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## The Current State of Anticoagulant Rodenticides in California



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## Two different kinds of ARs.

<p><b>1<sup>st</sup> Generation (FGAR)</b></p> <ul style="list-style-type: none"> <li>■ Multiple feedings</li> <li>■ Less persistent in tissues</li> <li>■ Commensal and outdoor use</li> <li>■ Chlorophacinone, diphacinone, warfarin</li> </ul>	<p><b>2<sup>nd</sup> Generation (SGAR)</b></p> <ul style="list-style-type: none"> <li>■ Intended for single feeding (more toxic)</li> <li>■ More persistent in tissue</li> <li>■ Registered only for commensal use</li> <li>■ Brodifacoum, bromadiolone, difethialone</li> </ul>
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## Two different kinds of ARs.

**2<sup>nd</sup> Generation (SGAR)**

- Intended for single feeding (more toxic)
- More persistent in tissue
- Registered only for commensal use
- Brodifacoum, bromadiolone, difethialone

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## Persistence of anticoagulants in liver tissue (USEPA)

**Brodifacoum:** 217 days  
**Bromadiolone:** 248 days  
**Difethialone:** 118 days  
 Diphacinone: 90 days  
 Warfarin: 35 days

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## Acute Oral Toxicity of Anticoagulants to Dogs (LD50 values in mg ai/kg)

**Brodifacoum:** 0.25 -1  
**Bromadiolone:** 8.1  
**Difethialone:** 4  
 Chlorophacinone: 50 100  
 Diphacinone: 3 15  
 Warfarin: 20 50



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## Background

- In the early 1990's, DFG began receiving animals with signs of anticoagulant toxicosis. Symptoms include unexplained bleeding in the body cavities and subcutaneously and lack of clotting in blood.
- Mostly result of secondary exposure.
- In 1999, DFG requested that DPR place products with **brodifacoum** in re-evaluation based on 58 cases of exposure.
- USEPA was also considering issue so no action by DPR.

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## Necropsies of Anticoagulant Cases



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## Summary of Mortality Data

- Current list contains 284 mortality incidents.
- Mortality database under-represents number of wildlife impacted.

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## Species Impacted

- Golden Eagle
- Great-horned Owl
- Barn Owl
- Red-tailed Hawk
- Red-shouldered Hawk
- Cooper's Hawk
- American Kestrel
- Turkey Vulture
- Canada Goose
- Black bear
- Fisher
- Red Fox
- Gray Fox
- SJ Kit Fox
- Coyote
- Mountain Lion
- Bobcat
- Kangaroo Rat
- Raccoon
- Badger
- Wild Pig

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## Monitoring Data

- San Joaquin Kit Foxes in Bakersfield
- Raptors in Central Valley and San Diego
- Bobcats and Mountain Lions in Southern California
- Fishers in California

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## San Joaquin Kit Foxes in Bakersfield

- San Joaquin Kit Fox (*Vulpes macrotis*) – permanent reproducing population in Bakersfield.
- Diet: rodents and rabbits.
- Federally endangered and State threatened.



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## Wildland-Urban Interface



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## The Study Area



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## Methods

- CSU Stanislaus (Brian Cypher) collected carcasses (radiocollared foxes) and extracted liver tissue. Also had archived foxes from as far back as 1977.
- Livers analyzed for anticoagulant rodenticides.

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## Results: Foxes with AR Detections

Pesticide	Bakersfield n=77	Lokern n=13
<b>Brodifacoum</b>	74%	0%
<b>Bromadiolone</b>	36%	8%
Chlorophacinone	8%	0%
Diphacinone	3%	0%
All ARs	79%	8%

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## Raptors in California

(Lima and Salmon 2010)



- Tested anticoagulant residues in livers of 96 birds of 11 raptor species in California. (Birds had died of other causes).
- 2 locations
  - San Diego (relatively urban)
  - Central Valley (more rural, agricultural use)

Lima, L. and T. Salmon. 2010. Assessing some potential environmental impacts from agricultural anticoagulant uses. Proceedings of Vertebrate Pest Conference.

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## Raptors in California


(Lima and Salmon 2010)

	San Diego	Central Valley
FGAR	0/53	2/43
SGAR	49/53	37/43

Lima, L. and T. Salmon. 2010. Assessing some potential environmental impacts from agricultural anticoagulant uses. Proceedings of Vertebrate Pest Conference. 17

## Bobcats and mountain lions in Southern California

Riley et al 2007




- Study area: Coastal mountain ranges around southern California (Santa Monica, Simi Hills, Santa Susana)
- Collected bobcats and mountain lions and analyzed livers for anticoagulants.
- 1997-2003.

Riley, S. 2007. Anticoagulant Exposure and Notoedric Mange in Bobcats and Mountain Lions in Urban Southern California. Journal of Wildlife Management.

## Bobcats and mountain lions in Southern California

Riley et al 2007



Bobcats:

- 35/39 had ARs
- 27/39 had 2 or more ARs
- 31/39 had **Brodifacoum**

Mountain Lions:

- 4/4 had ARs
- Brodifacoum** and **Bromadiolone** in all 4
- 2 died of AR poisoning

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## Update on Mountain Lions and Bobcats

- 14/14 mountain lions tested by DFG for ARs in the last year had ARs.
- Recent preliminary data by NPS on bobcats: 95% exposed (n=40). Most common number of ARs detected = 3. ARs detected in bobcat fetus.

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## Fisher Project

- Fishers live in old growth forests in northern California.
- 2 small populations in California
- ~1,100 individuals
- Project to re-establish population of fishers. Radiocollaring and tracking.

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## California Fisher

*Martes pennanti*

- Live in conifer/mixed hardwood forests.
  - Favor old growth-forest complexity
  - Den in tree cavities
- 2 populations
  - Northern CA
  - Southern Sierra Nevada (very small ~300 indiv.)
  - Multiple long-term research/monitoring projects that radio collar to assess survival, causes of mortality, reproduction and habitat use
- Currently trying to re-establish fishers in northern Sierra Nevada Joint agency-academia industry project

**PACIFIC FISHER**  
*Martes pennanti*

- **Habitat:** Conifer and mixed forests. Likely favors old-growth forests and often makes its home in tree cavities
- **Life cycle:** Lives up to 10 years; breeding season February through April; young are raised by the mother
- **Food:** Opportunistic feeder, eating anything it can catch, including mice, rabbits, squirrels and birds
- **Unique features:** Feet have five toes with retractable claws; rear paws can rotate nearly 180 degrees, allowing the fisher to climb down trees headfirst like a squirrel
- **Size:** 2.5 to 4 feet long
- **Weight:** Males 7 to 13 pounds, females 3 to 5.5 pounds

Source: U.S. Fish and Wildlife Service

\*California Wildlife Habitat Relationships (CWHR) range, 1995 data

**An adult Pacific fisher with radio collar**

Photo: J. MARK HIGLEY  
Hoopa Tribal Forestry

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## Conclusions from Mortality and Monitoring Data

- Widespread AR exposure to predators and scavengers
- Mortalities caused by exposure
- Multiple exposure scenarios: Urban, Rural, Wilderness
- Illegal/Legal Use?

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## Current Regulations

- 2008: USEPA Risk Mitigation Decision: SGARs not available for homeowner use. Will still be available to pest control companies.
- Field uses of FGARs are restricted.
- 3 companies sued USEPA – SGARs still available to consumers at retail outlets.

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## Rural Exposure Risks

- Loophole: SGAR availability at farm stores in large packages (>8 lbs) for use inside and around ag buildings.
- FGARs restricted use for field applications: easier to obtain SGARs?
- Rural exposure likely route for bobcats, mtn lions.
- Fishers?



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## California Restricted Materials

The criteria to designate a pesticide as a California “restricted material” include hazards to: public health, applicators, farm workers, domestic animals, honeybees, the environment, wildlife, or crops other than those being treated.

DPR may propose pesticides for designation as restricted materials at any time, often based on a review of data submitted by registrants, information obtained from field studies, or incident investigations. For example, pesticides found in ground water from routine agricultural use are designated as restricted materials to allow for greater local control over their use to prevent leaching to ground water.

Only DPR can give pesticides a “restricted material” designation and must do so through the regulation process.

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## CDFG Recommendation

- CDFG has recommended that Department of Pesticide Regulation make SGARs Restricted Use Materials (need a license to buy or use).
- The goal of this recommendation is to prevent the public from buying these products at farm stores.
- Available only to certified applicators.

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## Questions?



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