next decade, costs associated with adverse effects upon hydropower, logging, and highway construction. The study also reported $215 million in economic benefits associated with a restored bull trout fishery.[83]

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[80] Much of the cost analysis included money already spent in association with the Endangered Species Act (ESA) listing as well as money spent on critical habitat protection for other listed species that occur in the same habitats identified for the bull trout, as noted in the FWS press release, "Draft Economic Analysis of Critical Habitat Proposal for Bull Trout in the Columbia and Klamath River Basins Released for Public Comment," April 5, 2004. Available online at *http://news.fws.gov/newsreleases/r6/E6CD3A83-F8FD-484C-8523CF328EC43D93.html*. As the press release states, "The draft economic analysis does not separate costs associated with the designation of critical habitat from those already incurred by the listing of bull trout in the Columbia and Klamath basins in 1998." The press release also acknowledges, "Most of the estimated cost already is occurring due to the listing of bull trout and protective measures already in place for listed salmon and steelhead."

[81] The ESA permits the FWS to disregard scientific information in making critical habitat designation decisions under certain circumstances. Sec. 4(b)(2) of the ESA states: "The Secretary shall designate critical habitat, and make revisions therein…on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. **The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat**, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned." [Emphasis ours.]

[82] See Friends of the Wild Swan v. U.S. Fish and Wildlife Service, 945 F. Supp 1388; 81 F. 3d 168; 12 F. Supp. 1121; 910 F. Supp 1500; 966 F. Supp. 1002.

[83] FWS. 2004. "Draft Economic Analysis of Critical Habitat Proposal for Bull Trout in the Columbia and Klamath River Basins Released for Public Comment." Press release. April 5.

When officials at the FWS released the report, however, they deleted 55 pages of the analysis outlining the economic benefits of bull trout recovery.[84] The censorship spurred an anonymous FWS employee to leak a copy of the deleted chapter to a Montana-based environmental group, which then released it to *The Missoulian*, a Montana daily newspaper. Upon questioning from the press, Diane Katzenberger, an information officer in the FWS regional office in Denver, told a reporter that the censorship did not occur in either the Denver or Portland regional FWS offices but rather "was a policy decision made at the Washington level."[85]

Chris Nolin, chief of the division of conservation and classification in the Washington, DC FWS office, told the press that the benefits analysis was cut because its methodology was discouraged by the Office of Management and Budget (OMB).[86] However, similar benefits analyses have been released by the Bush administration. In February 2003, for instance, the Environmental Protection Agency used similar techniques that showed $113 billion in economic benefits over 10 years would result from implementation of the Bush administration's 2003 Clear Skies Act.[87]

Michael Garrity, executive director of the Alliance for the Wild Rockies, the group that helped bring the incident to light, stated that contrary to the contention of some Bush administration officials, the methodology of the benefits analysis is largely based on solid economic projections of income from sport fishing. Despite a public request, the full economic analysis has not been publicly released by the FWS.

The decision whether and where to designate critical bull trout habitat must be made by September 2004.[88] It is not yet clear whether the FWS will use the incomplete economic analysis to limit critical habitat below what is scientifically justified, but the stage is clearly set for such an outcome.[89]

Available online at *http://news.fws.gov/newsreleases/r6/E6CD3A83-F8FD-484C-8523CF328EC43D93.html.*

[84] The censored version of the report as released by FWS is available online at *http://pacific.fws.gov/bulltrout/colkla/documents/BT_finalDraftEconomicAnalysis_031804.pdf.*

[85] As quoted in Devlin, S. 2004. "Economic benefits of recovery omitted from bull trout report," *The Missoulian.* April 16. Available online at *http://www.missoulian.com/articles/2004/04/15/news/top/news01.txt.*

[86] As quoted in Harden, B. 2004. "Report condemned as one-sided: government cut out benefits of saving threatened trout," *San Francisco Chronicle.* April 17.

[87] See EPA. 2003. "Clear Skies Act, 2003, Technical Support Package, Section B: Human Health and Environmental Benefits." February. Available online at *http://www.epa.gov/air/clearskies/03technical_package_sectionb.pdf.* See also Harden, B. 2004. "Report condemned as one-sided: government cut out benefits of saving threatened trout," *San Francisco Chronicle.* April 17.

[88] The draft economic analysis and the FWS proposal to designate critical habitat in the Columbia and Klamath basins were open for public comment until May 5, 2004.

[89] The FWS has initiated other processes that could avoid protecting the bull trout. An April 13, 2004 press release announced that the agency would conduct a five-year review of the bull trout listing (it was first listed in 1998). While this review process cannot derail the court-dictated decision on critical habitat designations, it could lead to change of classification or delisting for the species, and puts the process to finalize Recovery Plans for bull trout populations on hold. The full text of the news release is available online at

Misrepresenting Scientific Knowledge on Rare Swans

According to documents released through the Freedom of Information Act, as well as testimony from consulting scientists, the director of the FWS based decisions concerning the status of rare trumpeter swans (*Cygnus buccinator)*[90] on a scientifically flawed, report that lacked outside peer review[91] and seriously misrepresented another study.[92]

In response to a petition by conservationists to list the population of "tri-state" trumpeter swans (a distinct population that breeds in the Rocky Mountain states of Montana, Wyoming, and Idaho) as threatened or endangered under the ESA, Director Steve Williams, an appointee of President Bush, ruled in January 2003 that the swans did not constitute a "distinct population segment" and were therefore ineligible for ESA protection.

Tri-state Rocky Mountain trumpeter swans—North America's largest waterfowl—constitute the only breeding population of trumpeter swans that survives in the lower 48 states, where this species was once ubiquitous. Some environmentalists and ornithologists have sought since 2000[93] to protect the tri-state trumpeter swans under the ESA. Migrating tri-state trumpeters, which resemble the smaller and more plentiful tundra swans, over-winter in Utah and are virtually always killed during the tundra swan hunt. If trumpeter swans were designated as a threatened species, the FWS would be forced to halt the popular swan hunting season in Utah. In response to these organizations' efforts, the FWS produced a document, devoid of peer review and contrary to the preponderance of scientific analysis,[94] that argues that the tri-state Rocky Mountain trumpeter swans do not constitute a "distinct population segment" but are actually part of a much larger population of trumpeter swans in Canada and Alaska.[95] As a result, the FWS avoided an ESA listing, and tri-state trumpeter swans continue to be killed during the Utah hunt.

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http://news.fws.gov/NewsReleases/R1/2E1647DE-8244-4AD2-BA58835CFAB5DAD5.html.

[90] See PEER. 2004. "Fish and Wildlife Director Overrules His Own Scientific Panel; Allows Continued Hunting of Rare Trumpeter Swans." Press release. April 13. Available online at *http://www.peer.org/press/447.html*.

[91] See Dubovsky, J. and J. Cornely. 2003. "Trumpeter Swan Survey of the Rocky Mountain Population, U.S. Breeding Segment, Fall 2002," Lakewood, CO: U.S. Fish and Wildlife Service Migratory Birds and State Programs, Mountain-Prairie Region. October. Available online at *http://grandjunctionfishandwildlife.fws.gov/species/birds/trumpeterswan/survey_fall2002.pdf.*

[92] Gale, R.S., E.O Garton, and I.J. Ball. 1987. "The History, Ecology and Management of the Rocky Mountain Population of Trumpeter Swans." Unpublished report. Missoula, MT: U.S. Fish and Wildlife Service, Montana Cooperative Wildlife Research Unit.

[93] On August 25, 2000, The Biodiversity Legal Foundation, Fund for Animals, and others petitioned the FWS to designate the tri-state swan population a Distinct Population Segment and list it as threatened or endangered.

[94] Gale, R.S. et al. 1987. See also PEER. 2001. *Swan Dive: Trumpeter Swan Restoration Trumped by Politics*. White Paper. Washington, DC: PEER. August. See also Shea, R., executive director, Trumpeter Swan Society. 2003. Letter (with scientific citations) to Steve Williams, FWS director. March 23. Available online at *www.trumpeterswansociety.org/news/letters/TTSS_resp_90day.pdf.*

[95] Dubovsky and Cornely, 2002.

To support its ruling, the agency also cited an earlier study of the tri-state swan population completed for the agency in 1987.[96] However, the study's principal author, Ruth (Gale) Shea, stated in a March 2003 letter to the FWS that the agency seriously misinterpreted her study.[97] Shea, a wildlife biologist and expert on the Rocky Mountain trumpeters, explains that her research found the tri-state population of trumpeter swans was notable for its reproductive isolation. "To date," Shea notes, "there are no data indicating that pairing with Canadian trumpeters is likely or that Canadian trumpeters will abandon their natal areas and fill in vacant tri-state breeding habitat as the tri-state population declines."[98] Nonetheless, Shea says, the FWS used her study in part to argue the precise opposite in support of the agency's ruling that the tri-state trumpeters are not a distinct population segment.[99]

Following FWS Director Steve Williams' denial of protection to the tri-state trumpeter swans in January 2003, an organization named PEER (Public Employees for Environmental Responsibility) filed a formal complaint,[100] which requested that Williams review the agency's ruling and its use of scientific information in the listing determination. PEER's request was denied and they filed an appeal.

To reach his decision after PEER's appeal, Williams convened a scientific panel to review the matter. The panel's assessment, made available only after a Freedom of Information Act request, unanimously recommended that Williams grant the appeal, concurring with the complaint that the agency's policy ought not have been based upon a non-peer reviewed document. As the panel members put it, "[T]his panel concludes that the Dubovsky-Cornely paper lacks the objectivity demanded by the IQA [Information Quality Act] because it was not subjected to any clearly documented quality assurance process, such as independent peer review." [101]

In a March 2004 letter to PEER,[102] Williams agreed to allow the regional FWS office to peer review the controversial internal paper upon which the agency's trumpeter swan policy is based. But, at the same time, Williams overruled his panel's unanimous recommendation and denied the appeal, continuing to refuse protection to the tri-state

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[96] Gale, R.S. et al. 1987. See also PEER. 2003. "Public Employees for Environmental Responsibility (PEER) v. Department of Interior." May 28. Available online at *www.peer.org/rocky_mountain/Trumpeter_DQA.pdf.*

[97] Author interview with Ruth (Gale) Shea, May 2004.

[98] As quoted in Shea, R., executive director, Trumpeter Swan Society. 2003. Letter (with scientific citations) to Steve Williams, FWS director. March 23. Available online at *www.trumpeterswansociety.org/news/letters/TTSS_resp_90day.pdf.*

[99] Ibid.

[100] PEER. 2003. "Public Employees for Environmental Responsibility (PEER) v. Department of Interior." May 28. Available online at *www.peer.org/rocky_mountain/Trumpeter_DQA.pdf.*

[101] Ashe, D., S. Haseltine, R. Bennet, FWS. 2004. Undated memo to FWS Director Steve Williams regarding the PEER appeal of FWS ruling on the designation of the tri-state population of trumpeter swans as a distinct population segment. Released June 4, 2004.

[102] Williams, S., FWS. 2004. Correspondence to Eric Wingerter, PEER. In his verdict on the matter, Williams states that the agency's dissemination of information, including the Dubovsky-Cornely paper, "met the agency's standard for objectivity." March 26. Available online at *http://www.peer.org/ForestService/fwswilliams_letter.pdf.*

trumpeter swan population in spite of the overwhelming evidence that the agency's policy had been based on inaccurate, misinterpreted, and highly questionable scientific information.[103]

[103] Notably, until the review panel's assessment was released in June 2004 under a Freedom of Information Act request, Williams even refused to make the names of the review panelists or their finding public. Williams claims that the appeal decision was his to make as director of the agency—a statement no one disputes. But it remains unclear whether Williams can claim any scientific basis for his decision as required by the ESA.

Section II:
Undermining the Integrity of Science Advisory Councils

Political Litmus Tests

Released in February 2004, the UCS report, *Scientific Integrity in Policy Making,*[104] documented that political litmus tests have been applied by representatives of the Bush administration to candidates for scientific advisory positions. In an official response, Bush administration Science Adviser John H. Marburger III stated recently, "[T]he accusation of a litmus test that must be met before someone can serve on an advisory panel is preposterous."[105] Since the initial publication of the UCS report, however, new information has surfaced that contradicts the Bush administration's denial of these charges.

Since Dr. Marburger's statement, more scientists have disclosed their personal experiences with political litmus tests applied by the Bush administration in the appointment process for a wide range of scientific advisory positions. For example, Sharon Smith, chair of the marine biology department at the Rosenstiel School of Marine and Atmospheric Science at the University of Miami, states that she was summarily rejected for a position on the U.S. Arctic Research Commission—a presidential appointment—after she gave a less-than-enthusiastic answer in response to a question from the White House personnel office about whether she supported President Bush.[106]

An investigation of the matter by UCS has determined that such political litmus tests have been widely applied by the Bush administration to nominees for science advisory positions, in a dramatic departure from the practices of other administrations. In particular, a number of such allegations have surfaced from scientists nominated for scientific advisory positions at the National Institutes of Health (NIH) "council level." The following section reviews these specific allegations in detail.

NIH Councils

The NIH is a large family of institutions that serves as a steward of medical and behavioral research in the United States. It is divided into some two dozen separate centers and institutes, most of which have a National Advisory Council or Board that serves as the oversight tier of the peer review process—a process upon which the NIH and the entire scientific community relies. Scientists asked to serve on these NIH councils

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[104] Union of Concerned Scientists (UCS). 2004. *Scientific Integrity in Policy Making: An Investigation into the Bush Administration's Misuse of Science.* Cambridge, MA: Union of Concerned Scientists. February 18. An updated edition of this report, published in March 2004, is available online at *http://www.ucsusa.org.*

[105] See Marburger III, J.H., 2004. "Statement of the Honorable John H. Marburger, III on Scientific Integrity in the Bush Administration." April 2. p.3. Available online at *http://www.ostp.gov/html/ucs/SummaryResponsetoCongressonUCSDocumentApril2004.pdf.*

[106] The details derive from an email from Dr. Sharon Smith, March 2004, and an author interview with Dr. Smith's office staff in June 2004 during her research trip in the Arctic.

are traditionally chosen based on their scientific credentials and technical expertise. Among their important functions, these council members oversee the process of allocating federal research funds. While NIH councils frequently make decisions that affect the direction of scientific research, they do not set or even recommend policy on behalf of the federal government. Because of their vital, independent role outside of the policy-making arena, committee heads at the NIH have traditionally received wide latitude in determining the scientific expertise needed in their committees' particular area of concern.

The law establishing these councils is very clear in its intention to create scientific bodies, not political or policy-making bodies. According to the guidelines published by the Office of Federal Advisory Committee Policy: "The basic criterion for [scientists chosen for] membership on NIH committees is excellence in biomedical and behavioral research…The Federal Advisory Committee Act (FACA), under which NIH committees operate, requires that membership must be fairly balanced in terms of points of view represented and the functions to be performed by the advisory committee."[107] As a result, council members' terms do not end with the inauguration of a new president, and members often overlap several administrations.

National Advisory Council for Human Genome Research

Two of the most recently appointed members to the National Advisory Council for Human Genome Research, Richard Myers of Stanford University and George Weinstock of Baylor College of Medicine, report that they were each subjected to inappropriate questions about their political views by representatives of the White House during their confirmation process.

Dr. Richard Myers

Dr. Myers, a biochemist with a distinguished scientific record, currently serves as chair of the Department of Genetics at Stanford University and director of Stanford's Human Genome Center. A recognized expert in genome analysis and the study of DNA variation, his research has furthered worldwide scientific understanding of numerous genetic disorders, including Huntington's disease, progressive myoclonus epilepsy, and basal cell carcinoma.

In the spring of 2002, Dr. Myers was notified that he had been nominated to serve on the National Advisory Council for Human Genome Research, an NIH council-level position. Shortly thereafter, he says, he received a call from Secretary Tommy Thompson's office at the Department of Health and Human Services (HHS).[108] The Bush administration official began asking questions about Dr. Myers' background and scientific credentials that, he recounts, soon turned increasingly political in nature. First, he recalls, he was asked questions about his view of stem cell research. "I was a little

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[107] See Office of Federal Advisory Committee Policy, National Institutes of Health (NIH). *Directory of NIH Federal Advisory Committees functions and members*. Online at *http://www1.od.nih.gov/cmo/committee/index.html.*

[108] Author interview with Richard Myers, March 2004.

surprised," he says, "given what I know about the nature of the committee's work."[109] But Myers answered the question candidly. "I told the official that I was in favor of stem cell research. I said that my father has Parkinson's disease and that I would very much like to see a cure. I believe I said it would be a crime in my view if we didn't do that kind of research."

"Then," Dr. Myers recalls, "the staffer asked questions that really shocked me. She wanted to know what I thought about President Bush: did I like him, what did I think of the job he was doing." Dr. Myers, who describes himself as normally "nonpolitical," objected to the line of questioning. "I said that I thought it was inappropriate to be asked these kinds of questions which led, I think, to an awkward situation for both of us," he says. "She said that she had been told that she needed to ask the questions and it appeared to me that she was reading from a prepared list. Because of her persistence, I tried to answer in the most nonspecific way possible. I talked about terrorism and the fact that it seemed that the attacks of September 11 had brought the country together. But there is no doubt that I felt the questions were an affront and highly inappropriate."

Not long after this interview, Dr. Myers was notified that he had been denied the NIH council position. "I was very depressed," he says. "I really wanted to serve in this capacity. I care deeply about the science and I'm an expert in this area." Most notably, Dr. Myers knew that he had been selected by his NIH colleagues and so he determined that his rejection must have been due to the fact that his answers to the political questions posed had been deemed unsatisfactory. Alarmed, he appealed his case directly to Dr. Francis Collins, a senior NIH scientist who is chair of the National Advisory Council for Human Genome Research and director of a branch of the NIH called the National Human Genome Research Institute.

Dr. Collins declined to be interviewed about the matter. But, through his office, he confirmed the fact that, learning of the circumstances, he personally intervened on Dr. Myers' behalf and successfully insisted that he be allowed to serve on the NIH council.[110]

Dr. George Weinstock

Dr. Weinstock, a microbiologist at Baylor College of Medicine, is a distinguished researcher, a professor in the departments of molecular and human genetics and molecular virology and microbiology as well as co-director of Baylor's Human Genome Sequencing Center. Dr. Weinstock, who was appointed to the same NIH advisory panel in 2002, says that he too was subjected to questioning about his political views.

After learning of his nomination, he received a call from someone at the HHS. He too was asked a series of questions that he describes as "leading political questions that had nothing to do with my role on the NIH committee."[111] Dr. Weinstock also reports that the interview included questions about his political views, whether he supported stem

[109] The National Advisory Council for Human Genome Research advises the NIH and the Department of Health and Human Services on genetics, genomic research, training, and programs related to the human genome initiative.
[110] Author interviews with two members of Dr. Collins' policy staff, National Human Genome Research Institute, March 2004.
[111] This and the statements that follow come from an author interview with George Weinstock, March 2004.

cell research, and what he thought of President Bush. "There is no doubt in my mind that these questions represented a political litmus test," he says. While he found the line of questioning disturbing, he chose not to confront the questioner but tried instead "to change the subject. I said things like: 'we live in complicated times.'" Dr. Weinstock believes his answers must have been "innocuous enough to be palatable" because he was confirmed by the White House to serve on the NIH council.

National Institute on Drug Abuse

Dr. Claire Sterk

During her confirmation process for the Council of the National Institute on Drug Abuse, Dr. Sterk reports she was subjected to repeated questioning about her political views in three separate calls from a White House staff member. Among the questions she was asked, and refused to answer, was whether she had voted for President Bush.

"I have nothing to hide," Dr. Sterk commented. "But I told the questioner that I did not see the connection between his line of questioning and my work on a scientific advisory council. And I refused to answer unless the questioner could tell me that I would have some kind of particular political policy role, which I knew I would not."[112]

Despite her refusal, however, Dr. Sterk states that the White House staffer continued trying to elicit an answer about her vote in the presidential election "for roughly 15 minutes." Dr. Sterk was asked many other overtly political questions that she refused to answer, such as whether she supported "faith-based" drug treatment programs. While Dr. Sterk was confirmed for a position on the NIH council, she says she believes that a high-ranking NIH official may well have intervened on behalf of her nomination. Nonetheless, she says she finds it deeply disturbing that the Bush administration would subject its nominees for a scientific advisory position to such intrusive, partisan political questions.

Like Dr. Sterk, other scientists interviewed by UCS expressed dismay and discouragement about what they consider to be an overt politicization of the appointment process for scientific advisory positions. Scientists who have served Democratic and Republican administrations alike agree that questions of political affiliation have no place in the confirmation process for our highest echelon of science advisers and that the current administration's practice is reprehensible.

As Donald Kennedy, editor of *Science* and former president of Stanford University, has noted, "I don't think any administration has penetrated so deeply into the advisory committee structure as this one, and I think it matters. If you start picking people by their ideology instead of their scientific credentials you are inevitably reducing the quality of the advisory group."[113]

As the following case indicates, however, the political questions asked of scientists in the confirmation process for high-level NIH advisory positions represent

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[112] This and the statements that follow come from an author interview with Claire Sterk, March 2004.

[113] As quoted in Zitner, A. 2002. "Advisors Put Under a Microscope," *The Los Angeles Times.* December 23.

only a small, albeit very important, aspect of the unprecedented politicization of the appointment process for NIH science advisers in the current administration.

Fogarty International Center Advisory Board

As originally reported in *the New England Journal of Medicine*,[114] Gerald T. Keusch, who served from October 1998 to December 2003 as associate director for international research at the NIH and as a director of an NIH branch called the Fogarty International Center, recounts a dramatic change in the appointment process when the Bush administration took office. Now serving as assistant provost for global health at Boston University Medical Center, Dr. Keusch states that during three years under the Bush administration, he proposed 26 candidates to serve on the Fogarty Center's council-level advisory board. All the candidates he nominated were approved within a week by the NIH director but, after many months of delays in almost every case, only seven were approved by the Bush administration, while the remaining 19 candidates were rejected. Dr. Keusch contrasts this record with his personal experience during the previous administration, in which all seven of his nominations for the board were swiftly approved.

In response to in-depth questioning for this report, Dr. Keusch responded with specific information about the circumstances surrounding the repeated rejection of his nominees. Because the Fogarty Center gives research grants, Dr. Keusch says, "I knew what skills I needed on my board to review grants and help determine future scientific directions for the Center. I had 30 years of experience in science and developing countries and I knew who understood and had personal experience in developing countries and who could provide the scientific insight the Center, and I as director, desired."[115] Accordingly, he says, all his scientific nominees to the Fogarty Center's advisory board represented highly credentialed experts in their fields.

In his first set of nominations, Dr. Keusch proposed to empanel Torsten Wiesel, a Nobel laureate in medicine; Jane Menken, a highly respected demographer at the University of Colorado; and Geeta Rao Gupta, an internationally known expert on women's health and the president of the Washington, DC-based International Center for Research on Women. After more than seven months of delay in Secretary Thompson's office at the HHS, Dr. Keusch said he learned that all three of these initial candidates had been rejected without explanation.

"I was disappointed and puzzled," Dr. Keusch recalls. He went to Ruth Kirschstein, then acting director of the NIH, and requested that he be allowed to meet with Secretary Thompson's office. As Dr. Keusch puts it, "I had managed to get a Nobel laureate to agree to serve on my board and, if he was going to be rejected, I wanted to know why."

In response to detailed questions about the process, Dr. Keusch recounts that the meeting with Secretary Thompson's staff and another administration official was deeply

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[114] Steinbrook, R. 2004. "Science, Politics, and Federal Advisory Committees," *The New England Journal of Medicine* 350(14):1454-1460. April 1.

[115] This and the statements that follow come from an author interview with Gerald T. Keusch, April 2004.

disturbing. "There is no written record, but I recall being told that Dr. Wiesel was rejected because he had signed too many full-page letters in *The New York Times* critical of President Bush. I was told Dr. Menken was unacceptable because she was on the board of the Alan Guttmacher Institute, a nonprofit reproductive health research organization. Dr. Rao Gupta, I was told, was deemed too political because she had publicly supported women's right to abortion."

Dr. Keusch reports that in one case even a sitting board member was rejected. When Dr. Keusch sought to renew the term of Cutberto Garza, associate provost at Cornell University and an expert on international nutrition, Secretary Thompson's office rejected Dr. Keusch's request. Eventually, Dr. Keusch said, the experience was so frustrating that he stopped even talking to candidates in advance of their confirmation. "It was too embarrassing to me to get these top people to agree to serve as board members only to have to tell them they were rejected by the Department of Health and Human Services."

President's Council on Bioethics

In another clear case of political interference in the science advisory appointment process, on February 27, 2004, the Bush administration dismissed Dr. Elizabeth Blackburn, a leading cell biologist, and Dr. William May, a prominent medical ethicist, from the President's Council on Bioethics. For three years, Dr. Blackburn had served on the panel, which is charged with advising the president on the ethical implications of advancements in biomedical research. Dr. Blackburn is best known as the co-discoverer of telomerase, an enzyme linked to cancer cell growth. This discovery launched a burgeoning cancer research field. According to Nobel laureate Thomas Cech, president of the Howard Hughes Medical Institute, Dr. Blackburn "is a very smart and successful scientist…one of the top biomedical researchers in the world."[116] Dr. Blackburn states that she believes she was dismissed because she disapproved of the Bush administration's restrictive position on stem cell research. According to Dr. Blackburn, she and Dr. May frequently disagreed with the administration's positions on the ethics of biomedical research.[117] She was removed from the panel soon after she objected to a Council report on stem cell research. In an essay in the April 1, 2004 issue of *The New England Journal of Medicine*, Dr. Blackburn recounted how the dissenting opinion she submitted, which she believes reflects the scientific consensus in America, was not included in the council's reports even though she had been told the reports would represent the views of all the council's members.[118]

The removal of Drs. Blackburn and May—and the subsequent appointment of new panel members who are supportive of the administration's stated positions, significantly limits the range of views now available to the president on bioethical issues.

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[116] As quoted in Elias, P. 2004. "Scientist lauded after government fires her," Associated Press. March 18.
[117] Author interview with Elizabeth Blackburn, March 2004.
[118] Blackburn, E. 2004. "Bioethics and the Political Distortion of Biomedical Science," *The New England Journal of Medicine* 350(14):1379-1380. April 1. See also "Science and the Bush administration: Cheating nature?" *The Economist,* April 7, 2004.

This action violates the spirit, if not the letter, of the Federal Advisory Committee Act of 1972, which requires balance on such advisory bodies.[119] As Dr. Blackburn herself has pointed out, she was one of only three full-time biomedical scientists on the panel, which, even prior to her dismissal, was weighted heavily to nonscientists with strong ideological views. While no one disputes that nonscientists should play an important role on a bioethics panel, it is equally important that scientists, with strong biomedical expertise, provide the necessary scientific context for the panel.

The administration has claimed that politics played no role in Dr. Blackburn's dismissal,[120] but in the wake of Dr. Blackburn's firing, some 170 researchers signed an open letter to President Bush protesting the decision.[121] Dr. Janet Rowley,[122] Distinguished Service Professor of Medicine and Molecular Genetics at the University of Chicago and current member of the Bioethics Council, has characterized Dr. Blackburn's dismissal as "an important example of the absolutely destructive practices of the Bush administration."[123]

Among those expressing concerns about Dr. Blackburn's dismissal was the American Society for Cell Biology (ASCB), which represents 11,000 scientists worldwide. ASCB issued a public statement contending that Dr. Blackburn's dismissal reflected a pattern in the Bush administration in which politics trumps science. As ASCB President Harvey Lodish noted: "In his 2001 speech announcing the creation of the Council, President Bush said the Council would include strong representation from leading scientists. This action significantly undermines the ability of Councilors to base their considerations on the foundation of sound science."[124]

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[119] See Federal Advisory Committee Act, 5 U.S.C. Appendix 2, Section 5(b) 2 and 3.
[120] See, for example, Kass, L. 2004. "We Don't Play Politics with Science," *The Washington Post.* Op-ed. March 3.
[121] See Holden, C. 2004. "Researchers blast U.S. bioethics panel shuffle," *Science* 303:1447. March 5.
[122] Among her many credentials, Janet D. Rowley M.D., D.Sc. is internationally renowned for her studies of chromosomal abnormalities in human leukemia and lymphoma. She is the recipient of the National Medal of Science (1999) and the Albert Lasker Clinical Medicine Research Prize (1998), the most distinguished American honor for clinical medical research.
[123] As quoted in Elias, P. 2004. "Scientist lauded after government fires her," Associated Press. March 18.
[124] American Society for Cell Biology. 2004. "Cell Biologists Oppose Removal of Top Scientist." Press release. March 2. Available online at *http://www.ascb.org/newsroom/blackburn.html.*

Section III: Finding Solutions

This report provides additional evidence that when scientific knowledge has been found to be in conflict with its political goals, the Bush administration has manipulated the process through which science enters into its decisions.

The mountaintop removal strip mining case reveals a flagrant abuse of political power by the deputy secretary of the Interior, a former lobbyist for the National Mining Association, for the purpose of eliminating any and all plans not espoused by the mining industry. This action will have a severe impact on the environment of Appalachia. The decision of a senior FDA official to deny women over-the-counter access to emergency contraception, against the advice of both an expert advisory committee and his own scientific staff, will lead to more unplanned pregnancies and, ultimately, more abortions. The four cases regarding application of the Endangered Species Act demonstrate a disturbing pattern of administration officials suppressing or distorting the best available science when it conflicts with their policy objectives.

The report also provides further examples of political meddling with scientific advisory committees, showing how prominent scientists, in the course of being considered for important committees, have been asked inappropriate political questions, including whether they had voted for President Bush. This practice appears to be most prevalent in the HHS where, as we reported in our earlier study, Secretary Tommy Thompson has imposed previously unheard of political oversight on the selection of scientific advisors.

This report and its predecessor, *Restoring Scientific Integrity in Policy Making*, having established widespread and serious abuse, raise the issue of what reforms should be adopted to restore scientific integrity to the formation and implementation of federal public policy. This is a significant question, and will continue to be the subject of analysis, public education, and advocacy by the Union of Concerned Scientists. Since the first report was published, UCS has consulted with scientists who have served in government, experienced congressional staff, and other experts about reforms that might be pursued. The reforms suggested so far fall into several distinct categories:

- *Protecting Government Scientists.* The vulnerability of full-time scientific staff to actions by superiors that breach the ethical code of science can impede or prevent the transmission of objective scientific information and advice to policy makers. Such practices undermine the morale of scientific staff and make it more difficult to attract scientists to government service. Government scientists have minimal legal protection should they seek to resist orders or actions by their superiors that violate the ethical code of science. The Whistleblower Protection Act only offers protection against such abuse if the abuse violates laws or creates imminent danger to public health and safety. A handful of individual statutes, including the Clean Air and Clean Water Acts, protect disclosures of information that further implementation of those laws. Additional protection is needed for agency scientists who are pressured to distort or suppress scientific findings. One solution could be to create a corps of scientific ombudsmen who would, on a confidential basis, be responsible for resolving such problems in collaboration with the inspector general of the department and the Office of Science and Technology

Policy. Such a process, if properly designed, would conform to the culture of science and would reduce the likelihood that every such conflict becomes a public legal joust or political *cause celebre.*

- *Providing Better Scientific Advice to Congress*. The abolishment in 1995 of the Office of Technology Assessment left Congress with very little capacity to assess important science and technology issues independently of the executive branch. A bipartisan group of House members, including the chairman and ranking member of the Science Committee, is proposing creation of a Center for Scientific and Technical Assessment within the General Accounting Office, to restore some of this capability.[125] A Congress more fully informed about science and technology could play a stronger role in ensuring that federal policy making is informed by the best available science.

- *Strengthening the Office of Science and Technology Policy (OSTP).* The OSTP director, as the most senior scientific advisor in the U.S. government, should once again have the stature of assistant to the president for science and technology, and should report directly to the president. When a new administration comes to office, the OSTP director should be among the earliest appointments, so that he or she can be involved in the selection of the most senior appointees having scientific responsibilities in all departments. The staff of the OSTP should be expanded so that it can better provide the director with independent assessment of controversies involving science. OSTP staff should also have the ability and resources to receive and assess reports from the proposed ombudsman corps.

- *Ensuring the Independence of Scientific Advisory Committees.* The Federal Advisory Committee Act (FACA) stipulates that members of such committees are to be appointed as Special Government Employees (SGEs), with full disclosure of any conflicts of interest, when they are to serve in the role of experts, or as "representatives" when they are to represent various stakeholders. A number of departments, both in this administration and in past administrations, have appointed many experts as representatives, thereby avoiding the requirement for disclosure of conflicts of interest. Congress should see to it that the FACA is fully enforced, and that clear rules are established and applied to all departments. These rules should stipulate that committees that have a purely scientific or technical advisory mission, or that review research proposals, should be composed entirely of SGEs, and more generally, should require full transparency in the selection and activities of such committees. Furthermore, it should be forbidden to ask scientists and other experts being vetted for membership on scientific advisory committees about their political or policy positions, let alone how they have voted in past elections.

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[125] The initial sponsors of this proposal are Representatives Rush Holt, Sherwood Boehlert, Amo Houghton, and Bart Gordon.

- *Providing for Increased Access to Information.* Full access to scientific information is critical for informed, transparent decision making. Unfortunately, such information is increasingly being withheld from the outside scientific community, the public, and even Congress. Among needed reforms are a top-to-bottom review of classification policy for all agencies, to ensure that only information that truly needs to be kept secret is withheld from disclosure, and a tightening of the "pre-decisional" exemption to the Freedom of Information Act that allows agency officials to suppress discordant or ill-timed release of scientific findings by indefinitely keeping reports in "draft" form.

Even if these and other reforms are adopted, scientists and scientific societies will still have an important role in monitoring the use of science in federal policy making and bringing any future abuses to the attention of the media, the public, and their elected representatives.

Finally, it should be acknowledged that in the American system of government, the chief executive inevitably sets the tone, and if science is to play the constructive role that citizens expect and deserve, the president must demonstrate a strong personal commitment to respecting objective scientific advice, even in situations where it is ultimately rejected because other factors carry greater weight. In his April 2 response to the scientists' statement and original UCS report, OSTP Director Marburger stated that, "President Bush believes policies should be made with the best and most complete information possible, and expects his Administration to conduct its business with integrity and in a way that fulfills that belief." [126] If this is indeed the case, this report demonstrates that there are many senior officials in the president's administration who have yet to get the message.

[126] Statement of the Honorable John H Marburger, III on Scientific Integrity in the Bush Administration, April 2, 2004, online at *http://www.ostp.gov/html/ucs/ResponsetoCongressonUCSDocumentApril2004.pdf*