



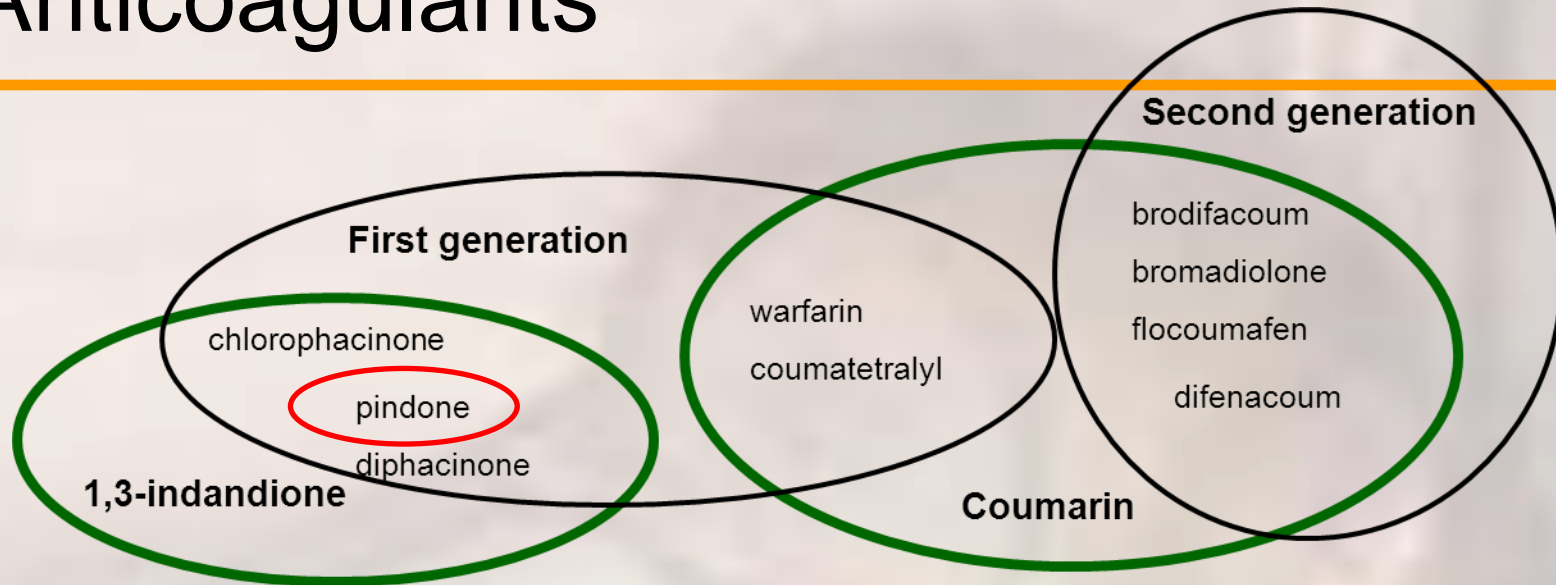
Landcare Research
Manaaki Whenua

Pindone residues in rabbits

Penny Fisher
Samantha Brown
Jane Arrow



Anticoagulants

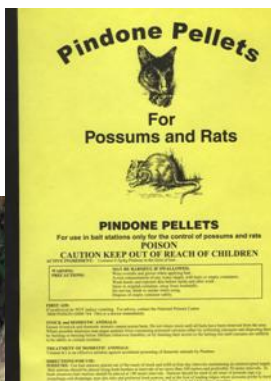


- Inhibit Vitamin-K metabolism in liver, prevent formation of blood clotting factors
- Clotting factors become depleted in blood, coagulation cannot occur
- Haemorrhage more likely to occur following normal movement or small injury
- First signs of poisoning within a few days - stop feeding, lethargy
- Poisoning can be treated with Vitamin K1
- Death after several days through massive (usually internal) haemorrhage

Pindone use in NZ

Possum & rat control

- 0.5 g/kg pindone pellet bait
- bait stations
- No CSL required



Rabbit control

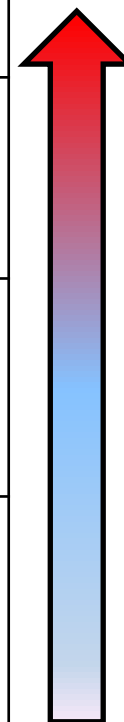
- 0.25 g/kg pindone AgTech or RS5 pellets
- bait stations (no CSL)
- ground/aerial broadcast (CSL required)
- Liquid concentrate applied to chopped carrot bait (target 0.17 g/kg pindone)
- ground/aerial broadcast (CSL required)



Toxicity of pindone to targets

- More toxic when ingested as multiple, consecutive exposures

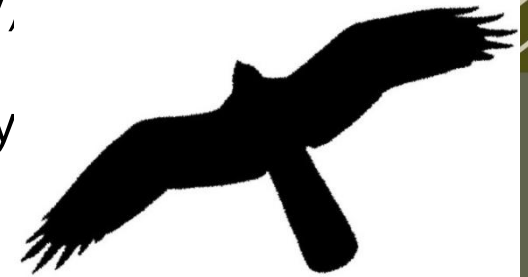
Species	Oral LD ₅₀ (mg pindone / kg bodyweight)	
Rabbit	13 mg/kg	single dose
	0.52 mg/kg / day	multiple dose
Rat	280 mg/kg	single dose
	5 mg/kg / day	multiple dose
Possum	>100 mg/kg	single dose
	64 mg/kg / day	multiple dose



Sensitivity to pindone

Pindone for rabbit control

- Pre-feeding not essential (slow onset of poisoning)
- Bait needs to be available over consecutive days for optimum efficacy (higher chronic toxicity)
- More expensive than 1080 bait (usually
- Aerial application of pindone
 - *less controversial than 1080?*
 - *perceived lower environmental & non-target risk*



....BUT very little research or monitoring of the effects & risks of pindone (compared to 1080)



Secondary risk of pindone ?

- Anticipated increase in pindone baiting for rabbits
- Anecdotal secondary kills of hawks & gulls
- No studies of residues in poisoned rabbits or non-target impacts

INFORMATION GAP

Laboratory trials: rabbits fed different lethal amounts of pindone bait & tissues tested for residues

Field monitoring: collect rabbit carcasses after pindone baiting and tissues tested for residues



Laboratory trials – pindone residues in rabbits

- Used laboratory (white) rabbits as a model for wild rabbits
- Kept in individual cages but given daily exercise sessions on floor
- Feed pellets, lucerne hay & carrots as normal diet
- During trials, twice daily checks for signs of pindone poisoning
- Euthanased if signs of poisoning severe
- Necropsy & tissue samples for pindone residue testing



Laboratory trials – pindone residues in rabbits

Trial 1. **Chronic exposure over 7 days**

- offered c. 12 g of pindone pellets each day, consumption measured
- normal lab diet available

Trial 2. **Acute exposure over one day**

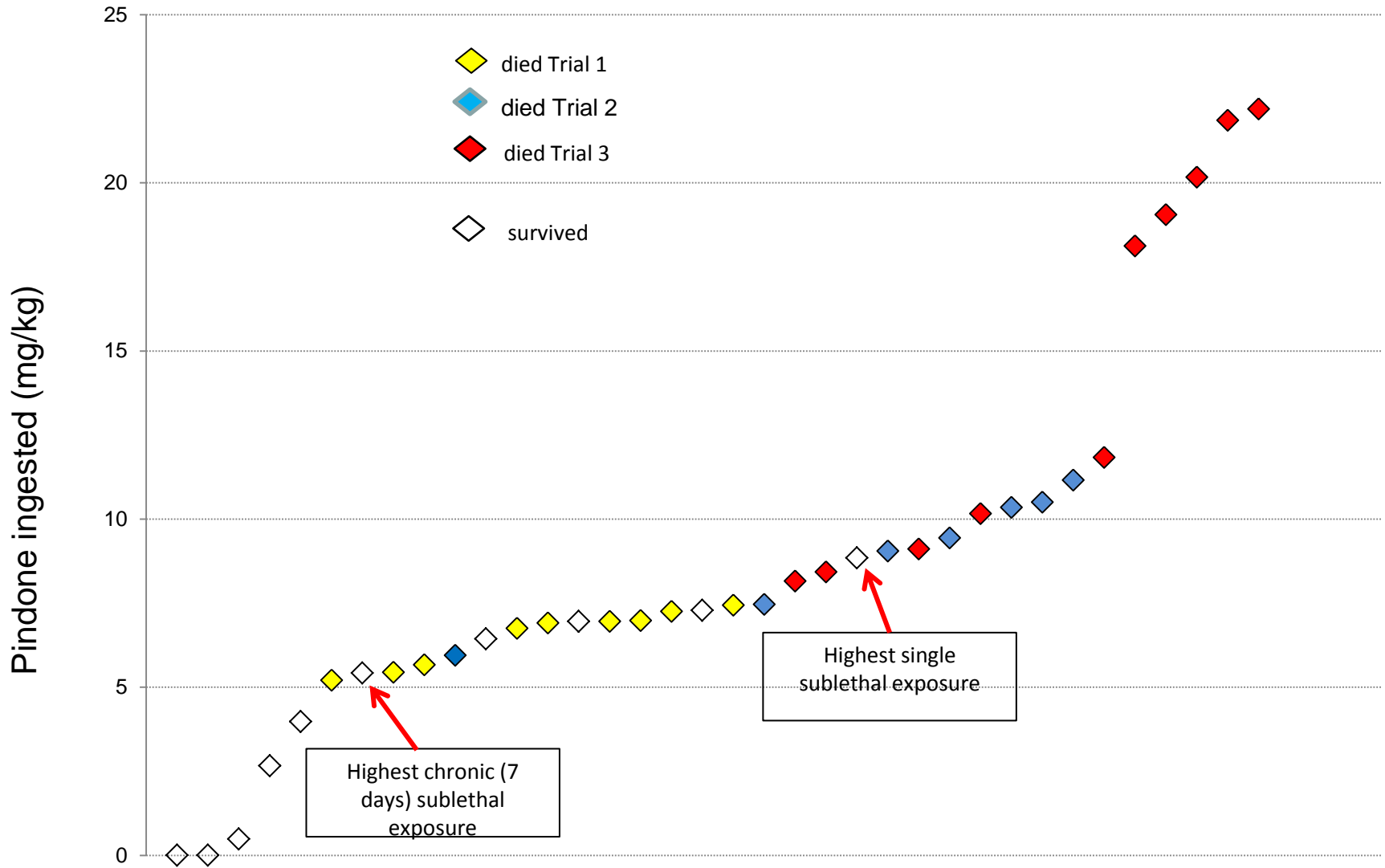
- offered c. 200 g pellets over 24 hours, consumption measured
- normal lab diet available

Trial 3. **High exposure over 5 days (worst case)**

- offered 200 g pellets each day, consumption measured
- normal pellet diet not available but hay & carrots available



Summary results, Trials 1-3



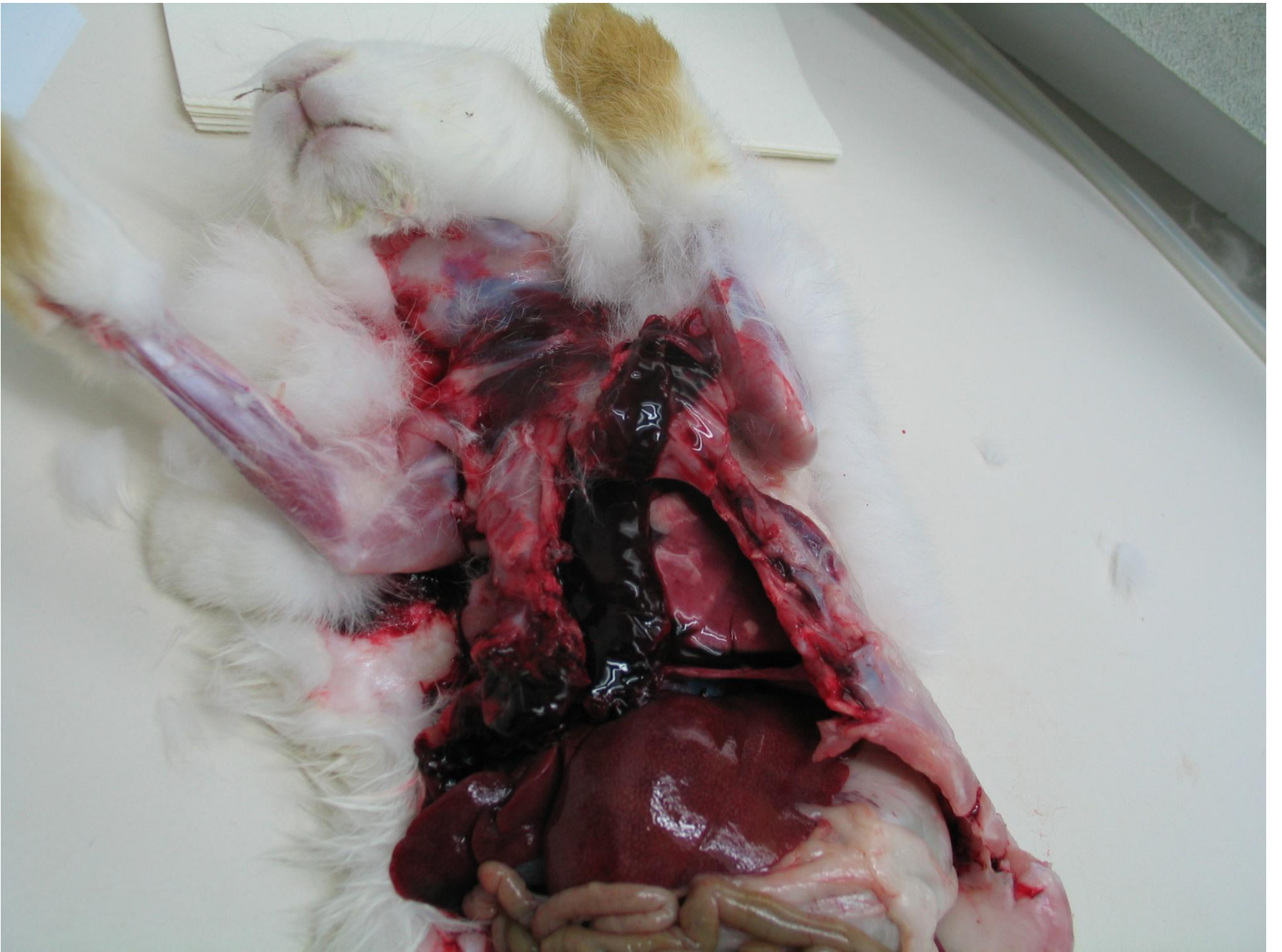
Summary results, Trials 1-3

- Confirm greater sensitivity of rabbits to chronic ingestion of pindone
- Existing LD₅₀ estimates based on oral gavage likely to overestimate actual toxicity with bait ingestion
- Individual variation in sensitivity & importance of defining sublethal exposure limits
- Baiting operations need to account for the least sensitive individuals

Summary results, Trials 1-3

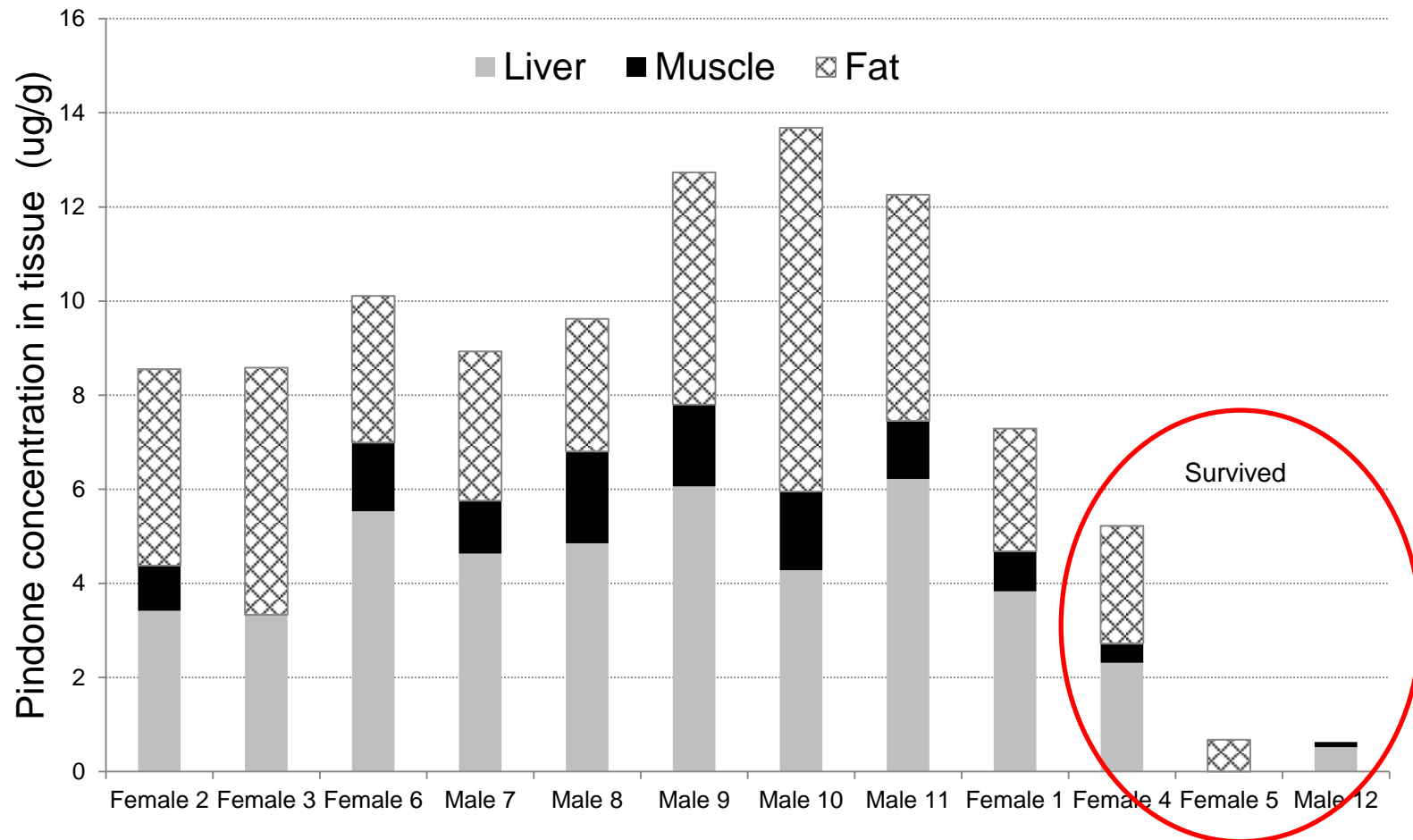
- First signs of poisoning occurs 7 to 8 days after bait first introduced
- Time to death average 10.37 days after bait first ingested
- Necropsy typically showed massive haemorrhage in cardiac cavity, leg muscles or abdominal cavity

WARNING: following image may be disturbing.....



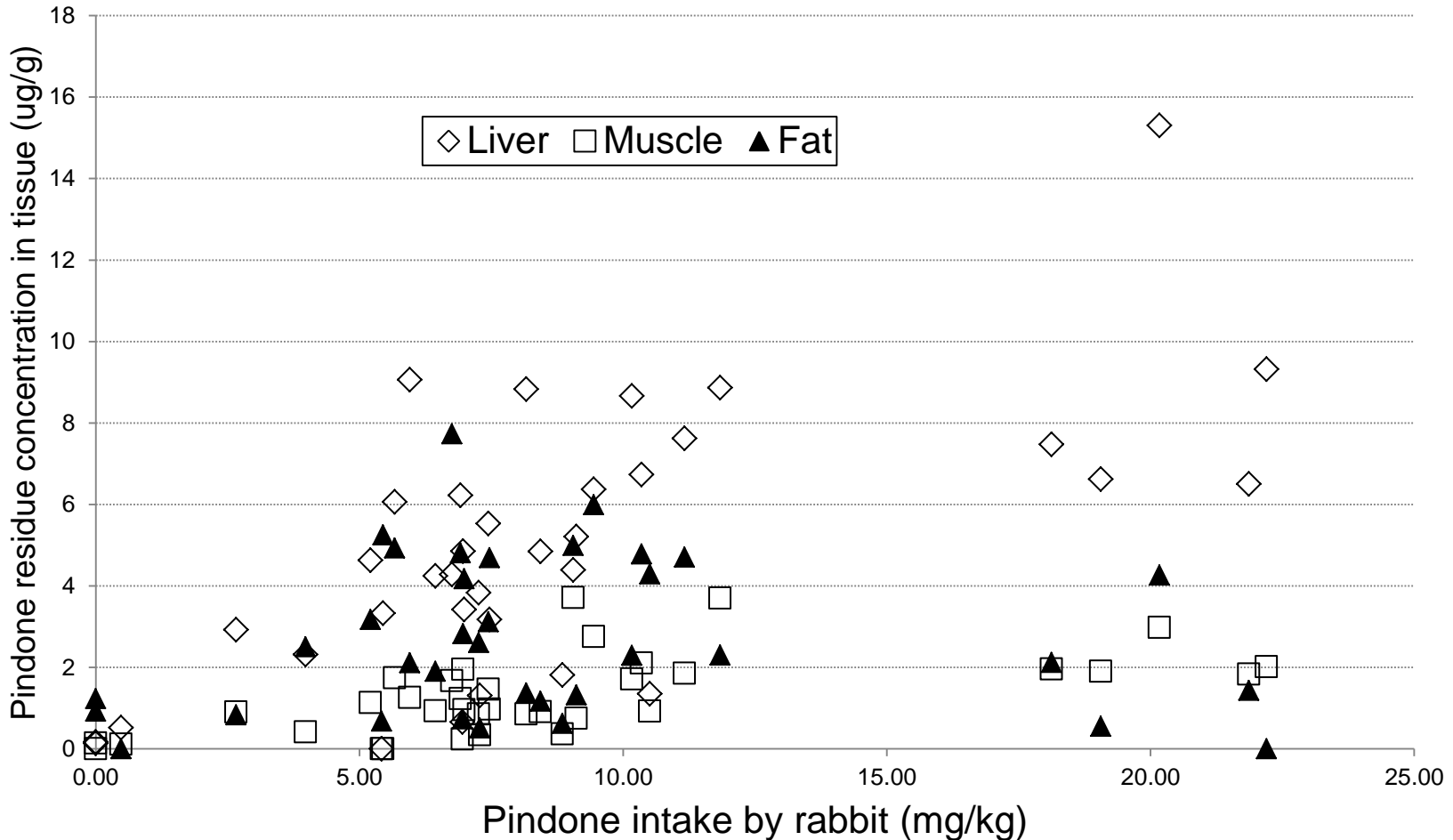
Where are the residues?

Residues overall highest in liver, but also high concentrations in fat

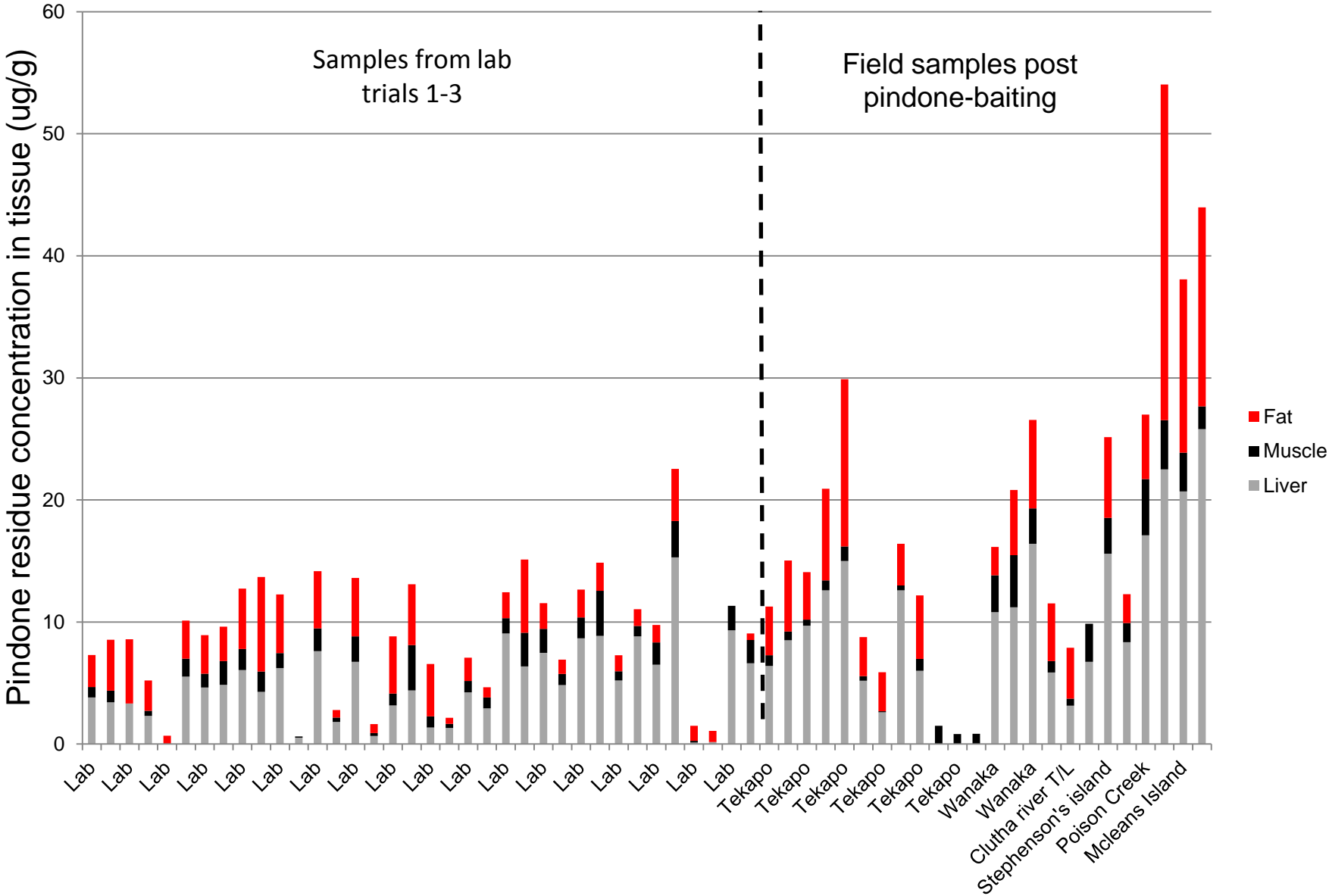


Are residue concentrations related to bait intake?

Yes for liver residues.....sort of for fat...and less so for muscle tissue



What residue concentrations occur in the field?



Preliminary conclusions.....

- Fat tissue can present a similar secondary hazard as liver
- Rabbits eating excessive lethal amounts of bait in pindone field operations >> increased residue burdens in carcasses, available to scavengers & predators
- On paper, a high theoretical secondary poisoning risk where scavengers have chronic feeding on rabbit carcasses (full risk assessment underway)
- Can we change baiting practices to lower lethal exposures in rabbits & reduce available residues?

