INVESTIGATION OF WILDLIFE LOSSES FROM PESTICIDES

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Background

- Department of Fish and Wildlife is responsible for protecting fish and wildlife in California.
- DFW Wildlife Investigations Laboratory is responsible for monitoring pesticide impacts on fish and wildlife in California.
- Receive animal carcasses from suspected pesticide poisonings all over the State.
- Department of Pesticide Regulation regulates pesticide use in California.
- Work with County Agricultural Commissioner's offices on pesticide-related wildlife incidents.

Pesticide Investigations: Some trends

- Fewer agricultural incidents.
- Fewer problematic ingredients.
- Smaller incidents.
- Fewer fish kills.

Typical pesticide case: 1990

- Agriculture: Rice, alfalfa, grapes
- Average of 539 animals per episode
- Most common pesticides: carbofuran (carbamate insecticide) and endosulfan (organochlorine insecticide)

Typical pesticide case:2010

- Urban/residential pesticide use
- Small number of animals (average of 17/episode)
- Most common pesticide: anticoagulant rodenticide

WE'VE COME ALONG WAY, BUT STILL HAVE A FEW ISSUES TO SOLVE.

No rodenticide is completely safe for wildlife (or kids or pets).

Acute rodenticides

- Kill quickly.
- Usually primary exposure is the problem.
- Often no antidote
- Strychnine, bromethalin, zinc phosphide, cholecalciferol.

Anticoagulant rodenticides

- Take several days to kill.
- Usually secondary exposure is a bigger problem.
- There are antidotes.
- First generation, second generation.

Non-target wildlife

Is it on the label?

Some Trends in Nontarget Losses

- Anticoagulant rodenticides were responsible for the highest number of incidents.
- Incidents caused by acute toxicants involved more animals per incident.
- Strychnine was the rodenticide most often involved in intentional poisoning incidents.
- Bromethalin cases are increasing.

Anticoagulant Rodenticides

- Cause death by impairing clotting – animal takes several days to die.
- In the early 1990's, DFW 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.

Species Impacted

- Golden Eagle
- Bald 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

How do we diagnose AR toxicosis?

- Signs of coagulopathy (abnormal bleeding) without signs of trauma.
- Concentration of AR in liver.

Necropsies of Anticoagulant Cases

Interpretation can be difficult

- Often more than 1 kind of AR.
- Persistent in liver – don’t know when exposure(s) occurred.
- Each AR has its own toxicological profile for different species.
- Gross necropsy doesn’t tell the whole story.
- Other stressors (disease, trauma, starvation)

Monitoring Studies Confirm Widespread Exposure

- 79% of San Joaquin Kit Foxes in Bakersfield had been exposed to ARs.
- Mountain Lions and Bobcats: 90% of bobcats, all of mt lions tested in Southern California (Riley, 2007).
- Raptors (Lima and Salmon, 2010): In San Diego 49/53 detections. In Central Valley 37/43 detections.
- Fishers (Mourad Gabriel, UCDavis): 79% had AR detections.

Conclusions from Mortality and Monitoring Data

- Widespread AR exposure to predators and scavengers
- Mortalities caused by exposure
- Sublethal Effects?
- Multiple exposure scenarios:

  Urban, Rural, Wilderness
- Illegal/Legal Use?

Illegal Sources

(Gabriel 2012)

Two different kinds of ARs.

1st Generation

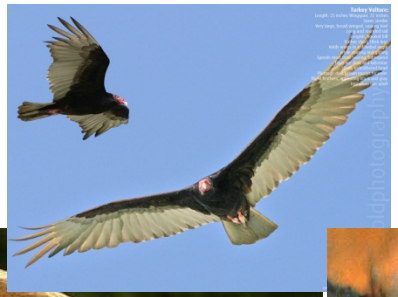
- Multiple feedings
- Less persistent in tissues
- Commensal and outdoor use
- Chlorophacinone, diphacinone, warfarin

2nd Generation

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

Second-Generation Anticoagulant Rodenticides

- High number of losses of predators and scavengers.
- Monitoring studies of bobcats, mountain lions, San Joaquin kit foxes, raptors, fishers – show that most (around 70%) animals tested were exposed.



Regulation Change

- July 2014: California made SGARs restricted use.
- Also limited outdoor use to within 50 feet of manmade structure.
- CDFW continues to monitor to determine if regulations have had the desired effect.

First-Generation Anticoagulant Rodenticides

- Were used primarily by agriculture but use should be increasing by residential users.
- Secondary exposure to predators and scavengers, primary exposure to herbivores.
- Exposure more common than mortality.
- Chlorophacinone and warfarin less toxic than diphacinone.

The Question of FGARs

- SGARs clearly a threat to non-target wildlife.
- FGARs less clear.
- Greater toxicity than mammals to birds.
- Mortalities not common.
- Sub-lethal impacts?

Detections of FGARs: 2013 (DFW only)

- 42/43 animals tested contained ARs
- 40/43 brodifacoum
- 10/43 diphacinone (mt lions, bobcats, gray fox, DKF, coyote, CSO). All had other ARs as well.
- 1/43 warfarin (mt lion)

UCLA's Study

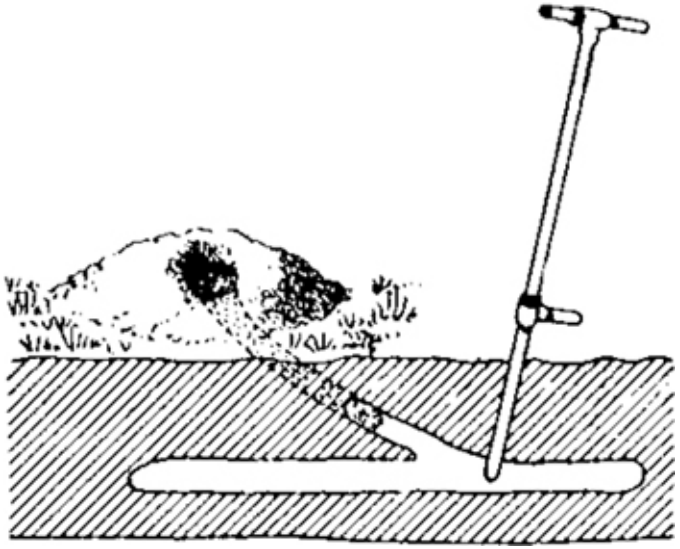
- Bobcats in Orange and LA County
- Sampled blood in ~200 bobcats
- ~30% had diphacinone exposure
- Liver samples were more likely to show SGARs.
- Possible connection to mange.

FGARs vs. SGARs 2015

- SGARs still the major problem.
- FGARs detections increasing: 62% of analyzed animals had an FGAR. Mostly diphacinone. (Since regulation change).
- Formulations w/ acute + FGAR being tested for field rodents.

Strychnine

- Restricted and general use.
- Only legally applied underground for gopher control.



Strychnine

- Mostly primary exposure.
- Most commonly used pesticide for intentional poisoning.
- Flock of birds or “problem” wildlife.
- Animal show neural signs (tremors, convulsions) while alive, or stiff-legged when dead.

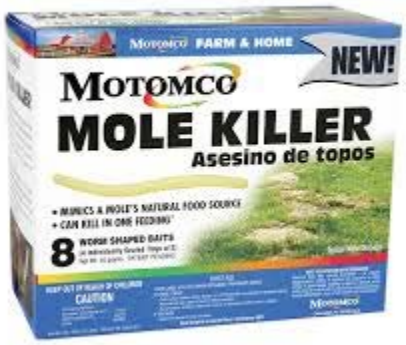
Which one was strychnine?

Photo credit: Jaime Rudd

Strychnine Concerns

- California went from 1999 to 2011 without a reported strychnine loss.
- 2011-2015: ~60 losses in several different incidents.
- Use practices that have caused recent losses have not been determined.
- San Joaquin kit fox: Federally Endangered Species.
- Tricolored blackbird: Species of Special Concern.

Bromethalin



- Acute toxicant
- Secondary toxicity rare.
- No antidote + kills quickly.
- Available over the counter
- About a dozen confirmed incidents all in the last year.
- Inside use only recommended by CDFW.

IS IT FOR ME?
OH! YOU SHOULDN'T HAVE

KILLS HOUSE MICE
4 DISPOSABLE BAIT STATIONS
KID RESISTANT STATION
TOMCAT
MOUSE KILLER II
MATA RATONES
Station Is Child Resistant
Ready-to-Use
No Need To Touch The Bait When Placing Station
NET WT. 4 OZ
CAUTION

Zinc Phosphide

- Restricted and General Use.
- 3 intentional - geese.
- 1 accidental - no prebaiting – label violation.
- 1 unknown source (prob accidental)
- High risk of primary exposure.

Fumigants

- Acrolein, Aluminum phosphide, Gas cartridges
- No known losses, but…?
- Proper burrow identification essential for protection of non-targets.

What's in that burrow?

USEPA's Comparative Analysis

- Mortality (primary and secondary hazard to birds and mammals)
- Blood retention
- Liver retention

USEPA's Risk Model

High Risk

Lower Risk

Brodifacoum

Zinc Phosphide

Difethialone

Diphacinone

Bromadiolone

Chlorophacinone

Cholecalciferol

Warfarin

Bromethalin

Summary

- All vertebrate toxicants have the potential to cause non-target mortality.
- Acute toxicants and fumigants – primary exposure.
- Anticoagulants – primary and secondary exposure.

What can we do?

- Monitoring.
- Careful use practices.
- Reporting and investigating.
- Tinkering with old tools and developing new ones.
- Increased regulation when necessary.

Thank you for helping protect wildlife!!!!
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