

**ANTICOAGULANT BAITING STRATEGIES FOR CONTROL OF
CALIFORNIA GROUND SQUIRRELS, *Spermophilus beecheyi***

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SUMMARY

Anticoagulant rodenticides are used extensively for field rodent control. Because of the potential secondary poisoning hazards, there is a need to develop baiting strategies that minimize the amount of bait applied, while still providing a high level of control. From 1997 to 2000, we conducted laboratory and field studies to develop minimal risk baiting strategies for California ground squirrels (*Spermophilus beecheyi*). Specifically, we investigated:

- i) the effect of amount of bait applied, and the timing and number of bait applications on squirrel mortality (laboratory study);
- ii) the efficacy of different bait concentrations (0.005% and 0.01%) for spot or broadcast treatments (laboratory study);
- iii) the effect of a single dose of diphacinone on blood-clotting time in squirrels (laboratory study);
- iv) the efficacy of spot and broadcast applications using 0.005% and 0.01% diphacinone and bait diluted by 50% with clean grain (field study);
- v) the effectiveness of bait stations (field study)

For broadcast or spot baiting applications, our results suggest that only 2 applications with 4 or 5 d between applications are necessary to achieve control, as opposed to previous beliefs that there must be no more than 48 hours between feedings. Furthermore, in our study, squirrels only required a small amount (less than 4g of bait) per application to receive a lethal dose. Analysis of blood-clotting time showed that the maximum effect of diphacinone was at 4 to 5 days after squirrels received a dose. We suggest that a second dose when blood-clotting time is at a maximum would have the greatest effect.

In strictly controlled field studies, we achieved high levels of control even for those applications where a minimal amount of active ingredient was applied (18% of recommended amount), suggesting that we were still providing excess bait. Field trials that further reduce the amount of bait applied are needed to determine the minimum application rate necessary to achieve good control of California ground squirrels. We also need to determine whether a delay in the second bait application (as may occur in an operational program) has a significant impact on efficacy. This will determine whether it is practical to change label recommendations.

Results from our test of bait stations suggest that although this baiting strategy can effectively control a squirrel population, it requires significantly more bait and time for the population to be controlled. We used 115-lb bait to control a population of 16 squirrels (approximately 6-lb per squirrel) over a 55-d baiting period. Results from our study using non-toxic grain suggested that territorial individuals exclude others from the bait. It is likely that squirrels using bait stations consume significantly more bait than necessary to obtain a lethal dose. This may contribute to higher secondary hazards in the field. Residue analysis of squirrels poisoned from bait stations is needed to confirm this.

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