

RODENTICIDES



Introduction to Rodenticides
containing anticoagulant active
substances (AVKs)

FIRST GENERATION (FGARS)

warfarin, chlorophacinone, coumatetralyl

SECOND GENERATION (SGARS)

brodifacoum, bromadiolone, difethialone,
difenacoum, flocoumafen

Anticoagulant Rodenticides

- The Story of WARFARIN
- Northeastern USA early 1900s
- Cattle died of Haemorrhage – blood not clotting
- Sweet Clover from Europe grew well in USA
- 1933 Farmer Ed Carson drove to UW with Dead cow. Bucket of Unclothed blood and sweet clover hay.(wet)
- Coumarin Found by Professor Karl-Paul Link



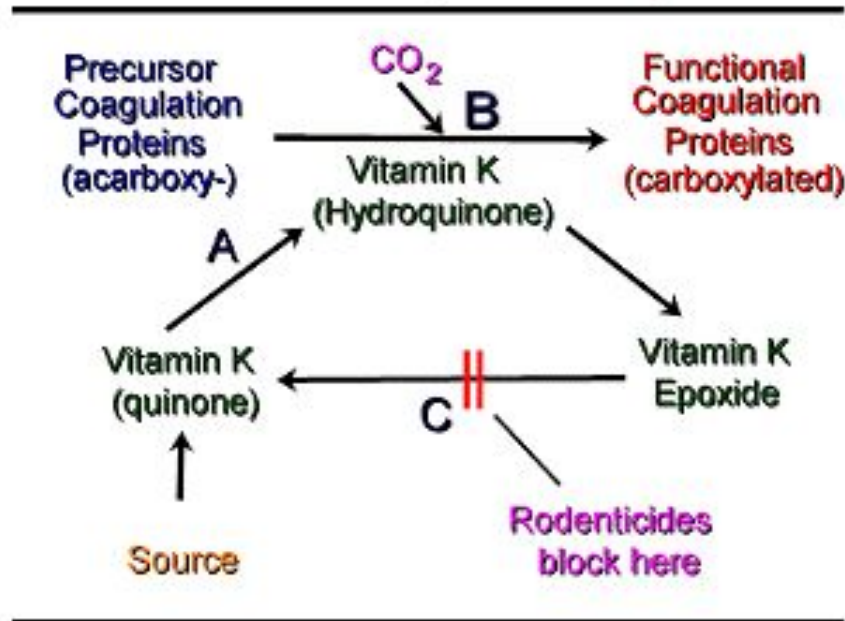
Warfarin

- Coumarin was converted to Dicoumarol by moulds – Vitamin K antagonist
- **W**isconsin **A**lumni **R**esearch **F**oundation
- Similar Compounds developed:
- Chlorophacinone. Coumatetralyl.
- These known as First Generation VKA



How AVK Rodenticides Work

Vitamin K - epoxide cycle



A. Vitamin K reductase

B. Carboxylase - epoxidase

C. Epoxide reductase

Rodenticide Types

First-generation anticoagulants

warfarin, chlorophacinone, coumatetralyl

- Less acutely toxic & less persistent in tissues
- Lower risk of primary & secondary poisoning
- Larger quantities required for longer periods

Second-generation anticoagulants -

**brodifacoum, bromadiolone, difethialone,
difenacoum, flocoumafen**

- Acutely toxic, have chronic effects and long biological half lives

Rodenticide Types

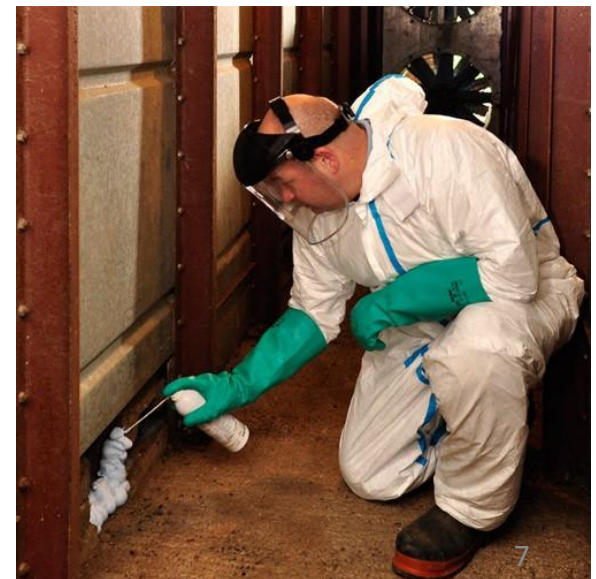
Second-generation AVK rodenticides (SGARs)

more acutely toxic & more persistent in the environment

- **difenacoum**
- **bromadiolone**
- **brodifacoum (more potent)**
- **flocoumafen (more potent)**
- **difethialone (more potent)**

Delivery Methods

- Baiting - Ingestion
- Contact/Grooming – ingestion Foams/dusts



TOXICITY

Table 2: Non-target toxicity – LD₅₀ grams of bait per kilo of animal

Active	Rabbit	Pig	Dog	Cat	Chicken
Difenacoum	40	1600-2000	1000	2000	1000
Bromadiolone	20	60	200	500	
Brodifacoum	5.8	10-40	5-20	500	90
Flocoumafen	14	1200	1.5-5	200	2000
Difethialone	15	40-60	100	320	
Coumatetralyl	>500				

Data taken from WHO and *The Pesticide Manual*

Rodenticide Formulations (Types)



- If a rodenticide is to be used, a key step is selection of the bait to be used:

- **active substance**

- Which anticoagulant?

- **Method of delivery**

- Ingestion by grooming/contact
- Ingestion of bait

- **Bait formulation**

Rodenticide Formulations

Formulation	Description	Advantages	Disadvantage
Whole wheat 	Loose grain – The most common formulation consisting of whole grain.	These tend to be preferred foods for rural rodents. Difficult for rodents to hoard or relocate into open locations.	Easy to spill. Birds and other non-targets at risk, as these are difficult to secure in place.
Place packs 	Loose grain in a bag, which rodents will chew through to gain access to the baits.	Reduce the operator exposure through contamination; premeasured and capable of lasting longer externally.	Larger quantities of palatable rodenticides are within one pack and maybe dragged by rats into exposed areas.
Canary seed bait 	Canary seed base with rodenticide, to control mice.	Activity based feeding allowing mice to pick-up bait. Clear evidence left behind once mice have stripped outer shell.	Easy to spill. Birds and other non-targets at risk, as these are difficult to secure in place.
Wax and extruded blocks 	Rodenticide formulated into a wax or hard food based block	Often easier to secure in place and prevent movement. Can be more tolerant to damp conditions, so last longer.	Larger quantity of rodenticide in one package.

Rodenticide Formulations

Pasta or gel sachets  (Aka-soft block or T-Bags)	Often higher calorie, soft formulations, applied in ready to use sachets.	Fixed quantity of rodenticide that can be used in most locations* Higher lard / oil based formulation, useful in drier environments.	Additives make these smell appealing; this can also work on larger non-target species. The sachet formulation may be 'hoarded' by rats.
Caulking gel 	Similar to the soft blocks but applied with a caulking tube.	Variable quantity can be applied, as supplied in 300ml tubes.	In consistently warm weather, the product has been known to leak the oil. However this is being improved.
Contact products  Generally indoor use only	Non-edible gels and foam applied to pinch-points where rodents are active.	Ingested as part of natural grooming; so no requirement for the rodents to digest the baits.	Will dry-up in warm weather and buildings. Cannot be used within two meters of a food surface.

READING RODENTICIDE LABELS

Extracts from Label Instructions

“KLERAT® Wax Blocks is a ready-to-use wax block bait containing 0.05 g/kg **brodifacoum** (0.005 % w/w), for use as a rodenticide by trained professionals”

Authorisation number:

IE/BPA 70601

Batch number: Refer to packaging

Expiry date: Refer to packaging

“Product stewardship requirements: Not for sale to the general public or any person other than trained professionals. Proof of competence: Trained professional users must register with DAFM as a ‘Trained Professional - Pest Management Professional’ (PMU) and must present their PMU No at point of sale to purchase this product for use only as specified on the label. This product should only be used in accordance with a code of best practice such as **the CRRU Ireland Best Practice Requirements** for Rodent Control and Safe Use of Rodenticides. Follow any additional instructions in that code of best practice”

“Carry out a pre-baiting survey of the infested area and an on-site assessment in order to identify the rodent species, their places of activity and determine the likely cause and the extent of the infestation.

Remove food which is readily attainable for rodents (e.g. spilled grain or food waste). Apart from this, do not clean up the infested area just before the treatment, as this only disturbs the rodent population and makes bait acceptance more difficult to achieve.

The product should only be used as part of an integrated pest management (IPM) system, including, amongst others, hygiene measures and, where possible, physical methods of control”

“Do not use the product as permanent baits for the **prevention** of rodent infestation or **monitoring** of rodent activities”

A ready to use wax block bait containing **bromadiolone (0.005% w/w) for use as a rodenticide by the Professionals and Trained Professionals for the control of rats and mice indoors, outdoors around buildings, in outdoor open areas and waste dumps, and in sewers, for the protection of public health, stored products and materials**

Authorisation Number: IE/BPA 70551

This product should only be used in accordance with a code of best practice such as the CRRU Ireland Best Practice Requirements for Rodent Control and Safe Use of Rodenticides.

Follow any additional instructions in that code of best practice.

Trained professional users must register with DAFM as a 'Trained Professional – Pest Management Professional' (PMU) and must present their PMU No at point of sale to purchase this product for use only as specified on the label

“Carry out a pre-baiting survey of the infested area and an on-site assessment in order to identify the rodent species, their places of activity and determine the likely cause and the extent of the infestation.

Where possible, prior to the treatment inform any possible bystanders (e.g. users of the treated area and their surroundings) about the rodent control campaign in accordance with the applicable code of good practice.

Consider preventive control measures (e.g. plug holes, remove potential food and drink)”

“Do not use baits containing anticoagulant active substances as permanent baits for the prevention of rodent infestation or monitoring of rodent activities.”

What is a Rodenticide Treatment Programme ?

START

MIDDLE

END

Rodenticide Use

- **Most applications succeed within 21 days when correctly applied**
- **Treatments must not last more than 35 days**
 - refer to product label instructions
- If rodents persist after that time, there:
 - **may be insufficient bait or bait points**
 - **baits may be in the wrong places**
 - **rodents may be resistant to the active substance used**

Pulsed Baiting Programmes



- Require a different approach
- Deliver the quickest elimination, with the least amount of bait, and with the fewest visits
- Require less time and are less expensive
- It is essential that following the elimination of an infestation monitoring be conducted using a non-toxic method for possible re-infestation

Burrow Baiting AVKs



- Establish that it is a rat burrow
- Block entrance with a sod - only bait re-opened burrows
- Use long-handled spoon to deeply place bait
- Lightly block burrows - prevent bait ejection
- Mark baited burrows – to find them again
- Some bait will be ejected - check regularly and clean up spillage
- If possible, recover bait at the end of treatment
- Check for dead rodents and dispose of them safely

Rodenticide Use- Records

- Must keep detailed records of risk/site assessment, IPM, baiting strategies, location of bait points, dates and amounts of bait/traps applied and dates spent bait & rodent bodies collected.
- Service Reports / Checklists

Rodenticide – Statutory Restrictions

Programmes involving Continuous Use of Toxic Bait

- May only be undertaken by **Trained Professionals**
- Only **difenacoum & bromadiolone** products
- Limited to sites with high potential for re-invasion
- Limited to sites where other methods of control proved insufficient
- Revisit sites per Product Label

Review approach periodically – having regard to IPM & re-infestation assessment

Alternatives to anticoagulant rodenticides

Gassing



Aluminium phosphide tablets & pellets provide an effective method for rat control

- Effects are virtually immediate
- Burrow fumigation should be used in preference to use of anticoagulant baits
- Impacts on non-target animals are rare and residues of fumigants do not persist

Alternatives to anticoagulant rodenticides

Gassing - Requires considerable training and expertise

- Use of fumigants brings additional responsibilities for safe storage and transportation
- Correct procedures – CRRU Ireland
Best Practice Requirements for Rodent Control and Safe Use of Rodenticides
<http://www.crru.ie/best-practice>



Only those who hold a current nationally recognised qualification in safe use of phosphine gas may purchase & use phosphine generating fumigants

Alternatives to anticoagulant rodenticides

- Alphachloralose (4%)
- Acute Poison
- Immediate
- Narcotic - CNS Depressant
- Temps below 16⁰ C
- **Mice only - Indoors only**



BLACK PEARL

Alternatives to anticoagulant rodenticides

D3 (Calciferol)

- Sub-Acute Poison
- Excess blood Ca^{++} (Kidney Failure)
- Death 48 hours
- Mice – Very Effective
- Rats – Must Pre-bait



May not be available in Ireland!

AN ENVIRONMENTAL RISK ASSESSMENT MUST BE DOCUMENTED WHEN RODENTICIDES ARE USED OUTSIDE

CRRU IRELAND ENVIRONMENTAL INFORMATION SHEET

Ready-to-Use Rodenticide Bait



RECORDS REQUIRED - IN FOLDER

Mo nit or(s) N0. Nu mb er	Initi als	Visit 1		Visit 2		Visit 3		Visit 4		Visit 5	
		Qty	Date	Qty	Date	Qty	Date	Qty	Date	Qty	Date
1,2 4	Qty IN										
	Qty OUT										

GOING BEYOND 35 DAYS

- **PROGRAMME REVIEW** Long Term Baiting (to be completed if treatment extends beyond 35 Days)
– IN JOURNAL
- Why you intend to continue this baiting programme until infestation is cleared therefore:
- Have you checked that your baiting technique is correct?
- Have you considered rodenticide resistance ?
- Have you re-surveyed the site to ensure thorough treatment ?

Moving to LONGTERM BAITING

- **PERMANENT BAITING** – using only permitted rodenticides – **REQUIRES CONTINUOUS REVIEW**
- Do you understand that permanent baiting is only required in exceptional circumstances
- Do they exist on this site ??? What are they ?
- Have all other methods failed (see records)
- Is there a High risk of reinvasion WHY?(see records)
- Will you continue to review and document every 35 days until site activity characteristics change and permanent baiting is discontinued

ERA – Post Treatment Procedure - Journal

Record your procedure for carcass collection and disposal

Record your procedure for disposal of spent bait



Records for Rodenticide use - Journal

- DISPOSAL OF WASTE BAIT

Use Licensed disposal scheme / company

Confirm Target Rodent Activity

- PRIOR TO USING RODENTICIDES OR LETHAL TRAPS TARGET RODENT ACTIVITY SHOULD BE CONFIRMED
- CAN BE DIFFICULT !
- IF INCORRECTLY ASSUMED THAT A TARGET RODENT HAS TAKEN NON-TOXIC BAIT SUBSTITUTING RODENTICIDE WOULD BE IRRESPONSIBLE

Confirm Target Rodent Activity

- TRAPPING NON-TARGETS IS NOT DESIRABLE BUT CAREFUL USE CAN:
- MAKE CLEAR WHICH SPECIES AND NUMBERS ARE PRESENT AFTER NON-TOXIC BAIT TAKE
- FACILITATE RAPID REVIEW / ADJUSTMENT
- EFFECTS ARE LOCAL & POPULATION LOSSES ARE QUICKLY COMPENSATED
- FACILITATES IMMEDIATE CARCASS REMOVAL

Collection and disposal of dead rodents

- Search for dead rodents every time you visit treated site – they likely contain rodenticide residues
- Keep records of time & duration of searches & numbers of bodies found
- Dispose of dead bodies safely (in order of preference):
 - with on-site small carcass incinerator
 - with site farm / domestic waste
 - in site/farm normal non-hazardous waste
 - by deep burial (> 50cm) on-site



Resistance to Rodenticides

- Physiological resistance is the ability of a rodent to survive doses of a rodenticide that would normally be expected to kill it. Resistance is a genetically inherited characteristic and it cannot be acquired during the lifetime of an animal.
- A rodent is either born resistant or born susceptible to a particular rodenticide.
- Behavioural resistance is when an animal behaves in such a way that it refuses to eat the poison bait or ignores bait boxes or eats alternative foodstuffs.

Good Bait Take – No Bodies
Could be resistance or UNDERBAITING

Double number of bait stations – Still No Bodies –
RESISTANCE if other evidence is not consistent
with bait take

- Coloured droppings after 35 days
- Baiting proportionate to observed population levels
- No Bodies



**SUSPECT
RESISTANCE**

**Change to more
potent AVK**

Rodent Monitoring Cycle



- Survey the site at each monitoring inspection as agreed by the SLA and adjust the schedule as required
- Address all new and outstanding proofing and environmental issues identified
- Monitoring should be carried out by the appropriate use of non-toxic bait or tracking/imaging devices
- Toxic baits should not be used for monitoring

Rodent Monitoring Cycle



Be sure that activity at monitoring stations is properly identified as Target Rodents before using rodenticides or traps!



The CRRU Code

ALWAYS:

- have a planned approach
- record the quantity of bait used and where it is placed
- use enough baiting points
- collect and dispose of rodent bodies

NEVER:

- leave bait exposed to non-target animals and birds
- fail to inspect bait as required by label
- leave bait down at the end of the treatment

