Meat Research Corporation

Final Reports

Projects DAQ.096 and DAN.084

Uptake and Depletion Studies on Residues of Ectoparasiticides in Cattle Produced Under Typical Farm Situations Within the Cattle Tick and Buffalo Fly Infested Areas of Queensland and New South Wales.

DPI QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES SOUTH EAST REGION

DAQ.096

Conducted by the Queensland Department of Primary Industries

DAN.084

Conducted by the New South Wales Department of Agriculture

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EXECUTIVE SUMMARY

Background:

The projects DAQ.096 and DAN.084 came about in response to the detection of residues of a synthetic pyrethroid pesticide in Australian beef in late 1991.
This happened in the course of routine Port of Entry Testing under the Import Section of the US National Residue Program Plan.
The level found was just over half of the Australian Maximum Residue Limit (MRL), but more than twice the US tolerance.
This focused Australian attention on international variances in tolerances. It quickly became clear that use patterns and residue tolerances for a range of pesticides used in northern and eastern Australia for cattle tick and buffalo fly control do not match those of our export markets. In most cases the US tolerances for these products are nominal or zero.

Industry expressed an urgent need for further information on the fat depletion characteristics of these chemicals. There were no data on the critical area between the domestic MRLs and the practical limits of determination by conventional methods. Without this information, producers were unable to use the products confidently, regulators were unable to make intelligent recommendations for use, and meat exporters were unable to pack product with assurance, even after extensive end point testing.

Objectives Of The Research:

DAQ.096 set out to:-

1. Determine if current acaricide usage practices result in chemical residues unacceptable to the USA or other countries importing Australian beef.
2. Construct residue depletion curves for each active component of the acaricide in question.
3. Determine the effect of fat depth, weight, age, breed and sex on residue levels and depletion rates.
4. Integrate project results into joint recommendations for chemical manufacturers and extension programmes for the cattle industry.

DAN.084 set out to parallel DAQ.096 using the buffalo fly spray and backrubber treatments in the 'normal' way. Note that the manufacturers of these products do not specify intertreatment intervals on labels.
The spray treatment regimens chosen as 'normal' were three sprayings at 21 day intervals, and for one formulation containing cypermethrin, an additional series of three sprayings at 14 day intervals. This was considered necessary because of the very short intertreatment intervals for buffalo fly commonplace in the Northern Rivers District due to heavy pressure from animal welfare agencies.

At the request of the feedlot industry, a commonly used pour-on lousicide, "Arrest", was added to the study.

The preparations trialed were:-

1. Acaricides.	Method of Application	Active
Barricade 'S' Cattle Dip and Spray	Dip	cypermethrin / chlorfenvinphos
Bayticol Cattle Dip and Spray	Dip	flumethrin
Bayticol Pour-on Cattle Tickicide	Pour-on	flumethrin
Tixafly	Dip	deltamethrin / ethion
Grenade Cattle Dip and Buffalo Fly Spray	Dip	cyhalothrin
Taktic WP	Dip	amitraz
Taktic EC	Spray	amitraz
2. Buffalo Fly Treatments	**Method of Application**	**Active**
Cypafly	Spray	cypermethrin
Swot Buffalo Fly Spray	Spray	cypermethrin
Sumifly Buffalo Fly Insecticide	Spray	fenvalerate
Bayofly Buffalo Fly Insecticide	Spray	cyfluthrin
Coopafly	Pour-On	deltamethrin
Grenade Cattle Dip and Buffalo Fly Spray	Spray	cyhalothrin
Nucidol	Spray	diazinon
Diazinon 200	Spray	diazinon
Buff-Fly-Di	Spray	diazinon
Diazinon 200	Backrubber	diazinon
Supona Buffalo Fly Insecticide	Backrubber	chlorfenvinphos
3. Cattle Lousicides	**Method of Application**	**Active**
Arrest	Pour-on	deltamethrin

Sufficient data were provided by the makers of diazinon impregnated buffalo fly eartags (Spike and Ytex Optimiser) to obviate the need for trial work.

Methods.

Commercial slaughter cattle were treated and held for varying time intervals, and then sampled at slaughter. In all, nearly 1500 head were involved. The successful outcomes of this study were only achieved through the generous assistance of the meat processors, Australian Meat Holdings (AMH), Northern Cooperative Meat Co, Kilcoy Pastoral Company and South Burnett Meatworks Cooperative Association, who bought, fed and held many of the cattle, and a number of cooperating cattle producers who booked cattle for slaughter at time intervals designed to meet the requirements of the trial.

All trial cattle were naive to the trial chemical treatment used. This was established historically and confirmed by analysis of hair samples collected prior to treatment.

Analyses were performed using routine gas chromatographic methods at the residue laboratories of the QDPI at the Animal Research Institute, Yeerongpilly, and the Chemical Residues Laboratory, NSW Department of Agriculture at Lismore. Quality assurance was maintained through submission of random duplicate samples to the Australian Government Analytical Laboratory in Sydney.

Results.

The suppositions and conclusions of the "Mc Ewan Report" (MRC project M.230), were broadly confirmed. The default, interim, "export withholding period" of 21 days, which had been applied by meat processors, was mostly justified.
Most of the chemical residues under scrutiny had peaked by day fifteen after treatment and declined to acceptable concentrations by day 21.
However, while all of the synthetic pyrethroid insecticides examined were capable of forming residues, there were significant differences between them, and in one case between different formulations of the same active.
There was considerable individual animal variation to the same treatments, which was not entirely explained by fat cover or weight changes.
This highlights the need for adequate numbers of experimental animals and for variation in the trial environments when data are being established for registration purposes.
The results gave further fuel to the debate over the appropriate fat depot for meatworks sampling. On average, loin fat concentrations were lower than renal fat concentrations except in the case of the organophosphates, chlorfenvinphos and diazinon, where the relationship was reversed. In Australia, renal fat is collected in abattoirs because it is convenient. However, port of entry testing uses subcutaneous and intermuscular fat from carton core samples.
Some products gave particular cause for concern. For instance, one of the three animals slaughtered on day two and one of the three slaughtered on day three after treatment with Bayofly (nil withholding period (WHP)) violated the MRL and were condemned.
Again Grenade, both in dip and fly spray formulations, was found to produce residues of the order of tenfold the US tolerance at intervals well beyond the normal intertreatment cycles.
Flumethrin in pour-on formulation, which has a persistent tickicidal action, proved also to have very persistent residue behaviour in some animals, and an export slaughter interval of 56 days - at the very limit of the intertreatment cycle, was recommended.
Paradoxically, flumethrin in dip and spray formulations did not provoke significant residues at all.
Chlorfenvinphos levels consistently exceeded the MRL for about one week following treatment with Barricade 'S'. The National Registration Authority (NRA) subsequently amended the nil withholding period to eight days for this product following single use and to 14 days for cattle used to stir the dip.
As expected, amitraz formulations were found to be suitable in cases where repeated treatments are required close to slaughter.

Outcomes.

The results have been used to make recommendations for the use of these products on cattle destined for slaughter for export beef.
These recommendations are expressed as "Export Slaughter Intervals (ESIs)", ie the period which should elapse between the last treatment and slaughter in cases in which the statutory withholding period is inadequate to meet export market requirements.
These have been made widely available to industry.

SECTION 1

Meat Research Corporation

FINAL REPORT

PROJECT DAQ.096

Residues Of Ectoparasiticides In Tissues Of Cattle Produced Under Typical Farm Situations Within The Cattle Tick And Buffalo Fly Infested Areas Of Queensland.

DPI QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES SOUTH EAST REGION

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ABSTRACT

Detections of residues of two ectoparasiticides in Australian beef during routine port-of-entry testing in the USA in late 1991 and 1993 caused great alarm in the beef industry and serious disruptions to trade.

The chemicals concerned are commonly used by beef producers in northern and eastern Australia as integral components of pest control strategies. The residual concentration of one of the chemicals, a synthetic pyrethroid, was less than half the Australian MRL but more than double the US tolerance.

This brought the problem of disharmony between international tolerances sharply into focus.

Many products used in Australia for cattle tick and buffalo fly control contain active constituents for which domestic MRLs are much higher than tolerances set by export markets.

There was little information available on the fat depletion characteristics of these chemicals in the concentration range critical to the export market i.e. between half the domestic MRL and the practical limits of detection of conventional analytical methodology.

Project DAQ.096 in conjunction with Project DAN.084 was designed to supply much of this vital information.

The outcomes of the two projects have been used to make recommendations regarding the use of these products on cattle destined for slaughter for export beef. These recommendations should prove indispensable to cattle producers, meat processors, regulators and advisers to the industry.

SUMMARY OF RESEARCH OUTCOMES

Withholding Periods

Acaricides

For all preparations trialed, the statutory WHPs were found to be adequate for all active constituents except one. Chlorfenvinphos residues in the fat of animals treated with Barricade 'S' Cattle Dip and Spray consistently exceeded the MRL of 0.2 mg/Kg (Australia, USA and Codex) up to and including four days post treatment. The nil withholding period was subsequently amended to eight days for single dipped cattle and to 14 days for cattle used to stir the dip.

Lousicides

At the request of the feedlot industry the lousicide, Arrest, was added to the list of preparations to be trialed. The data generated supported the statutory WHP.

Export Slaughter Intervals.

Acaricides

Synthetic Pyrethroids

In broad outline it was found that with one exception the synthetic pyrethroid (SP) acaricidal formulations trialed all generated persistent residues at measurable concentrations beyond the statutory WHPs.

Many of these residues were at concentrations which significantly exceeded the tolerances set by Australia's major export markets.

As results of the study became available it became apparent that, for at least some of the preparations trialed, there was an urgent need for additional withholding periods applicable to export market requirements.

In order to avoid confusion with WHPs appropriate for domestic MRLs, the term Export Slaughter Interval or ESI, was coined, for this new set of recommendations. Such was the urgency of the situation, the ESIs for each product were set as sufficient trial data became available.

The MRC compiled the information into an easily understood, readable, one page fact sheet. A copy of this flier is included in this report as Appendix A.

It was possible to recommend an ESI for each product trialed except Grenade Cattle Dip and Buffalo Fly Spray. For this preparation the residual concentrations of cyhalothrin in the fat of all trial cattle at the final sampling period of thirty days significantly exceeded the US tolerance of 0.01 mg/Kg.

Organophosphates

The two Organophosphate (OP) actives, ethion and chlorfenvinphos in the dip wash preparations trialed behaved predictably; reaching a maximum concentration rapidly

at around two days and declining to acceptable concentrations within five days. The ESI established for the SP component of these two preparations was more than adequate to cover the OPs.

Amidines

Two preparations containing amitraz were trialed. Neither the spray application, Taktic EC, nor the dipwash, Taktic WP, provoked significant residues and a nil ESI was set for each product.

Lousicides

Arrest, a pour-on preparation containing deltamethrin as the active, was the only lousicide trialed. Its residual behaviour was similar to that of deltamethrin when formulated as a dipwash.
For similar reasons an ESI of 21 days was recommended for this preparation.

Statistical Analyses

The full and comprehensive report compiled by the project statistician is included as Appendix B, Section 1 (pages 69 to 73) of this report.
The following is a summary of the salient points from this report.
For each trial, chemical type and body site an analysis of variance was conducted on log-transformed data, using animals as replicates. The balanced factors of treatments by time (days) were tested, along with a number of covariates.
Results showed consistent and significant treatment by time interactions, indicating that the concentration profiles of the treatments over time are different. These have been graphed for interpretation (Appendix B).
Of the covariates, concentration of the dip, and age and sex of the animals had no measurable influence on residual concentration. The lack of measurable effect of 'dip concentration' was no doubt due to the tight experimental control over these values.
A strong breed effect was found, with *Bos indicus* animals having on average 42% lower concentrations than *Bos taurus* cattle.
The effects of fat depth and weight proved important, but as these covariants were confounded their individual contributions could not both be estimated. The effect of fat depth is listed (Appendix B), with the fatter animals having up to 32% lower concentrations than their lean counterparts.

Residual Concentrations In Perirenal Fat Compared To Subcutaneous Fat.

Subcutaneous fat samples were collected from all animals, generally from the loin region. This is the fat type subjected to scrutiny by importers of Australian beef.
To determine the correlation between loin and perirenal fat residual concentrations a selection of perirenal fat samples was also collected. In Australia, analyses conducted as part of the National Residue Survey are performed on perirenal fat.
For purposes of comparison, a simple ratio was calculated by dividing the average residual concentration of the pesticide in perirenal fat by the corresponding average concentration in the subcutaneous fat. This ratio appears in the table below as the P/S Ratio. The ratio was calculated for the six actives which provoked significant residual concentrations.

Product Name	Active	Chemical Class	P/S Ratio
Barricade 'S' Cattle Dip and Spray	cypermethrin	SP	1.1
	chlorfenvinphos	OP	0.31
Tixafly	deltamethrin	SP	1.4
	ethion	OP	1.6
Bayticol Pour-on Cattle Tickicide	flumethrin	SP	1.9
Grenade Cattle Dip and Buffalo Fly Spray	cyhalothrin	SP	2.0

For the four SPs the residual concentrations in perirenal fat were, on average, higher than the corresponding subcutaneous fat concentrations, with deltamethrin, flumethrin and cyhalothrin being markedly higher.
In the case of the OP, ethion, the perirenal fat concentration was on average significantly higher than the subcutaneous fat concentration but for chlorfenvinphos the relationship was reversed.

Extension of Project Outcomes to Industry

The trial results indicated from an early stage, a pressing need for changes to use patterns for over half the products trialed if beef producers were to be confident that their product would meet the increasingly stringent requirements of the export market.
Project outcomes were made directly available to all sections of industry and also disseminated through regional newsletters and press releases.
Recommendations for buffalo fly control have been incorporated into publicity prepared by the NSW Department of Agriculture and jointly by QDPI and MRC.
The QDPI held a series of workshops within the problem areas of Queensland focussing on application techniques and management strategies aimed at minimising residues of ectoparasiticides.
The trial outcomes have also been incorporated into the Queensland Dairy Cattle Tick Control Program.

MAIN RESEARCH REPORT

BACKGROUND

Project DAQ.096 came about in response to three major stimuli.

1) The detection of residues of a synthetic pyrethroid pesticide in Australian beef in late 1991. This occurred in the course of routine port-of-entry testing under the import section of the US National Residue Program Plan.
The level found was less than half the Australian MRL but more than twice the US tolerance.
This focused Australian attention on international variances in tolerances.
The levels at which MRLs are set at the national and international level, are dependant on Good Agricultural Practices (GAPs). National GAPs vary widely from country to country. Climate, geography, the crops grown, the major pests present, the type of animal raised, the range of chemicals available for use and historical farming practices will all influence GAPs.
It quickly became clear that the use patterns and residue tolerances for a range of pesticides used in northern and eastern Australia for cattle tick and buffalo fly control do not match those of some of our export markets.
In most cases US tolerances for these chemicals are nominal, or, in the case where tolerances have not been established, are set at the lowest concentration that can be quantified and confirmed by a validated analytical method.

2) In early 1992 Australia Meat Holdings Pty Ltd commissioned the Chemical Residues Laboratory of the Queensland Department of Primary Industries to analyse some 5000 samples of beef fat. The target analytes were the synthetic pyrethroids commonly used as ectoparasiticides in Queensland and Northern New South Wales. The analytical methods employed were optimised so that the limits of detection were below the US tolerances or at least matched the limits of detection of the methods used by US regulatory laboratories.
Sample collection was targeted insomuch that all animals originated from properties in the cattle tick and buffalo fly infested areas of Queensland and the buffalo fly infested areas of New South Wales.
12% of all samples collected contained measurable (greater than the limit of detection) residual concentrations of a synthetic pyrethroid with 83% of the detections exceeding US tolerances. It should be noted, that in the cases of deltamethrin and flumethrin, for which tolerances have not been set in the USA, any detection greater than the method limit of detection was considered to have exceeded the US tolerance.

3) In late 1993, as project details were being finalised, Australian authorities were notified of a series of six detections in the USA of the organophosphorus type pesticide, chlorfenvinphos, in beef originating from Queensland and processed by two New South Wales abattoirs.

The concentrations detected were in the range 0.20 to 0.65 mg/Kg. The US and Australian MRLs for this chemical are both 0.20 mg/Kg.
Subsequent investigations revealed that the consignment of animals concerned had been consecutively dipped in a product containing cypermethrin and chlorfenvinphos to allow transport to NSW from tick infested areas in Queensland.

Against this background industry expressed an urgent need for detailed information on the residue forming potential and depletion characteristics of the ectoparasiticides in common used in Queensland and New South Wales. Of major concern was the concentration range critical to the export market i.e. between half the domestic MRLs and the practical limits of determination of contemporary, conventional analytical methodology.
Project DAQ.096 was designed to generate this information for a range of ectoparasiticides commonly used for buffalo fly and tick control in Queensland and New South Wales.
Where possible, trial animals were sourced from co-operating properties and were treated and held under typical farm situations.

Definitions.

Maximum Residue Limit (MRL)

The maximum concentration for a pesticide/ veterinary medicine residue resulting from the use of a substance according to the registered/ approved use pattern (Good Agricultural/ Veterinary Practice) that is legally permitted, in or on food or commodity.

Withholding Period (WHP)

The Australian Withholding Period is the approved minimum interval of time that must elapse between the last:

- Application of a product to a crop/ plant produce/ vegetation/ soil - and the harvesting, grazing, cutting, feeding, and /or further processing thereof; or
- Application of a product to an animal, or administration of a product to an animal - and the slaughtering thereof; or the use or sale of milk, eggs or other produce from that animal.

Export Slaughter Interval (ESI)

The Export Slaughter Interval is the minimum suggested time interval that should elapse between the last application of a product to an animal, or administration of a product to an animal, or feeding of a livestock feed to an animal - and:

- further testing of that animal for residue levels;
- Slaughtering of that animal for a particular export market; and/or
- use or sale of milk, eggs or other produce from that animal for a particular export market.

Export Slaughter Intervals must not be confused with Australian statutory withholding periods.

PROJECT OBJECTIVES

1. To determine if current acaricide usage practices result in chemical residues unacceptable to the U.S.A. or other countries importing Australian beef.

2. To construct residue depletion curves for each active component of the acaricide or buffalo fly treatment in question.

3. To determine the effect of fat cover (P8 site), weight, age, breed and sex on residue levels and depletion rates.

4. To integrate project results into joint recommendations for chemical manufacturers and Government agency extension programs to the cattle industry.

PROJECT METHODOLOGY

Trial Animals

The trial cattle were sourced, in the main from co-operating properties. They were selected to best represent the type of cattle supplying the USA market.
The trial was designed to provide information on residues of ectoparasiticides in cattle produced under typical farm situations and conditions in Queensland.
The cattle were from herds with no recent record of exposure to the chemicals under investigation. This was confirmed by collecting hair samples from each group and demonstrating the absence of chemical residues of interest by compound specific analytical techniques.

Treatment Details

Seven products were incorporated into the trial they are listed in Table 1 along with the method of application employed and the active constituent/constituents in each formulation.

1. Acaricides.	**Method of Application**	**Active**
Barricade 'S' Cattle Dip and Spray	Dip	cypermethrin / chlorfenvinphos
Bayticol Cattle Dip and Spray	Dip	flumethrin
Bayticol Pour-on Cattle Tickicide	Pour-on	flumethrin
Tixafly	Dip	deltamethrin / ethion
Grenade Cattle Dip and Buffalo Fly Spray	Dip	cyhalothrin
Taktic WP	Dip	amitraz
Taktic EC	Spray	amitraz
2. Cattle Lousicides	**Method of Application**	**Active**
Arrest	Pour-on	deltamethrin

Table 1 Preparations Trialed

Three methods of application were investigated; plunge dipping, spraying and as a backline 'pour-on'.
The effects on residual concentrations and depletion rates of (1) a single application and (2) two applications at a predetermined intertreatment interval were examined.
It is common practice to use a group of cattle to stir a plunge dip prior to use. This group of 'stirrer' animals is then reunited with the rest of the mob to be treated.
The stirrer animals therefore have more contact with the ectoparasiticide than the rest of the cattle treated.
To determine if this practice effected fat residual concentrations or depletion rates, treatment regimens involving the use of stirrer animals were added to the trial. For treatment regimens involving two treatments and stirrer animals, the same group of animals was used to stir the dip on both occasions.
The treatment regimens used for each product are listed in Tables 2 and 3. The intertreatment intervals when two applications of 'the product' were involved are listed in Fig. 1.
Individual treatments were applied exactly according to manufacturers' recommendations.
Dipping vat fluids were analysed prior to dipping and concentrations adjusted if necessary.

Sample Schedule

In general, groups of three animals were slaughtered at each designated sampling period for each treatment regimen.
Additional animals were added to groups destined for slaughter at time periods considered critical to defining the uptake/ depletion curves.
As results became available the original sampling schedule was modified to provide extra data points where required.
The number in each cell in Tables 2 and 3 is the number of animals slaughtered at the indicated time post treatment for each treatment regimen.
The sampling schedule was designed in such a way as to accommodate the expected different rates of incurrence and depletion for residues of the various chemicals under investigation.
Each animal was assigned a predetermined slaughter date and, where possible, held on the property of origin pending consignment to an appropriate abattoir.
Figure 1 is a key to Tables 2 and 3

Chemical Treatment Regimen	Time between last treatment and slaughter (days)										
	1/2	1	2	4	7	10	15	21	30	45	Controls
A1			3	3**	6	6	6	6	4		3
A2			3	3	6*	6**	6	6	4		3
A3			3**	3	6*	6*	6	6	4		3
A4			3	3	6*	6*	6	6	4		3
B1			3*	3*	6	6	3	3	3		3
B2			3	3	3*	3**	3	3	3		3
B3			3	3	3*	6*	3	3	3		3
B4			3	3	6*	6*	3	3	3		3
C1			3*	3*	3*		3*	3*	3*		3
C2			3*	3*	3*		3*	3*	3*		3
C3			3*	3*	3*		3*	3*	3*		3
C4			3*	3*	3*		3*	3*	3*		3
C5			3*	3*	3*	3*	3*	6*	3*	3*	3
C6			3*	3*	3*	3*	3*	6*	3*	3*	3
D1	3*	3**	3								2
D2	3*	3	3								2
D3	3*	3**	3	3							2
D4	3*	3*	3	3	3		3*				2
E1			3	3	3	3	3	3	3		3
E2			3	3	3	3	3	3	3		3
E3			3	3**	3*	3*	3	3	3		3
E4			3	3*	3*	3*	3	3	3		3
F5	REFER TO TABLE 2										
G7		3*		3*	3*						1
G8		3*		3*	3*						

Table 2

Chemical Treatment Regimen	Time between last treatment and biopsy (days)						
	3	7	14	21	28	42	96
F5	5	5	5	5	5	5	5

Table 3

KEY

PRODUCT	TREATMENT REGIMEN
A. Barricade 'S' Cattle Dip and Spray	1. Single dipped (not used as stirrers)
B. Tixafly	2. Double dipped (used as stirrers)
C. Bayticol Cattle Dip and Spray	3. Two dippings at a 3 or 4 day interval (not used as stirrers)
C. Bayticol Pour-On Cattle Tickicide	4. Two dippings at a 3 or 4 day interval (used as stirrers)
D. Taktic WP	5. Pour on
E. Grenade Cattle Dip and Buffalo Fly Spray	6. Two pour ons at a 7 day interval
F. Arrest	7. Spray - Single application
G. Taktic EC	8. Two sprays at a 3 day interval

Figure 1

SAMPLE COLLECTION

At slaughter, subcutaneous fat from the loin area was collected from all animals. This is the fat type subjected to scrutiny by importers of Australian beef.

To determine the correlation between loin and perirenal fat residue levels, a selection of perirenal fat samples was also collected. This was deemed prudent as the National Residue Survey analyses are conducted on perirenal fat.

A single asterisk (*) following cattle numbers in the cells of Table 2 indicates that perirenal fat samples were collected from three animals in that group. Two asterisks (**) indicate that a sample of perirenal fat was collected from one animal only in the group.

Samples of muscle and liver were also collected from all animals treated with preparations containing amitraz.

Core samples were collected from cartons of frozen product originating from animals treated with Bayticol Pour-on. This work was not included in the original project design but was included at the instigation of Bayer Australia and was performed in a manner designed to closely simulate the procedure followed during port-of-entry Inspection in the USA.

At the request of the feedlot industry a commonly used pour-on lousicide, Arrest, was added to the study. The trial animals were held under feedlot conditions and the samples collected were caudal subcutaneous fat by biopsy technique.

ANALYTICAL METHODOLOGY

Synthetic Pyrethroids and Organophosphorus type pesticides

Deltamethrin, Cypermethrin, Cyhalothrin, Flumethrin, Ethion, Chlorfenvinphos.

The method that was used is a modification of the Mills, Oxley, Gaither procedure. The modification was necessary to obtain at least 80% recoveries for all analytes.

Fat was isolated by repetitive extractions with hexane. The analytes were extracted from the hexane/fat solution with acetonitrile and then back extracted into hexane by aqueous dilution of the acetonitrile extract. The solution was then purified by passage through a Florisil column. The final extracts were examined by gas-liquid chromatography with electron capture detection.

Amidines

Amitraz

The method used by this laboratory for the determination of amitraz residues in offal involves the conversion by acid hydrolysis of the parent compound (amitraz) and its major metabolite (N-(2,4-dimethylphenyl) -N^1-methylformamidine) to 2,4-dimethylaniline (2,4-DMA). The 2,4-DMA is then steam distilled following adjustment of the pH of the acid hydrolysate to 14, extracted into an organic solvent, derivitised, and measured by electron capture G.L.C.

The concentration of 2,4-DMA is then converted to an equivalent concentration of amitraz using a correction factor to account for molecular weight difference.

Quality Control

As part of quality control procedures a selection of samples was sent to a recognised independent laboratory for analysis.

STATISTICAL ANALYSIS

The following information was also collected at slaughter for each animal.

Carcase Weight
Fat depth (P8 Site)
Breed
Sex
Age

All raw data collected are listed in Appendix C
All data were presented to the project statistician to estimate possible influences of these variables on residue concentrations and depletion rates.
The statisticians report is presented in full as Appendix (B)

FORMAT OF THE REPORT

The main body of this report contains a separate section for each preparation trialed. Each section contains:

- Product information.
- The statutory withholding period
- A list of revelant MRLs
- A sampling schedule listing the number of samples collected at each designated time period post treatment for each treatment regimen.
- Tables of the residual concentrations of each active constituent in all samples analysed.
- Graphical illustrations, where sufficient results were available to warrant this form of presentation. Two types of graphs were used in presenting the data.

    1. Bar Charts
       These charts plot the residual tissue concentrations for each individual animal versus time. They provide visual illustrations of trends and the range of concentrations measured at each sampling period for each treatment.
       The purple bars in the charts represent results less than the relevant limit of detection of the analytical method.
    2. Line Graphs
       These are graphs of the average concentrations for all animals in each treatment group at each sampling period versus time.
       They are arranged so that the depletion rates for each treatment group for each active constituent can be easily compared.
       In constructing these graphs no attempt has been made to allow for the effects on concentration of any other variable such as fat depth, breed, age or sex.
       Some results were reported as less than the limit of detection of the analytical method. To omit these results would be incorrect and result in upward bias of the estimated concentrations. As these values were known to be somewhere in the range of zero to the detection limit, the convention of setting them all to half of the detection limit was used.

BARRICADE 'S' CATTLE DIP AND SPRAY

COMPOSITION:

CYPERMETHRIN	25g/L
CHLORFENVINPHOS	138g/L

METHOD OF ADMINISTRATION:

PLUNGE DIP

DIP CHARGE RATE:

CYPERMETHRIN	0.010%
CHLORFENVINPHOS	0.055%

WITHHOLDING PERIOD:

Nil

Following the receipt of preliminary results from this study the National Registration Authority amended the WHP for Barricade 'S' Cattle Dip and Spray to :-

(1) Single dipped Cattle: 8 days
(2) Stirrer Cattle: 14 days

MRL:

	MRL (mg/Kg)	
	Cypermethrin	**Chlorfenvinphos**
Australia	0.5	0.2
USA	0.05	0.2
Codex	0.2	0.2

MRL values stated pertain to fat.

Treatment Details

147 animals were used in this part of the study. The effects of four different treatment regimens were investigated. Each treatment group involved 34 cattle dipped in Barricade 'S' Cattle Dip and Spray.
Treatment A1 involved a single dipping.
Treatment A2 involved a single dipping but the animals were also used to stir the dip.
Treatment A3 involved the animals being dipped twice with an intertreatment interval of three days.

Treatment A4 duplicated treatment A3 but with the animals used to stir the dip on both treatment days.

Sample Collection

Samples of loin fat were collected from all animals at slaughter as listed in the sampling schedule detailed in Table A1.
Three untreated animals were included in each group and acted as experimental controls.
A selection of perirenal fats as described in Table 2 was also collected.

SAMPLING SCHEDULE - Barricade 'S' Cattle Dip and Spray

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN LAST TREATMENT AND SLAUGHTER (days)							
	2	4	7	10	15	21	30	0 (control)
A1	3	3	6	6	6	6	4	3
A2	3	3	6	6	6	6	4	3
A3	3	3	6	6	5	6	4	3
A4	3	3	6	6	6	6	4	3

Table A1

Number in each cell = Number of animals treated.

A1 Single dipping
A2 Single dipping (used to stir dip)
A3 Two dips - 3 days apart
A4 Two dips - 3 days apart (used to stir dip)

Results

The residual concentrations of the two actives, chlorfenvinphos and cypermethrin, in loin fat samples are listed by sampling period for each treatment regimen in Tables A2 and A3.
The concentrations of the actives in the perirenal fat samples collected are listed by sampling period and treatment regimen in Tables A4, A5, A6, and A7. For purposes of comparison the concentrations in the corresponding loin fat samples are also included in these tables.
As part of the quality control checks a selection of samples was forwarded for analysis to the Australian Government Analytical Laboratory (AGAL) in Sydney. Results of these assays and the ARI results are listed in Table A8.

Discussion

The bar charts supplied afford a graphical illustration of residual concentrations versus time. Each bar represents a different animal and the marked variation between trial animals is clearly evident. This variation should be kept in mind when viewing Graphs A9 and A10. These graphs were generated by plotting the treatment group average residual concentrations of the active constituents versus time.

The chlorfenvinphos residual fat concentrations reached a maximum within four days post treatment and had depleted to acceptable concentrations by day six.

In many cases, however, the maximum reached greatly exceeded the MRL (Australia, USA and Codex) of 0.2 mg/Kg.

The National Registration Authority has subsequently accepted an application to amend the nil withholding period for this product to read 8 days for single treatment animals and to 14 days for animals used to stir the dip.

Predictably, the double treatment stirrer group (A4) had the overall highest concentration of cypermethrin followed in descending order by the double treatment group (A3), the single treatment stirrer group (A2), and the single treatment group (A1). All residues in animals in all treatment groups had depleted to below the US MRL of 0.05 mg/Kg by day 21 post treatment. However, the average concentration in treatment group A4 animals slaughtered at day 30 increased to 0.066 mg/Kg compared to 0.022 mg/Kg at day 21.

On average, the chlorfenvinphos residual concentrations in perirenal fat were 0.31 times lower than the corresponding concentrations in the loin fat. For cypermethrin, the average perirenal fat concentrations were 1.1 times higher than the corresponding concentrations in the loin fat.

The correlation between the ARI and AGAL interlaboratory quality control checks was excellent (correlation coefficient (r) = 0.983).

BARRICADE 'S' CATTLE DIP AND SPRAY
A1 - TWO DIPS (Three Days Apart)
A2 - TWO DIPS (Three Days Apart) STIRRERS
LOIN FAT

	2 days		4 days		7 days		10 days		15 days		21 days		30 days	
	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR
A1	0.043[2]	0.29[2]	0.083[2]	0.26[2]	0.12[1]	0.012[1]	0.092[2]	0.028[2]	0.093[2]	0.020[2]	0.012[24]	0.021[24]	0.014[14]	<0.005[14]
	0.012[15]	0.45[15]	0.067[8]	0.26[8]	0.018[6]	0.014[6]	0.018[18]	<0.005[18]	0.12[2]	<0.005[2]	0.042[21]	0.035[21]	0.017[6]	<0.005[6]
	<0.010[21]	0.37[21]	0.019[10]	0.23[10]	0.014[16]	0.065[16]	0.032[6]	<0.005[6]	0.015[16]	0.030[16]	0.013[22]	<0.005[22]	0.029[16]	<0.005[16]
					0.010[30]	0.032[30]	0.031[14]	0.012[14]	<0.010[16]	0.006[16]	0.032[16]	0.032[16]	0.033[11]	<0.005[11]
					0.032[7]	<0.005[7]	0.021[21]	0.013[21]	0.020[9]	0.009[9]	0.024[20]	0.034[20]		
					0.032[12]	0.030[12]	0.043[7]	<0.005[7]	<0.010[14]	0.022[14]	0.026[12]	0.041[12]		
	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR
A2	0.052[1]	0.60[1]	0.067[1]	0.19[1]	0.16[2]	0.035[2]	0.23[1]	0.006[1]	0.18[1]	0.020[1]	0.033[19]	0.042[19]	0.026[10]	<0.005[10]
	0.017[5]	0.21[5]	0.020[6]	0.35[6]	0.017[11]	0.009[11]	0.032[8]	<0.005[8]	0.092[2]	<0.005[2]	0.036[17]	0.056[17]	0.026[9]	<0.005[9]
	0.020[11]	0.57[11]	<0.010[12]	<0.005[12]	0.033[6]	<0.005[6]	0.029[8]	<0.005[8]	<0.010[11]	0.028[11]	0.045[11]	0.022[11]	0.014[26]	<0.005[26]
					0.047[8]	0.005[8]	0.053[13]	<0.005[13]	0.011[20]	0.031[20]	0.015[20]	0.006[20]	0.010[18]	<0.005[18]
					0.032[9]	0.009[9]	0.046[6]	<0.005[6]	0.014[19]	0.012[19]	0.013[28]	<0.005[28]		
					0.050[9]	0.005[9]	0.028[5]	<0.005[5]	<0.010[23]	0.036[23]	<0.010[24]	<0.005[24]		

Table A2

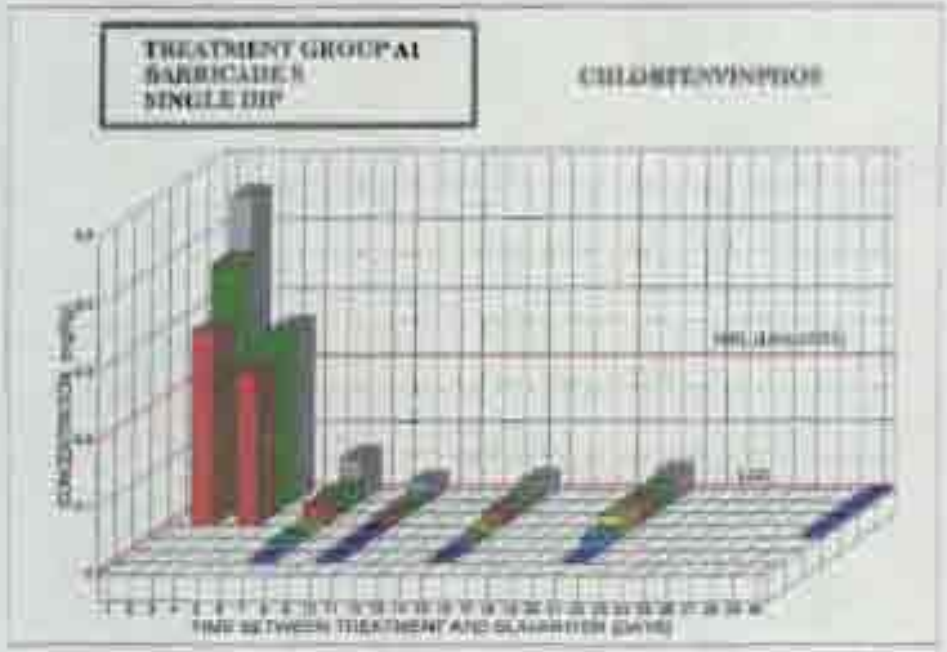
codes:
CYP = cypermethrin concentration (mg/kg)
CHLOR = chlorfenvinphos concentration (mg/kg)
days = number of days between treatment and slaughter.
superscript = fat depth in mm

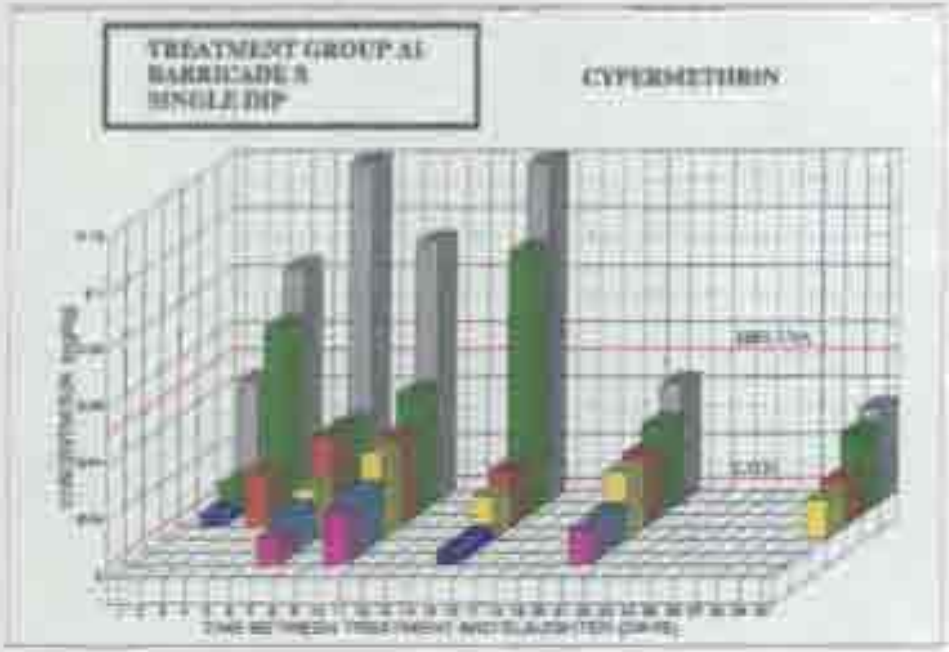
BARRICADE 'S' CATTLE DIP AND SPRAY
A3 - SINGLE DIP
A4 - SINGLE DIP (STIRRERS)
LOIN FAT

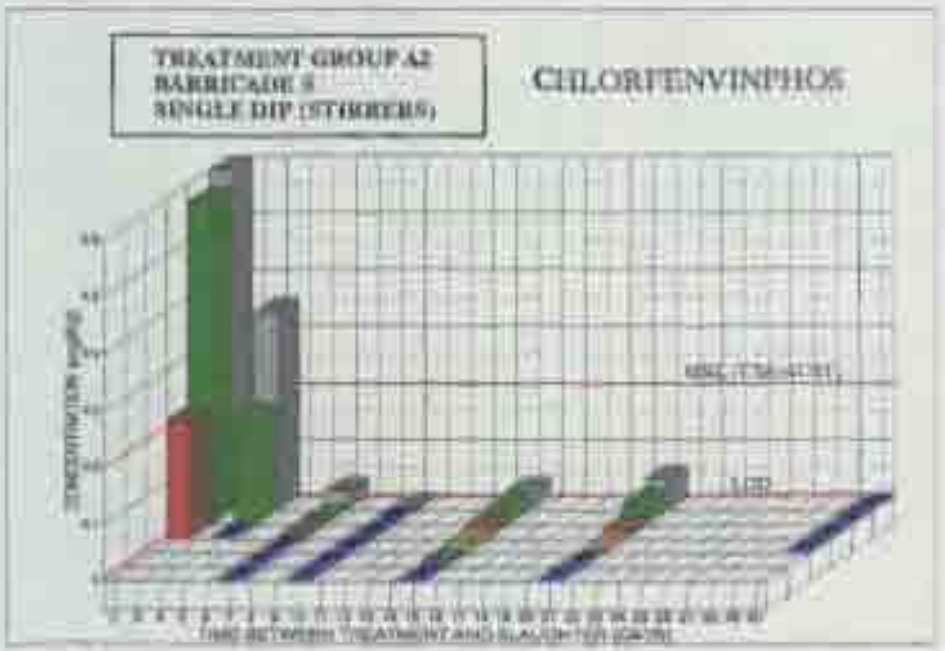
	2 days		4 days		7 days		10 days		15 days		21 days		30 days	
	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR
A3	0.068[2]	0.39[2]	0.13[3]	0.16[3]	0.076[4]	0.080[4]	0.18[2]	0.030[2]	0.24[1]	0.007[1]	0.021[8]	<0.005[8]	0.031[19]	0.005[19]
	0.027[10]	1.0[10]	0.049[7]	0.008[7]	0.080[10]	<0.005[10]	0.045[8]	<0.005[8]	0.11[3]	<0.005[3]	0.030[11]	<0.005[11]	0.024[12]	<0.005[12]
	0.046[5]	0.050[5]	0.039[12]	0.024[12]	0.065[6]	0.012[6]	0.034[10]	<0.005[10]	0.042[28]	0.023[28]	0.011[11]	<0.005[11]	0.018[20]	<0.005[20]
					0.090[11]	0.012[11]	0.051[11]	0.012[11]	0.016[8]	0.021[8]	0.011[24]	0.006[24]	0.012[12]	<0.005[12]
					0.090[11]	0.010[11]	0.044[8]	0.008[8]	0.011[13]	0.021[13]	0.015[8]	<0.005[8]		
					0.074[5]	<0.005[5]	0.046[8]	<0.005[8]			0.018[18]	0.005[18]		
	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR	CYP	CHLOR
A4	0.16[2]	0.90[2]	0.23[1]	0.028[1]	0.10[2]	0.023[2]	0.16[0]	0.011[0]	0.18[2]	<0.005[2]	0.019[15]	0.030[15]	0.040[12]	<0.005[12]
	0.027[4]	0.12[4]	0.067[8]	0.011[8]	0.090[15]	0.020[15]	0.022[9]	<0.005[9]	0.31[0]	<0.005[0]	0.026[10]	<0.005[10]	0.055[4]	<0.005[4]
	0.050[5]	0.14[5]	0.052[10]	0.031[10]	0.080[7]	0.050[7]	0.055[8]	<0.005[8]	0.034[31]	0.015[31]	0.017[19]	0.020[19]	0.10[6]	<0.005[6]
					0.080[7]	0.020[7]	0.050[6]	0.009[6]	0.030[33]	0.087[33]	0.023[14]	0.006[14]	0.068[14]	<0.005[14]
					0.070[6]	0.008[6]	0.10[7]	0.007[7]	0.017[14]	0.020[14]	0.017[23]	0.010[23]		
					0.15[10]	0.009[10]	0.056[6]	<0.005[6]	0.048[14]	<0.005[14]	0.025[6]	<0.005[6]		

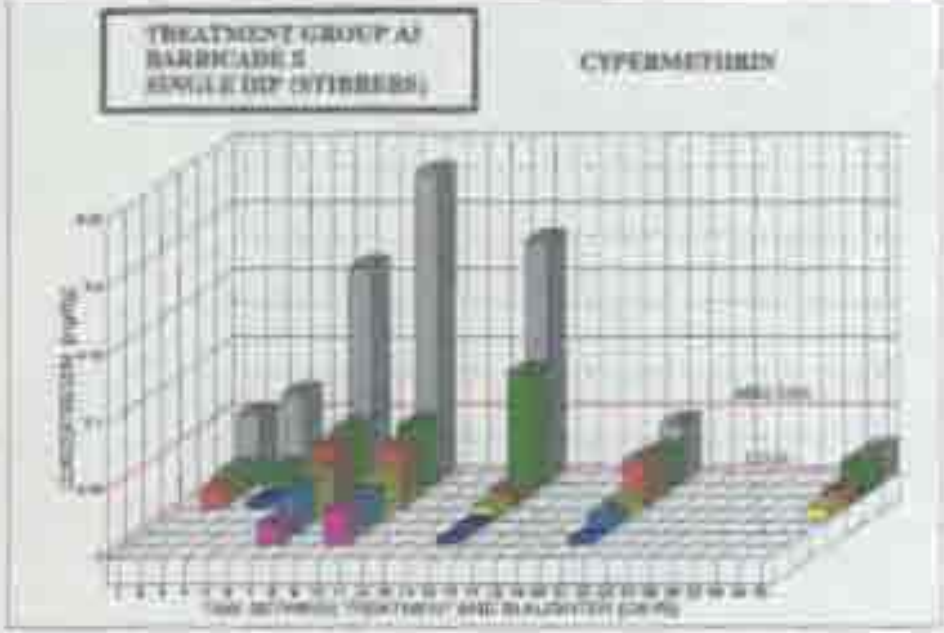
Table A3

codes:
CYP = cypermethrin concentration (mg/kg)
CHLOR = chlorfenvinphos concentration (mg/kg)
days = number of days between treatment and slaughter.
superscript = fat depth in mm


TREATMENT GROUP A1
BARRICADE S
SINGLE DIP
CHLORTENVINPHOS

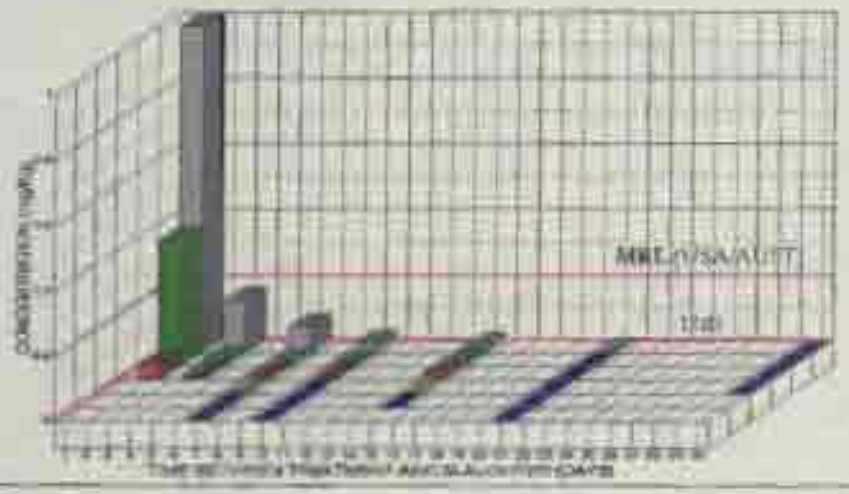

TREATMENT GROUP A1
BARRICADE S
SINGLE DIP
CYPERMETHRIN


TREATMENT GROUP A2
BARRICADE S
SINGLE DIP (STIRRERS)
CHLORTENVINPHOS


TREATMENT GROUP A2
BARRICADE S
SINGLE DIP (STIRRERS)
CYPERMETHRIN

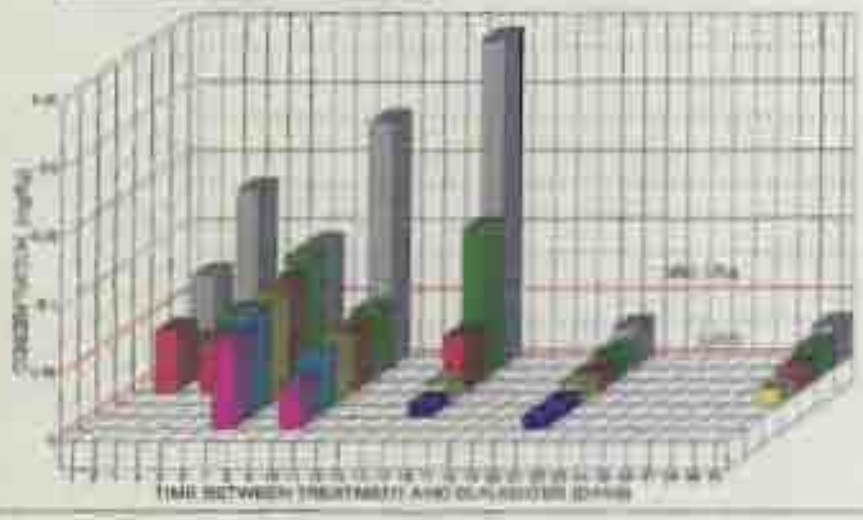
TREATMENT GROUP A?
BARRICADE 6
TWO DIPS - 2 DAYS APART

CHLORFENVINPHOS

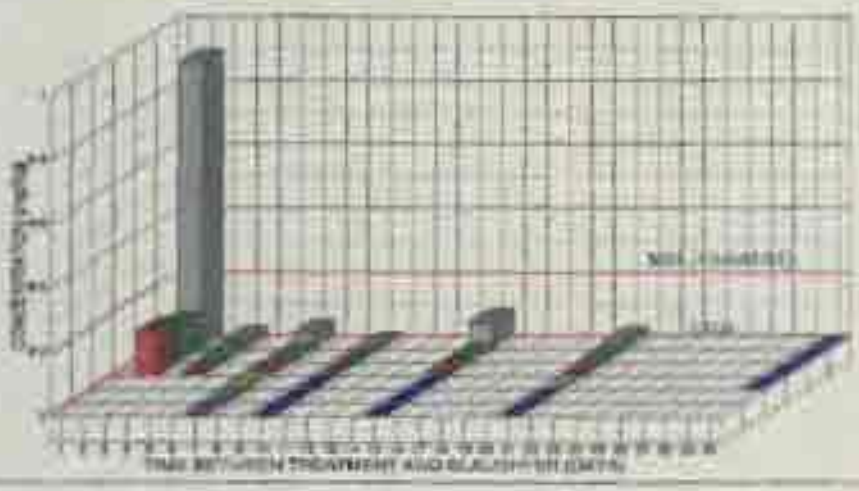


TREATMENT GROUP A3
BARRICADE 6
TWO DIPS THREE DAYS APART

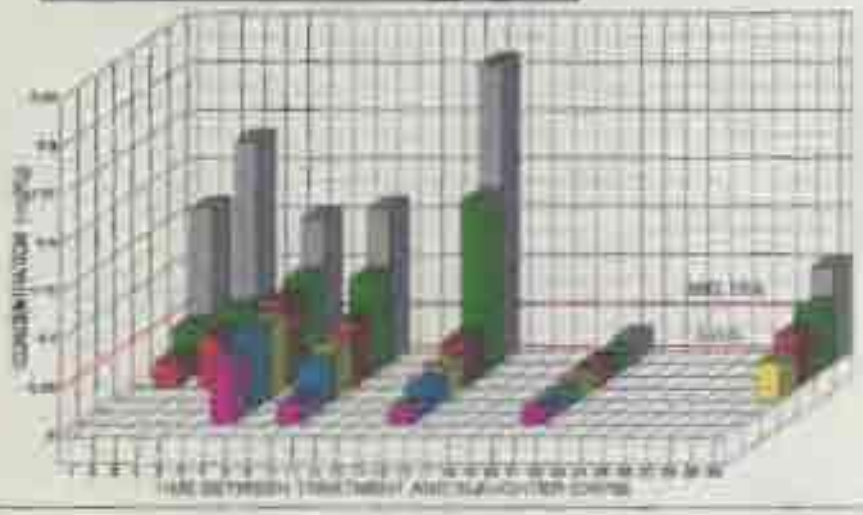
CYPERMETHRIN



TREATMENT GROUP A4
BARRICADE 6
TWO DIPS THREE DAYS APART (CHLORFENVINPHOS)



TREATMENT GROUP A4
BARRICADE 6
TWO DIPS THREE DAYS APART (CYPERMETHRIN)



BARRICADE 'S' - TREATMENT GROUP A1 - SINGLE DIP

4 DAYS			
CYP		CHLOR	
LOIN	RENAL	LOIN	RENAL
0.019^{10}	0.040^{10}	0.23^{10}	0.046^{10}
0.067^{8}	0.10^{8}	0.26^{8}	0.057^{8}

Table A4

BARRICADE 'S' - TREATMENT GROUP A2 - SINGLE DIP (STIRRERS)

7 DAYS				10 DAYS			
CYP		CHLOR		CYP		CHLOR	
LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
0.16^{2}	0.13^{2}	0.035^{2}	0.011^{2}	0.23^{1}	0.088^{1}	0.006^{1}	$<0.005^{1}$
0.017^{11}	0.035^{11}	0.009^{11}	<0.005	0.029^{8}	0.050^{8}	$<0.005^{8}$	$<0.005^{8}$
0.033^{6}	0.040^{6}	$<0.005^{6}$	$<0.005^{6}$				
0.047^{8}	0.055^{8}	0.005^{8}	$<0.005^{8}$				

Table A5

BARRICADE 'S' - TREATMENT GROUP A3 - TWO DIPS THREE DAYS APART

2 DAYS				7 DAYS				10 DAYS			
CYP		CHLOR		CYP		CHLOR		CYP		CHLOR	
LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
0.027^{10}	0.08^{10}	1.0^{10}	0.33^{10}	0.076^{4}	0.095^{4}	0.080^{4}	0.026^{4}	0.18^{2}	0.11^{2}	0.030^{2}	0.017^{2}
				0.065^{6}	0.083^{6}	0.012^{6}	0.007^{6}	0.045^{8}	0.066^{8}	$<0.005^{8}$	$<0.005^{8}$
				0.090^{11}	0.070^{11}	0.012^{11}	0.010^{11}	0.034^{10}	0.037^{10}	$<0.005^{10}$	$<0.005^{10}$
				0.090^{11}	0.10^{11}	0.010^{11}	0.007^{11}	0.051^{11}	0.044^{11}	0.012^{11}	$<0.005^{11}$

Table A6

BARRICADE 'S' - TREATMENT GROUP A4 - TWO DIPS THREE DAYS APART (STIRRERS)

7 DAYS				10 DAYS			
CYP		CHLOR		CYP		CHLOR	
LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
0.10^{2}	0.11^{2}	0.023^{2}	$<0.005^{2}$	0.16^{0}	0.15^{0}	0.011^{0}	$<0.005^{0}$
0.090^{15}	0.16^{15}	0.020^{15}	0.009^{15}	0.022^{9}	0.056^{9}	$<0.005^{9}$	$<0.005^{9}$
0.070^{6}	0.12^{6}	0.008^{6}	0.007^{6}	0.055^{8}	0.087^{8}	$<0.005^{8}$	$<0.005^{8}$
0.080^{7}	0.090^{7}	0.050^{7}	0.020^{7}	0.10^{7}	0.095^{7}	0.007^{7}	$<0.005^{7}$
				0.056^{6}	0.053^{6}	$<0.005^{6}$	$<0.005^{6}$

Table A7

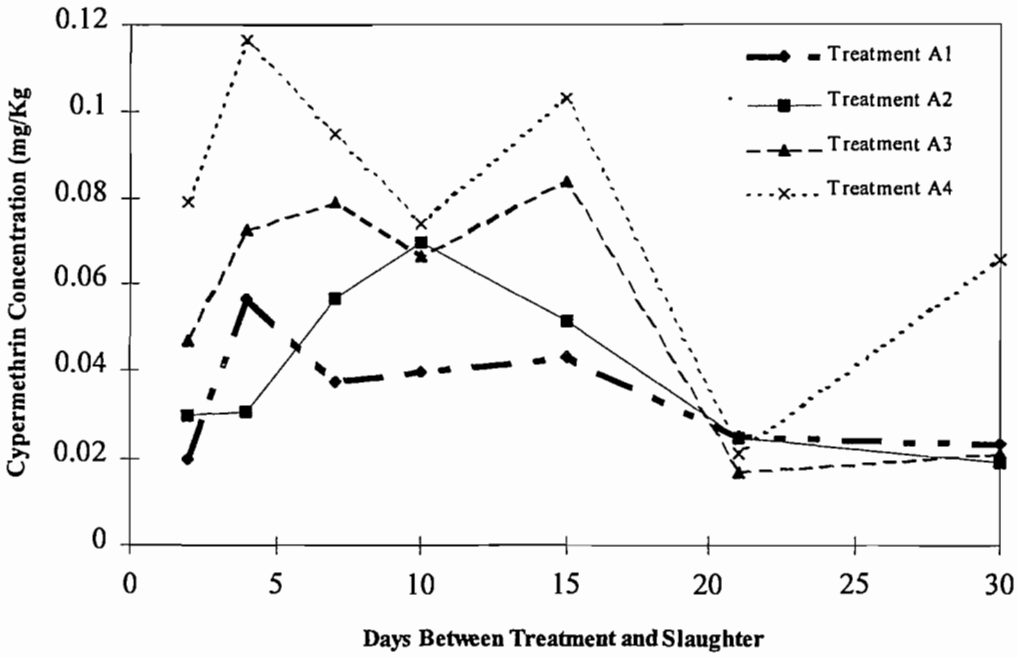
Concentration expressed as cypermethrin or chlorfenvinphos in mg/Kg.
Days = number of days between last treatment and slaughter.
CYP = cypermethrin
CHLOR = chlorfenvinphos
superscript = fat depth in mm

INTERLABORATORY QUALITY CONTROL CHECK SAMPLE RESULTS

SAMPLE NO.	SAMPLE GROUP	TAG NO.	ANALYTE	ARI RESULT	AGAL RESULT
1	C6-10	277 (#40)	Flumethrin	0.025	0.024
2	C6-10	279 (#52)	Flumethrin	0.025	0.028
3	A1-21	8798	Cypermethrin	0.042	0.043
4	A1-21	8800	Cypermethrin	0.032	0.030
5	A2-21	206	Cypermethrin	0.033	0.031
6	A1-10	8793	Cypermethrin	0.032	0.034
7	A1-15	713	Cypermethrin	0.12	0.12
8	A1-30	8795	Cypermethrin	0.033	0.030
9	A3-10	229	Cypermethrin	0.044	0.042
10	A4-10	4156	Cypermethrin	0.056	0.060

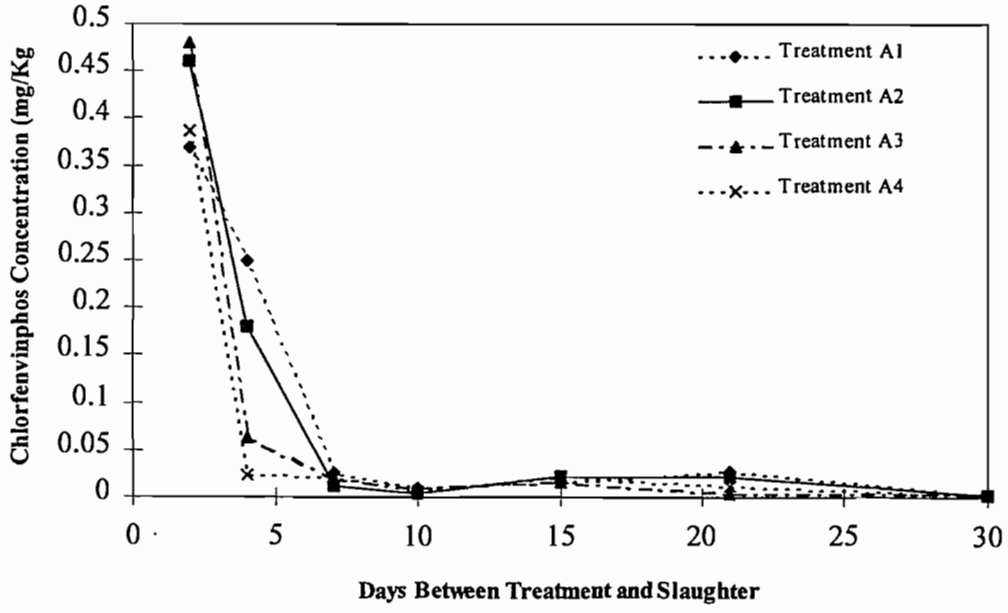
Table A8
All Results Expressed in mg/Kg.

Barricade S Cattle Dip and Spray
Average Cypermethrin Concentrations in Subcutaneous Fat



Graph A9

Barricade S Cattle Dip and Spray
Average Chlorfenvinphos Concentrations in Subcutaneous Fat



Graph A10

TIXAFLY

COMPOSITION:

DELTAMETHRIN	25g/L
ETHION	125g/L

METHOD OF ADMINISTRATION:

PLUNGE DIP

DIP CHARGE RATE:

DELTAMETHRIN	0.005%
ETHION	0.025%

WITHHOLDING PERIOD:

None Listed

MRL:

	MRL (mg/Kg)	
	Deltamethrin	Ethion
Australia	0.5	2.5
USA	*	2.5
Codex	0.5	2.5#

* No MRL set for deltamethrin in USA.
During this study the National Registration Authority approved a change in the MRL for deltamethrin in the fat of meat of cattle. The ammended MRL is 0.5mg/Kg as listed in the latest edition of the MRL Standard (Commonwealth Department of Human Services and Health).

\# Codex Committee on Pesticide Residues deleted the ethion MRL (1995 meeting).

Treatment Details

112 animals were used in this part of the study. The effects of four different treatment regimens were investigated The animals were allocated to the different treatment groups as outlined in Table B1.
Treatment B1 involved a single dipping.
Treatment B2 involved a single dipping but the animals were also used to stir the dip.
Treatment B3 involved the animals being dipped twice with an intertreatment interval of three days.
Treatment B4 duplicated treatment group B3 but with the animals used to stir the dip on both occasions.

The dip strengths were checked by analysis prior to treatment and adjusted to the manufacturer's recommendation if required.

Sample Collection

Samples of loin fat were collected from all animals at slaughter as listed in the sampling schedule detailed in Table B1.
Three untreated animals were included in each group and acted as experimental controls. A selection of perirenal fats as described in Table 2 was also collected.

SAMPLING SCHEDULE - TIXAFLY

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN LAST TREATMENT AND SLAUGHTER (days)							
	2	4	7	10	15	21	30	0 (control)
B1	3	3	6	6	3	3	3	3
B2	3	3	3	3	3	3	3	3
B3	3	3	3	6	3	3	3	3
B4	3	3	6	6	3	3	3	3

Table B1

Number in each cell = Number of animals treated.

B1 Single dipping
B2 Single dipping (used to stir dip)
B3 Two dips - 3 days apart
B4 Two dips - 3 days apart (used to stir dip)

Results

The residual concentrations of deltamethrin and ethion in all loin fat samples collected and analysed are listed by sampling period and treatment regimen in Tables B2 and B3.
The concentrations of deltamethrin and ethion in perirenal fat samples collected are listed by sampling period and treatment regimen in Tables B4, B5, B6 and B7.

Discussion

The bar charts supplied afford a graphical illustration of residual concentrations versus time. Each bar represents a different animal and the marked variation between trial animals is clearly evident. This variation should be kept in mind when viewing Graphs B8 and B9. These graphs were generated by plotting the treatment group average residual concentrations versus time.
In general the average ethion concentration in fat for all treatment groups reached a maximum within the first five days post treatment then remained relatively constant for the remainder of the trial. None of the individual concentrations measured

exceeded the US and Australian MRL of 2.5 mg/Kg. The highest concentration recorded was 1.8 mg/Kg.
None of the deltamethrin concentrations measured approached the Australian and Codex MRL of 0.5 mg/Kg.
There is no tolerance set for deltamethrin in the USA. The majority of animals used in the trial contained easily measurable residues of deltamethrin with most of the higher concentrations being present at day 30 post treatment in all treatment groups.
On average the ethion concentrations in perirenal fat were 1.6 times higher than the concentrations in the corresponding loin fats.
For deltamethrin the average perirenal fat concentrations were 1.4 times higher than the average concentrations in the corresponding loin fats.

TIXAFLY
B1 - SINGLE DIP
B2 - SINGLE DIP (STIRRERS)
LOIN FAT

	2 days		4 days		7 days		10 days		15 days		21 days		30 days	
	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA
B1	0.43[6]	<0.005[6]	0.23[18]	0.007[18]	0.25[16]	0.015[16]	0.54[22]	0.023[22]	0.050[20]	0.005[20]	0.060[23]	<0.005[23]	0.26[8]	0.015[8]
	0.42[21]	0.010[21]	0.29[10]	0.007[10]	0.65[6]	0.020[6]	0.32[20]	<0.005[20]	0.15[11]	0.007[11]	0.050[7]	<0.005[7]	0.32[3]	0.058[3]
	0.74[6]	0.010[6]	0.25[15]	0.005[15]	0.51[5]	0.010[5]	0.32[20]	0.015[20]	0.27[16]	0.007[16]	0.35[7]	0.010[7]	0.32[4]	0.039[4]
					0.61[8]	0.015[8]	<0.050[14]	<0.005[14]						
					<0.050[31]	<0.005[31]	0.23[32]	0.020[32]						
					0.51[20]	0.010[20]	0.30[15]	0.025[15]						
	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA
B2	0.46[1]	0.024[1]	0.25[17]	<0.005[17]	0.78[13]	0.015[13]	0.58[24]	0.010[24]	0.42[7]	0.017[7]	0.38[20]	0.009[20]	0.28[4]	0.021[4]
	0.50[3]	0.018[3]	0.29[19]	<0.005[19]	0.70[21]	0.010[21]	0.64[42]	0.020[42]	0.26[9]	0.009[9]	0.47[16]	0.022[16]	0.45[14]	0.048[14]
	0.24[4]	0.020[4]	0.22[15]	<0.005[15]	0.74[25]	0.025[25]	0.43[10]	0.016[10]	0.21[38]	0.008[38]	0.63[9]	0.026[9]	0.26[7]	0.029[7]

Table B2

codes:

Eth = ethion concentration (mg/Kg)
Delta = deltamethrin concentration (mg/Kg)
days = time between treatment and slaughter.
superscript = fat depth in mm

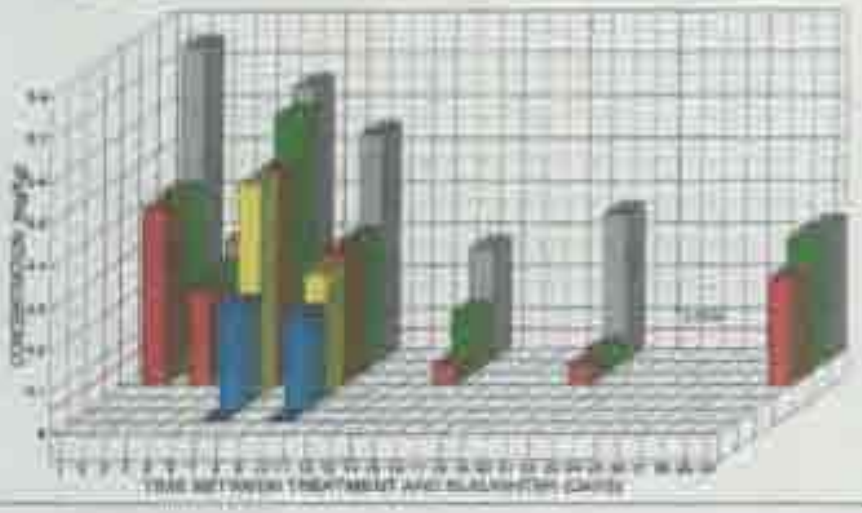
TIXAFLY
B3 - TWO DIPS (Three Days Apart)
B4 - TWO DIPS (Three Days Apart)
STIRRERS
LOIN FAT

	2 days		4 days		7 days		10 days		15 days		21 days		30 dyas	
	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA
B3	1.2^{7}	0.024^{7}	0.20^{15}	$<0.005^{15}$	0.25^{18}	0.010^{18}	0.22^{24}	0.011^{24}	0.20^{31}	0.008^{31}	0.44^{31}	0.025^{31}	0.39^{4}	0.018^{4}
	0.84^{3}	0.036^{3}	0.19^{10}	0.006^{10}	0.12^{17}	0.007^{17}	0.20^{25}	0.011^{25}	0.15^{30}	0.008^{30}	0.36^{8}	0.020^{8}	0.49^{4}	0.047^{4}
	0.57^{18}	0.018^{18}	0.34^{16}	0.006^{16}	0.81^{2}	0.061^{2}	0.31^{12}	0.018^{12}	0.31^{23}	0.011^{23}	0.39^{38}	0.015^{38}	0.46^{2}	0.039^{2}
							0.27^{18}	0.023^{18}						
							0.22^{27}	0.017^{27}						
							0.18^{17}	0.010^{17}						
	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA	ETH	DELTA
B4	1.8^{2}	0.065^{2}	0.70^{10}	0.013^{10}	0.21^{22}	0.009^{22}	0.37^{15}	0.019^{15}	0.73^{7}	0.012^{7}	0.55^{48}	0.023^{48}	0.30^{1}	0.038^{1}
	1.1^{8}	0.048^{8}	0.54^{9}	0.016^{9}	0.27^{28}	0.011^{28}	0.42^{28}	0.024^{28}	0.35^{25}	0.013^{25}	0.85^{10}	0.026^{10}	0.82^{1}	0.059^{1}
	0.49^{11}	0.025^{11}	0.64^{20}	0.021^{20}	0.31^{17}	0.009^{17}	0.56^{23}	0.025^{23}	0.45^{11}	0.019^{11}	0.37^{17}	0.013^{17}	0.60^{5}	0.065^{5}
					0.18^{19}	0.009^{19}	0.31^{21}	0.025^{21}						
					0.33^{25}	0.007^{25}	0.50^{23}	0.010^{23}						
					0.20^{25}	0.017^{25}	0.47^{16}	0.031^{16}						

Table B3 codes:
Eth = ethion concentration (mg/Kg)
Delta = deltamethrin concnetration (mg/Kg)
days = time between treatment and slaughter
superscript = fat depth in mm

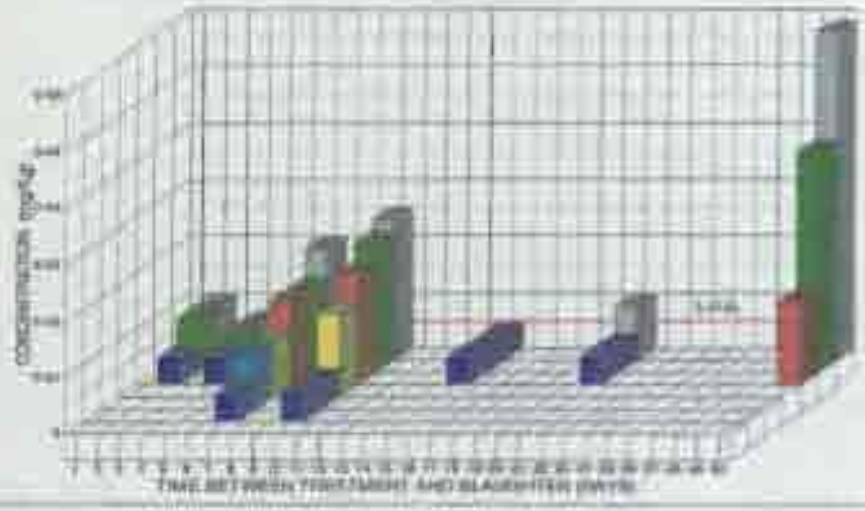
TREATMENT GROUP B1
TIXAFLY
SINGLE DIP

ETHION



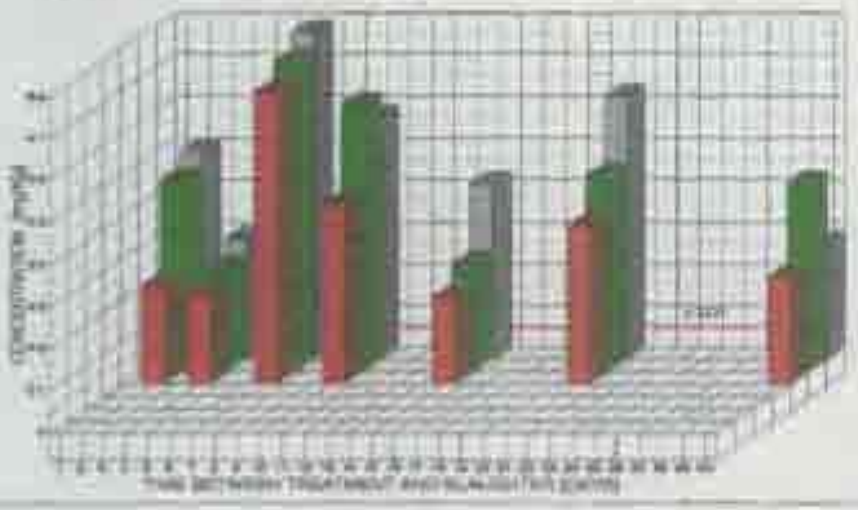
TREATMENT GROUP B1
TIXAFLY
SINGLE DIP

DELTAMETHRIN



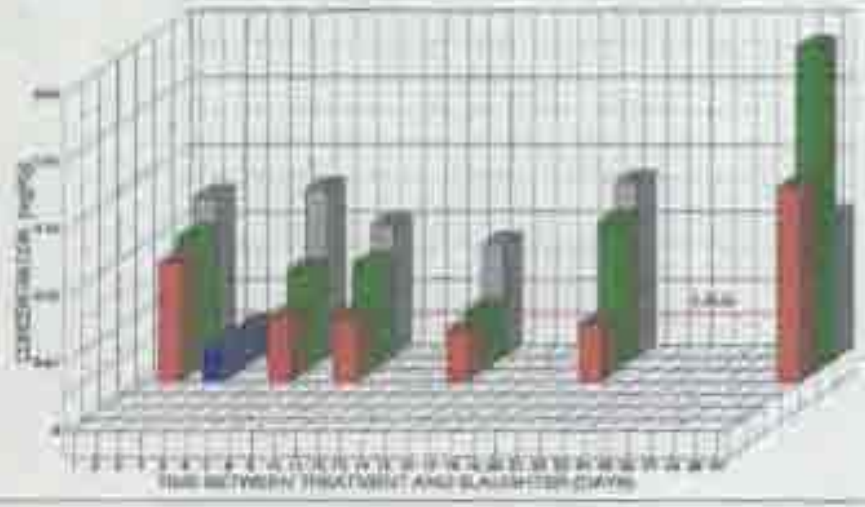
TREATMENT GROUP B2
TIXAFLY
SINGLE DIP (5TIRRERS)

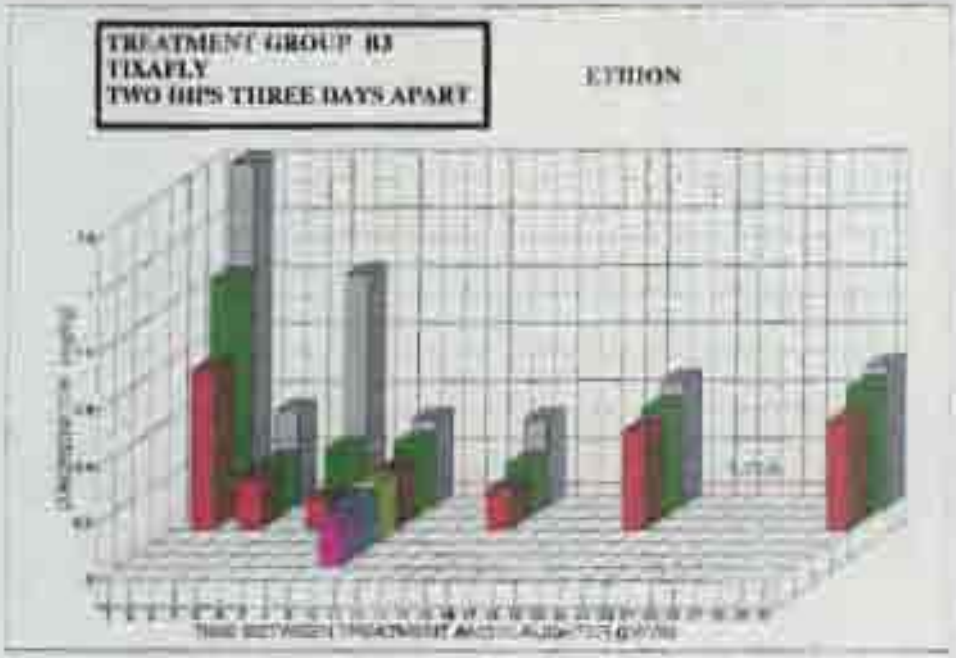
ETHION

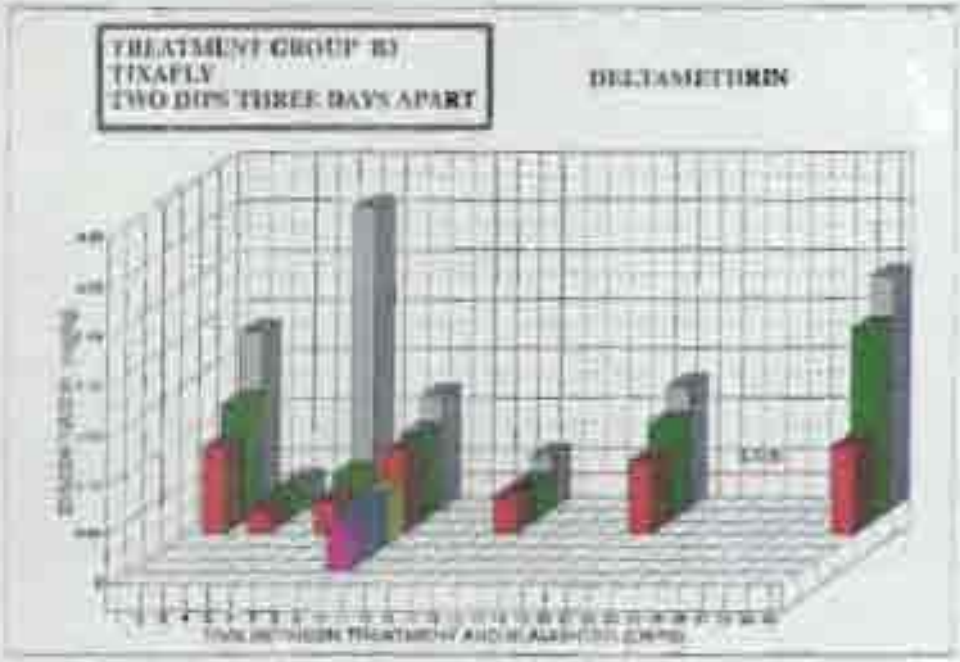


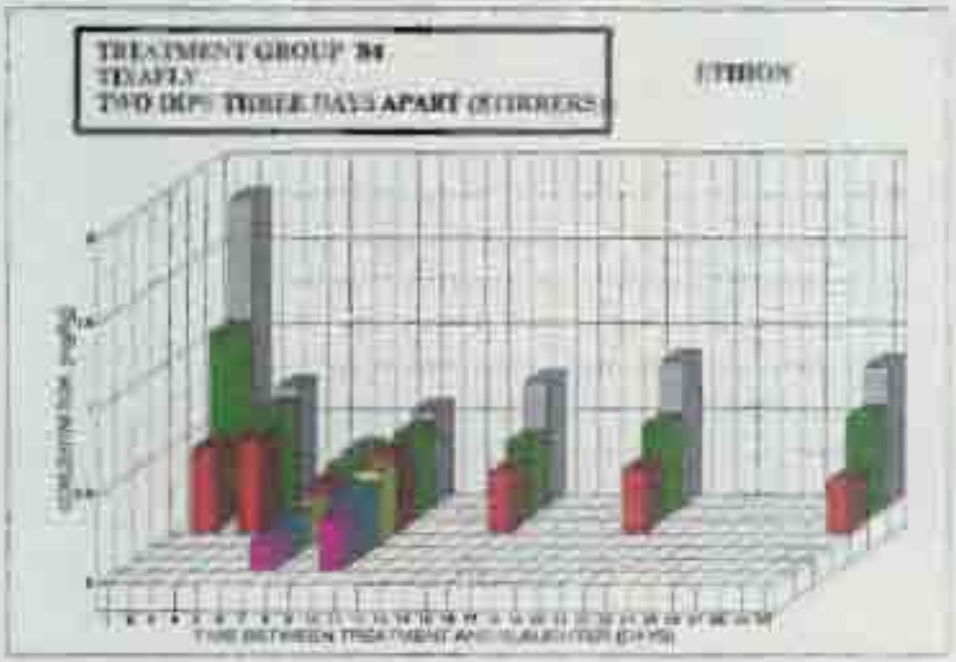
TREATMENT GROUP B2
TIXAFLY
SINGLE DIP (5TIRRERS)

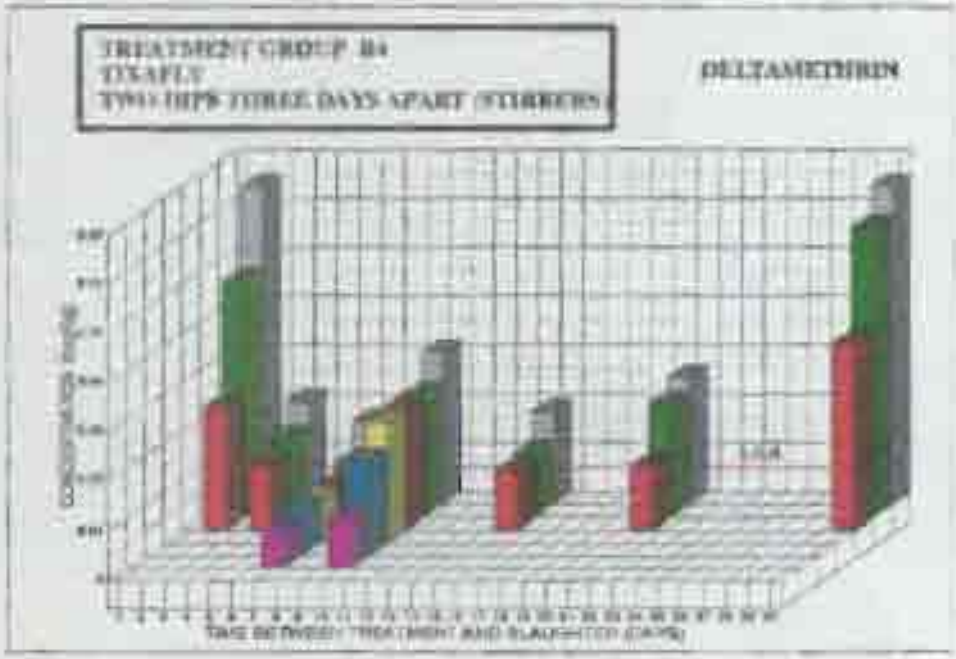
DELTAMETHRIN




TREATMENT GROUP B3
TIXAFLY
TWO DIPS THREE DAYS APART
ETHION


TREATMENT GROUP B3
TIXAFLY
TWO DIPS THREE DAYS APART
DELTAMETHRIN


TREATMENT GROUP B4
TIXAFLY
ETHION


TREATMENT GROUP B4
TIXAFLY
DELTAMETHRIN

TIXAFLY - TREATMENT GROUP B1 - SINGLE DIP

2 DAYS				4 DAYS			
ETH		DELTA		ETH		DELTA	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.42^{21}	0.84^{21}	0.010^{21}	0.010^{21}	0.23^{18}	0.30^{18}	0.007^{18}	0.009^{18}
0.43^{6}	0.47^{6}	$<0.005^{6}$	$<0.005^{6}$	0.29^{10}	0.55^{10}	0.007^{10}	0.009^{10}
0.74^{6}	0.97^{6}	0.010^{6}	$<0.005^{6}$	0.25^{15}	0.56^{15}	0.005^{15}	0.007^{15}

Table B4

TIXAFLY - TREATMENT GROUP B2 - SINGLE DIP (STIRRERS)

7 DAYS				10 DAYS			
ETH		DELTA		ETH		DELTA	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.78^{13}	1.3^{13}	0.015^{13}	0.030^{13}	0.58^{24}	0.98^{24}	0.010^{24}	0.020^{24}
0.70^{21}	1.3^{21}	0.010^{21}	0.030^{21}	0.43^{10}	0.69^{10}	0.016^{10}	0.020^{10}
0.74^{25}	1.6^{25}	0.025^{25}	0.043^{25}				

Table B5

TIXAFLY - TREATMENT GROUP B3 - TWO DIPS THREE DAYS APART

7 DAYS				10 DAYS			
ETH		DELTA		ETH		DELTA	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.25^{18}	0.42^{18}	0.010^{18}	0.022^{18}	0.22^{24}	0.30^{24}	0.011^{24}	0.015^{24}
0.12^{17}	0.28^{17}	0.007^{17}	0.015^{17}	0.20^{25}	0.32^{25}	0.011^{25}	0.017^{25}
0.81^{2}	0.88^{2}	0.061^{2}	0.053^{2}	0.31^{12}	0.34^{12}	0.018^{12}	0.020^{12}

Table B6

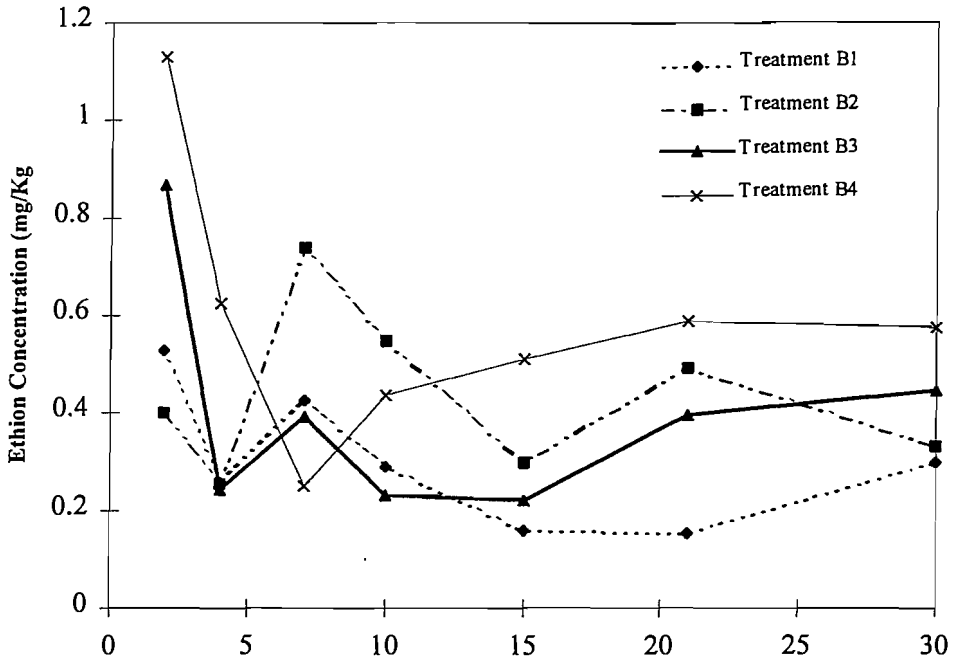
TIXAFLY - TREATMENT GROUP B4 - TWO DIPS THREE DAYS APART (STIRRERS)

7 DAYS				10 DAYS			
ETH		DELTA		ETH		DELTA	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.21^{22}	0.38^{22}	0.009^{22}	0.015^{22}	0.31^{21}	0.41^{21}	0.025^{21}	0.019^{21}
0.27^{28}	0.77^{28}	0.011^{28}	0.018^{28}	0.50^{23}	0.51^{23}	0.010^{23}	0.011^{23}
0.31^{17}	0.69^{17}	0.009^{17}	0.021^{17}	0.47^{16}	0.52^{16}	0.031^{16}	0.043^{16}

Table B7

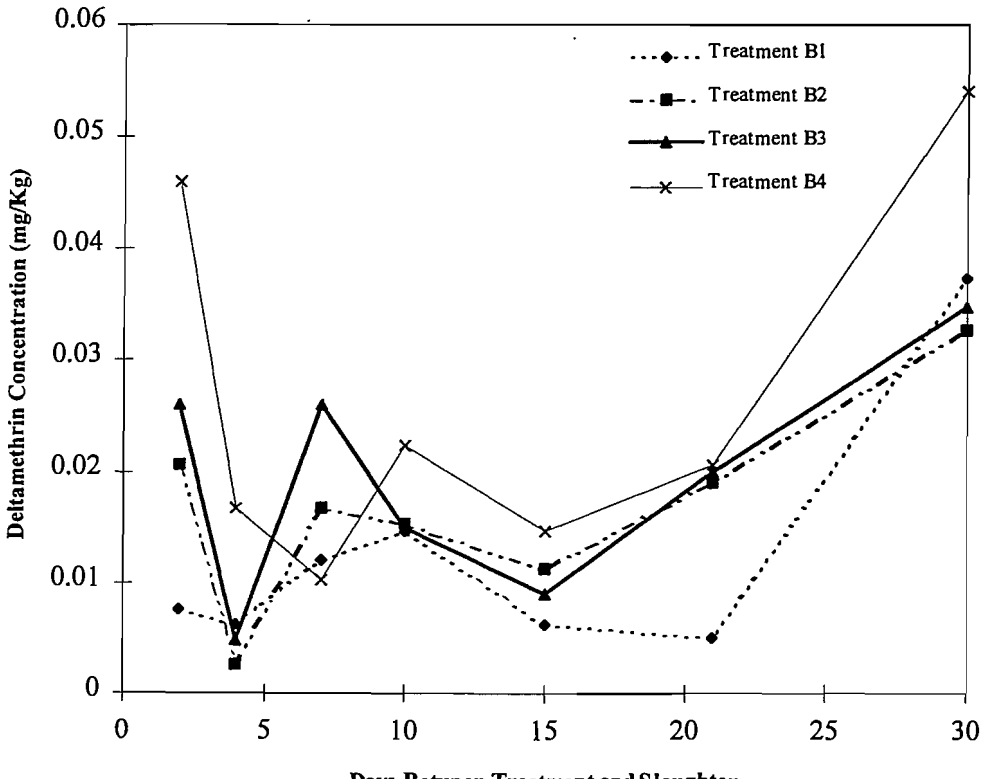
codes: Eth = ethion concentration (mg/Kg)
Delta = deltamethrin concnetration (mg/Kg)
Days = time between treatment and slaughter
superscript = fat depth in mm

Tixafly
Average Ethion Concentration in Subcutaneous Fat



Graph B8

Tixafly
Average Deltamethrin Concentration in Subcutaneous Fat



Graph B9

BAYTICOL CATTLE DIP AND SPRAY

COMPOSITION:

FLUMETHRIN 75g/L

METHOD OF ADMINISTRATION:

PLUNGE DIP

DIP CHARGE RATE:

0.0075%

WITHHOLDING PERIOD:

Nil

MRL:

	MRL (mg/Kg)
Australia	0.05
USA	*
Codex	*

- The MRL Australia is set on meat.
- An interim action level of 0.25mg/Kg flumethrin in fat has been set by the Australian Quarantine Inspection Service (AQIS).

* Flumethrin is not listed in Codex or USA standards

Treatment Details

84 animals were used in this part of the study. The effects of four different treatment regimens were investigated. Each treatment group involved 18 cattle dipped in Bayticol Cattle Dip and Spray.
Treatment C1 involved a single dipping.
Treatment C2 involved a single dipping but the animals were also used to stir the dip.
Treatment C3 involved the animals being dipped twice with an intertreatment interval of three days.
Treatment C4 duplicated treatment group C3 but with the animals used to stir the dip on both treatment days.
The dip strengths were checked by analysis prior to treatment and adjusted to the manufacturer's recommendation if required.

Sample Collection

Samples of loin fat were collected from all animals at slaughter as listed in the sampling schedule detailed in Table C1.
Three untreated animals were included in each group and acted as experimental controls.
A selection of perirenal fats as described in Table 2 was also collected.

SAMPLING SCHEDULE - BAYTICOL CATTLE DIP AND SPRAY

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN TREATMENT AND SLAUGHTER (days)							
	2	4	7	10	15	21	30	0 (control)
C1	3	3	3		3	3	3	3
C2	3	3	3		3	3	3	3
C3	3	3	3		3	3	3	3
C4	3	3	3		3	3	3	3

Table C1

Number in each cell = Number of animals treated.

C1 Single dipping

C2 Single dipping (used to stir dip)

C3 Two dips - 3 days apart

C4 Two dips - 3 days apart (used to stir dip)

Results

The residual concentrations of flumethrin in all loin and perirenal fat samples collected are listed in Tables C2 and C3

Discussion

Flumethrin, when formulated as Bayticol Cattle Dip and Spray and used according to the manufacturer's recommendations by plunge dipping did not provoke residues of concern in any of the trial animals.

Only five of the 72 animals treated in all treatment groups had measurable concentrations of flumethrin in fat tissues. The highest concentration recorded was 0.047 mg/Kg in a perirenal fat sample collected from an animal slaughtered 2 days post treatment.

None of the other concentrations recorded exceeded 0.015 mg/Kg.

BAYTICOL CATTLE DIP AND SPRAY
C1 - SINGLE DIP
C2 - SINGLE DIP (STIRRERS)

Flumethrin (mg/Kg)

	2 days		4 days		7 days		10 days		15 days		21 days		30 days	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
C1	<0.005[5]	<0.005[5]	<0.005[12]	<0.005[12]	<0.005[2]	<0.005[2]			<0.005[7]	<0.005[7]	<0.005[16]	<0.005[16]	<0.005[31]	<0.005[31]
	<0.005[5]	<0.005[5]	<0.005[6]	<0.005[6]	<0.005[27]	<0.005[27]			<0.005[5]	0.008[5]	<0.005[1]	<0.005[1]	<0.005[26]	<0.005[26]
	0.041[20]	0.047[20]	<0.005[6]	<0.005[6]	<0.005[7]	<0.005[7]			<0.005[1]	<0.005[1]	<0.005[0]	<0.005[0]	<0.005[21]	<0.005[21]
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
C2	<0.005[7]	<0.005[7]	<0.005[14]	<0.005[14]	<0.005[18]	<0.005[18]			<0.005[11]	<0.005[11]	<0.005[21]	<0.005[21]	<0.005[20]	<0.005[20]
	<0.005[4]	<0.005[4]	<0.005[8]	0.006[8]	<0.005[2]	<0.005[2]			<0.005[8]	<0.005[8]	<0.005[17]	<0.005[17]	<0.005[22]	<0.005[22]
	<0.005[21]	<0.005[21]	<0.005[3]	<0.005[3]	<0.005[2]	<0.005[2]			<0.005[23]	<0.005[23]	<0.005[18]	<0.005[18]	<0.005[12]	<0.005[12]

Table C2

codes:
days = time between treatment and slaughter.
superscript = fat depth in mm

BAYTICOL CATTLE DIP AND SPRAY
C3 - TWO DIPS THREE DAYS APART
C4 - TWO DIPS THREE DAYS APART (STIRRERS)

Flumethrin (mg/Kg)

	2 days		4 days		7 days		10 days		15 days		21 days		30 days	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
C3	$<0.005^{12}$	$<0.005^{12}$	$<0.005^{6}$	$<0.005^{6}$	$<0.005^{5}$	$<0.005^{5}$			$<0.005^{10}$	$<0.005^{10}$	$<0.005^{18}$	$<0.005^{18}$	$<0.005^{20}$	0.011^{20}
	$<0.005^{11}$	$<0.005^{11}$	$<0.005^{6}$	$<0.005^{6}$	$<0.005^{3}$	$<0.005^{3}$			$<0.005^{2}$	$<0.005^{2}$	$<0.005^{23}$	$<0.005^{23}$	$<0.005^{26}$	$<0.005^{26}$
	$<0.005^{6}$	$<0.005^{6}$	$<0.005^{2}$	$<0.005^{2}$	$<0.005^{15}$	$<0.005^{15}$			$<0.005^{18}$	$<0.005^{18}$	$<0.005^{16}$	$<0.005^{16}$	$<0.005^{18}$	$<0.005^{18}$
C4	$<0.005^{0}$	$<0.005^{0}$	$<0.005^{11}$	$<0.005^{11}$	$<0.005^{3}$	$<0.005^{3}$			$<0.005^{4}$	$<0.005^{4}$	$<0.005^{16}$	$<0.005^{16}$	0.009^{24}	0.013^{24}
	$<0.005^{7}$	$<0.005^{7}$	$<0.005^{13}$	$<0.005^{13}$	$<0.005^{10}$	$<0.005^{10}$			$<0.005^{10}$	$<0.005^{10}$	$<0.005^{27}$	$<0.005^{27}$	$<0.005^{11}$	$<0.005^{11}$
	$<0.005^{3}$	$<0.005^{3}$	$<0.005^{11}$	$<0.005^{11}$	$<0.005^{1}$	$<0.005^{1}$			$<0.005^{3}$	$<0.005^{3}$	$<0.005^{31}$	$<0.005^{31}$	$<0.005^{22}$	0.010^{22}

Table C3

codes:
days = time between treatment and slaughter.
superscript = fat depth in mm

BAYTICOL POUR-ON CATTLE TICKICIDE

COMPOSITION:

FLUMETHRIN 10g/L

METHOD OF ADMINISTRATION:

To be applied evenly along the midline of the back from the front of the shoulder to the tail setting.

DOSAGE

Bodyweight	Dose
150Kg	35mL
151Kg To 300Kg	55mL
301Kg To 500Kg	75mL
501Kg To 750Kg	112.5mL

WITHHOLDING PERIOD:

Nil

MRL:

	MRL (mg/Kg)
Australia	0.05
USA	*
Codex	*

- The Australian MRL is set on meat.
- An interim action level of 0.25mg/Kg flumethrin in fat is used by Australian Quarantine and Inspection Service (AQIS).

* Flumethrin is not listed in Codex or USA Standards.

Treatment Details

Two treatment regimens were studied using this preparation. 27 cattle were treated by single application (designated treatment C5). A second group of 27 animals was treated twice with a seven day intertreatment interval (designated treatment C6). All animals were weighed prior to treatment and the dosage calculated according to the manufacturer's directions.

Sample Collection

Samples of loin and perirenal fat were collected from all animals at slaughter as listed in the sampling schedule detailed in Table C1.
Three untreated animals were included in each group and acted as experimental controls.
At the instigation of Bayer Australia Ltd, samples were also collected from frozen cartoned product. The product originated from treated trial animals.
Samples were collected by a coring technique designed to closely simulate that used during port-of-entry inspection in the USA. Three replicate samples were taken from each of four cartons of frozen product by staff of Bayer Australia Ltd. Each set of replicates were taken from cuts from the same carcase.
Duplicate core samples were despatched for analysis to the Animal Research Institute, ARI and to the Australian Government Analytical Laboratory in Sydney.

SAMPLING SCHEDULE - Bayticol Pour-On

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN LAST TREATMENT AND SLAUGHTER (days)								
	2	4	7	10	15	21	30	45	0 (control)
C5	3	3	3	3	3	6	3	3	3
C6	3	3	3	3	3	6	3	3	3

Table C1

Number in each cell = Number of animals treated.

C5 Bayticol pour-on - single application
C6 Bayticol pour-on - two applications seven days apart

Results

The residual concentrations of flumethrin in both the loin and perirenal fat samples are listed by sampling period in Table C2.
The residual concentration of flumethrin in the core samples analysed are presented in Table C3. The concentrations of flumethrin in the corresponding loin and perirenal fats collected form the same carcase are also listed.
The core samples were analysed by first extracting the fat from the minced sample. Results were expressed on an extracted fat basis. This is the same procedure followed in the USA.
To complete quality control procedures, samples of fat were submitted to AGAL as interlaboratory check samples. The results of these assays are presented in Table C4.

Discussion

The bar charts supplied afford a graphical illustration of residual concentrations versus time. Each bar represents a different animal and the marked variation between trial

animals is clearly evident. This variation should be kept in mind when viewing Graphs C5 and C6. These graphs were generated by plotting the treatment group average residual concentrations of the active constituents against time.
As expected, in the first twenty days of the trial the double treatment resulted in higher average residual concentrations than the single treatment.
The results clearly indicate that flumethrin formulated as Bayticol Pour-On Cattle Tickicide gives rise to easily detectable highly persistent residues in cattle fat.
On average the flumethrin residual concentrations in perirenal fat were 1.9 times higher than those in loin fat.
When expressed on an extracted fat basis the core sample results agreed well with the corresponding loin and renal fat concentrations.
The correlation between the ARI and AGAL core sample results was excellent (correlation coefficient (r) = 0.978).
The correlation between the ARI and AGAL interlaboratory quality control check samples for synthetic pyrethriods was again excellent (correlation coefficient (r) = 0.983).
The situation with regards to MRLs for flumethrin in cattle tissues is a complicated one. Flumethrin is not used in the USA, so a tolerance for this chemical in animal tissues has not been set. There is no MRL listed for flumethrin in animal tissues under Codex. The Australian MRL for flumethrin, a highly lipophilic compound (as demonstrated by this trial), is set for the meat of cattle only.

BAYTICOL
C5 - SINGLE TREATMENT
C6 - TWO TREATMENTS 7 DAYS APART

lumethrin (mg/Kg)

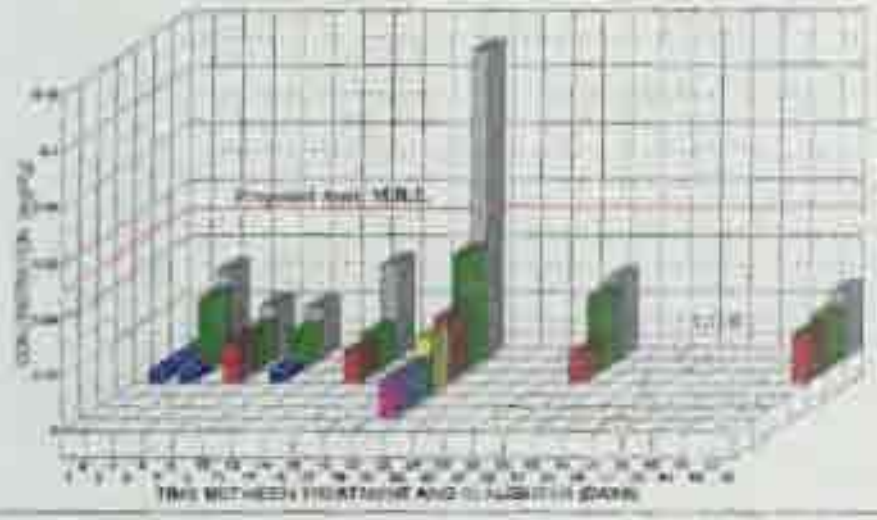
	2 days		4 days		7 days		10 days		15 days		21 days		30 days		45 days	
	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal
C5	<0.005[10]	<0.005[10]	0.023[17]	0.032[17]	0.013[5]	0.015[5]	<0.005[20]	<0.005[20]	0.011[19]	0.012[19]	0.006[18]	0.014[18]	0.020[14]	0.027[14]	<0.005[7]	0.018[7]
	<0.005[7]	<0.005[7]	<0.005[18]	<0.005[18]	0.011[10]	0.020[10]	0.014[19]	0.019[19]	0.007[15]	0.014[15]	0.008[15]	0.021[15]	0.008[17]	0.029[17]	<0.005[7]	0.024[7]
	<0.005[20]	<0.005[20]	0.029[17]	0.026[17]	0.008[14]	0.015[14]	0.009[18]	0.014[18]	0.011[6]	0.034[6]	0.040[13]	0.11[13]	0.008[13]	0.011[13]	0.009[15]	0.020[15]
											0.017[11]	0.024[11]				
											0.010[9]	0.014[9]				
											0.029[14]	0.042[14]				
	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal	loin	renal
C6	0.015[17]	0.040[17]	0.028[7]	0.058[7]	0.031[15]	0.037[15]	0.022[16]	0.044[16]	0.052[9]	0.14[9]	0.017[13]	0.036[13]	0.014[25]	0.027[25]	0.023[12]	0.051[12]
	0.014[8]	0.034[8]	0.025[10]	0.022[10]	0.018[9]	0.036[9]	0.022[15]	0.038[15]	0.020[10]	0.038[10]	0.011[14]	0.026[14]	0.017[13]	0.030[13]	0.012[18]	0.028[18]
	0.013[7]	0.023[7]	0.023[12]	0.035[12]	0.019[11]	0.022[11]	0.029[21]	0.097[21]	0.020[12]	0.035[12]	0.016[12]	0.049[12]	0.020[20]	0.027[20]	0.029[14]	0.044[14]
											0.015[19]	0.026[19]				
											0.022[10]	0.054[10]				
											0.019[16]	0.033[16]				

able C2

ays = number of days between treatment and slaughter.
uperscript = fat depth in mm

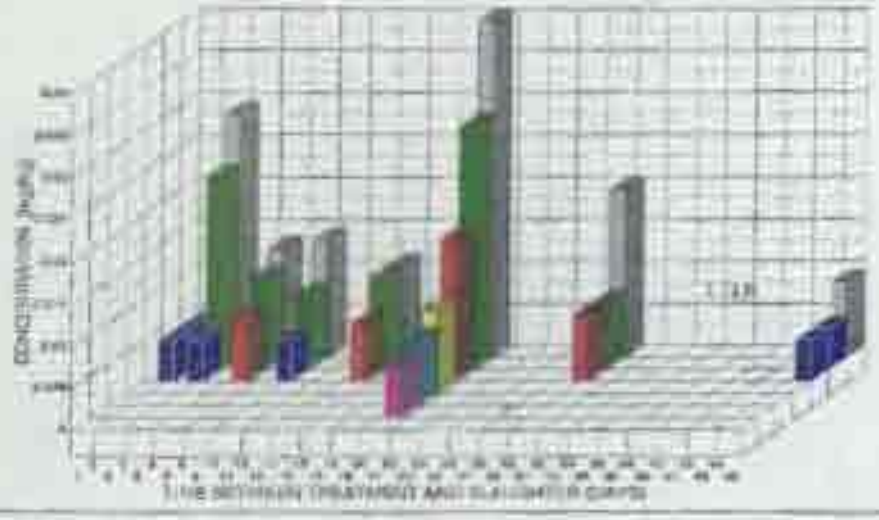
TREATMENT GROUP C5
SINGLE POUR ON
BAYTICOL

RENAL (FLUMETHRIN)



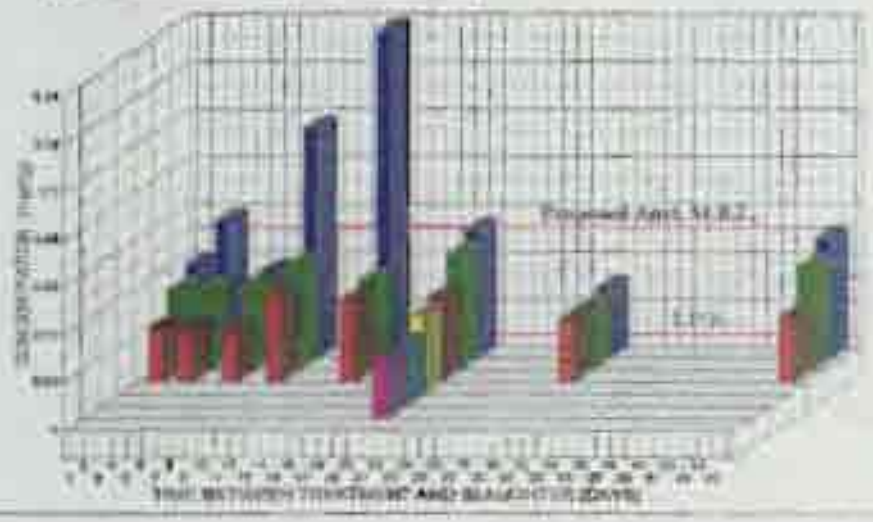
TREATMENT GROUP C5
SINGLE POUR ON
BAYTICOL

LOIN (FLUMETHRIN)



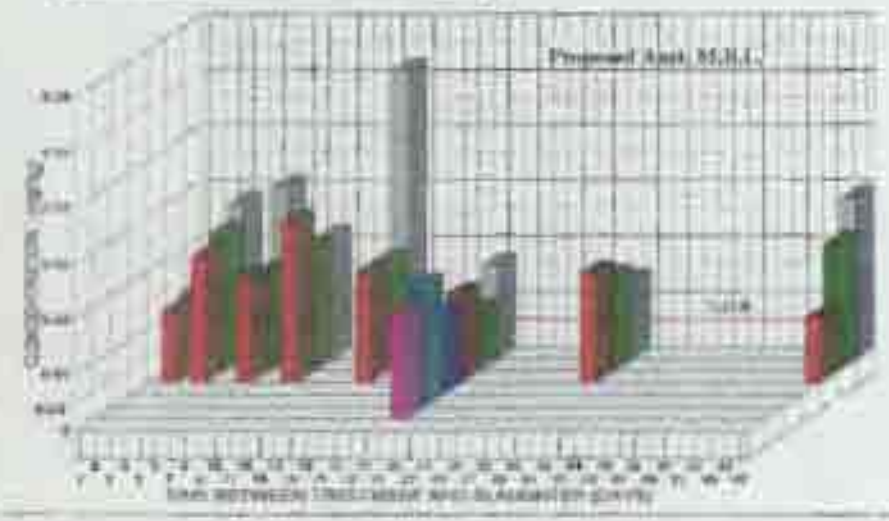
TREATMENT GROUP C6
DOUBLE POUR ON 7 DAYS APART
BAYTICOL

RENAL (FLUMETHRIN)



TREATMENT GROUP C6
DOUBLE POUR ON 7 DAYS APART
BAYTICOL

LOIN (FLUMETHRIN)



CORE SAMPLES

FLUMETHRIN CONCENTRATION (mg/Kg)

Bayer ID.	Body No.	Renal	Loin	Core Samples	
				ARI	AGAL
6	control			<0.005	<0.02
1	1989	0.026	0.029	0.037	0.047
2	1989			0.035	0.027
7	1989			0.038	0.043
3	228	0.015	0.013	0.017	<0.02
4	228			0.014	<0.02
5	228			0.013	<0.02
5	control			<0.005	<0.02
1	9	0.11	0.04	0.063	0.076
2	9			0.067	0.085
6	9			0.060	0.075
3	7	0.024	0.017	0.023	0.021
4	7			0.029	0.020
7	7			0.023	<0.02

Table C3

ARI results expressed on an extracted dried fat basis.

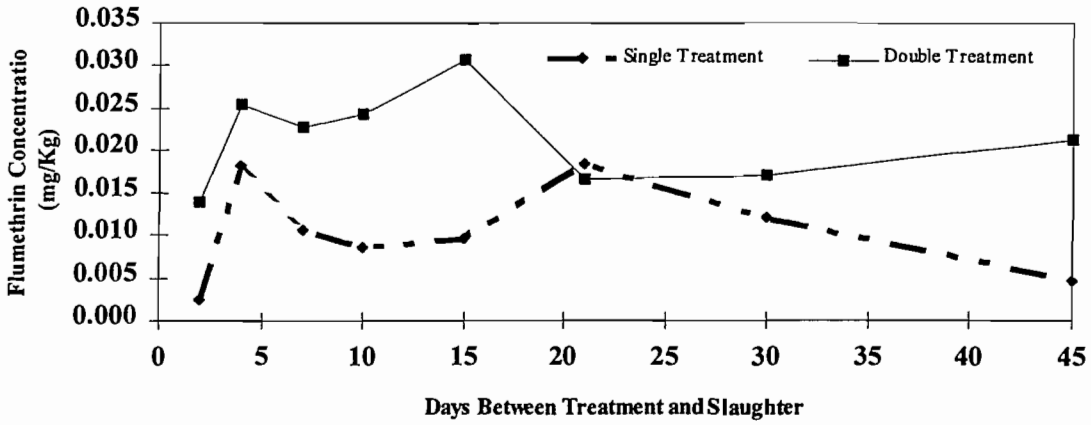
INTERLABORATORY QUALITY CONTROL CHECK SAMPLES

Sample No.	Sample Group	Tag No.	Analyte	ARI Result	AGAL Result
1	C6-10	277(#40)	Flumethrin	0.025	0.024
2	C6-10	279(#52)	Flumethrin	0.025	0.028
3	A1-21	8798	Cypermethrin	0.042	0.043
4	A1-21	8800	Cypermethrin	0.032	0.030
5	A2-21	206	Cypermethrin	0.033	0.031
6	A1-10	8793	Cypermethrin	0.032	0.034
7	A1-15	713	Cypermethrin	0.012	0.012
8	A1-30	8795	Cypermethrin	0.033	0.030
9	A3-10	229	Cypermethrin	0.044	0.042
10	A4-10	4156	Cypermethrin	0.056	0.060

Table C4

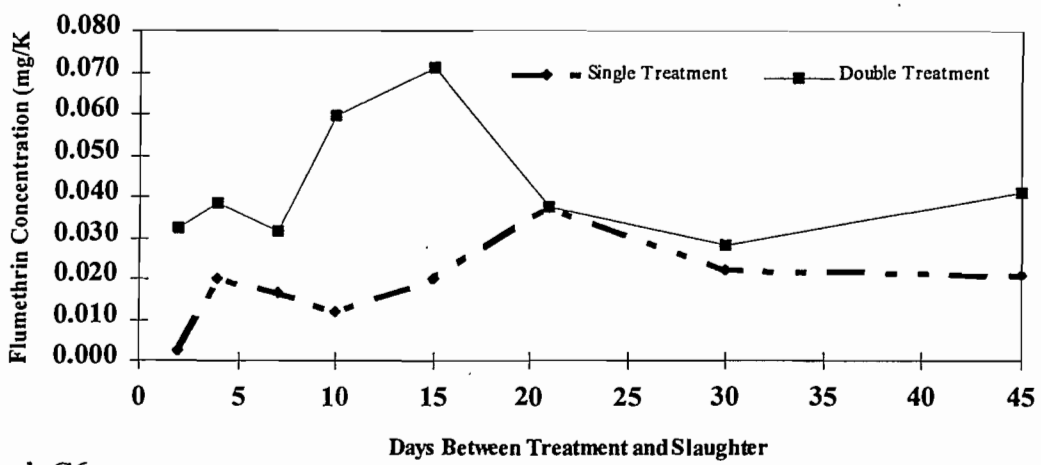
All results expressed in mg/Kg.

Bayticol Pour-On Cattle Tickicide
Average Flumethrin Concentrations in Subcutaneous Fat



Graph C5

Bayticol Pour-On Cattle Ticicide
Average Flumethrin Concentrations in Perirenal Fat



Graph C6

TAKTIC WP

COMPOSITION:

AMITRAZ 500g/Kg

METHOD OF ADMINISTRATION:

PLUNGE DIP

DIP CHARGE RATE:

0.025% W/V

WITHHOLDING PERIOD:

Nil

MRL:

	Chemical	MRL (mg/Kg)		
		Muscle	♣Offal/Meat By-products	Fat
Australia	Amitraz	0.1	**0.5	*
USA	Amitraz & Metabolites	0.05	0.3	0.1
Codex	Amitraz & Metabolites	0.05	0.2	*

* No MRL is listed for Australia or Codex

** No MRL listed under the Australian Food Standards Code 1993. MRL taken from MRL Standard (Commonwealth Department of Human Services and Health).

♣ Australian and Codex MRL for offal.
US MRL for meat by-products.

Treatment Details

53 animals were treated with Taktic WP by plunge dipping according to the manufacturer's recommendations.
The effects of four different treatment regimens on residual concentrations in meat and liver were investigated.
Treatment D1 involved a single dipping.

Treatment D2 involved a single dipping with the animals also used to stir the dip.
Treatment D3 involved the animals being dipped twice with an intertreatment interval of 3 days.
Treatment D4 involved the animals being dipped twice with an intertreatment interval of 3 days with the animals being used to stir the dip on both occasions.
Animals were allocated to the different treatment groups as outlined in Table D1.
Dip strengths were checked by analysis prior to treatment and adjusted to the manufacturer's recommendation if required.

Sample Collection

Samples of muscle and liver were collected from all animals at slaughter at the time periods listed in Table D1. Two untreated animals were included in each group to act as experimental controls.

SAMPLING SCHEDULE - TAKTIC WP

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN TREATMENT AND SLAUGHTER (DAYS)						
	1/2	1	2	4	7	15	0 (control)
D1	3	3	3				2
D2	3	3	3				2
D3	3	3	3	3			2
D4	3	3	3	3		3	2

Table D1
Number in each cell = Number of animals treated.
D1 Single dipping
D2 Single dipping (used to stir dip)
D3 Two dips - 3 days apart
D4 Two dips - 3 days apart (used to stir dip)

Results

The residual concentrations of amitraz in all muscle and liver samples collected are listed in Tables D2 and D3.

Discussion

The bar charts supplied afford a graphical illustration of residual concentrations versus time. Each bar represents a different animal. Amitraz when formulated as Taktic WP and used according to the manufacturer's recommendations did not provoke any residues of concern in either muscle or liver tissues.

TAKTIC WP
D1 - SINGLE DIP
D2 - SINGLE DIP (STIRRER)

AMITRAZ (Equivalent) mg/Kg

	1/2 days		1 day		2 days	
	meat	liver	meat	liver	meat	liver
D1	<0.005	0.02	<0.005	0.01	<0.005	0.02
	<0.005	0.01	<0.005	<0.005	<0.005	0.03
	<0.005	0.02	<0.005	<0.005	<0.005	0.01
D2	<0.005	0.02	<0.005	0.02	<0.005	0.02
	<0.005	0.02	<0.005	0.03	<0.005	0.02
	<0.005	0.02	<0.005	0.02	<0.005	0.02

Table D2

Concentrations expressed as Amitraz equivalent in mg/Kg.

codes:

days = time between last treatment and slaughter.

TAKTIC WP
D3 - TWO DIPS 3 DAYS APART
D4 - TWO DIPS 3 DAYS APART (STIRRERS)

AMITRAZ (Equivalent) mg/Kg

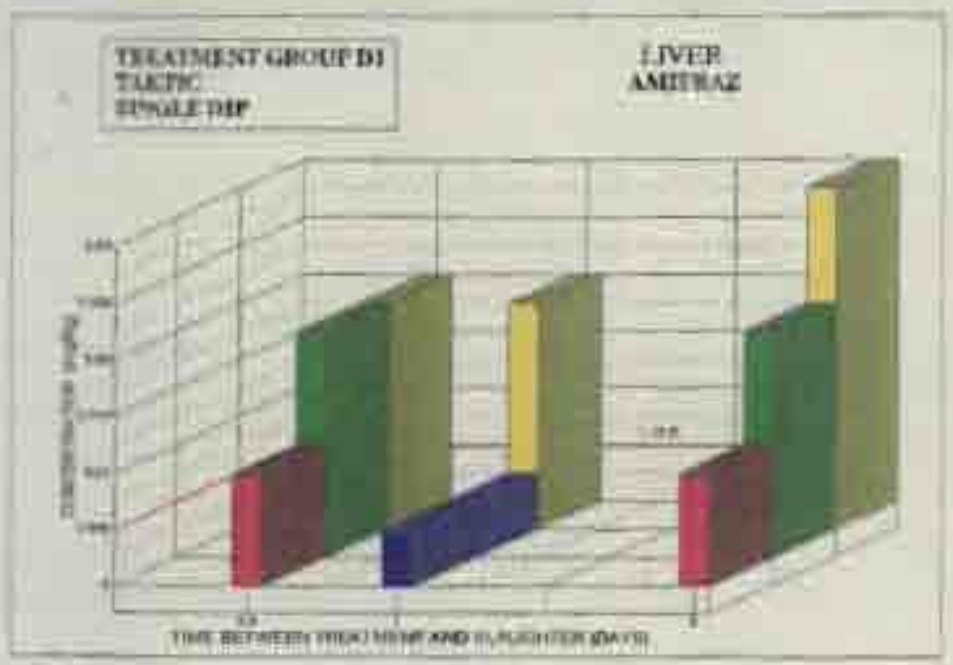
	1/2 days		1 days		2 days		4 days		7 days		15 days	
	meat	liver	meat	liver	meat	liver	meat	liver	meat	liver	meat	liver
D3	<0.005	0.03	0.007	0.06	0.005	0.03	<0.005	0.01	<0.005	0.02		
	0.005	0.04	<0.005	0.03	<0.005	0.01	0.005	0.02	<0.005	0.03		
	<0.005	0.05	0.008	0.03	<0.005	0.02	<0.005	0.03	<0.005	0.02		
D4	0.01	0.05	<0.005	0.01	<0.005	0.01	<0.005	0.02			<0.005	<0.005
	<0.005	0.02	0.006	0.03	<0.005	0.03	<0.005	0.03			<0.005	<0.005
	0.01	0.04	<0.005	0.03	<0.005	0.02	<0.005	0.02			<0.005	<0.005

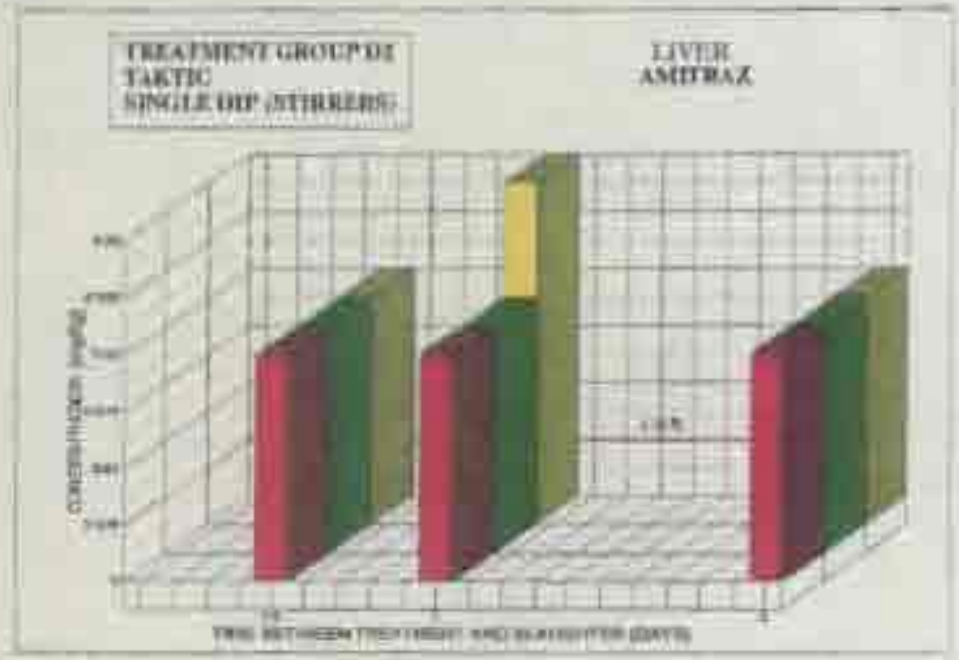
Table D3

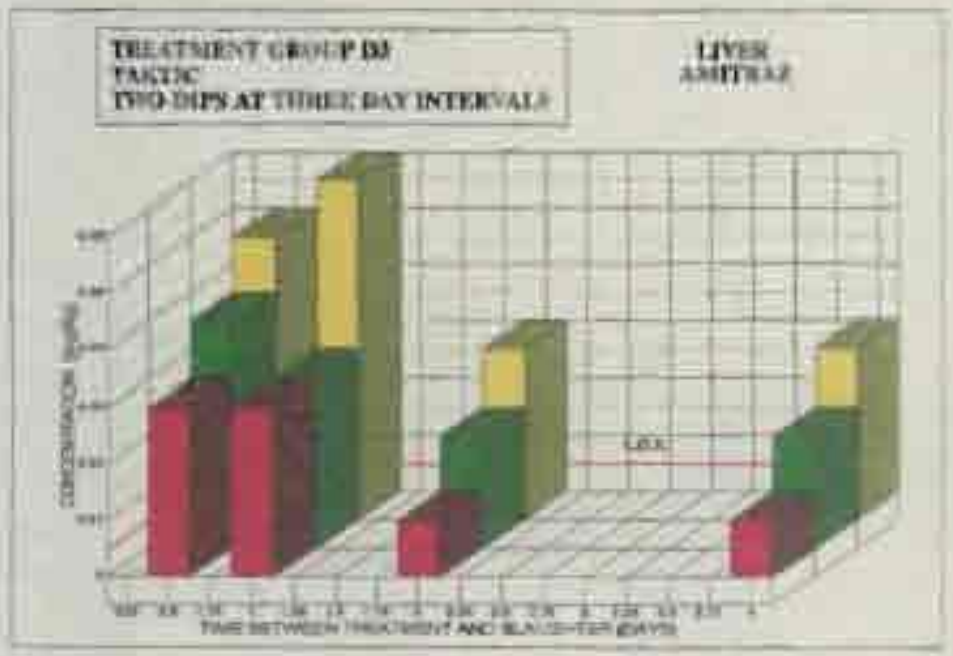
Concentrations expressed as Amitraz equivalent in mg/Kg.

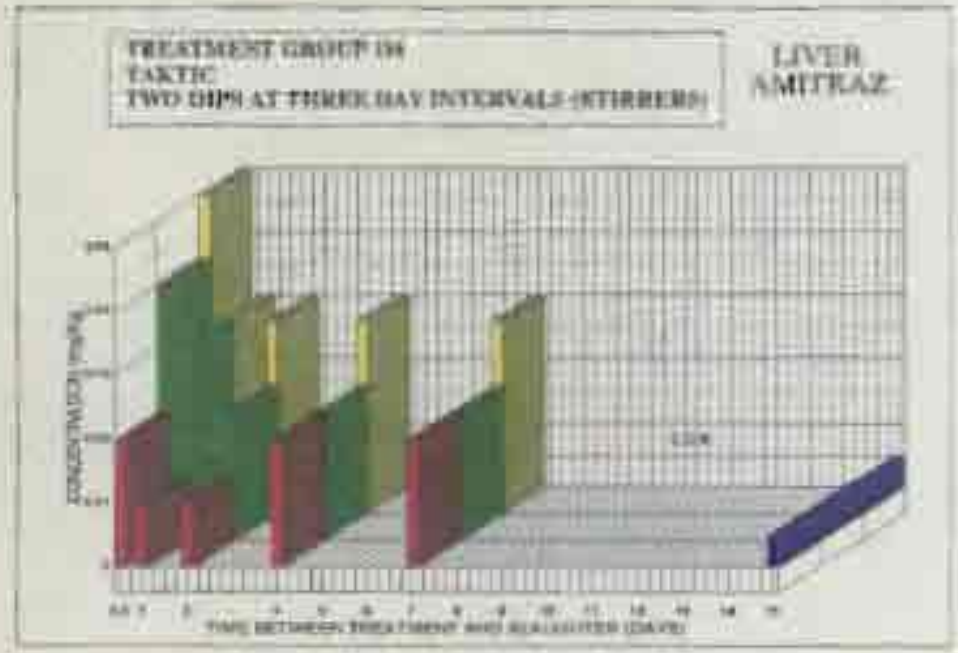
codes:

days = time between last treatment and slaughter.


TREATMENT GROUP D1
TAKTIC
SINGLE DIP
LIVER
AMITRAZ


TREATMENT GROUP D1
TAKTIC
SINGLE DIP (STIRRER)
LIVER
AMITRAZ


TREATMENT GROUP D3
TAKTIC
TWO DIPS AT THREE DAY INTERVALS
LIVER
AMITRAZ


TREATMENT GROUP D4
TAKTIC
TWO DIPS AT THREE DAY INTERVALS (STIRRER)
LIVER
AMITRAZ

GRENADE CATTLE DIP & BUFFALO FLY SPRAY

COMPOSITION:

CYHALOTHRIN 200g/L

METHOD OF ADMINISTRATION:

PLUNGE DIP

DIP CHARGE RATE:

0.007%

WITHHOLDING PERIOD:

Nil

MRL:

	MRL (mg/Kg)
Australia	0.5
USA	0.01
Codex	*

MRL values stated pertain to fat.

* No MRL is stated for cyhalothrin by Codex.

Treatment Details

96 animals were used in this part of the study. The effects of four different treatment regimens were investigated. Each treatment group involved 21 cattle dipped in Grenade Cattle Dip and Buffalo Fly Spray.
Treatment E1 involved a single dipping.
Treatment E2 involved a single dipping but the animals were also used to stir the dip.
Treatment E3 involved the animals being dipped twice with an intertreatment interval of three days.
Treatment E4 duplicated treatment group E3 but with the animals used to stir the dip on both occasions.
The dip strengths were checked by analysis prior to treatment and adjusted to the manufacturer's recommendation if required.

Sample Collection

Samples of loin fat were collected from all animals at slaughter as listed in the sampling schedule detailed in Table E1.
Three untreated animals were included in each group and acted as experimental controls. A selection of perirenal fats as described in Table 2 was also collected.

SAMPLING SCHEDULE - GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN LAST TREATMENT AND SLAUGHTER (days)							
	2	4	7	10	15	21	30	0 (control)
E1	3	3	3	3	3	3	3	3
E2	3	4	3	3	3	3	3	3
E3	3	3	3	3	3	3	3	3
E4	3	3	3	3	3	3	2*	3

Table E1
* Animal died before slaughter.
Number in each cell = Number of animals treated.
E1 Single dipping
E2 Single dipping (used to stir dip)
E3 Two dips - 3 days apart
E4 Two dips - 3 days apart (used to stir dip)

Results

The residual concentrations of cyhalothrin in all fat samples collected and analysed are listed by sampling period and treatment regimen in Tables E2 and E3.

Discussion

The bar charts supplied afford a graphical illustration of residual concentrations versus time. Each bar represents a different animal and the marked variation between trial animals is clearly evident. This variation should be kept in mind when viewing Graph E4. These graphs were generated by plotting the treatment group average residual concentrations of the active constituent versus time.
The average concentration versus time graphs indicated that three of the four treatment groups E2, E3, and E4, reached a maximum between 14 and 21 days with treatment group E1 recording a highest average concentration at day 30 post treatment.
On average the cyhalothrin residual concentrations in perirenal fat were 2.0 times higher than the corresponding loin fat concentrations.
The Australian MRL of 0.5 mg/Kg was proven to be more than adequate for this product used in the manner trialed. The highest concentration measured was 0.19 mg/kg.

However, 76 of the 84 trial animals treated with this product exceeded the US MRL of 0.01 mg/Kg. All animals in all treatment groups at day 30 post treatment had cyhalothrin fat concentrations greater than 0.01 mg/Kg with the highest recorded at this time being 0.15 mg/Kg.

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY
E1 - SINGLE DIP
E2 - SINGLE DIP (STIRRER)

CYHALOTHRIN (mg/Kg)

	2 days		4 days		7 days		10 days		15 days		21 days		30 days		Control	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
E1	0.018^{18}		0.018^{12}		0.013^{14}		0.013^{23}		0.031^{4}		$<0.010^{14}$		0.029^{3}		<0.010	
	0.055^{4}		0.010^{24}		0.019^{7}		0.015^{10}		0.030^{12}		0.025^{8}		0.055^{7}		<0.010	
	0.023^{8}		0.19^{5}		0.036^{10}		0.029^{8}		0.036^{4}		0.055^{2}		0.15^{1}		<0.010	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
E2	0.026^{6}		0.019^{8}		0.018^{16}		0.012^{30}		$<0.010^{15}$		0.080^{2}		0.079^{5}		<0.010	
	0.015^{4}		0.027^{51}		0.011^{18}		0.043^{9}		$<0.010^{23}$		0.049^{2}		0.022^{10}		<0.010	
	0.015^{7}		0.035^{10}		0.013^{25}		0.032^{13}		0.013^{10}		0.033^{3}		0.020^{8}		<0.010	
			0.015^{23}													

Table E2

codes:

days = time between treatment and slaughter.

superscript = fat depth in mm

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY
E3 - TWO DIPS THREE DAYS APART
E4 - TWO DIPS THREE DAYS APART (STIRRERS)

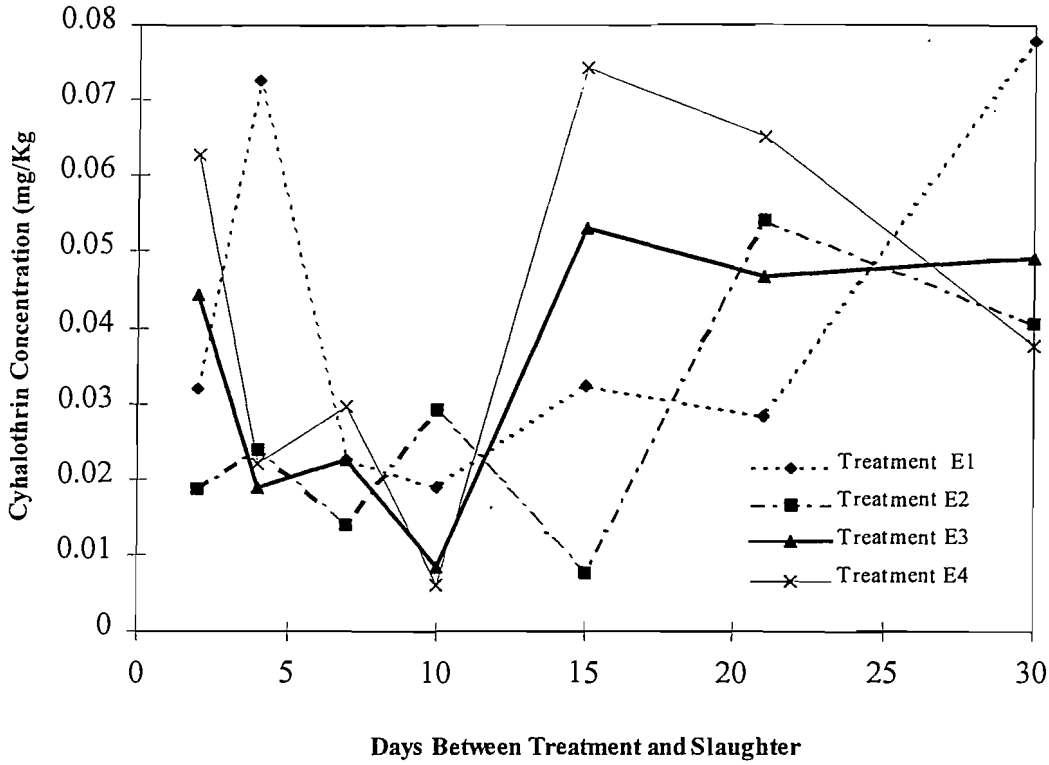
CYHALOTHRIN (mg/Kg)

	2 days		4 days		7 days		10 days		15 days		21 days		30 days		Control	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
E3	0.063[6]		0.025[10]	0.039[10]	0.015[16]	0.031[16]	<0.010[34]	<0.010[34]	0.039[10]		0.042[8]		0.052[7]		<0.010	
	0.029[8]		0.012[10]		0.023[24]	0.070[24]	0.015[20]	0.023[20]	0.061[5]		0.045[8]		0.079[5]		<0.010	
	0.041[6]		0.020[10]		0.030[22]	0.045[22]	<0.010[19]	0.011[19]	0.059[7]		0.053[7]		0.016[10]		<0.010	
	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL	LOIN	RENAL
E4	0.060[13]		0.027[8]	0.056[8]	0.016[14]	0.046[14]	<0.010[9]	0.018[9]	0.077[6]		0.033[9]		0.063[7]		<0.010	
	0.041[14]		0.017[15]	0.025[15]	0.026[15]	0.042[15]	0.013[16]	0.036[16]	0.073[4]		0.078[6]		0.012[5]		<0.010	
	0.087[6]		0.022[10]	0.025[10]	0.047[20]	0.11[20]	<0.010[23]	0.016[23]	0.073[8]		0.084[2]		D.O.A.		<0.010	

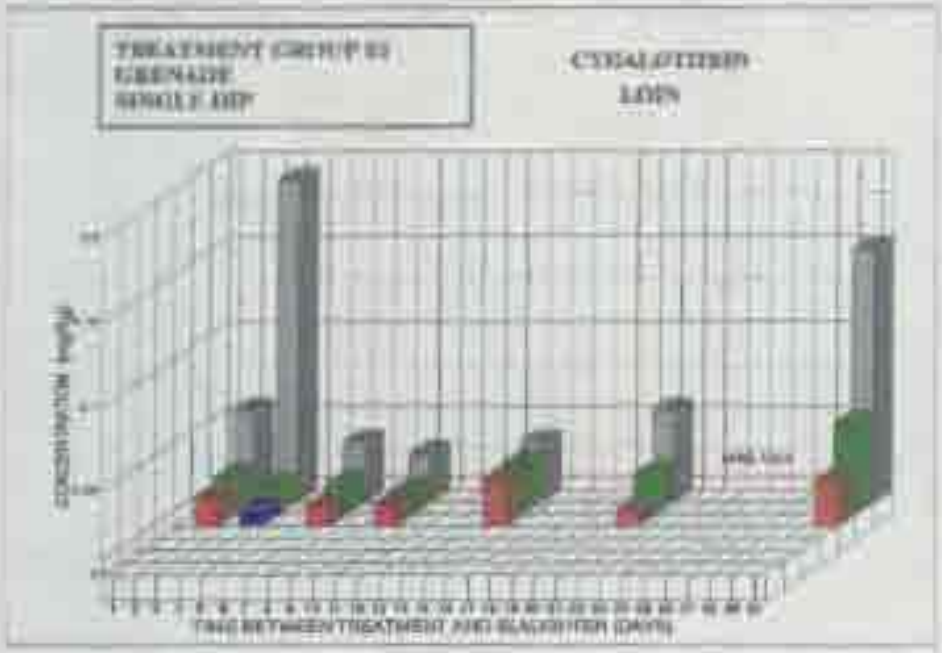
Table E3

codes:
days = time between treatment and slaughter.
D.O.A. = Dead on arrival at abattoir.
superscript = fat depth in mm

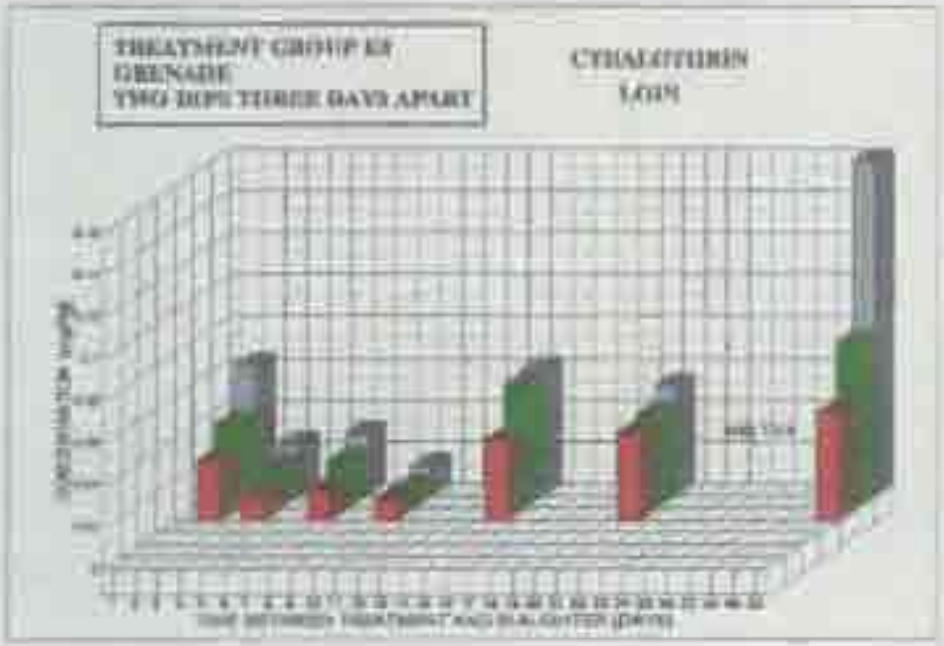
Grenade Cattle Dip and Buffalo Fly Spray
Average Cyhalothrin Concentrations in Subcutaneous Fat.

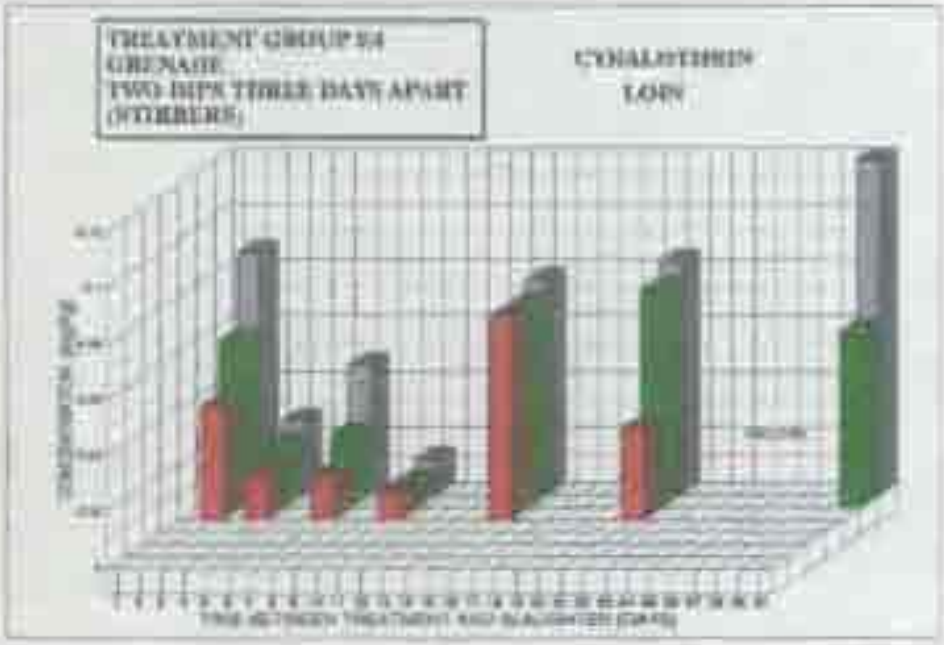


Graph E4


CYHALOTHRIN
LD50


CYHALOTHRIN
LD50


CYHALOTHRIN
LD50


CYHALOTHRIN
LD50

ARREST

COMPOSITION:

DELTAMETHRIN 7.5g/L

TARGET PESTS:

Biting and sucking lice plus nuisance flies in all ages of cattle.

ADMINISTRATION:

Applied as a single strip along the backline.

DOSAGE:

Bodyweight	Dose
UP - 100Kg	10ml
101 - 200Kg	20ml
201 - 300Kg	30ml
301 - 400Kg	40ml
401 - 500Kg	50ml
501 - 600Kg	60ml
Greater than 600Kg	10ml/100Kg live weight.

WITHHOLDING PERIOD:

Nil

MRL:

	MRL (mg/Kg)
	DELTAMETHRIN
AUSTRALIA	0.1
USA	*
CODEX	0.5

During this study the National Registration Authority approved a change in the MRL for deltamethrin in the fat of meat of cattle. The amended MRL is 0.5mg/Kg as listed in the latest edition of the MRL Standard (Commonwealth Department of Human Services and Health).

* MRL not listed for USA.

Trial Design

The trial design for Arrest differed from the other preparations studied in this project in that samples were collected from live animals by a biopsy technique. This permitted more than one sample to be collected from each animal.

Experimental Animals

13 steers were used. Body weights ranged from 400 - 442Kg. Individual bodyweights are listed in Table F1. All animals were fed under normal feedlot conditions.

Animal Number	Weight (Kg)	Animal Number	Weight (Kg)
1	432	8	416
2	434	9	418
3	424	10	400
4	432	11	402
5	442	12	416
6	432	13	404
7	400		

Table F1

Treatment Details

Each animal was treated once with the manufacturers recommended dose applied as a single strip along the backline.
Trial animals were allocated to three groups as listed in Table F2. Sampling occurred at 7 pre-determined periods post-treatment. The sampling schedule and allocation of animals is listed in Table. F2.

3 days	7 days	14 days	21 days	28 days	42 days	96 days
1	5	9	1	5	9	1
2	6	10	2	6	10	2
3	7	11	3	7	11	3
4	8	12	4	8	12	4
13	13	13	13	13	13	13

Table F2
The number in each cell represents the animal identification number.
Animal number 13 was sampled on all 7 sampling dates.

Sample Collection

Fat samples were collected by a biopsy technique from the fat pads either side of the tail. This allowed more than one sample to be collected from each animal.
Safeguards were taken to ensure that samples were not contaminated during collection from deposits of deltamethrin on the hide of the animal.
The precautions taken are attached (attachment 1).

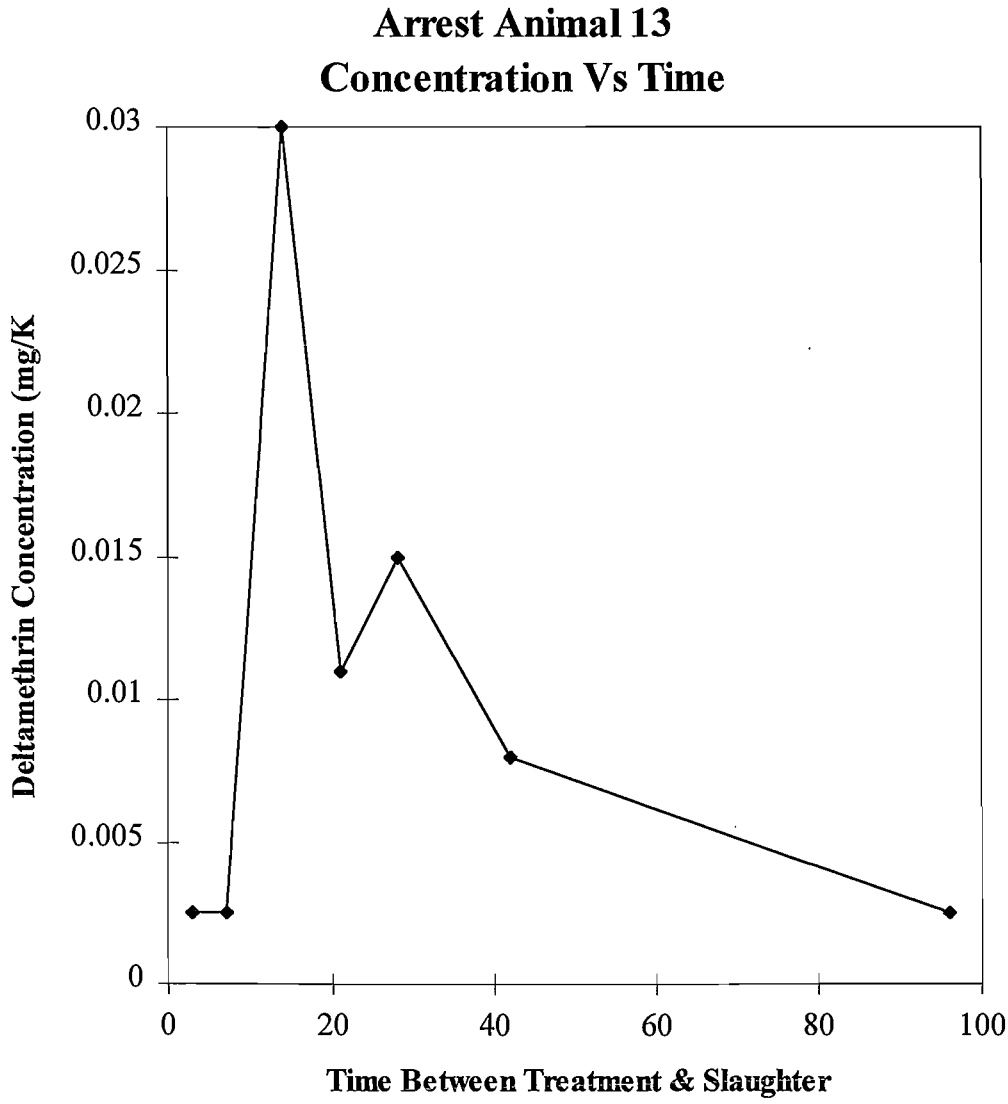
Results

The residual concentrations of deltamethrin for each designated interval are presented in Table F3 and Apendix B. The limit of determination for the analytical method used was 0.005mg/Kg.

Under the sampling protocols used, swab samples were collected from the skin at the site prepared for surgical incision (see attachment 1). These were analysed to ensure absence of deltamethrin contamination.
None of the swab samples collected contained detectable concentrations of deltamethrin.

Discussion

None of the concentrations measured approached the Australian and Codex MRL of 0.5 mg/kg. The highest level recorded was 0.03 mg/Kg. None of the animals sampled at 96 days post treatment contained measurable concentrations of deltamethrin.
A tolerance has not been set for deltamethrin in the USA.
Animal Number 13 was sampled on all seven sampling dates. An uptake / depletion curve was constructed from the data generated for this animal (Graph F1).



Graph F1

ARREST
F5 - Single Pour on

Time Between Treatment and Biopsy (days)													
3		7		14		21		28		42		96	
Animal No.	Deltamethrin conc. mg/kg	Animal No.	Deltamethrin conc. mg/kg	Animal No	Deltamethrin conc. mg/kg	Animal No	Deltamethrin conc. mg/kg	Animal No	Deltamethrin conc. mg/kg	Animal No	Deltamethrin conc. mg/kg	Animal No	Deltamethrin conc. mg/kg
1	<0.005	5	0.013	9	0.009	1	0.019	5	0.009	9	0.010	1	<0.005
2	<0.005	6	0.013	10	0.008	2	<0.005	6	0.011	10	0.010	2	<0.005
3	<0.005	7	<0.005	11	0.010	3	<0.005	7	0.013	11	0.006	3	<0.005
4	<0.005	8	0.014	12	0.007	4	<0.005	8	0.006	12	0.006	4	<0.005
13	<0.005	13	<0.005	13	0.030	13	0.011	13	0.015	13	0.008	13	<0.005

Table F3

ATTACHMENT 1

SUGGESTED PROTOCOL FOR FAT BIOPSY COLLECTION

- Precautions must be taken to guard against contamination.
- The concentration of deltamethrin on the hide of will be many times greater than in the fat of the biopsy.
- Great care should be exercised in handling the biopsy samples and sample containers to safeguard against contamination from the surgeons hands.

Step1. Shave the area on the hide where the incision is to be made.
Step2. Swab the area well using a swab saturated with cleaning solution held in forceps.
Discard swab and forceps.
Repeat step 2.
Repeat step 2 but place swab in designated bottle. Label bottle with animal identification.
Collect biopsy (>10g) and place in designated bottle. Label bottle with animal identification.

To be supplied by the laboratory

- Swabs
- Disposable forceps
- Cleaning solution
- Wash bottle
- Sample containers (swabs)
- Sample containers (biopsies)

If possible the following information should be recorded for each animal

- Body weight
- Fat depth (P8 site)
- Breed
- Sex
- Age

TAKTIC EC

COMPOSITION:

AMITRAZ 125 g/L

METHOD OF ADMINISTRATION:

SPRAY

SPRAY CONCENTRATION:

400ml/200L water.

WITHHOLDING PERIOD:

Nil

MRL:

	Chemical	MRL (mg/Kg)		
		Muscle	♣Offal/Meat By-Products	Fat
Australia	Amitraz	0.1	**0.5	*
USA	Amitraz & Metabolites	0.05	0.3	0.1
Codex	Amitraz & Metabolites	0.05	0.2	*

* No MRL is listed for Australia and Codex

** No MRL listed under the Australian Food Standards Code 1993. MRL taken from MRL Standard (Commonwealth Department of Human Services and Health).

♣ Australian and Codex MRL for offal.
US MRL for meat by-products.

Treatment Details

19 animals were treated with Taktic EC by spray application according to the manufacturer's recommendations.
The effects of two different treatment regimens on residual concentrations in meat and liver were investigated.
Treatment G7 involved a single spraying.
Treatment G8 involved the animals being sprayed twice with an intertreatment interval of 3 days.
Animals were allocated to the different treatment groups as outlined in Table G1.

Sample Collection

Samples of muscle and liver were collected from all animals at slaughter at the time periods listed in Table G1. One untreated animal was included in each group to act as experimental controls.

SAMPLING SCHEDULE - TAKTIC EC

CHEMICAL TREATMENT REGIMEN	TIME BETWEEN TREATMENT AND SLAUGHTER (DAYS)			
	1	4	7	Control
G7	3	3	3	1
G8	3	3	3	

Table G1.
Number In Each Cell = Number Of Animals Treated.
G7 Single spraying Taktic EC
G8 Two sprayings Taktic EC three days apart

Results

The residual concentrations of amitraz in all muscle and liver samples collected are listed in Table G2.

Discussion

Amitraz when formulated as Taktic EC and used according to the manufacturer's recommendations did not provoke any residues of concern in either muscle or liver tissues.

TAKTIC EC
G7 SINGLE SPRAYING
G8 TWO SPRAYINGS 3 DAYS APART

AMITRAZ (Equivalent) mg/Kg

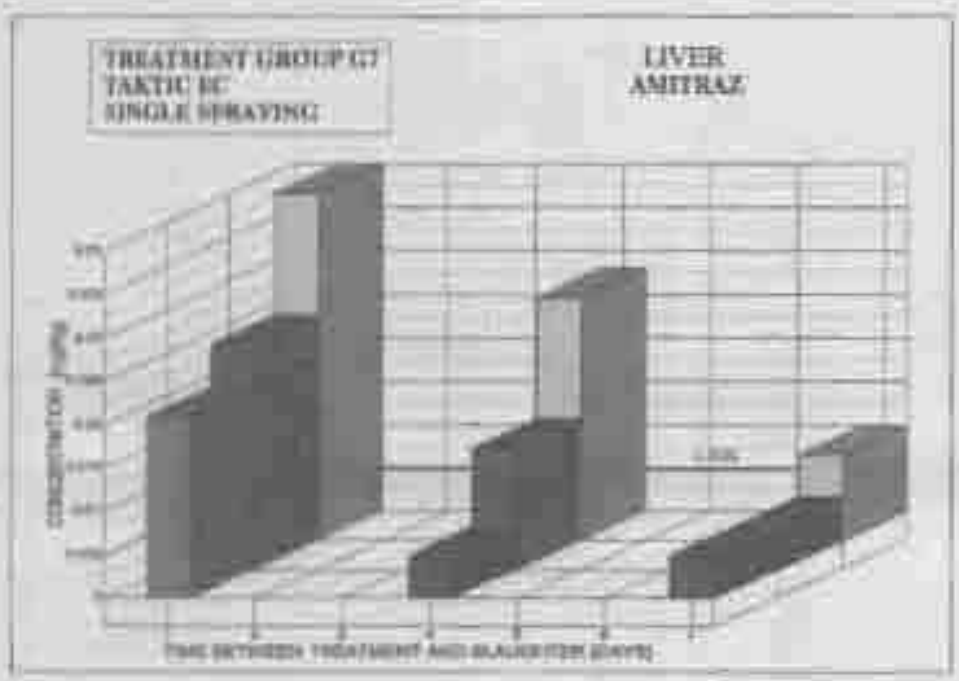
	1 day		4 days		7 days		Control	
	meat	**liver**	**meat**	**liver**	**meat**	**liver**	**meat**	**liver**
G7	<0.005	0.040	<0.005	0.028	<0.005	0.010	<0.005	<0.005
	<0.005	0.021	<0.005	0.014	<0.005	<0.005		
	<0.005	0.026	<0.005	<0.005	<0.005	<0.005		
G8	<0.005	0.030	<0.005	0.020	<0.005	0.006		
	<0.005	0.035	<0.005	0.019	<0.005	0.006		
	<0.005	0.029	<0.005	0.010	<0.005	0.017		

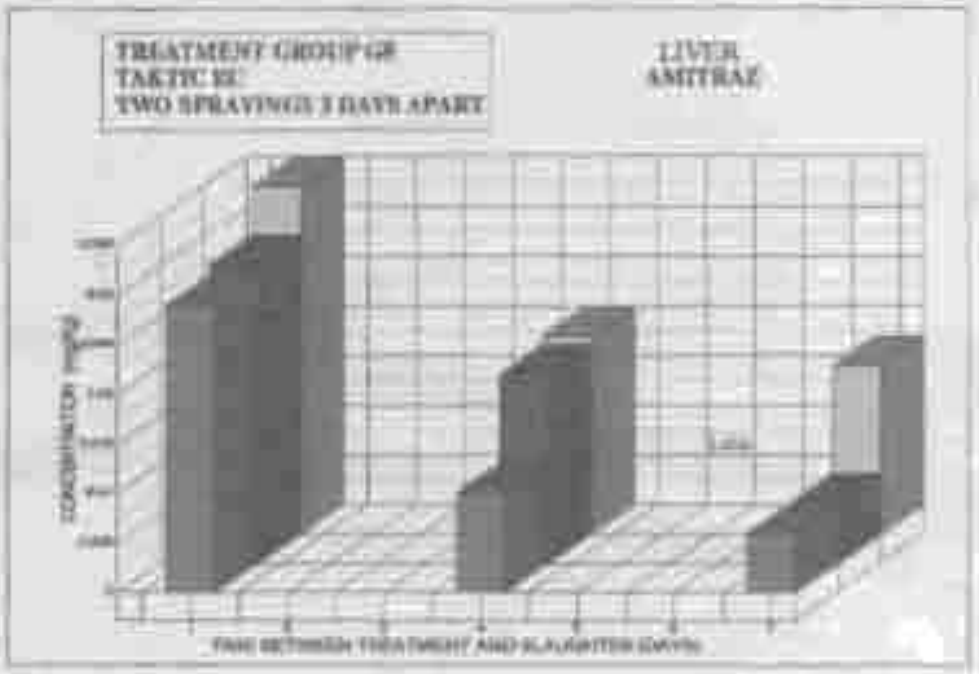
Table G2

Concentrations expressed as Amitraz equivalent in mg/Kg.

codes:

days = time elapsed between last treatment and slaughter.


TREATMENT GROUP G7
TAKTIC IIC
SINGLE SPRAYING
LIVER
AMITRAZ


TREATMENT GROUP G8
TAKTIC IIC
TWO SPRAYINGS 3 DAYS APART
LIVER
AMITRAZ

APPENDIX A - MRC EXPORT SLAUGHTER INTERVALS FACT SHEET

Meat Research Corporation

EXPORT SLAUGHTER INTERVALS FOR CATTLE ECTOPARASITICIDES

SEPTEMBER 1995

"ESIs are recommended intervals between treatment and slaughter for exporters selling meat into markets with different statutory residue requirements to Australia. They come from Australian trials done jointly by the MRC, the NSW and QLD Governments, and some manufacturers.

NOTE:

- That the label WHP is the minimum requirement at all times.
- That ESI's are only applicable when label directions for dose or washstrength and interval between treatments are strictly followed.
- That lean cattle usually have higher residue levels than normal. It is wise to add a margin to ESI's being applied to very poor stock.
- That "not recommended" means that because of persistent unacceptable residues within the limits of the trial, it was not possible to propose an ESI.

BRAND	ACTIVE	WHP (days)	Aust MRL	US tol	Canada MRL	ESI days
Amitik Taktic Ditik Nu-tic SPR Amitraz	Amitraz	nil	0.1 (meat) ♣ 0.5 (offal)	0.05 (meat) 0.3 (meat by-products)	0.1 (meat) P 0.2 (offal)	nil
Bayticol Pour-on	Flumethrin	nil	0.05 (meat) ♣ 0.05 (offal)T	nls	nls	56
Bayticol dip/spray	Flumethrin	nil	0.05 (meat) ♣ 0.05 (offal)T	nls	nls	nil
Barricade S or Blockade S	Cypermethrin and Chlorfenvinphos	8	0.5 0.2	0.05 0.2	nls nls	21
Tixafly	Deltamethrin	nil	0.5 (DHSH) 0.1 (NFA)	nls	nls	21
	Ethion		2.5	2.5	2.5	
Cydectin Pour-on	Moxidectin	14	2.0 (meat)T ♣ 0.5 (offal)T	nls	nls	28
Grenade Dip/Spray	Cyhalothrin	nil	0.5	0.01	nls	Not recommended
Acatak	Fluazuron	42	♣ 7.0	nls	nls	Not recommended
Sumifly	Fenvalerate	nil	0.2	1.5	0.1	nil
Supona BF	Chlorfenvinphos	nil	0.2	0.2	nls	nil
Cypafly Swot	Cypermethrin	3	0.5	0.05	nls	WHP*
Coopafly	Deltamethrin	nil	0.5 (DHSH) 0.1 (NFA)	nls	nls	30
Bayofly	Cyfluthrin	nil	0.2	0.05	nls	21
DIAZINON BACKSPRAYS						
Diazinon 200 Buff Fly Di Nucidol	Diazinon	3	0.7	0.7	0.1	WHP
DIAZINON BACKRUBBERS						
Nucidol Diazinon 200	Diazinon	3	0.7	0.7	0.1	10#
DIAZINON EARTAGS						
Spike YTex Optimiser	Diazinon	nil	0.7	0.7	0.1	nil^
LOUSICIDE						
Arrest	Deltamethrin	nil	0.5 (DHSH) 0.1 (NFA)	nls	nls	21

NOTES

nls	No limit set
♣	MRL value obtained from MRL Standard, Commonwealth Department of Human Services and Health. No value listed under the National Food Authority.
P	Proposed MRL
T	Temporary MRL
NFA	MRL from the 'Australian Food Standards', National Food Authority
DHSH	MRL from the 'Australian Food Standard', Commonwealth Department of Human Services and Health
*	Danger - Only applicable where treatments are given at intervals of 21 days or more.
#	ESI - Only required to meet Canadian or equivalent requirements

APPENDIX B - STATISTICIANS REPORT

Methods

There were 8 trials in this series, each testing a different product name. Each of these trials was conducted according to a statistical factorial design, with animals (being independent) used as replicates. The treatments in these designs were the method of application, and time (measured in days). Separate analyses were conducted for each chemical type and body site sampled, for each trial.

A number of potential covariates were measured in these trials. Carcass weight (kg), fat depth (mm), and dip concentrations (%) were included in the analyses of covariance as continuous variates. Due to the availability of experimental animals, the potential influences of breed, age and sex could not be adequately balanced in the design, so these were considered as binary covariates in the analyses. For age, 'young' animals (up to and including two years) were separated from 'mature' or 'aged'. The two levels of sex were male (steers) and female, although the latter were more dominant in the sample.

In a minor number of cases, the measured level of pesticide was below the limit of detection. To omit these observations would be incorrect, and result in upward bias of the estimated levels, as these are legitimate observations. As these values were known to be somewhere in the range of zero to the detection limit, the standard of setting them all to half of the detection limit was used. Also, any observations recorded as 'trace of pesticide' were set to the limit of detection. Any time by treatment groups which had all replicate animals below the limit of detection were omitted from the analyses, as their variance (being zero) could not be assumed poolable with other (variable) groups.

Results

Of the 19 sample distributions of pesticide levels, all were positively skewed (as expected), with 15 of these departures from normality being significant ($P<0.05$).Their average skewness coefficient (g_1) was 2.2, which is quite severe. Because of this, and to stabilise variances, all concentrations data were subjected to the natural log (ln) transformation prior to analyses. Following this, the average skewness of the distributions was -0.1, which indicates that they were then virtually symmetrical, in agreement with the underlying assumptions of the analytical method.

For each analysis, all possible covariates were trialed, having first fitted the base factorial design of application method by time (including their interaction). In some of the analyses a couple of covariates could not be fitted, because (for example) all or most of the animals were of the one breed type. As well as being added in a step-forward manner, the

covariates were also fitted as a saturated model (where appropriate) and screened individually.

Overall, the covariate of 'dip concentration' had no measurable effect, probably because of the good experimental control over these values. With generally very narrow ranges of dip concentrations, these had no effect on subsequent levels in the animal tissues, although this finding would probably not hold if wider ranges were observed. For these trials, dip concentration was excluded from further consideration.

The effects of 'age' and 'sex' were minor (if any), and also varied in their direction. There was certainly no strong or consistent effect of either of these, although the 'sex' effect could not be comprehensively tested, as only a few trials had sufficient balance in this factor. Hence, these two covariates were also excluded from further analyses.

The remaining covariates, namely 'breed', 'weight' and 'fat depth', all influenced resultant tissue concentrations, more than could be expected by mere random chance. 'Breed' was the strongest effect, and with it either of the other two contributed strongly. All three could not be included, due to high degree of correlation between weight and fat depth, as listed in Table 2. It is pleasing to note the virtual independence between breed and the other factors, indicating the sample animals covered a good range of these variables in each breed group, which increases confidence in the results.

Also given in this table are the correlations between concentrations measured in different body sites of the same animals, which (as expected) tend to be significant and rather high. It is interesting to note that a slope of one represents equal responsiveness in concentrations between the two sites. Slopes greater than one indicate that the loin concentrations are more responsive to changes in levels, and *vise-versa.* Between the loin and renal fat sites, results are mixed for the different chemicals. In the 'Taktic' trial, the liver concentrations were much more responsive than those at the muscle site.

TABLE 1. Correlation Coefficients Between Variables (**bold** indicates significant, $P<0.05$)

Product Name	Breed vs. Weight	Breed vs. Fat depth	Weight vs. Fat depth	Chemical	Loin vs Renal Fat Concs.[+]	Slope(Y=Loin X=Renal Fat)[+]
Barricade 'S'	0.08	0.10	**0.66**	Cypermethrin	**0.65**	0.98
				Chlorfenvinphos	**0.92**	2.62
Tixafly	**0.26**	0.07	**0.51**	Deltamethrin	**0.82**	0.93
				Ethion	**0.85**	0.48
Bayticol	-	-	0.16	Flumethrin	**0.84**	0.34
Taktic	0.15	0.14	**0.53**	Amitraz	**0.53**	0.07
Grenade	0.10	0.06	**0.51**	Cyhalothrin	**0.88**	0.40

[+]Except for 'Taktic', which is Muscle vs. Liver Concentration

The dependencies between weight and fat depth mean that either of these covariates can be fitted with breed, but not both. Their independent effects could only be estimated in a trial with sufficient balance of all three factors. Statistically, the degree of improvement in the models from fitting weight or fat depth were virtually identical. Biologically, it was felt that

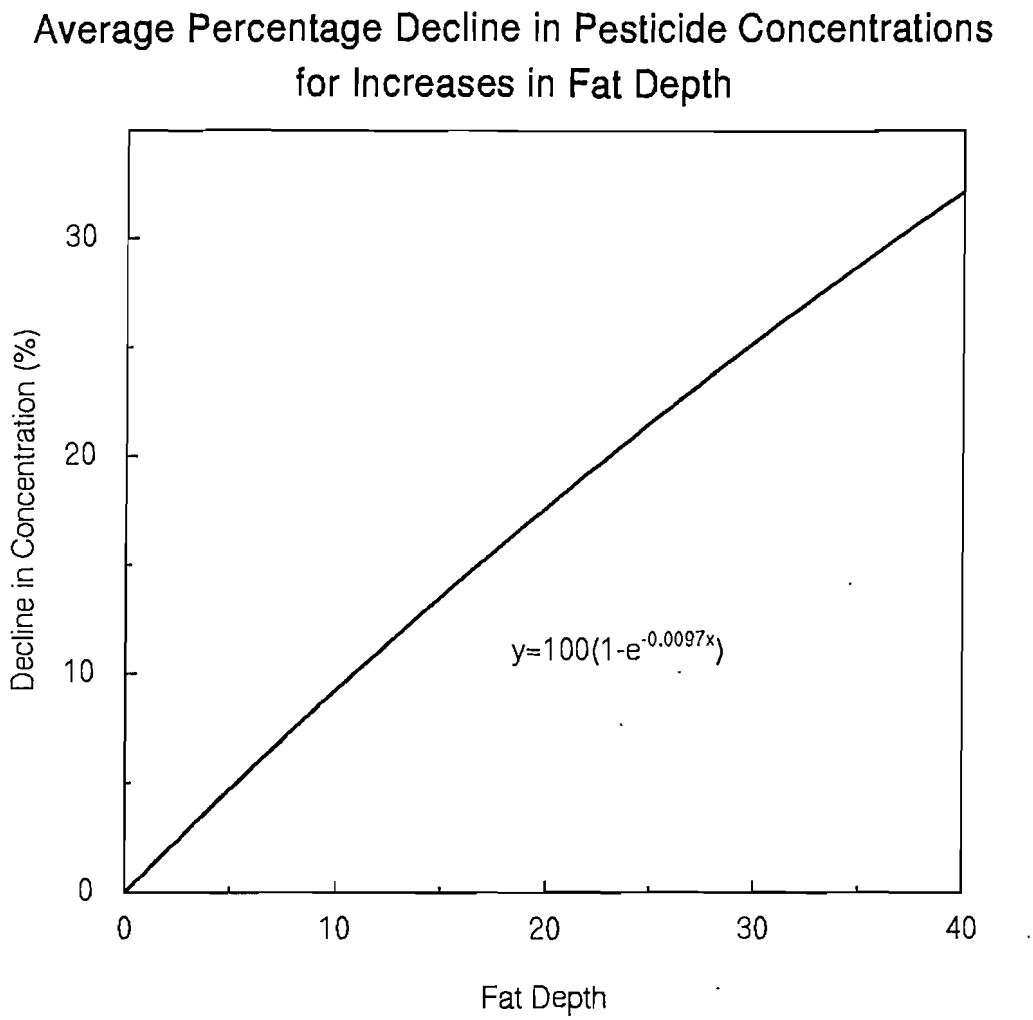
fat depth was the more meaningful explanatory variable, as increased fat content in the animal tends to dilute the pesticide concentration. Whether or not increasing weight also has a dilution effect which is independent and in addition to that of increasing fat depth, or whether this effect is apparent only because of its correlation with fat depth (heavier animals have higher fat depths) is open to conjecture, and could not be determined from these data. Hence, for all analyses of covariance, two covariates (breed and fat depth) were fitted for consistency. Their effects in these analyses, as measured by the combined degree of residual variation explained, and their individual slopes, are listed in Table 2.

TABLE 2. Degree of Variation Explained (R^2), and Slopes of Covariates (**bold** : $P<0.05$)

Product Name	Chemical	Site on Animal	Number of Replicates	R^2 (%)	Slope for Breed	Slope for Fat depth
Barricade 'S'	Cypermethrin	Loin Fat	135	**51.3**	**-0.57**	**-0.071**
		Renal Fat	26	**35.0**	**-0.35**	-0.018
	Chlorfenvinphos	Loin Fat	135	**22.8**	**-1.12**	**0.042**
		Renal Fat	26	**37.5**	**-1.20**	0.071
Tixafly	Deltamethrin	Loin Fat	99	**9.5**	**-0.36**	**-0.017**
		Renal Fat	23	38.3	-0.31	-0.032
	Ethion	Loin Fat	99	**14.7**	**-0.40**	**-0.025**
		Renal Fat	23	**57.7**	**-0.47**	-0.012
Bayticol	Flumethrin	Loin Fat	54	0.6	-	-0.011
		Renal Fat	54	2.3	-	-0.024
Taktic	Amitraz	Muscle	66	0.3	0.04	0.001
		Liver	66	12.3	**-0.46**	-0.016
Grenade	Cyhalothrin	Loin Fat	84	**20.4**	**-0.45**	**-0.030**
		Renal Fat	16	8.4	-0.26	-0.015

The covariates generally contributed a good degree of explanation, of up to 58 % of the residual variation. This has a major effect on the estimated level of precision in the analyses. Considering the breed effect, this was (virtually) always negative, with a mean value (weighted by the number of observations) across analyses of -0.54. This value applies to the ln-transformed scale, which has an interpretational advantage of any difference representing a constant proportional shift, regardless of the actual concentration level. The estimated value (-0.54, with a 95% confidence limit of $CI_{95\%}$ = -0.97 to -0.11) thus converts to a proportion of 0.58, meaning that, for a given residue in a *Bos taurus* animal, a corresponding *Bos indicus* animal will have (on average) 0.58 ($CI_{95\%}$ =0.38 to 0.89) of this level, or 42 % less ($CI_{95\%}$ =11% to 62% less).

The effect of fat depth was also mostly negative (as expected), with a weighted mean slope of -0.0097. Via the exponential back-transformation, its effect is also proportional, as illustrated in the following figure. For example, an animal (of given breed) with 20mm fat depth will have a residue level approximately 9 % lower than one with 10 mm, and a 40 mm animal should have a concentration 32 % lower than a zero fat depth animal.

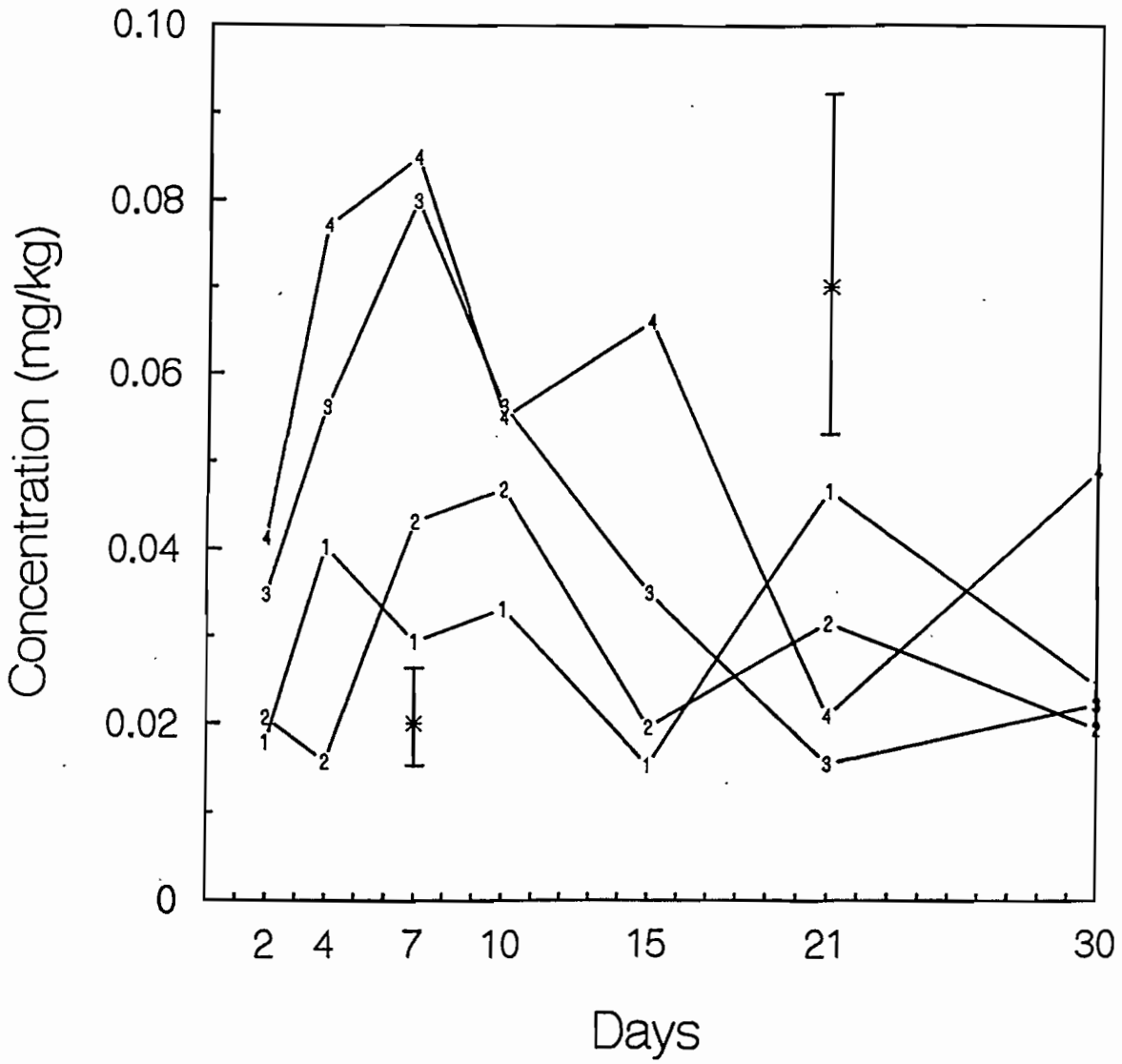


The above results were auxiliary to the main investigation, which was to show response surfaces for each of the products over time. For the Bayticol dip treatments, analyses were not conducted, as over 90 % of the 144 observations were recorded as below the limit of detection. Resultant patterns reflected only random drift of occurrences over treatments and time. For this product, only the pour-on treatments warranted analysis. Results of the analyses of covariance are summarised in Table 3. Here, the interaction terms (where estimable) or the days terms were consistently significant ($P<0.05$), justifying presentation and interpretation of the full treatment by time means, rather than a summarisation of main effects. For each analysis, these are presented in the following series of figures. These means are adjusted for the covariates in the analyses, and have been back-transformed from the ln-scale to concentrations in mg/kg. This back-transformation alters the relativity between means in different vertical regions, with more precision in the lower values (as is logical). For this reason, two example means are marked on the graphs (with plus and minus one standard error) to indicate the degree of variability, at the lower and upper regions of each graph. Intermediate values can be visually estimated from these.

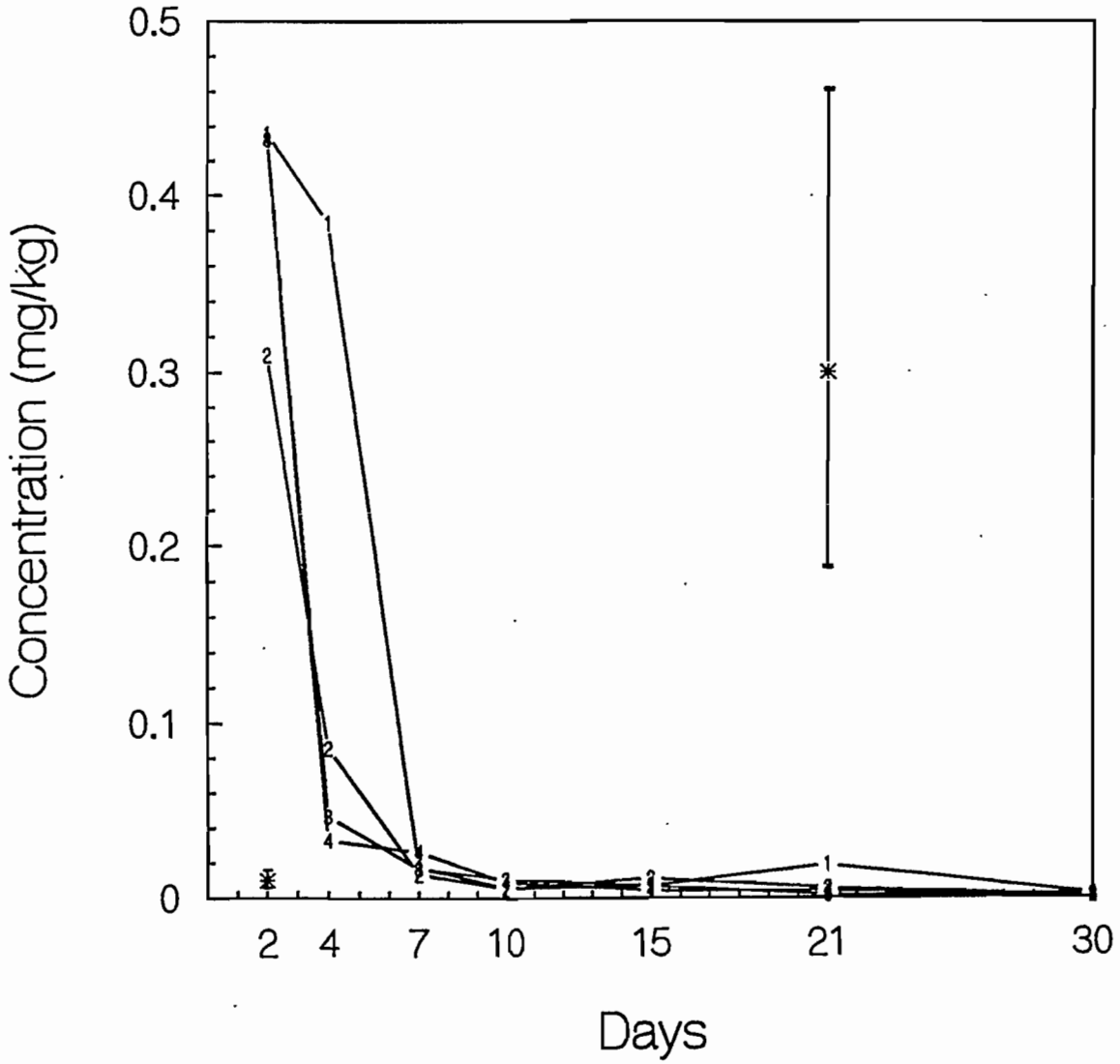
TABLE 3. Variance Ratios (F-test) from Covariance Analyses (**bold** : $P<0.05$)

Product Name	Chemical	Site on Animal	'Treatment' Effect	'Days' Effect	Interaction
Barricade 'S'	Cypermethrin	Loin Fat	**9.5**	**4.1**	**2.7**
		Renal Fat	3.2	1.8	0.6
	Chlorfenvinphos	Loin Fat	**3.1**	**45.7**	**1.9**
		Renal Fat	2.9	**7.1**	0.3
Tixafly	Deltamethrin	Loin Fat	**12.9**	**10.3**	**2.1**
		Renal Fat	0.2	0.3	1.4
	Ethion	Loin Fat	**9.3**	1.7	**2.0**
		Renal Fat	**15.4**	2.0	1.3
Bayticol	Flumethrin	Loin Fat	**38.3**	**2.7**	2.0
		Renal Fat	**37.6**	**3.0**	**2.4**
Taktic	Amitraz	Muscle	-	-	**3.3**
		Liver	-	-	**5.6**
Grenade	Cyhalothrin	Loin Fat	**3.0**	**4.7**	**3.4**
		Renal Fat	0.2	3.2	0.4
Arrest	Deltamethrin	Precaudal	-	1.1	-
Diazinon 200	Diazinon	Loin Fat	-	**3.4**	-
		Renal Fat	-	**9.2**	-
Supona	Chlorfenvinphos	Loin Fat	-	0.2	-
		Renal Fat	-	0.4	-

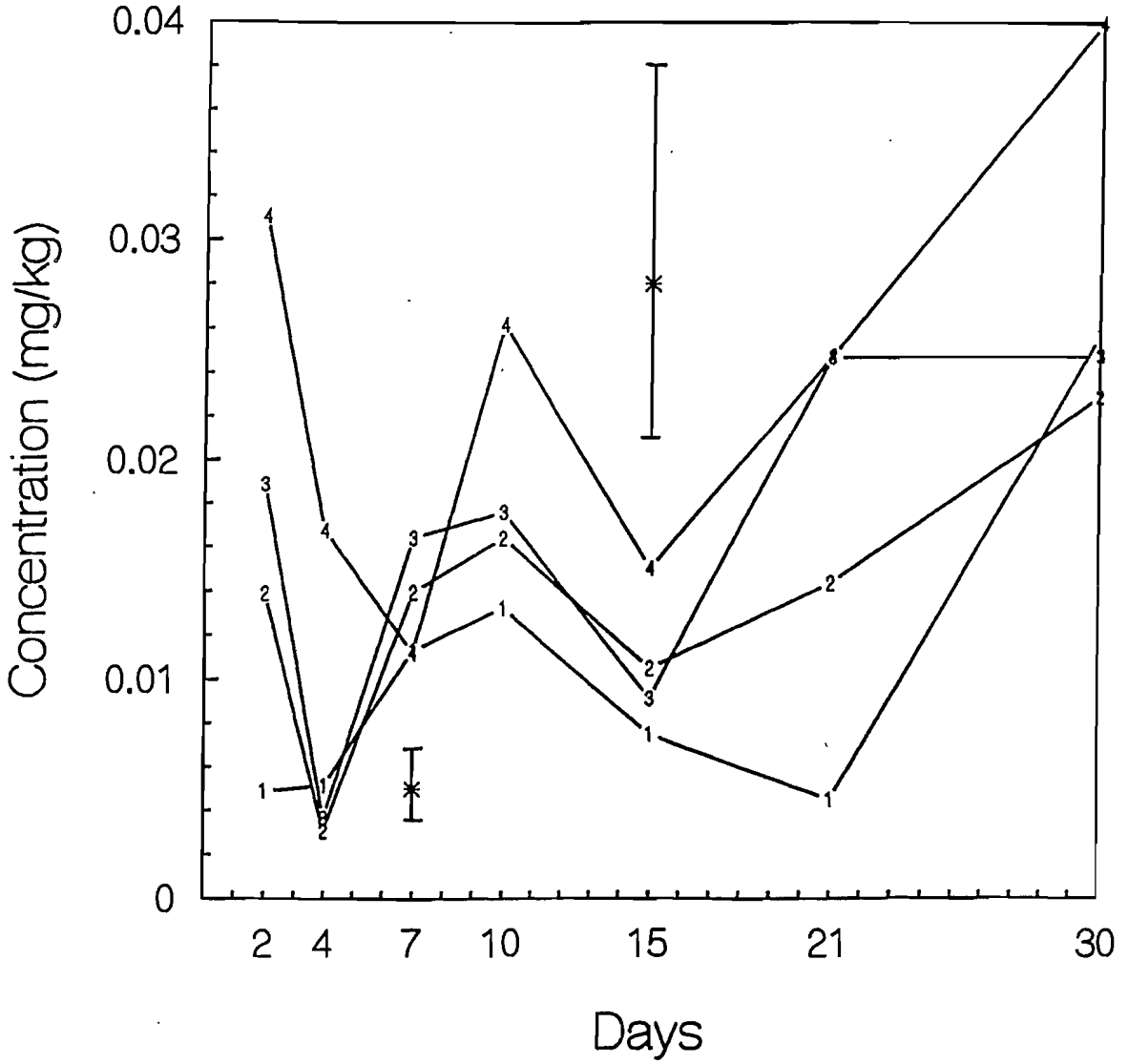
Barricade 'S' - Cypermethrin in Loin Fat

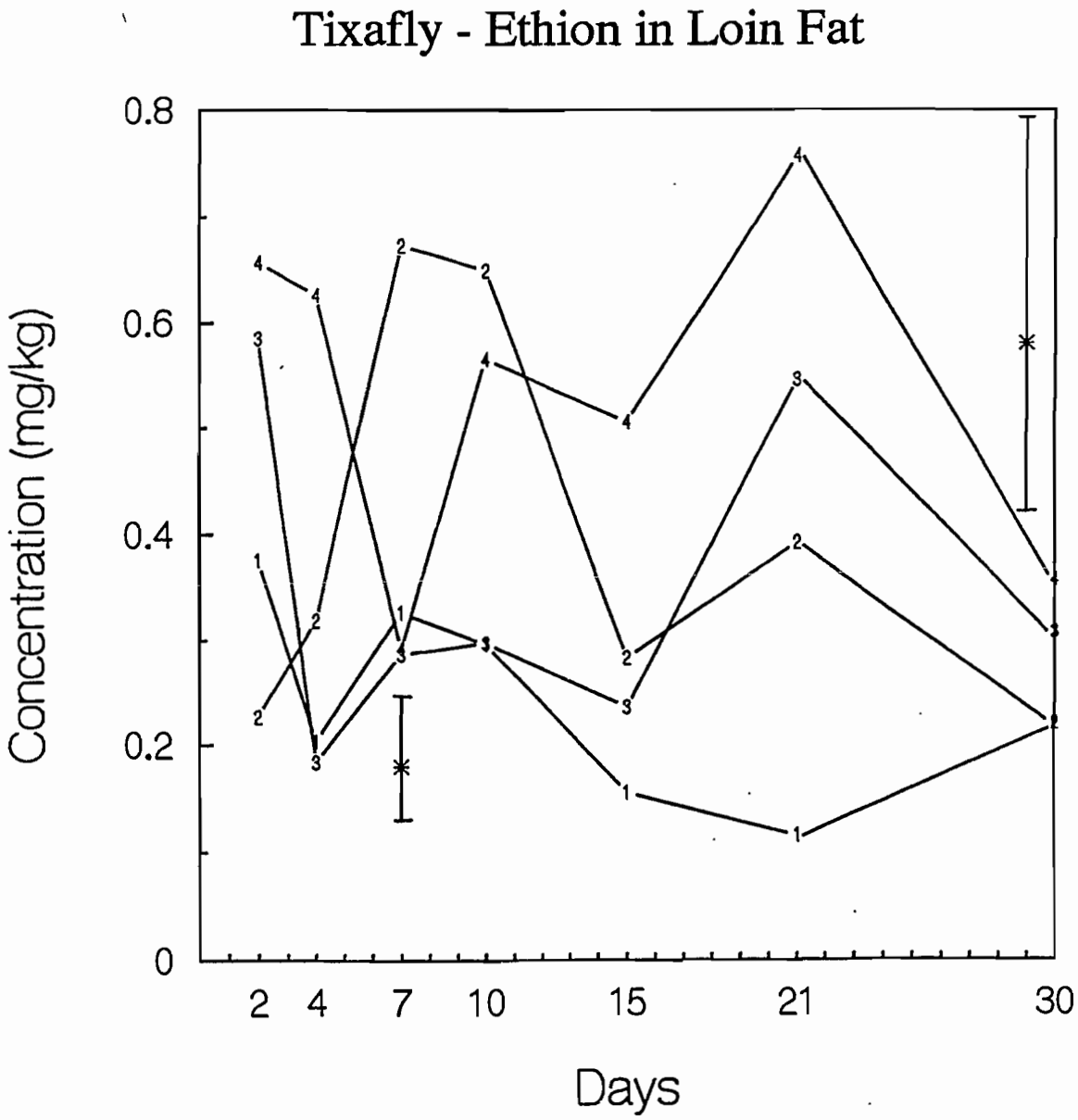


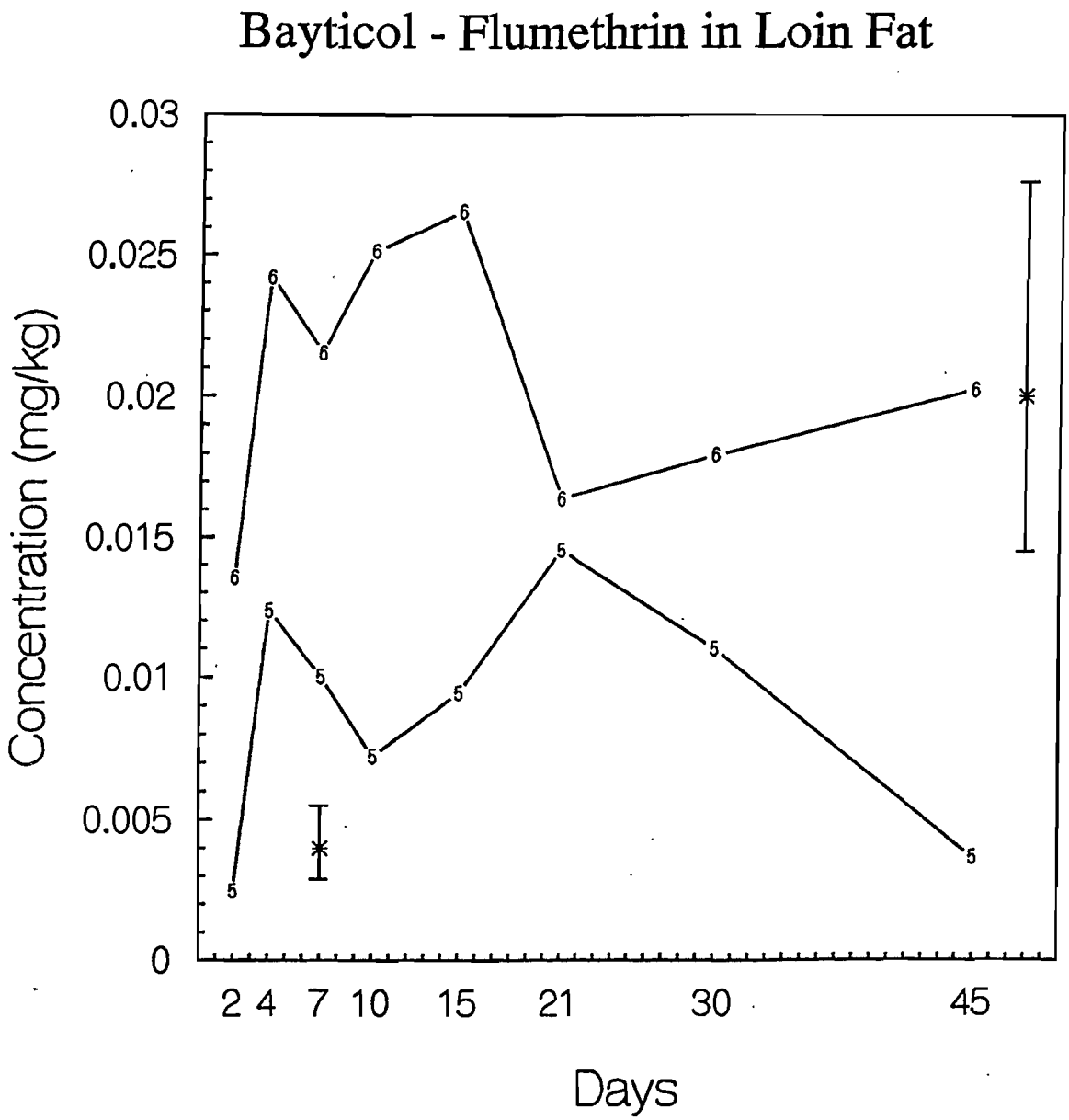
Barricade 'S' - Chlorfenvinphos in Loin Fat



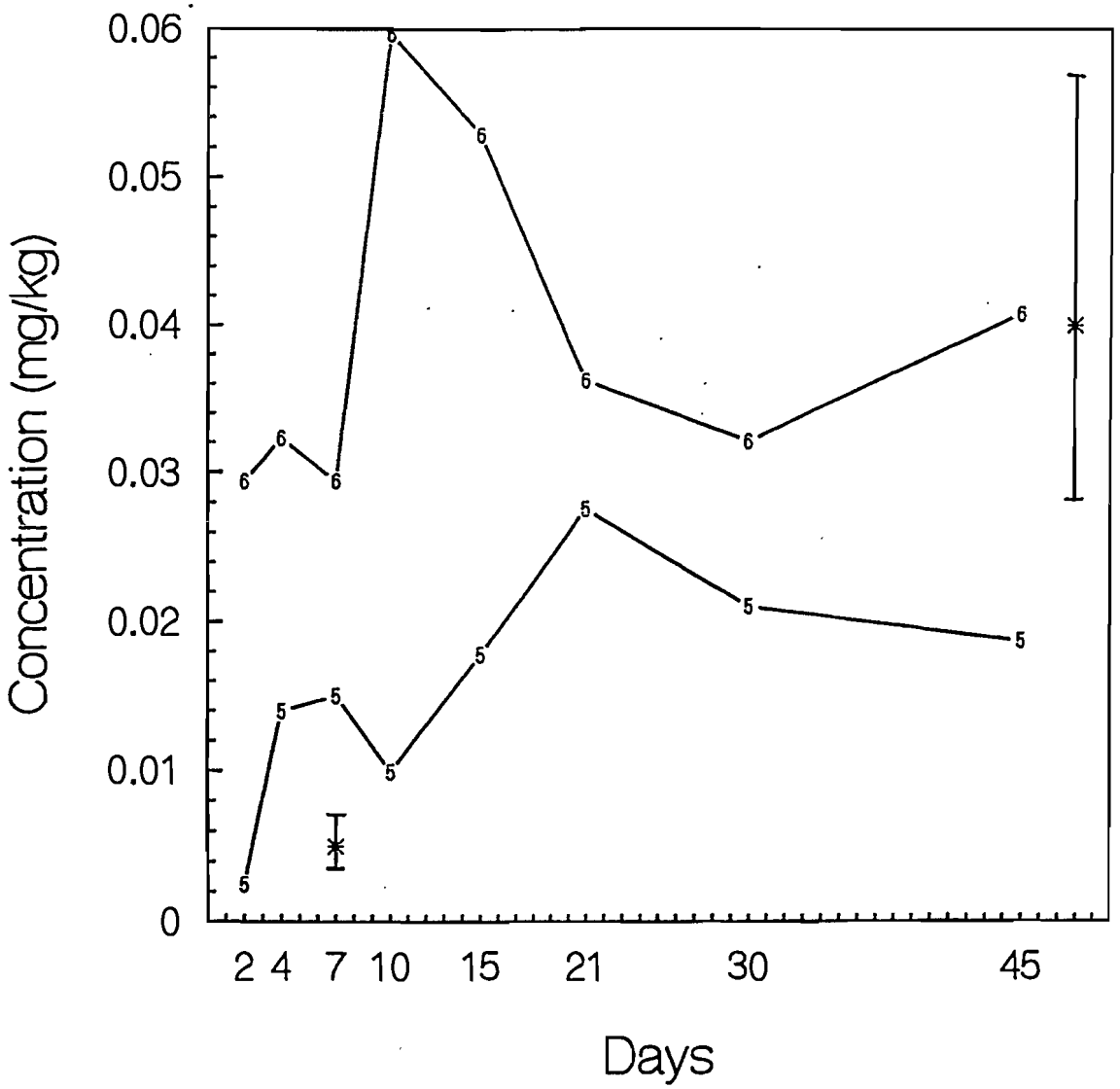
Tixafly - Deltamethrin in Loin Fat

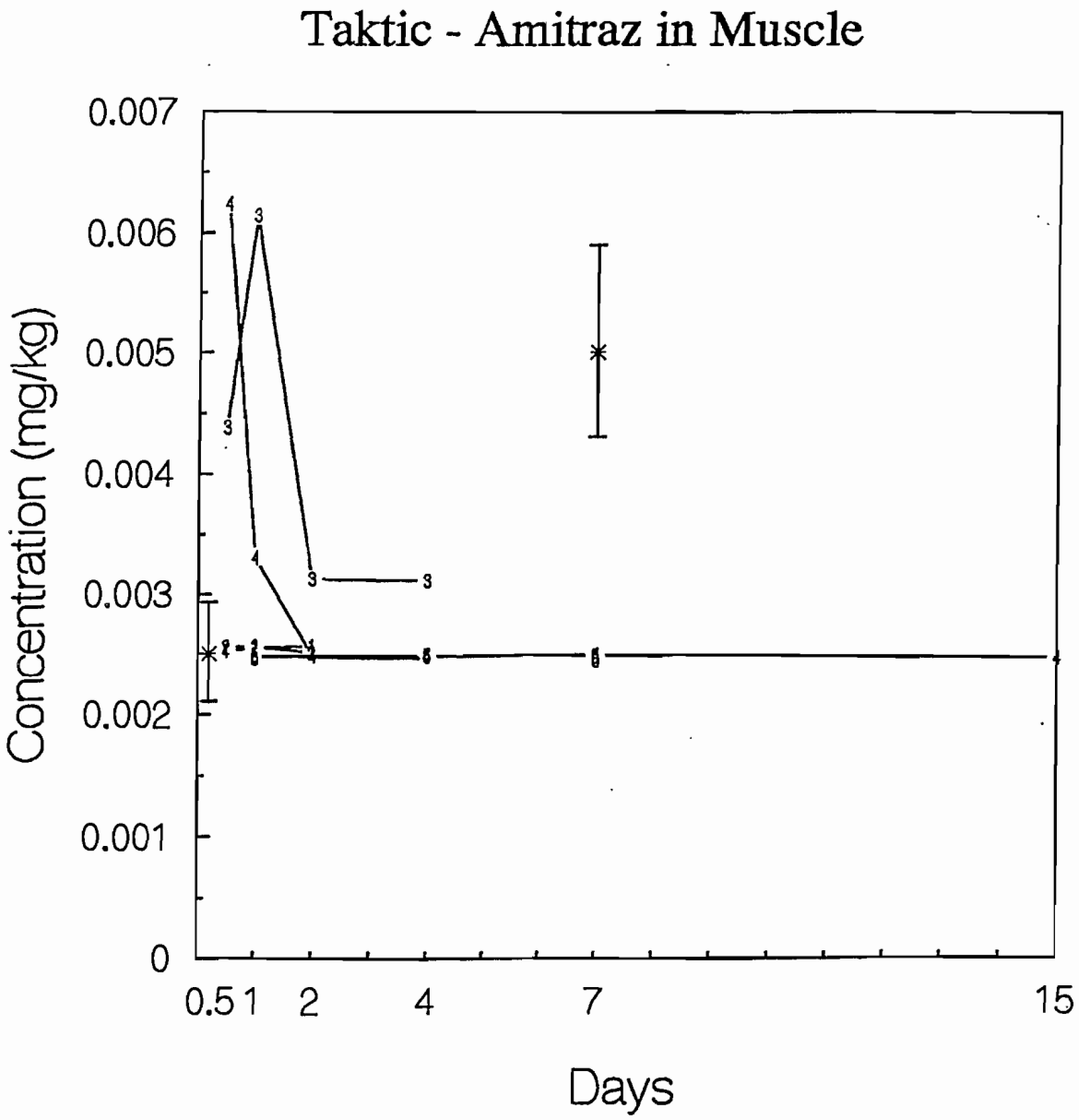



Tixafly - Ethion in Loin Fat
Concentration (mg/kg)
0.8
0.6
0.4
0.2
0
2
4
7
10
15
21
30
Days

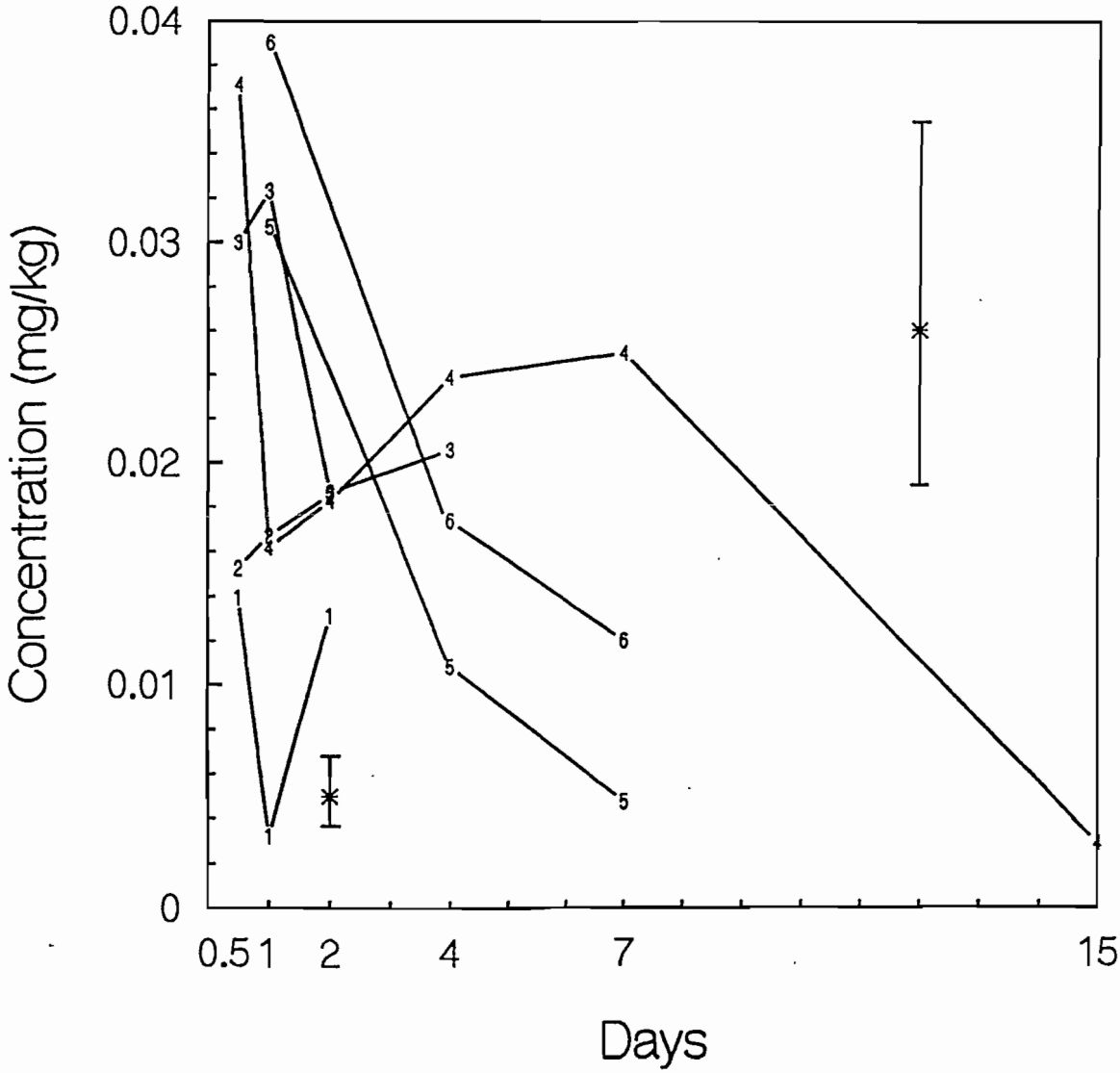

Bayticol - Flumethrin in Loin Fat
Concentration (mg/kg)
0.03
0.025
0.02
0.015
0.01
0.005
0
2 4 7 10 15 21 30 45
Days

Bayticol - Flumethrin in Renal Fat

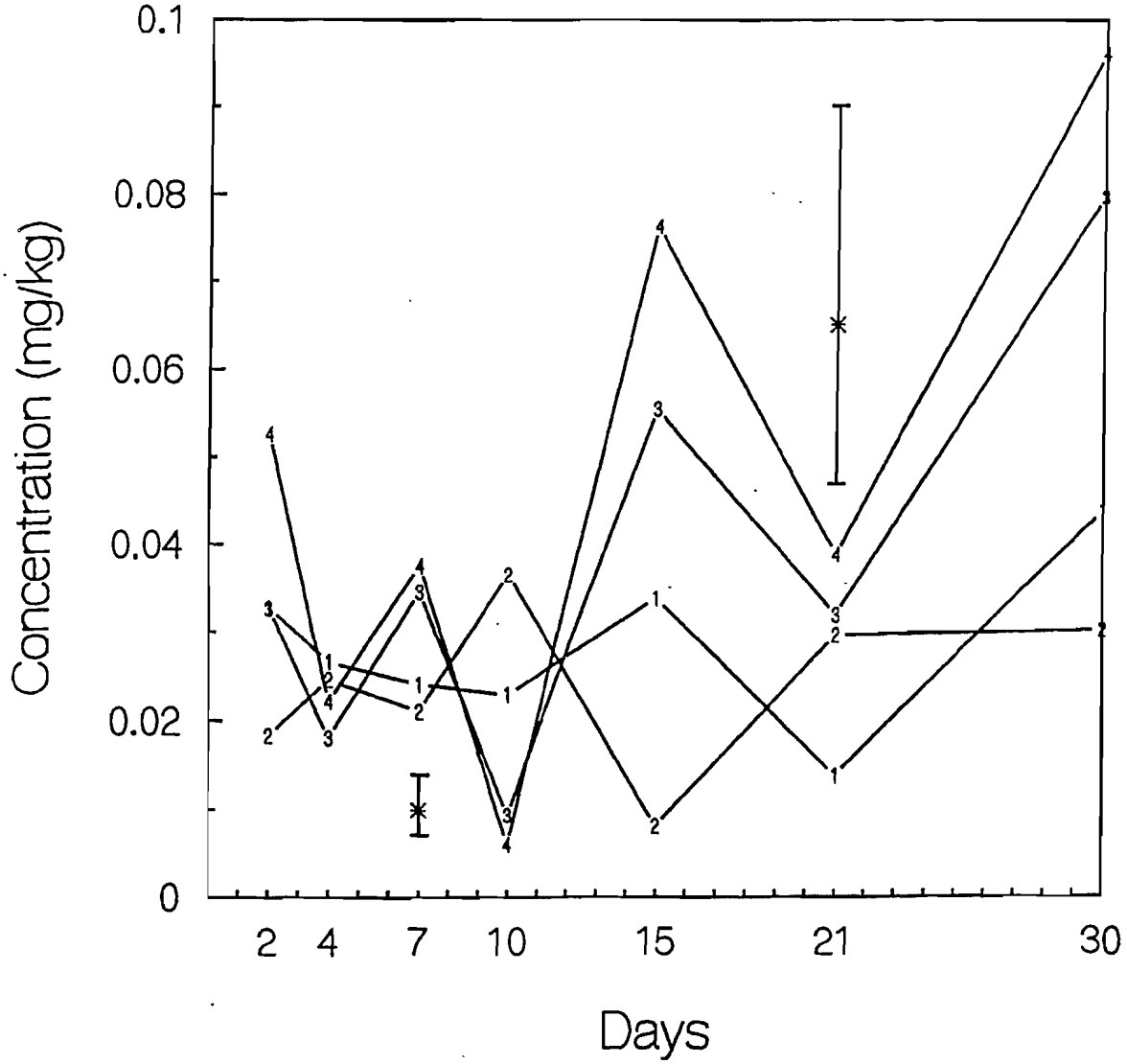


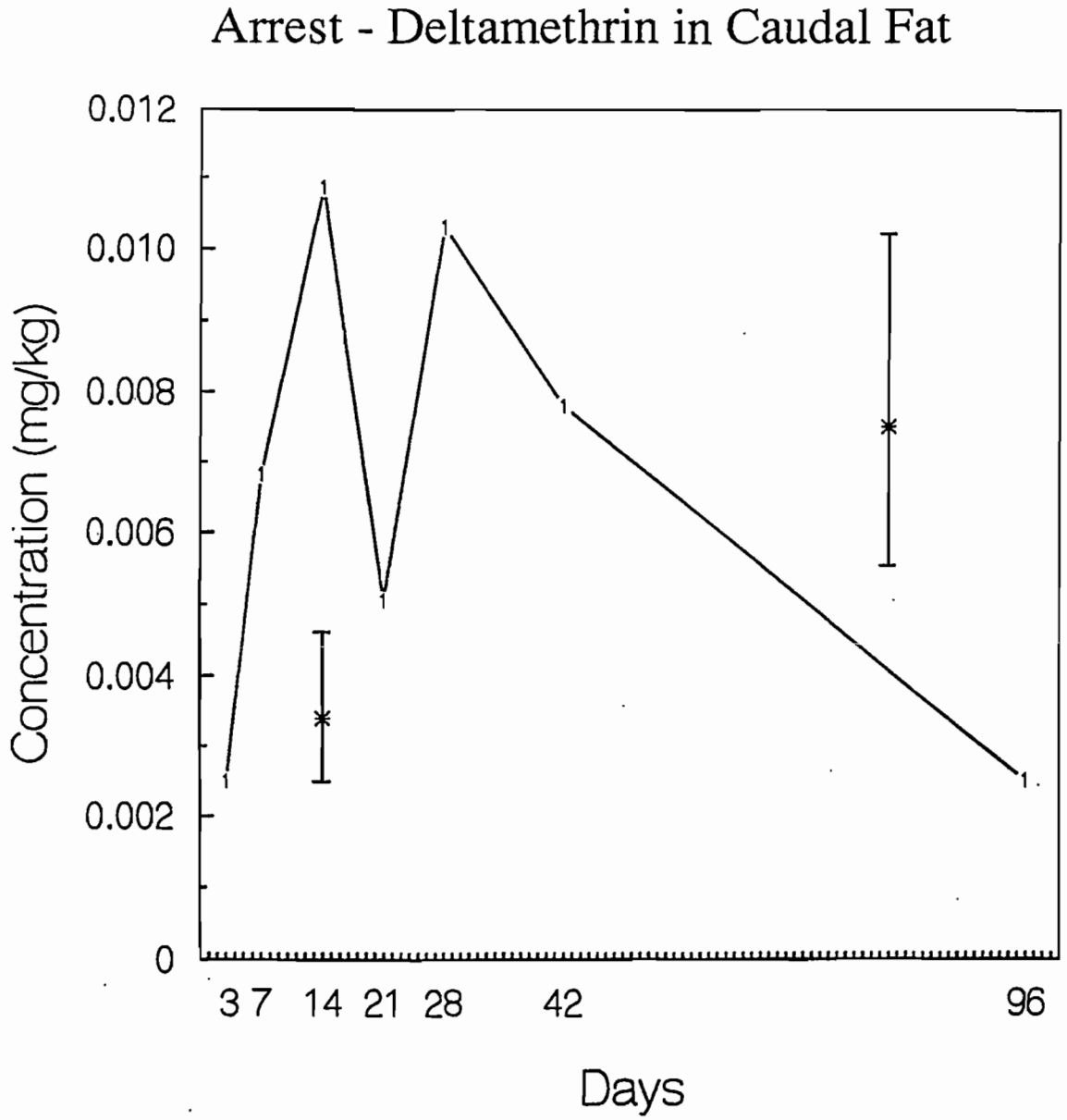

Taktic - Amitraz in Muscle
Concentration (mg/kg)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0.5
1
2
4
7
15
Days

Taktic - Amitraz in Liver



Grenade - Cyhalothrin in Loin Fat




Arrest - Deltamethrin in Caudal Fat
Concentration (mg/kg)
0.012
0.010
0.008
0.006
0.004
0.002
0
3 7 14 21 28 42 96
Days

APPENDIX C - COMPREHENSIVE LISTING OF PROJECT RAW DATA

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
A1/ 2	731	Hereford	Female	<18 months	131.5	2	0.043	----	0.29	----	0.01	0.059
2	483	Braford	Heifer	18 months	198.5	15	0.012	----	0.45	----	0.01	0.055
2	484	Santa	Heifer	18 months	182	21	<0.010	----	0.37	----	0.01	0.055
4	723	Hereford	Female	<18 months	116.5	2	0.083	----	0.26	----	0.01	0.059
4	624	Brahman Cross	Female	Dent 0	167.5	8	0.067	0.10	0.26	0.057	0.01	0.055
4	625	Brahman Cross	Female	Dent 0	180	10	0.019	0.04	0.23	0.046	0.01	0.055
7	720	Hereford	Female	<18 months	118.5	1	0.12	----	0.012	----	0.01	0.059
7	8784	Santa/Hereford Cross	Female	Aged	225.5	6	0.018	----	0.014	----	0.0103	0.055
7	8792	Hereford	Female	Aged	280.5	16	0.014	----	0.065	----	0.0103	0.055
7	8799	Hereford	Female	Aged	242	30	0.01	----	0.032	----	0.0103	0.055
7	664	Santa	Heifer	18 months	192	7	0.032	----	<0.005	----	0.01	0.055
7	66	Santa	Heifer	18 months	194.5	12	0.032	----	0.03	----	0.01	0.055
10	715	Hereford	Female	<18 months	112	2	0.092	----	0.028	----	0.01	0.059
10	8783	Santa/Hereford Cross	Female	Dent 2	249	18	0.018	----	<0.005	----	0.0103	0.055
10	8797	Hereford	Female	Dent 8	236	21	0.021	----	0.013	----	0.0103	0.055
10	8793	Hereford	Female	Dent 8	237	6	0.032	----	<0.005	----	0.0103	0.055
10	8796	Hereford	Female	Dent 8	209.5	14	0.031	----	0.012	----	0.0103	0.055
10	488	Santa/Murray Grey Cross	Heifer	<18 months	188	7	0.043	----	<0.005	----	0.01	0.055
15	724	Hereford	Heifer	<18 months	118.5	2	0.093	----	0.02	----	0.01	0.059
15	713	Hereford	Heifer	<18 months	122.5	2	0.12	----	<0.005	----	0.01	0.059
15	97	Hereford	Female	Aged	147.5	16	0.015	----	0.03	----	0.0097	0.052
15	98	Hereford	Female	Aged	242.5	16	<0.010	----	0.006	----	0.0097	0.052
15	99	Hereford	Female	Aged	214	9	0.02	----	0.009	----	0.0097	0.052
15	100	Simental Cross	Female	Aged	251	14	<0.010	----	0.022	----	0.0097	0.052
21	8790	Santa Cross	Female	Dent 8	255.5	22	0.013	----	<0.005	----	0.0103	0.055

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
21	8798	Hereford	Female	Dent 8	189.5	21	0.042	----	0.035	----	0.0103	0.055
21	8791	Santa	Female	Dent 7	204	12	0.026	----	0.041	----	0.0103	0.055
21	8785	Santa	Female	Dent 7	234.5	24	0.012	----	0.021	----	0.0103	0.055
21	8789	Santa	Female	Dent 8	214	20	0.024	----	0.034	----	0.0103	0.055
21	8800	Hereford	Female	Dent 8	231.5	16	0.032	----	0.032	----	0.0103	0.055
30	8787	Santa	Female	Dent 8 Aged	227	14	0.014	----	<0.005	----	0.0103	0.055
30	8794	Hereford	Female	Dent 8 Aged	223	16	0.029	----	<0.005	----	0.0103	0.055
30	8788	Santa	Female	Dent 8 Aged	199.5	6	0.017	----	<0.005	----	0.0103	0.055
30	8795	Hereford	Female	Dent 4 18-24 months	207.5	11	0.033	----	<0.005	----	0.0103	0.055
A2/ 2	714	Hereford	Female	<18 months	122	1	0.052	----	0.06	----	0.01	0.059
2	971	Brahman Cross	Steer	<18 months	190	5	0.017	----	0.21	----	0.01	0.055
2	972	Santa	Heifer	18 months	168.5	11	0.02	----	0.57	----	0.01	0.055
4	721	Hereford	Female	<18 months	135.5	1	0.067	----	0.19	----	0.01	0.059
4	328	Brahman Cross	Female	Dent 4	191	6	0.02	----	0.35	----	0.01	0.055
4	329	Braford	Female	Dent 0	233.5	12	<0.010	----	<0.005	----	0.01	0.055
7	709	Hereford	Female	<18 months	136	2	0.16	0.13	0.035	0.011	0.01	0.059
7	221	Santa	Heifer	18 months	193	11	0.017	0.035	0.009	<0.005	0.01	0.055
7	222	Santa	Heifer	18 months	206.5	6	0.033	0.04	<0.005	<0.005	0.01	0.055
7	223	Santa	Heifer	18 months	166	8	0.047	0.055	0.005	<0.005	0.01	0.055
7	224	Santa	Heifer	18 months	182	9	0.032	----	0.009	----	0.01	0.055
7	225	Santa	Heifer	18 months	187.5	9	0.05	----	0.005	----	0.01	0.055
10	733	Hereford	Female	<18 months	111	1	0.23	0.088	0.006	<0.005	0.01	0.059
10	653	Santa	Heifer	<18 months	195.5	8	0.032	----	<0.005	----	0.01	0.055
10	654	Santa/Brahman Cross	Heifer	<18 months	213.5	8	0.029	0.05	<0.005	<0.005	0.01	0.055
10	655	Santa	Heifer	<18 months	206	13	0.053	----	<0.005	----	0.01	0.055
10	656	Santa	Heifer	<18 months	177.5	6	0.046	----	<0.005	----	0.01	0.055

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
10	657	Santa	Heifer	<18 months	202	5	0.028	----	<0.005	----	0.01	0.055
15	732	Hereford	Heifer	<18 months	125.5	1	0.18	----	0.02	----	0.01	0.059
15	710	Hereford	Heifer	<18 months	120.5	2	0.092	----	<0.005	----	0.01	0.059
15	Q0762	Hereford	Female	Dent 0	275	11	<0.010	----	0.028	----	0.0097	0.052
15	Q0770	Hereford	Female	Dent 0	286	20	0.011	----	0.031	----	0.0097	0.052
15	Q0775	Hereford/Santa Cross	Female	Dent 0	250.5	19	0.014	----	0.012	----	0.0097	0.052
15	Q0795	Simmental	Female	Dent 0	284	23	<0.010	----	0.036	----	0.0097	0.052
21	208	Hereford	Female	Dent 8	249.5	11	0.045	----	0.022	----	0.0103	0.055
21	207	Hereford	Female	Dent 8	211.5	17	0.036	----	0.056	----	0.0103	0.055
21	206	Hereford	Female	Dent 8	260.5	19	0.033	----	0.042	----	0.0097	0.052
21	576	Hereford	Female	Aged	238	20	0.015	----	0.006	----	0.0097	0.052
21	665	Simmental Cross	Female	Aged	309	28	0.013	----	<0.005	----	0.0097	0.052
21	675	Hereford/Santa Cross	Female	Aged	269	24	<0.010	----	<0.005	----	0.0097	0.052
30	26	Hereford	Female	Dent 8 Aged	258	10	0.026	----	<0.005	----	0.0103	0.055
30	28	Hereford	Female	Dent 4 18-24 months	194	9	0.026	----	<0.005	----	0.0103	0.055
30	234	Hereford	Female	Aged	254	26	0.014	----	<0.005	----	0.0097	0.052
30	235	Hereford	Female	Aged	275	18	0.01	----	<0.005	----	0.0097	0.052
A3 2	711	Hereford	Female	<18 months	128.5	2	0.068	----	0.39	----	0.01	0.059
2	651	White Brahman	Female	Dent 6	213.5	10	0.027	0.08	1	0.33	0.01	0.005
2	652	Brahman Cross	Female	Dent 2	185	5	0.046	----	0.05	----	0.01	0.005
4	734	Hereford	Female	<18 months	130	3	0.13	----	0.16	----	0.01	0.059
4	973	Santa	Female	<18 months	184	7	0.049	----	0.008	----	0.01	0.055
4	974	Santa	Female	<18months	191.5	12	0.039	----	0.024	----	0.01	0.055
7	716	Hereford	Female	<18 months	133	4	0.076	0.095	0.08	0.026	0.01	0.059

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
7	981	Brahman Cross	Heifer	18 months	180.5	6	0.065	0.083	0.012	0.007	0.01	0.055
7	950	Brahman	Heifer	18 months	204	11	0.09	0.07	0.01	0.01	0.01	0.055
7	997	Braford Cross	Heifer	20 months	219.5	11	0.09	0.1	0.012	0.007	0.01	0.055
7	948	Santa	Heifer	27 months	217	10	0.08	----	<0.005	----	0.01	0.055
7	984	Brahman	Heifer	18 months	191	5	0.074	----	<0.005	----	0.01	0.055
10	712	Hereford	Female	<18 months	120.5	2	0.18	0.11	0.03	0.017	0.01	0.059
10	226	Santa	Heifer	<18 months	174.5	8	0.045	0.066	<0.005	<0.005	0.01	0.055
10	227	Santa	Heifer	<18 months	197	10	0.034	0.037	<0.005	<0.005	0.01	0.055
10	228	Santa	Heifer	<18 months	213	11	0.051	0.044	0.012	<0.005	0.01	0.055
10	229	Santa	Heifer	<18 months	191	8	0.044	----	0.008	----	0.01	0.055
10	230	Santa	Heifer	<18 months	213.5	8	0.046	----	<0.005	----	0.01	0.055
15	728	Hereford	Female	<18 months	109.5	1	0.24	----	0.007	----	0.01	0.059
15	708	Hereford	Female	<18 months	125	3	0.11	----	<0.005	----	0.01	0.059
15	801	Hereford	Female	Aged	230	28	0.042	----	0.023	----	0.0097	0.052
15	802	Hereford	Female	Aged	213.5	8	0.016	----	0.021	----	0.0097	0.052
15	804	Hereford	Female	Aged	300.5	13	0.011	----	0.021	----	0.0097	0.052
21	989	Hereford	Female	Aged	228	8	0.021	----	<0.005	----	0.0097	0.052
21	990	Hereford	Female	Aged	241	11	0.03	----	<0.005	----	0.0097	0.052
21	992	Hereford	Female	Aged	333.5	11	0.011	----	<0.005	----	0.0097	0.052
21	993	Hereford	Female	Aged	274.5	24	0.011	----	0.006	----	0.0097	0.052
21	969	Hereford	Female	Aged	269.5	8	0.015	----	<0.005	----	0.0097	0.052
21	987	Hereford	Female	Aged	189	18	0.018	----	0.005	----	0.0097	0.052
30	671	Hereford	Female	Aged	273.5	19	0.031	----	0.005	----	0.0097	0.052
30	672	Hereford	Female	Aged	294	12	0.024	----	<0.005	----	0.0097	0.052
30	673	Hereford	Female	Aged	242.5	20	0.018	----	<0.005	----	0.0097	0.052
30	674	Hereford	Female	Aged	228	12	0.012	----	<0.005	----	0.0097	0.052
A4/ 2	730	Hereford	Female	<18 months	115	2	0.16	----	0.9	----	0.01	0.059
2	998	Brahman Cross	Female	Dent 2	175.5	4	0.027	----	0.12	----	0.01	0.055

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
2	999	Braford	Female	Dent 2	187.5	5	0.05	----	0.14	----	0.01	0.055
4	717	Hereford	Female	<18 months	118.5	1	0.23	----	0.028	----	0.01	0.059
4	985	Santa	Heifer	<18 months	178.5	8	0.067	----	0.011	----	0.01	0.055
4	960	Santa	Heifer	<18 months	176.5	10	0.052	----	0.031	----	0.01	0.055
7	727	Hereford	Female	<18 months	136	2	0.10	0.11	0.023	<0.005	0.01	0.059
7	4151	Brahman	Heifer	18 months	160.5	15	0.09	0.16	0.02	0.009	0.01	0.055
7	4152	Braford	Heifer	18 months	189	6	0.07	0.12	0.008	0.007	0.01	0.055
7	4153	Charolais Cross	Heifer	18 months	224.5	7	0.08	0.09	0.05	0.02	0.01	0.055
7	454	Brahman Cross	Heifer	18 months	156.5	7	0.08	----	0.02	----	0.01	0.055
7	4155	Brahman	Heifer	18 months	201.5	10	0.15	----	0.009	----	0.01	0.055
10	719	Hereford	Female	<18 months	130.5	0	0.16	0.15	0.011	<0.005	0.01	0.059
10	4157	Santa	Heifer	<18 months	206	9	0.022	0.051	<0.005	<0.005	0.01	0.055
10	4158	Santa	Heifer	<18 months	182.5	8	0.055	0.087	<0.005	<0.005	0.01	0.055
10	4159	Santa	Heifer	<18 months	173	6	0.05	----	0.009	----	0.01	0.055
10	4160	Brahman Cross	Heifer	<18 months	192.5	7	0.10	0.095	0.007	<0.005	0.01	0.055
10	4156	Santa	Heifer	<18 months	188.5	6	0.056	0.053	<0.005	<0.005	0.01	0.055
15	722	Hereford	Female	<18 months	121.5	2	0.18	----	<0.005	----	0.01	0.059
15	726	Hereford	Female	<18 months	110.5	0	0.31	----	<0.005	----	0.01	0.059
15	901	Hereford	Female	Aged	212	31	0.034	----	0.015	----	0.0097	0.052
15	902	Hereford	Female	Aged	251.5	33	0.03	----	0.087	----	0.0097	0.052
15	903	Simmental Cross	Female	Aged	254	14	0.017	----	0.02	----	0.0097	0.052
15	904	Hereford	Female	Aged	191	14	0.048	----	<0.005	----	0.0097	0.052
21	474	Hereford/Simmental Cross	Female	Aged	264	15	0.019	----	0.03	----	0.0097	0.052
21	477	Simmental	Female	Aged	240	10	0.026	----	<0.005	----	0.0097	0.052
21	478	Hereford Cross	Female	Aged	204	19	0.017	----	0.02	----	0.0097	0.052
21	481	Simmental	Female	Aged	357	14	0.023	----	0.006	----	0.0097	0.052
21	486	Simmental	Female	Aged	304.5	23	0.017	----	0.01	----	0.0097	0.052

BARRICADE 'S'

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Cypermethrin Concentration Loin Fat (mg/Kg)	Cypermethrin Concentration Renal Fat (mg/Kg)	Chlorfenvinphos Concentration Loin Fat (mg/Kg)	Chlorfenvinphos Concentration Renal Fat (mg/Kg)	Dip Conc.(%) Cypermethrin	Dip Conc.(%) Chlorfenvinphos
21	496	Hereford/Simmental Cross	Female	Aged	304	6	0.023	----	<0.005	-----	0.0097	0.052
30	4168	Simmental	Female	Aged	246	12	0.039	----	<0.005	----	0.0097	0.052
30	4167	Simmental/ Braford Cross	Female	Aged	283	4	0.055	----	<0.005	----	0.0097	0.052
30	4166	Hereford	Female	Aged	185.5	6	0.10	----	<0.005	----	0.0097	0.052
30	4162	Hereford	Female	Aged	217.5	14	0.068	----	<0.005	----	0.0097	0.052

BAYTICOL POUR-ON

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Flumethrin Concentration Loin Fat (mg/Kg)	Flumethrin Concentration Renal Fat (mg/Kg)
C5/ 2	41	Brahman	Female	>18 months	193.5	10	<0.005	<0.005
2	39	Brahman	Female	18 months	212	20	<0.005	<0.005
2	40	Brahman	Female	18 months	206.5	9	<0.005	<0.005
4	1990	Brahman	Female	18 months	239.5	17	0.023	0.032
4	1991	Braford	Female	Aged	271	18	<0.005	<0.005
4	1989	Brahman	Female	<18 months	206	17	0.029	0.026
7	228	Braford	Female	Aged	253.5	5	0.013	0.015
7	229	Brahman	Female	18 months	198.5	10	0.011	0.02
7	230	Brahman	Female	18 months	215.5	14	0.008	0.015
10	1994	Brahman	Female	Aged	281	20	<0.005	<0.005
10	1992	Brahman	Female	3 years	252	19	0.014	0.019
10	1993	Brahman	Female	18 months	214	18	0.009	0.014
15	2173	Brahman	Female	18 months	219.5	19	0.011	0.012
15	2174	Brahman	Female	18 months	208	15	0.007	0.014
15	2175	Brahman	Female	<18 months	222.5	6	0.011	0.034
21	8765	Brahman	Female	18 months	218	18	0.006	0.014
21	8766	Brahman	Female	2.25 years	212.5	15	0.008	0.021
21	8767	Brahman	Female	18 months	200	13	0.04	0.11
21	8768	Brahman	Female	18 months	232.5	11	0.017	0.024
21	8769	Brahman	Female	<18 months	209.5	9	0.01	0.014
21	8770	Brahman	Female	18 months	220.5	14	0.029	0.042
30	4943	Brahman	Female	20 months	237	14	0.02	0.027
30	4944	Brahman	Female	22 months	261.5	17	0.008	0.029

BAYTICOL POUR-ON

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Flumethrin Concentration Loin Fat (mg/Kg)	Flumethrin Concentration Renal Fat (mg/Kg)
30	4945	Brahman	Female	20 months	219.5	13	0.008	0.011
45	1998	Brahman	Female	18 months	224	7	<0.005	0.018
45	1999	Brahman	Female	2.25 years	223.5	7	<0.005	0.024
45	2000	Santa	Female	Aged	288.5	15	0.009	0.02
C6/ 2	43	Brahman	Female	18 months	197.5	17	0.015	0.04
2	44	Brahman	Female	18 months	229	8	0.014	0.034
2	42	Brahman	Female	18 months	209.5	7	0.013	0.023
4	22	Brahman	Female	18 months	224.5	7	0.028	0.058
4	23	Brahman	Female	3.5 years	223.5	10	0.025	0.022
4	24	Brahman	Female	<18 months	199.5	12	0.023	0.035
7	225	Brahman	Female	<18 months	186.5	15	0.031	0.037
7	226	Brahman	Female	18 months	208	9	0.018	0.036
7	227	Brahman	Female	<18 months	223	11	0.019	0.022
10	277	Brahman	Female	18 months	219	16	0.022	0.044
10	278	Brahman	Female	3 years	252	15	0.022	0.038
10	279	Brahman	Female	18 months	214	21	0.029	0.097
15	2176	Brahman	Female	<18 months	211	9	0.052	0.14
15	2177	Brahman	Female	18 months	223	10	0.02	0.038
15	2178	Braford	Female	Aged	275.5	12	0.02	0.035
21	8759	Brahman	Female	18 months	198	13	0.017	0.036
21	8760	Brahman	Female	<18 months	224.5	14	0.011	0.026
21	8761	Brahman	Female	18 months	204.5	12	0.016	0.049

BAYTICOL POUR-ON

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Flumethrin Concentration Loin Fat (mg/Kg)	Flumethrin Concentration Renal Fat (mg/Kg)
21	8762	Brahman	Female	18 months	190	19	0.015	0.026
21	8763	Brahman	Female	2.25 years	220.5	10	0.022	0.054
21	8764	Brahman	Female	18 months	205.5	16	0.019	0.033
30	4985	Droughtmaster	Female	3.5 years	255.5	25	0.014	0.027
30	4986	Brahman	Female	18 months	233.5	13	0.017	0.03
30	4987	Brahman	Female	20 months	206.5	20	0.02	0.027
45	1995	Brahman	Female	18 months	241	12	0.023	0.051
45	1996	Brahman	Female	2.25 years	225.5	18	0.012	0.028
45	1997	Brahman	Female	18 months	211.5	14	0.029	0.044

TAKTIC WP

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver	Dip Conc. at Treatment (%) Amitraz
D1/ 0.5	29	Hereford	Female	Aged	258	25	<0.005	0.02	0.023
0.5	30	Santa	Female	Aged	193.5	1	<0.005	0.01	0.023
0.5	31	Hereford	Female	Aged	185	5	<0.005	0.02	0.023
1	32	Hereford	Female	Aged	194.5	4	<0.005	0.01	0.023
1	1	Hereford	Female	6 Yrs	262.4	23	<0.005	<0.005	0.025
1	2	Hereford	Female	6Yrs	276.8	17	<0.005	<0.005	0.025
2	33	Hereford	Female	Aged	224	9	<0.005	0.02	0.023

TAKTIC WP

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver	Dip Conc. at Treatment (%) Amitraz
2	34	Hereford	Female	Aged	197	7	<0.005	0.03	0.023
2	35	Hereford	Female	Aged	212	7	<0.005	0.01	0.023
D2/ 0.5	6	Hereford	Female	Aged	243	4	<0.005	0.02	0.023
0.5	7	Hereford	Female	Aged	242.5	14	<0.005	0.02	0.023
0.5	8	Hereford	Female	Aged	229.5	15	<0.005	0.02	0.023
1	9	Hereford	Female	Aged	222.5	8	<0.005	0.02	0.023
1	10	Hereford	Female	Aged	217	8	<0.005	0.03	0.023
1	11	Hereford	Female	Aged	232.5	9	<0.005	0.02	0.023
2	12	Hereford	Female	Aged	204	3	<0.005	0.02	0.023
2	13	Santa	Female	Aged	382	4	<0.005	0.02	0.023
2	14	Braford	Female	Aged	219.5	6	<0.005	0.02	0.023
D3/ 0.5	209	Santa	Female	Aged	209.5	0	0.004	0.03	0.023
0.5	210	Hereford	Female	Aged	235	0	0.005	0.04	0.023
0.5	211	Hereford	Female	Aged	193.5	6	0.004	0.05	0.023
1	212	Hereford	Female	Aged	239.5	7	0.007	0.06	0.023
1	213	Hereford	Female	Aged	216.5	18	0.004	0.03	0.023
1	214	Santa	Female	Aged	220	1	0.008	0.03	0.023
2	215	Santa	Female	Aged	223.5	0	0.005	0.03	0.023
2	216	Santa	Female	Aged	231	1	<0.005	0.01	0.023
2	217	Santa	Female	Aged	217.5	3	<0.005	0.02	0.023

TAKTIC WP

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver	Dip Conc. at Treatment (%) Amitraz
4	218	Braford	Female	Aged	228	8	<0.005	0.01	0.023
4	219	Santa	Female	Aged	234	6	0.005	0.02	0.023
4	220	Santa	Female	Aged	221.5	8	<0.005	0.03	0.023
D4/ 0.5	8701	Santa	Female	Aged	215	2	0.01	0.05	0.023
0.5	8702	Santa	Female	Aged	255	2	<0.005	0.02	0.023
0.5	8703	Santa	Female	Aged	241	10	0.01	0.04	0.023
1	8704	Santa	Female	Aged	285	6	<0.005	0.01	0.023
1	8705	Braford	Female	Aged	215	13	0.006	0.01	0.023
1	8706	Santa	Female	Aged	176	1	<0.005	0.03	0.023
2	8707	Braford	Female	Aged	247	6	<0.005	0.01	0.023
2	8708	Santa	Female	Aged	207.5	0	<0.005	0.03	0.023
2	8709	Santa	Female	Aged	270.5	----	<0.005	0.02	0.023
4	8710	Santa	Female	Aged	253.5	0	<0.005	0.02	0.023
4	8711	Santa	Female	Aged	201	0	<0.005	0.03	0.023
4	8712	Santa	Female	Aged	255.5	7	<0.005	0.02	0.023
7	8713	Santa	Female	Aged	245.5	2	<0.005	0.02	0.023
7	8714	Hereford	Female	Aged	233	26	<0.005	0.03	0.023
7	8715	Santa	Female	Aged	224	15	<0.005	0.02	0.023
15	580	Braford	Male	1.5Yrs	237.5	9	<0.005	<0.005	0.027
15	591	Santa Cross	Male	<1.5Yrs	275.5	8	<0.005	<0.005	0.027

TAKTIC WP

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver	Dip Conc. at Treatment (%) Amitraz
15	590	Santa Cross	Male	<1.5Yrs	179	7	<0.005	<0.005	0.027

TAKTIC EC								
Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver
G7/ 1	32	Murray Gray	Male	1.5Yrs	313.5	8	<0.005	0.04
1	140	Brahman x	Male	2.25Yrs	296	11	<0.005	0.021
1	0	Santa x Hereford	Male	2.25Yrs	320.5	25	<0.005	0.026
4	128	Hereford	Male	2.25Yrs	325	10	<0.005	0.028
4	139	Braford	Male	1.5Yrs	302	15	<0.005	0.014
4	138	Braford	Male	<1.5Yrs	287	18	<0.005	<0.005
7	48	Braford	Male	2.25Yrs	281	23	<0.005	0.01
7	11	Murray Gray	Male	1.5Yrs	347	15	<0.005	<0.005
7	130	Brahman x	Male	2.25Yrs	332.5	22	<0.005	<0.005
G8/ 1	126	Brahman x	Male	<1.5Yrs	303.5	15	<0.005	0.03
1	150	Brahman x	Male	2.25Yrs	303	23	<0.005	0.035
1	133	Braford	Male	1.5Yrs	294.5	2	<0.005	0.029
4	663	Angus	Male	1.5Yrs	342	22	<0.005	0.02
4	33	Braford	Male	<1.5Yrs	285	11	<0.005	0.019
4	136	Drought Master	Male	2.25Yrs	302	14	<0.005	0.01
7	151	Braford	Male	2.25Yrs	324	28	<0.005	0.006
7	578	Drought Master	Male	2.25Yrs	337	18	<0.005	0.006

TAKTIC EC

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Amitraz Conc. (mg/Kg) Muscle	Amitraz Conc. (mg/Kg) Liver
7	496	Red Brahman	Male	1.5Yrs	307.5	17	<0.005	0.017

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
B1/ 2	217	Hereford	Female	Aged	250.5	21	0.01	0.01	0.42	0.84	0.0052	0.026
2	216	Hereford	Female	Aged	204	6	< 0.005	< 0.005	0.43	0.47	0.0052	0.026
2	218	Hereford	Female	Aged	245	6	0.01	< 0.005	0.74	0.97	0.0052	0.026
4	63	Hereford	Female	Aged	281.5	18	0.007	0.009	0.23	0.3	0.005	0.022
4	64	Hereford	Female	Aged	268.5	10	0.007	0.009	0.29	0.55	0.005	0.022
4	65	Hereford	Female	Aged	231	15	0.005	0.007	0.25	0.56	0.005	0.022
7	203	Santa	Female	Aged	231	6	0.02	-----	0.65	----	0.0052	0.026
7	204	Santa	Female	2.25yrs	246.5	5	0.01	----	0.51	----	0.0052	0.026
7	219	Hereford	Female	Aged	210.5	20	0.01	----	0.51	----	0.0052	0.026
7	213	Santa	Female	Aged	244	31	< 0.005	----	< 0.05	----	0.0052	0.026
7	202	Santa	Female	Aged	280.5	16	0.015	-----	0.25	----	0.0052	0.026
7	210	Santa	Female	Aged	238	8	0.015	-----	0.61	----	0.0052	0.026
10	207	Santa	Female	Dent 6	227	20	0.015	-----	0.32	----	0.0052	0.026
10	206	Santa	Female	Dent 8	320	20	< 0.005	----	0.32	----	0.0052	0.026
10	208	Santa	Female	Dent 8	278.5	14	< 0.005	----	< 0.05	----	0.0052	0.026

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
10	211	Santa	Female	Dent 8	269	32	0.02	----	0.23	----	0.0052	0.026
10	214	Santa	Female	Dent 8	253.5	15	0.025	----	0.3	----	0.0052	0.026
10	205	Santa	Female	Dent 8	246.5	22	0.023	----	0.54	----	0.0052	0.026
15	12	Santa Cross	Female	Aged	248.5	20	0.005	----	0.05	----	0.004	0.019
15	13	Santa Cross	Female	Aged	256.5	11	0.007	----	0.15	----	0.004	0.019
15	14	Brahman Cross Hereford	Female	Aged	227.5	16	0.007	----	0.27	----	0.004	0.019
21	215	Santa	Female	Dent 6	269	7	0.01	----	0.35	----	0.0052	0.026
21	201	Santa	Female	Dent 8	267.5	23	< 0.005	----	0.06	----	0.0052	0.026
21	209	Santa	Female	Dent 8	231.5	7	< 0.005	----	0.05	----	0.0052	0.026
30	1	Brahman	Female	Aged	191.5	8	0.015	----	0.26	----	0.004	0.02
30	2	Hereford	Female	Aged	167.5	3	0.058	----	0.32	----	0.004	0.02
30	3	Hereford	Female	2.25yrs	190	4	0.039	----	0.32	----	0.004	0.02
B2/ 2	4191	Hereford	Female	Aged	254.5	1	0.024	----	0.46	----	0.005	0.022

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
2	4196	Hereford	Female	Aged	220	3	0.018	----	0.5	----	0.005	0.022
2	4197	Hereford	Female	Aged	231.5	4	0.02	----	0.24	----	0.005	0.022
4	595	Braford	Female	Aged	254.5	17	< 0.005	----	0.25	----	0.004	0.019
4	596	Braford	Female	2.25yrs	240	19	< 0.005	----	0.29	----	0.004	0.019
4	597	Braford	Female	Aged	289.5	15	< 0.005	----	0.22	----	0.004	0.019
7	2	Hereford	Female	Aged	230.5	13	0.015	0.03	0.78	1.3	0.0052	0.026
7	3	Hereford	Female	Aged	259.5	21	0.01	0.03	0.7	1.3	0.0052	0.026
7	5	Hereford	Female	Aged	209.5	25	0.025	0.043	0.74	1.6	0.0052	0.026
10	4	Hereford	Female	Dent 8	247.5	42	0.02	----	0.64	----	0.0052	0.026
10	1	Hereford	Female	Dent 8	233.5	24	0.01	0.02	0.58	0.98	0.0052	0.026
10	237	Brahman Cross	Male	2.5yrs	260.5	10	0.016	0.02	0.43	0.69	0.004	0.02
15	587	Hereford	Female	Aged	260	7	0.017	----	0.42	----	0.004	0.019
15	588	Brahman Cross Hereford	Female	Aged	261	9	0.009	----	0.26	----	0.004	0.019
15	589	Hereford	Female	Aged	284.5	38	0.008	----	0.21	----	0.004	0.019
21	955	Hereford	Female	Aged	196	20	0.009	----	0.38	----	0.004	0.019

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
21	956	Hereford	Female	2.5yrs	225.5	16	0.022	----	0.47	----	0.004	0.019
21	957	Hereford	Female	Aged	319.5	9	0.026	----	0.63	----	0.004	0.019
30	258	Hereford	Female	2.5yrs	180.5	4	0.021	----	0.28	----	0.004	0.02
30	259	Hereford	Female	Aged	187	14	0.048	----	0.45	----	0.004	0.02
30	260	Hereford	Female	2.5yrs	178	7	0.029	----	0.26	----	0.004	0.02
B3/ 2	936	Hereford	Female	Aged	239.5	7	0.024	----	1.2	----	0.005	0.022
2	937	Hereford	Female	Aged	227	3	0.036	----	0.84	----	0.005	0.022
2	938	Hereford	Female	Aged	255	18	0.018	----	0.57	----	0.005	0.022
4	999	Hereford	Female	2.5yrs	241.5	15	< 0.005	----	0.2	----	0.004	0.019
4	973	Hereford	Female	2.5yrs	267	10	0.006	----	0.19	----	0.004	0.019
4	736	Hereford	Female	2.5yrs	227.5	16	0.006	----	0.34	----	0.004	0.019
7	805	Brahman Cross	Male	20mths	297	18	0.01	0.022	0.25	0.42	0.004	0.02
7	806	Santa Cross Hereford	Male	2.25yrs	309	17	0.007	0.015	0.12	0.28	0.004	0.02
7	1	Hereford	Female	Aged	273.5	2	0.061	0.053	0.81	0.88	0.004	0.02

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
10	905	Hereford	Male	2.25yrs	307	24	0.011	0.015	0.22	0.3	0.004	0.02
10	906	Hereford Cross Santa	Male	2.5yrs	309.5	25	0.011	0.017	0.2	0.32	0.004	0.02
10	907	Hereford Cross Santa	Male	2.25yrs	306.5	12	0.018	0.02	0.31	0.34	0.004	0.02
10	908	Santa Cross	Male	20mths	279.5	18	0.023	----	0.27	-----	0.004	0.02
10	909	Santa Cross	Male	20mths	287	27	0.017	-----	0.22	-----	0.004	0.02
10	910	Santa Cross	Male	20mths	294.5	17	0.01	-----	0.18	----	0.004	0.02
15	794	Hereford	Female	Aged	301.5	31	0.008	----	0.2	----	0.004	0.019
15	796	Hereford	Female	Aged	308	30	0.008	----	0.15	----	0.004	0.019
15	977	Hereford	Female	Aged	236	23	0.011	----	0.31	----	0.004	0.019
21	8	Hereford	Female	Aged	226.5	31	0.025	----	0.44	----	0.004	0.019
21	9	Braford Cross	Female	Aged	224	8	0.02	----	0.36	----	0.004	0.019
21	10	Hereford Cross	Female	Aged	277	38	0.015	----	0.39	----	0.004	0.019

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
		Santa										
30	3498	Brahman Cross	Female	Aged	176	4	0.018	----	0.39	----	0.004	0.02
30	3499	Hereford	Female	2.5yrs	181.5	4	0.047	----	0.49	----	0.004	0.02
30	3500	Hereford	Female	2.5yrs	174.5	2	0.039	----	0.46	----	0.004	0.02
B4/ 2	864	Hereford	Female	Aged	201.5	2	0.065	----	1.8	----	0.005	0.022
2	865	Hereford	Female	Aged	216	8	0.048	----	1.1	----	0.005	0.022
2	866	Hereford	Female	Aged	265	11	0.025	----	0.49	----	0.005	0.022
4	252	Hereford	Female	2.25yrs	217	10	0.013	----	0.7	----	0.004	0.019
4	253	Braford	Female	2.25yrs	257	9	0.016	----	0.54	----	0.004	0.019
4	254	Braford	Female	2.25yrs	228.5	20	0.021	----	0.64	----	0.004	0.019
7	4176	Braford Cross	Male	2.25yrs	396.5	22	0.009	0.015	0.21	0.38	0.004	0.02
7	4577	Hereford	Male	2.25yrs	318.5	28	0.011	0.018	0.27	0.77	0.004	0.02
7	4178	Hereford	Male	2.25yrs	309.5	17	0.009	0.021	0.31	0.69	0.004	0.02
7	4179	Hereford	Male	2.25yrs	318	19	0.009	----	0.18	----	0.004	0.02
7	4180	Santa	Male	20mths	289	25	0.007	----	0.33	----	0.004	0.02

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
7	4181	Santa Cross Hereford	Male	2.25yrs	322	25	0.017	----	0.2	----	0.004	0.02
10	88	Brahman Cross	Male	2.25yrs	300.5	15	0.019	----	0.37	----	0.004	0.02
10	89	Hereford Cross Santa	Male	2.25yrs	308.5	28	0.024	----	0.42	----	0.004	0.02
10	90	Hereford	Male	2.25yrs	301	23	0.025	----	0.56	----	0.004	0.02
10	85	Hereford Cross Brahman	Male	2.25yrs	294	21	0.025	0.019	0.31	0.41	0.004	0.02
10	86	Braford	Male	2.25yrs	309	23	0.01	0.011	0.5	0.51	0.004	0.02
10	87	Santa Cross Hereford	Male	2.25yrs	315	16	0.031	0.043	0.47	0.52	0.004	0.02
15	249	Hereford Cross Brahman	Female	Aged	235	7	0.012	----	0.73	----	0.004	0.019
15	250	Shorthor n Cross	Female	Aged	345	25	0.013	----	0.35	----	0.004	0.019
15	251	Brahman	Female	Aged	252	11	0.019	----	0.45	----	0.004	0.019

TIXAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat Depth (mm)	Deltamethrin Conc. (mg/Kg) Loin Fat	Deltamethrin Conc. (mg/Kg) Renal Fat	Ethion Conc. (mg/Kg) Loin Fat	Ethion Conc. (mg/Kg) Renal Fat	Dip Conc. at Treatment % Deltamethrin	Dip Conc. at Treatment % Ethion
21	814	Hereford	Female	Aged	287.5	48	0.023	----	0.55	----	0.004	0.019
21	815	Braford	Female	Aged	228.5	10	0.026	----	0.85	----	0.004	0.019
21	816	Braford	Female	Aged	246	17	0.013	----	0.37	----	0.004	0.019
30	977	Brahman Cross	Female	Aged	169.5	1	0.038	----	0.3	----	0.004	0.02
30	963	Hereford	Female	2.25yrs	159.5	1	0.059	----	0.82	----	0.004	0.02
30	964	Hereford	Female	2.25yrs	159.5	5	0.065	----	0.6	----	0.004	0.02

ARREST

Animal No.	Weight at Treatment (Kg)	Deltamethrin Conc. (mg/Kg) Day 3	Deltamethrin Conc. (mg/Kg) Day 7	Deltamethrin Conc. (mg/Kg) Day 14	Deltamethrin Conc. (mg/Kg) Day 21	Deltamethrin Conc. (mg/Kg) Day 28	Deltamethrin Conc. (mg/Kg) Day 42	Deltamethrin Conc. (mg/Kg) Day 96
1	432	<0.005			0.019			<0.005
2	434	<0.005			<0.005			<0.005
3	424	<0.005			<0.005			<0.005
4	432	<0.005			<0.005			<0.005
5	442		0.013			0.009		
6	432		0.013			0.011		
7	400		<0.005			0.013		
8	416		0.014			0.006		
9	418			0.009			0.01	
10	400			0.008			0.01	
11	402			0.01			0.006	
12	416			0.007			0.006	
13	404	<0.005	<0.005	0.03	0.011	0.015	0.008	<0.005

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
E1/ 2	238	Brangus Cross	Female	>3yrs	204.5	18	0.018	----	0.007
2	239	Braford	Female	>3yrs	198	4	0.055	----	0.007

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
2	240	Braford	Female	>3yrs	207	8	0.023	----	0.007
4	592	Hereford	Female	2yrs	208.5	12	0.018	----	0.0086
4	593	Hereford	Female	Aged	257.5	24	0.01	----	0.0086
4	D	Hereford	Female	Aged	211.5	5	0.19	----	0.0086
7	983	Hereford Cross	Female	1.5yrs	212	14	0.013	----	0.007
7	984	Hereford Cross	Female	2.25yrs	239	7	0.019	----	0.007
7	985	Hereford Cross	Female	2.25yrs	191	10	0.036	----	0.007
10	4163	Braford	Female	2.25yrs	224	23	0.013	----	0.007
10	4164	Braford	Female	2yrs	207.5	10	0.015	----	0.007
10	4165	Braford	Female	<1.5yrs	187	8	0.029	----	0.007
15	472	Santa Cross	Steer	2.25yrs	236.5	4	0.031	----	0.0095
15	470	Santa Cross	Steer	2.5yrs	282	12	0.03	----	0.0095
15	464	Santa Cross	Steer	2.25yrs	282.5	4	0.036	----	0.0095
21	8755	Hereford	Female	Aged	211.5	14	<0.010	----	0.007
21	8756	Hereford	Female	1.5yrs	167.5	8	0.025	----	0.007
21	8757	Hereford	Female	<1.5yrs	157.5	7	0.055	----	0.007
30	48	Brahman	Female	Aged	193.5	3	0.029	----	0.007

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
		Cross							
30	49	Hereford	Female	Aged	174	1	0.15	----	0.007
30	50	Hereford	Female	2.5yrs	200.5	7	0.055	----	0.007
E2/ 2	241	Brahman Cross	Female	>3yrs	224	6	0.026	----	0.007
2	242	Brahman Cross	Female	>3yrs	176	4	0.015	----	0.007
2	243	Brahman Cross	Female	>3yrs	213	7	0.015	----	0.007
4	195	Hereford	Female	Aged	179	8	0.019	----	0.0086
4	196	Hereford	Female	Aged	322.5	51	0.027	----	0.0086
4	197	Hereford	Female	Aged	199.5	10	0.035	----	0.007
4	669	Hereford	Female	Aged	237.5	23	0.015	----	0.007
7	4171	Hereford Cross	Female	2.25yrs	204	16	0.018	----	0.007
7	4172	Hereford Cross	Female	1.5yrs	211	18	0.011	----	0.007
7	4173	Hereford Cross	Female	1.5yrs	192	25	0.013	----	0.007
10	658	Braford	Female	2.25yrs	204	30	0.012	----	0.007
10	659	Braford	Female	2yrs	208.5	9	0.043	----	0.007
10	660	Braford	Female	2yrs	203.5	13	0.032	----	0.007

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
15	962	Hereford Cross	Female	Aged	242.5	15	<0.010	----	0.007
15	968	Hereford Cross	Female	Aged	260.5	23	<0.010	----	0.007
15	975	Hereford	Female	Aged	294	10	0.013	----	0.007
21	235	Hereford	Female	1.5yrs	138	2	0.08	----	0.007
21	236	Hereford	Female	<1.5yrs	147	2	0.049	----	0.007
21	237	Hereford	Female	2.25yrs	184	3	0.033	----	0.007
30	961	Hereford	Female	Aged	197	5	0.079	----	0.007
30	962	Brahman Cross	Female	Aged	196.5	10	0.022	----	0.007
30	963	Brahman x	Female	Aged	199.5	8	0.02	----	0.007
E3/ 2	8779	Hereford	Female	>3yrs	202.5	6	0.063	----	0.007
2	8778	Hereford	Female	>3yrs	207.5	8	0.029	----	0.007
2	8777	Brahman Cross	Female	>3yrs	171.5	6	0.041	----	0.007
4	773	Hereford Cross	Female	2.25yrs	213.5	10	0.025	0.039	0.007
4	774	Hereford	Female	2.5yrs	205	10	0.012	----	0.007
4	851	Braford Cross	Female	1.5yrs	194.5	10	0.02	----	0.007
7	19	Braford Cross	Female	1.5yrs	236	16	0.015	0.031	0.007

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
7	20	Braford	Female	2.25yrs	200.5	24	0.023	0.07	0.007
7	21	Braford	Female	2.25yrs	226.5	22	0.03	0.045	0.007
10	584	Santa Cross	Female	Aged	317	34	<0.010	<0.010	0.007
10	585	Hereford	Female	Aged	272	20	0.015	0.023	0.007
10	586	Hereford	Female	Aged	292.5	19	<0.010	0.011	0.007
15	Q0740	Santa Cross	Steer	<1.5yrs	222	10	0.039	----	0.0095
15	Q0720	Angus Cross	Steer	<1.5yrs	260.5	5	0.061	----	0.0095
15	Q0719	Brahman Cross	Steer	2.25yrs	264.5	7	0.059	----	0.0095
21	998	Hereford	Female	1.5yrs	192.5	8	0.042	----	0.007
21	999	Hereford	Female	2.5yrs	188	8	0.045	----	0.007
21	1000	Hereford	Female	Aged	210.5	7	0.053	----	0.007
30	811	Hereford	Female	Aged	210	10	0.16	----	0.007
30	812	Brahman Cross	Female	Aged	223	7	0.052	----	0.007
30	813	Brahman Cross	Female	Aged	174.5	5	0.079	----	0.007
E4/ 2	8782	Hereford	Female	>3yrs	179	13	0.06	----	0.007

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
2	8781	Braford Cross	Female	>3yrs	211.5	14	0.041	-----	0.007
2	8780	Hereford	Female	>3yrs	185	6	0.087	----	0.007
4	232	Hereford Cross	Female	1.5yrs	214.5	8	0.027	0.056	0.007
4	233	Hereford Cross	Female	3yrs	249	15	0.017	0.025	0.007
4	231	Hereford	Female	Aged	249	10	0.022	0.025	0.007
7	490	Braford Cross	Female	2.25yrs	209.5	14	0.016	0.046	0.007
7	491	Braford Cross	Female	2.5yrs	217.5	15	0.026	0.042	0.007
7	492	Braford	Female	2.25yrs	219	20	0.047	0.11	0.007
10	4185	Simmental Cross	Female	Aged	309	9	<0.010	0.018	0.007
10	4186	Hereford	Female	Aged	248.5	16	0.013	0.036	0.007
10	4187	Simmental Cross	Female	Aged	272	23	<0.010	0.016	0.007
15	QL3497	Angus Cross	Steer	<1.5yrs	231	6	0.077	-----	0.0095
15	QL3496	Angus Cross	Steer	<1.5yrs	215	4	0.073	-----	0.0095
15	QL3495	Santa Cross	Steer	2.5yrs	277	8	0.073	----	0.0095

GRENADE CATTLE DIP AND BUFFALO FLY SPRAY

Days Post Treatment	Animal Number	Breed	Sex	Age	Carcase Weight (Kg)	Fat depth (mm)	Cyhalothrin Concentration (mg/Kg) Loin Fat	Cyhalothrin Concentration (mg/Kg) Renal Fat	Dip Concentration at Treatment % Cyhalothrin
21	581	Hereford	Female	2.5yrs	183.5	9	0.033	----	0.007
21	582	Hereford	Female	1.5yrs	156.5	6	0.078	----	0.007
21	583	Hereford	Female	1.5yrs	151	2	0.084	----	0.007
30	792	Brahman Cross	Female	Aged	210.5	10	0.063	----	0.007
30	718	Brahman Cross	Female	Aged	188	7	0.12	----	0.007

BAYTICOL CATTLE DIP AND SPRAY

Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
C1/ 2	247	Angus	Female	Aged	212.5	5	<0.005	<0.005	0.008
2	248	Simmental	Female	Aged	226	5	<0.005	<0.005	0.008
2	Q8758	Red Bull	Female	Aged	230.5	20	0.041	0.047	0.0074
4	17	Charolais x Hereford	Female	Aged	230.5	12	<0.005	<0.005	0.008
4	15	Hereford x	Female	Aged	185	6	<0.005	<0.005	0.008
4	18	Santa Gertrudus x	Female	Aged	225	6	<0.005	<0.005	0.008

BAYTICOL CATTLE DIP AND SPRAY

Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
7	863	Brahman	Female	2 1/4 yrs	176.5	2	<0.005	<0.005	0.008
7	861	Braford	Female	2 1/4 yrs	202	27	<0.005	<0.005	0.008
7	862	Brahman	Female	2 1/4 yrs	190.5	7	<0.005	<0.005	0.008
15	980	Hereford x Santa	Female	Aged	207.5	7	<0.005	<0.005	0.008
15	970	Brahman x	Female	18 mths	174.5	5	<0.005	0.008	0.008
15	978	Hereford x Braford	Female	2 1/4 mths	175	1	<0.005	<0.005	0.008
21	236	Hereford	Male	2 1/4 yrs	312.5	16	<0.005	<0.005	0.008
21	2462	Hereford x	Female	Aged	168.5	1	<0.005	<0.005	0.0074
21	2463	Hereford x	Female	2 1/2 yrs	174	0	<0.005	<0.005	0.0074
30	489	Hereford	Male	2 1/2 yrs	324.5	31	<0.005	<0.005	0.008
30	479	Hereford	Male	2 1/2 yrs	341	26	<0.005	<0.005	0.008
30	480	Hereford	Male	2 1/4 yrs	355	21	<0.005	<0.005	0.008
C2/ 2	240	Hereford x	Female	Aged	156.5	7	<0.005	<0.005	0.0074
2	238	Hereford	Female	Aged	188.5	4	<0.005	<0.005	0.0074
2	239	Hereford	Female	Aged	174.5	21	<0.005	0.047	0.0074

BAYTICOL CATTLE DIP AND SPRAY

Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
4	244	Santa	Female	$2^1/_2$ yrs	212.5	14	<0.005	<0.005	0.008
4	245	Santa x Hereford	Female	Aged	197.5	8	Trace Flumethrin	<0.005	0.008
4	246	Santa x Hereford	Female	Aged	214	3	<0.005	<0.005	0.008
7	599	Santa x	Female	Aged	168.5	2	<0.005	<0.005	0.008
7	600	Brahman x	Female	Aged	160	2	<0.005	<0.005	0.008
7	---	Braford	Female	$2^1/_4$ yrs	201	18	<0.005	<0.005	0.008
15	83	Brahman x	Female	$2^1/_2$ yrs	165	11	<0.005	<0.005	0.008
15	84	Hereford x Braford	Female	$2^1/_4$ yrs	189	8	<0.005	<0.005	0.008
15	82	Hereford	Female	$2^1/_4$ yrs	198	23	<0.005	<0.005	0.008
21	808	Hereford	Male	3 yrs	342.5	21	<0.005	<0.005	0.008
21	809	Hereford	Male	$2^1/_4$ yrs	319	17	<0.005	<0.005	0.008
21	807	Hereford	Male	$2^1/_4$ yrs	340	18	<0.005	<0.005	0.008
30	966	Santa x Hereford	Male	$2^1/_4$ yrs	313.5	20	<0.005	<0.005	0.008

BAYTICOL CATTLE DIP AND SPRAY									
Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
30	967	Hereford	Male	$2^1/_2$ yrs	304	22	<0.005	<0.005	0.008
30	965	Santa x Hereford	Male	$2^1/_2$ yrs	375.5	12	<0.005	<0.005	0.008
C3/ 2	281	Simmental	Female	Aged	198.5	12	<0.005	<0.005	0.0074
2	282	Hereford x	Female	Aged	170	11	<0.005	<0.005	0.0074
2	280	Hereford	Female	Aged	231.5	6	<0.005	0.047	0.0074
4	8774	Charolais x	Female	Aged	242	6	<0.005	<0.005	0.008
4	8775	Brangus x	Female	Aged	208	6	<0.005	<0.005	0.008
4	8776	Brangus x Hereford	Female	Aged	206	2	<0.005	<0.005	0.008
7	498	Brahman x	Female	Aged	196	5	<0.005	<0.005	0.008
7	465	Brahman x	Female	Aged	160	3	<0.005	<0.005	0.008
7	473	Brahman x	Female	$2^1/_4$ yrs	184	15	<0.005	<0.005	0.008
15	257	Hereford	Female	$2^1/_4$ yrs	190.5	10	<0.005	<0.005	0.008
15	255	Brahman x	Female	$2^1/_2$ yrs	192	2	<0.005	<0.005	0.008
15	256	Hereford	Female	$2^1/_4$ yrs	195	18	<0.005	<0.005	0.008

BAYTICOL CATTLE DIP AND SPRAY

Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
21	77	Hereford	Male	$2^1/_2$ yrs	345.5	18	<0.005	<0.005	0.008
21	79	Hereford	Male	$2^1/_2$ yrs	360	23	<0.005	<0.005	0.008
21	78	Santa x Hereford	Male	$2^1/_2$ yrs	337.5	16	<0.005	<0.005	0.008
30	4190	Hereford	Male	$2^1/_4$ yrs	302	26	<0.005	<0.005	0.008
30	4188	Hereford	Male	$2^1/_4$ yrs	300	20	<0.005	0.011	0.008
30	4189	Hereford	Male	$2^1/_2$ yrs	349	18	<0.005	<0.005	0.008
C4/ 2	4961	Murray Grey	Female	$2^1/_2$ yrs	278.5	0	<0.005	<0.005	0.0074
2	4962	Hereford	Female	Aged	204	7	<0.005	<0.005	0.0074
2	4963	Hereford x	Female	Aged	205.5	3	<0.005	0.047	0.0074
4	8773	Braford x	Female	Aged	201	11	Trace	Trace	0.008
4	8772	Brahman x	Female	Aged	213.5	13	<0.005	<0.005	0.008
4	8771	Brangus	Female	Aged	227	11	<0.005	<0.005	0.008
7	916	Santa x	Female	Aged	184	3	<0.005	<0.005	0.008
7	917	Hereford	Female	18 mths	184	10	<0.005	<0.005	0.008
7	915	Brahman x	Female	Aged	196	1	<0.005	<0.005	0.008

BAYTICOL CATTLE DIP AND SPRAY

Days Post Treatment	Animal No	Breed	Sex	Age	Carcase Weight (Kg)	Fat Score (mm)	Flumethrin Conc. (mg/Kg) Loin Fat	Flumethrin Conc.(mg/Kg) Renal Fat	Dip Conc. At Treatment % Flumethrin
15	16	Hereford x	Female	$2^1/_2$ yrs	209.5	4	<0.005	0.008	0.008
15	17	Hereford x	Female	$2^1/_4$ yrs	192.5	10	<0.005	<0.005	0.008
15	15	Brahman x	Female	18 mths	174	3	<0.005	<0.005	0.008
21	582	Hereford	Male	$2^1/_4$ yrs	357	16	<0.005	<0.005	0.008
21	670	Hereford	Male	$2^1/_2$ yrs	333	27	<0.005	<0.005	0.008
21	578	Hereford	Male	$2^1/_2$ yrs	345.5	31	<0.005	<0.005	0.008
30	999	Hereford	Male	$2^1/_4$ yrs	307	24	0.009	0.013	0.008
30	924	Hereford	Male	$2^1/_2$ yrs	345	11	<0.005	<0.005	0.008
30	914	Santa x Hereford	Male	$2^1/_2$ yrs	321.5	22	<0.005	0.01	0.008

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SECTION 2

Meat Research Corporation

FINAL REPORT

PROJECT DAN.084

Pesticide Resides In Export Beef Produced Under Typical Farm Situations Within Buffalo Fly Infested Areas Of New South Wales And Queensland

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TABLE OF CONTENTS

ABSTRACT

Following commencement of project DAQ.096 studying residues of tickicides in cattle MRC identified potential residue problems due to stringent buffalo fly control regimens instituted in northern NSW. These rigorous treatments were in response to animal welfare concerns over buffalo fly irritation during peak infestation.
It was considered necessary to measure residues in cattle treated with all registered buffalo fly formulations including sprays, one pour-on and backrubbers.
Results indicated that one spray required review for the stated withholding period.
Importantly for export product where the comparison is made against import country tolerances, several of the treatments required extended Export Slaughter Intervals (ESI). One preparation exhibited residues well above import country tolerances and received a 'Not Recommended' status.
The Australian industry context now reveals a broad acceptance of the 'ESI concept' by producers, agents and processors.
Regulatory guidelines for ectoparasiticide registration now contain protocols similar to those used in DAQ.096 and DAN.084.

BACKGROUND

MRC had already recognised the problem of residues in export beef following pesticide treatment of cattle in response to cattle tick regulatory requirements in NSW and QLD. A major component of this recognition was MRC agreement, in November 1993, to fund a research project titled, "Pesticide Residues in Export Beef Produced under Typical Farm Situations within Tick Infested Areas of Qld and NSW", (DAQ.096) which will investigated residues in export beef created by normal pesticide treatment practises for cattle tick arising mainly from regulatory requirements. Early results from an initial treatment with Barricade S (cypermethrin and CVP) suggested that residues above USA tolerance levels are possible in loin fat of lean animals for up to fifteen days after a final treatment.

Following the most recent residue notifications serious reconsideration of cattle tick regulatory dipping policies has occurred. Schemes are being implemented to minimise residues by minimising dipping and by withholding or testing stock which are known to have been dipped. In addition, some ad hoc recommendations have been promulgated eg. producers are asked to treat cattle only once in the twenty one days prior to slaughter.

The identified residue problems of dipped cattle highlighted the likelihood of residues due to other, usually unregulated pesticide usage. In particular, on farm treatments for buffalo fly and lice have considerable potential to leave residues of concern in export meat. In coastal areas of NSW north of Kempsey, cattle are treated for buffalo fly during summer and autumn. NSW Agriculture survey figures showed that the mean interspray period for buffalo fly was seventeen days, with treatments twenty one days apart being the most common. Nevertheless, 40% of producers sprayed at fourteen days or less, while 14% sprayed at seven day intervals. Anecdotal evidence suggested an increase in the frequency of short interval applications in the two seasons since the survey was completed. The majority of the short spray intervals were associated with Barricade S and Cypafly.

The potential for serious residue problems with buffalo fly treatments can be further emphasised by consideration of their recommended concentrations relative to that used for tick control. For instance cypermethrin in tick dips is at 100ppm as Barricade but is used at 1,000ppm as cypafly buffalo fly spray, and cyhalothrin as Grenade is at 70ppm in dips but 2,000ppm in buffalo fly spray! There is anecdotal evidence to suggest that as resistance develops usage above recommended formulation strength becomes endemic.

Thus this project was instigated to ensure continued access to USA and other export markets for Australian beef. Construction of incurrence/depletion curves will enable predictions to be made of treatment regimes that will produce residue levels below tolerance levels (or MRLs) of countries that import Australian beef. It should

also be possible to design regulatory and management practices that minimise pesticide treatments.

It will also be possible to estimate loin fat residue levels for carcases with known residues levels in renal fat. It will therefore be possible to predict the prevalence of residues above trading partners tolerance levels (or MRLs) in exported product using NRS data.

Any testing regimes instituted in Australia, either research or targeted surveys, can be identified to the regulatory agencies of countries importing Australian beef as "proactive" initiatives which should markedly reduce the possibility that, if further detections above tolerance level (or MRL) were to be made by an importing country, Australia would be required to enter a large, open ended program similar to that commenced in 1987 following organochlorine detections in America.

SUMMARY OF RESEARCH OUTCOMES

Withholding Periods

For all preparations trialed, the statutory WHPs were found to be adequate for all active constituents except one. For the cyfluthrin (Bayofly) treatment two carcases recorded loin fat residues of 0.34 mg/Kg on day 2 and 0.36 mg/Kg on day 3,(Australian MRL=0.2 mg/Kg). Another carcase at day 7 had a loin fat residue close to the Australian MRL at o.18 mg/Kg. The MRC Acaricide Research Steering Group has requested that the National Registration Authority review the nil withholding period.

Export Slaughter Intervals

Cypafly and Swot Buffalo Fly Insecticide,active:cypermethrin.

At a 21 day intertreatment interval the ESI is nominated as the withholding period(WHP) of 3 days.Owing to the residues of cypermethrin present after 3 days when a 14 day intertreatment interval was used it was decided that the NRA be requested to include the 21 day intertreatment stipulation on the label.

Looking at the results for the two cypermethrin preparations, Cypafly and Swot Buffalo Fly Insecticide, it is difficult to justify the statutory 3 day WHP, in view of the fact that the highest concentrations detected occurred beyond day 8.

Sumifly Buffalo Fly Insecticide,active:fenvalerate.

As residues were virtually non existent for this treatment, a nil ESI was recommended, the same as the WHP.

Bayofly Buffalo Fly Insecticide,active:cyfluthrin.

An ESI of 21 days was recommended due to the fact that residues did not fall below the USA tolerance until 22 days.Two animals were condemned on the basis of the Australian MRL so the NRA was supplied with the data and requested to review the WHP of nil.

Coopafly,buffalo,stable and house fly,and lice pour on insecticide,active:deltamethrin.

An ESI of 30 days was recommended because residues were still high at the 20 day sampling but had declined to near limit of detection at the final sampling at 30 days.

Grenade Cattle Dip and Buffalo Fly Spray,active:cyhalothrin.

It was not possible to recommend an ESI for this product due to the failure of residue levels to decline to near the USA tolerance by day 30.

Nucidol,Diazinon 200,Buff Fly Di backsprays,active:diazinon.

An ESI of 3 days, the same as the WHP, was recommeded due to residues of less than detection or only slightly above detection for all sampling days.

Nucidol,Diazinon 200 backrubbers,active:diazinon.

An ESI of 10 days was recommended with a proviso that this was only necessary where the Canadian market was relevant because of a seven times lower MRL for diazinon.The WHP of 3 days still applies.

Supona Buffalo Fly Insecticide backrubber,active:chlorfenvinphos.

It was possible to recommed a nil ESI, the same as the WHP, due to residues well below tolerances at all samplings.

Statistical Analyses

The full and comprehensive report compiled by the project statistician is included as Appendix A, Section 2 (pages 152 to 153) of this report.
As indicated in the report a model,represented by the following equation, was fitted with and without the P8/carcase weight term and the deviance was unchanged.
Residue = S (*time*) + *e*
Where S( ) represents a smoothing spline and *e* is an error term. Therefore the independant effects of the covariates P8 fat depth and carcase weight could not be determined. A large proportion of the loin fat samples from the Cypafly (21 day), Sumifly and Nucidol back spray group had residues that were below the limit of detection (76%, 100%, 96% respectively). No effect of the covariates on these insecticide residues could be determined.
For the remaining treatments a significant relationship was found between loin and renal residues by linear regression.
No effect of sex, age and breed was expected to be found due to the restricted range of these covariates within treatment groups.

Residual Concentrations In Perirenal Fat Compared To Subcutaneous Fat.

The relationship between subcutaneous,i.e.loin and perirenal fat residues,(labelled S and P in the table below)was satisfactorily modelled by simple linear regression for each insecticide. A summary of these relationships is provided in the table below.
The Cypafly, Sumifly and Nucidol backspray treatments all had residues below the limit of detection for a substantial number of samples and no relationship could be derived.

Product Name	Active	Chemical Class	P/S Ratio
Cypafly, Swot Buffalo Fly Spray (14 day)	cypermethrin	SP	1.3
Bayofly Buffalo Fly Insecticide	cyfluthrin	SP	1.1
Coopafly	deltamethrin	SP	0.94
Grenade Cattle Dip and Buffalo Fly Spray	cyhalothrin (spray)	SP	1.8
Diazinon 200	diazinon (backrubber)	OP	0.43
Supona	chlorfenvinphos (backrubber)	OP	0.46

By reference to the table of P/S ratios in the DAQ.096 report the following comparisons can be made(note that P/S is simply 1/regression coefficient or slope for the loin vs renal linear regression).
The P/S ratio for the synthetic pyrethroids cypermethrin and cyhalothrin, is confirmed to be similar in dips and sprays.
In contrast, the P/S ratio for deltamethrin as a pour-on, is reversed relative to dips.
The P/S ratio for the organophosphates diazinon and chlorfenvinophos was similar to that found for chlorfenvinphos in dip treatments.

Extension of Project Outcomes to Industry

In September 1994 NSW Agriculture organised a Buffalo Fly Management Workshop. To assist with the successful promotion of the workshop an Integrated Buffalo Fly Mangement Technical Manual was produced. As a result of the workshop an ongoing consultative committee was establised between regulators, graziers and retailers to assist with the reduction of pesticide usage and the implementation of alternative strategies such as fly traps.
NSW Agriculture has published management brochures,Controlling Buffalo Fly, for the past two seasons emphasizing outcomes of MRC residue trials and canvassing alternative control strategies to pesticides.

MAIN RESEARCH REPORT

PROJECT OBJECTIVES

1. Determine pesticide residues in export beef resulting from normal spray treatment regimes for buffalo fly.

   Normal treatment is to spray with the recommended concentration three times at 21 day intervals.

   An additional treatment has been included for cypermethrin. This is three treatments at 14 day intervals. This treatment is normal in some infested areas. The pesticides to be tested are cypermethrin, fenvalerate, cyfluthrin, cyhalothrin and diazinon.

2. Determine pesticide residues in export beef resulting from "pour on" treatment containing deltamethrin, using the recommended treatment interval of 21 days.

3. Determine pesticide residues in export beef resulting from impregnated back rubber treatments with diazinon and chlorfenvinphos.

4. Determine the effect of time elapsed between treatment and slaughter on pesticide residues.

5. Determine the effect of fat level (P8 site), weight, age and breed on residue levels.

6. Correlate loin fat and pesticide residue levels in commercial export pack core samples with renal fat sample levels as taken by NRS.

7. Integrate the results into joint recommendation for chemical manufacturers and Government agency extension programs for the cattle industry.

SAMPLING SCHEDULE

The following table defines the number and type of samples proposed for each treatment.

Sample Schedule

Treatment Code	Time Between Last Treatment and Slaughter (days for loin fat sample)										
	1	2	4	7	10	150	21	30	45	Control	Hair
A1 (21d)		2	2	6*	6*	6	6	3		3	5
A2 (14 d)		3	3	6*	6*	6	6	3	3	3	5
B		3	3	6*	6*	6	6	3		3	5
C		3	3	6*	6*	6	6	3		3	5
D		3	3	6*	6*	6	6	3		3	5
E		3	3	6*	6*	6	6	3		3	5
F (spray)		3	6	6*	6*	3				3	5
F (rub)	5	5	5*	5*	5					3	5
G	5	5	5*	5*	5					3	5

* Collection of renal fat and export pack core samples in addition to loin fats.

TREATMENT

A1 = Cypafly; cypermethrin, 200ml per animal of 950mg/L (ie ppm), back spray, 3 times at 21 day intervals.
A2 = Swot; as for A1, but at 14 day intervals, 3 times.
B = Sumifly; fenvalerate, 200ml per animal of 1,000mg/L, back spray.
C = Bayofly; cyfluthrin, 200ml per animal of 2,000mg/L, back spray.
D = Coopafly; deltamethrin, 3-15ml per animal of 25,000mg/L, pour on.
E = Grenade; cyhalothrin, 100ml per animal of 2,000mg/L, back spray.
F = Nucidol, (or Diazinon 200 of Buffifly Di); one treatment 500ml per animal of 800g/L back spray and back rubber at 10,000mg/L
G = Supona; chlorfenvinphos, at 10,000mg/L, back rubber.

NB. Where cattle were under departmental or reputable control and no previous treatment was verifiable, hair samples were not taken. A similar consideration was used for control animals.

CATTLE TREATMENT and SAMPLING

Details of cattle treatments and sampling are included in the Results and Discussion section.

CORE SAMPLING

These samples were taken from normal frozen export packs derived from the treated cattle.The normal export coring protocol was followed with two standard size augers

taken from each pack.The complete sample was melted and the combined homogenised sample was analysed.

ANALYTICAL METHODOLOGY

Synthetic Pyrethroids

Cypermethrin, Fenvalerate, Cyfluthrin, Deltamethrin, Cyhalothrin.
A modification of the Mills (1959) procedure as described in the Pesticides Analytical Manual, second ed. (1994) of the United States FDA,section 304 ,p15 was used. The fat sample was dissolved in petroleum ether and extracted twice with 40 ml of Acetonitrile. The combined extracts were reduced and then adsorbed and eluted from 10% water deatctivated florisil columns with 50% diethyl/ether. Residues were quantified and confirmed using gas chromatography with electron capture detection on 0.52 μm or 0.32 μm DB1 DB5 or DB1701 phases (J&W).

Organophosphate Pesticides

Diazinon and Chlorfenvinphos

The method that was used is a modification of the Mills, Oxley, Gaither procedure. The modification was necessary to obtain at least 80% recoveries for all analytes.

Fat was isolated by repetitive extractions with hexane. The analytes were extracted from the hexane/fat solution with acetonitrile and then back extracted into hexane by aqueous dilution of the acetonitrile extract. The solution was then purified by passage through a Florisil column. The final extracts were examined by gas-liquid chromatography with electron capture detection.

Quality Assurance

During the course of the trial formal proficiency tests involving cypermethrin, deltamethrin, cyfluthrin, fenvalerate and diazinon were completed. Samples containing several of the synthetic pyrethroid residues were exchanged with the ARI Residue Laboratory for interlaboratory comparisons.

RESULTS and DISCUSSION

The results for each treatment are included as follows in order of treatment in the Sampling Schedule.

CYPAFLY

Composition: 950mg/L cypermethrin as "Cypafly"

Withholding period: 3 days

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.5
USA	0.05
Codex	0.2

Sampling Schedule

Cattle (cows) owned by the Northern Cooperative Meat Co. at Casino were treated using a diaphragm pump powered by a small petrol engine. Verifiable company records show no buffalo fly treatments this season. The delivery was calibrated for time per 200ml application and total mixture delivered was correct according to delivery container volumes. The first spray interval was 21 days, the second spray interval was 20 days to allow for slaughter synchronisation with treatments B,C,D when a 3 day withholding period was provided.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle.

Owing to the large number of samples with residues below the level of report,LOR,it was not possible to determine any significant relationship between residue and time,or the dependance of loin fat residue on any other factor.

TREATMENT GROUP A1
CYPERMETHRIN (x 21d, x 20d)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
3		5		8		11		16		22		31	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
$<0.005^{9}$		$<0.005^{17}$		$<0.005^{9}$		$<0.005^{10}$	0.009	0.009^{17}		$<0.005^{8}$		$<0.005^{19}$	
$<0.005^{24}$		$<0.005^{27}$		$<0.005^{8}$		$<0.005^{12}$	0.007	0.007^{20}		$<0.005^{7}$		$<0.005^{8}$	
$<0.005^{30}$		$<0.005^{29}$		0.018^{12}	0.012	$<0.005^{11}$	<0.005	0.01^{11}		$<0.005^{12}$		$<0.005^{18}$	
				$<0.005^{1}$	0.020	$<0.005^{19}$	<0.005	$<0.005^{11}$					
				$<0.005^{20}$	0.010	$<0.005^{12}$	0.027	$<0.005^{7}$					
				0.014^{19}		0.013^{12}	<0.005	0.006^{10}					
				<0.005*		<0.005*							

* = Core pack

Superscript is P8 fat depth (mm).

SWOT

Composition: 950mg/L cypermethrin as "SWOT"

Withholding period: 3 days

MRL:

Sampling Schedule

Cattle,sourced from six different properties,were purchased at a local sale and were transferred to Pearces Creek Substation of Wollongbar Agricultural Institute. The group comprised yearling and older crossbred steers in store condition. Some residues of cyhalothrin were detected in fat samples probably owing to this group being run in a single mob with treatment group E. No cyhalothrin was detected in hair samples.,prior to treatment. Treatment was with battery powered "Silvan" pump and tank with calibrated time for 200ml delivery.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle.

Residues reached a maximum average of 0.05 mg/kg at day 10,the tolerance level in the USA.The maximum loin fat residue reached 0.12 mg/kg,half the Australian MRL.The ESI for this treatment was thus set at the witholding period of 3 days with a stipulation that the 21 day intertreatment interval applied.Perirenal fat residues were,on average ,a factor of 1.3 higher than loin,(subcutaneous), residues. Core pack residues were on average lower than the combined averages for all tha loin and renal fat samples on day 8 and day 11,i.e. 0.023 mg/kg core pack vs 0.065mg/kg for day 8 average residue.For day 11 the comparison was 0.059mg/kg core pack and 0.062mg/kg for the average of loin and renal.

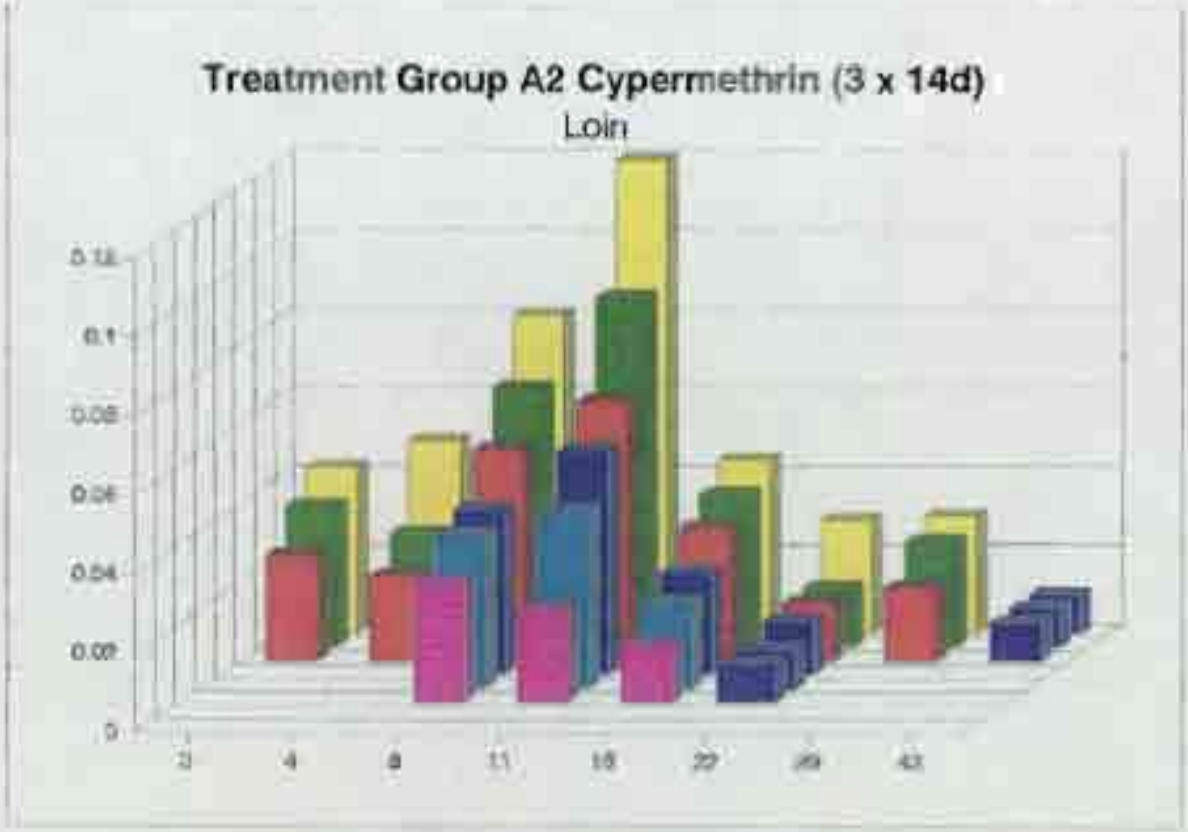
TREATMENT GROUP A2
CYPERMETHRIN (x 14d, x 13d)

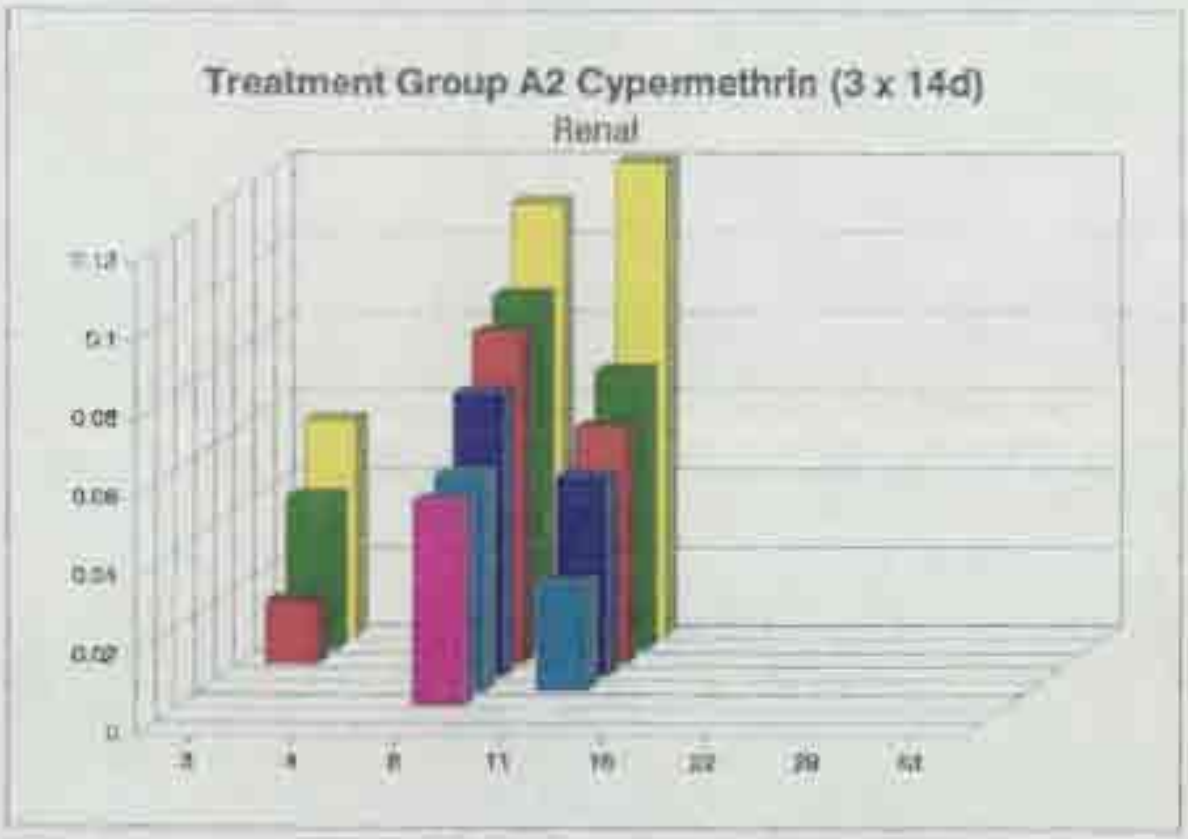
Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)															
3		4		8		11		16		22		29		43	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.036[4]	0.055	0.022[4]		0.031[5]	0.055	0.045[4]	---	0.034[2]		0.014[1]		0.030[1]		<0.01[4]	
0.027[6]	0.016	0.029[3]		0.039[4]	0.052	0.039[3]	0.051	0.044[3]		0.029[3]		0.027[4]		<0.01[4]	
0.042[10]	0.039	0.049[1]		0.042[4]	0.072	0.066[3]	0.071	0.015[4]		0.015[7]		0.019[3]		<0.01[1]	
				0.066[3]	0.090	0.12[2]	0.12	0.022[3]		<0.01[2]					
				0.081[2]	0.11	0.057[3]	0.060	0.026[2]		<0.01[2]					
				0.054[3]	0.084	0.024[2]	0.027	0.039[1]		0.015[3]					
				0.023 *		0.051 *									

* = Core pack

Superscript is P8 fat depth (mm).


Treatment Group A2 Cypermethrin (3 x 14d)
Loin


Treatment Group A2 Cypermethrin (3 x 14d)
Renal

SUMIFLY

Composition: 1,000mg/L fenvalerate as "SUMIFLY"

Withholding period: NIL

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.2
USA	1.5
Codex	1

Sampling Schedule

Cattle, styled "E.E.C. Steers" owned by the Northern Cooperative Meat Co. at Casino were treated using a diaphragm pump powered by a small petrol engine. The delivery was calibrated for time interval required for a 200ml application and total mixture delivered was correct according to delivery container volumes. Company records verified no previous treatment during that buffalo fly season.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle.

Due to all the loin samples having residues below the LOR no relationships could be determined between residue and time or any other covariate. The ESI was set at nil the same as the WHP.Perirenal residues were detectable and higher than loin at day 7.Both core pack samples were less than LOR.

TREATMENT GROUP B
FENVALERATE (x 21d)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
2		4		7		10		15		21		30	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
$<0.01^{12}$		$<0.01^{16}$		$<0.01^{11}$	0.012	$<0.01^{11}$	<0.01	$<0.01^{14}$		$<0.01^{20}$		$<0.01^{10}$	
$<0.01^{9}$		$<0.01^{16}$		$<0.01^{7}$	0.012	$<0.01^{12}$	<0.01	$<0.01^{14}$		$<0.01^{9}$		$<0.01^{15}$	
$<0.01^{19}$		$<0.01^{18}$		$<0.01^{9}$	0.009	$<0.01^{7}$	<0.01	$<0.01^{26}$		$<0.01^{13}$		$<0.01^{14}$	
				$<0.01^{18}$	0.014	$<0.01^{14}$	<0.01	$<0.01^{20}$					
				$<0.01^{12}$	0.009	$<0.01^{9}$	<0.01	$<0.01^{4}$					
				$<0.01^{17}$	0.008	$<0.01^{12}$	<0.01	$<0.01^{10}$					
				<0.01*		<0.01*							

* = Core pack
Superscript is P8 fat depth (mm).

BAYOFLY

Composition: 2,000mg/L cyfluthrin as "Bayofly"

Withholding period: NIL

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.2
USA	0.05
Codex	---

Sampling Schedule

In January 1994 treatments were commenced according to the treatment Schedule using Northern Co-Op Meat Co. cattle. After treatment was completed formulation analysis revealed that the second of three treatments was half strength. It was likely this had occurred due to only one sachet instead of two being mixed in 10 L The treatment was repeated starting in December 1994 using steers owned by Northern Co-Op Meat Co. Treatment was with a car battery powered "Silvan" pump with a volume marked tank. Application was metered by time for 200ml delivery. Tank volume was also monitered for correct application rate. The second,(correct)treatment was commenced in December 1994 using cattle supplied by the Northern Cooperative Meat Company at Casino.The herd comprised aneven line of 3 &1/2 to 4 year old hereford steers. Results for both treatments are reported as follows. Company records verified no previous treatments for each group of cattle in each buffalo fly season.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle.

The residues of cyfluthrin steadily declined from an early plateau. Two carcases had to be condemned at day 2 and day 3 for levels of 0.34 mg/kg and 0.36 mg/kg which exceeds the Australian MRL of 0.2 mg/kg. A recommendation was made to regulatory authorities that the nil witholding period be reviewed. The ESI was set at 21 days because residues did not decline to below the USA tolerance of 0.05 mg/kg until day 22. Caution is required in interpreting the P/S ratio in the table above because this ratio as calculated is the inverse of the linear regression slope. The regression equation derived has a loin axis intercept of 0.024 mg/kg. If the perirenal residues are averaged and divided by the average of the matching subcutaneous(loin) sample residues the ratio becomes 0.85. The core pack sample residue

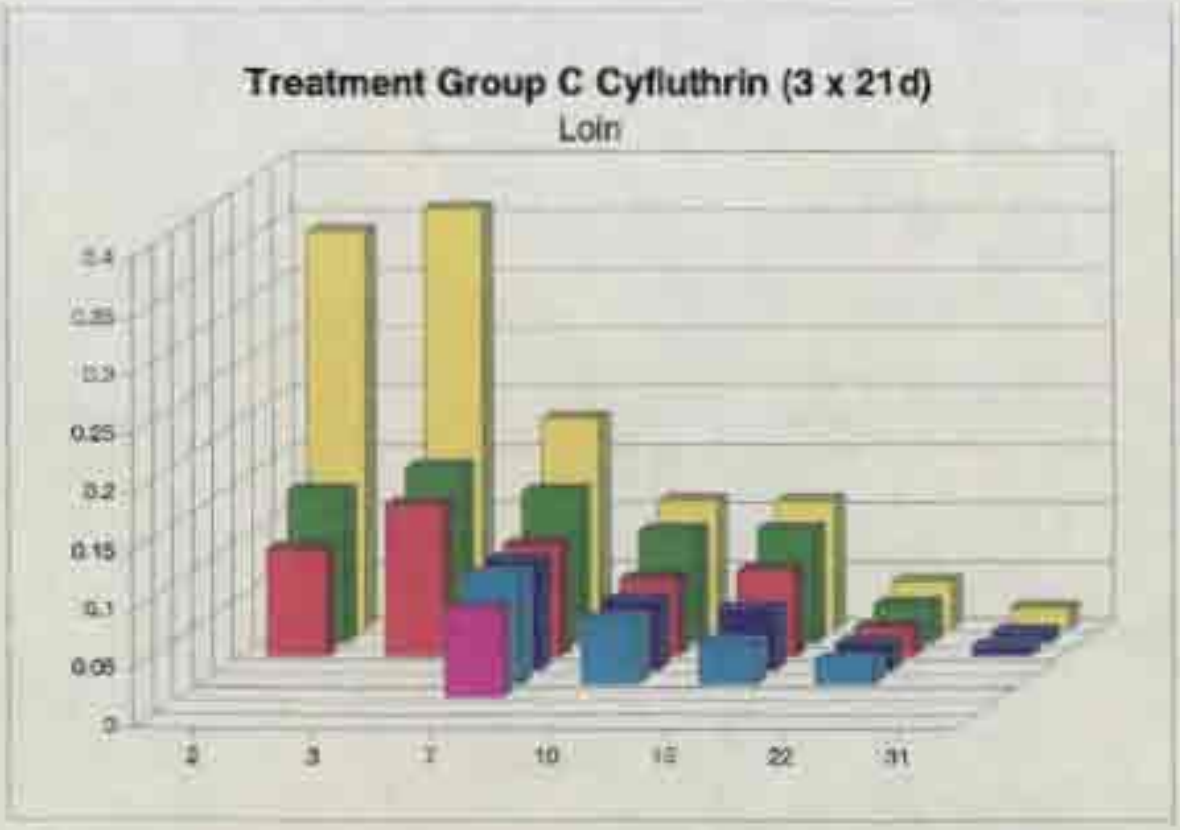
levels are lower than the average of the combined loin and renal residue levels of 0.10 mg/kg on day7 ,but in a similar range for day 10 where the average is 0.070 mg/kg.

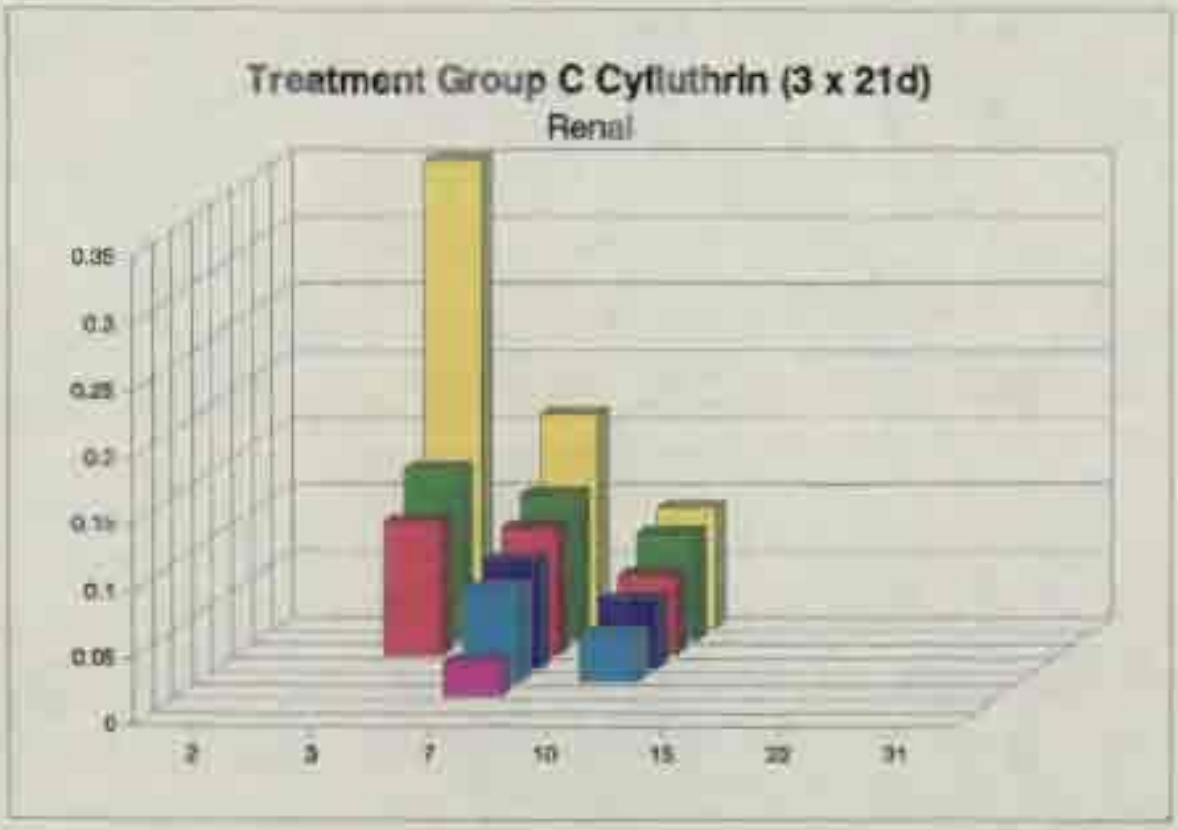
TREATMENT GROUP C
CYFLUTHRIN (x 21d)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
2		3		7		10		15		22		31	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.13^{17}		0.13^{20}	0.10	0.077^{28}	0.026	0.11^{14}	0.090	0.075^{25}		0.034^{29}		$<0.01^{19}$	
0.34^{18}		0.36^{16}	0.35	0.13^{22}	0.095	0.067^{20}	0.060	0.053^{17}		0.024^{22}		$<0.01^{19}$	
0.092^{11}		0.15^{18}	0.13	0.096^{22}	0.081	0.097^{19}	0.081	0.11^{21}		0.021^{25}		0.019^{18}	
				0.18^{14}	0.16	0.060^{28}	0.052	0.036^{22}		0.025^{31}			
				0.095^{21}	0.071	0.056^{18}	0.037	0.098^{25}		0.041^{17}			
				0.095^{27}	0.11	0.079*							
				0.041*		0.056*							

* = Core pack
Superscript is P8 fat depth (mm).


Treatment Group C Cyfluthrin (3 x 21d)
Loin
0.25
0.2
0.15
0.1
0.05
0
2
3
7
10
22
31


Treatment Group C Cyfluthrin (3 x 21d)
Renal
0.35
0.3
0.25
0.2
0.1
0.05
0
2
3
7
10
15
22
31

TREATMENT GROUP C
CYFLUTHRIN (x 21d) †

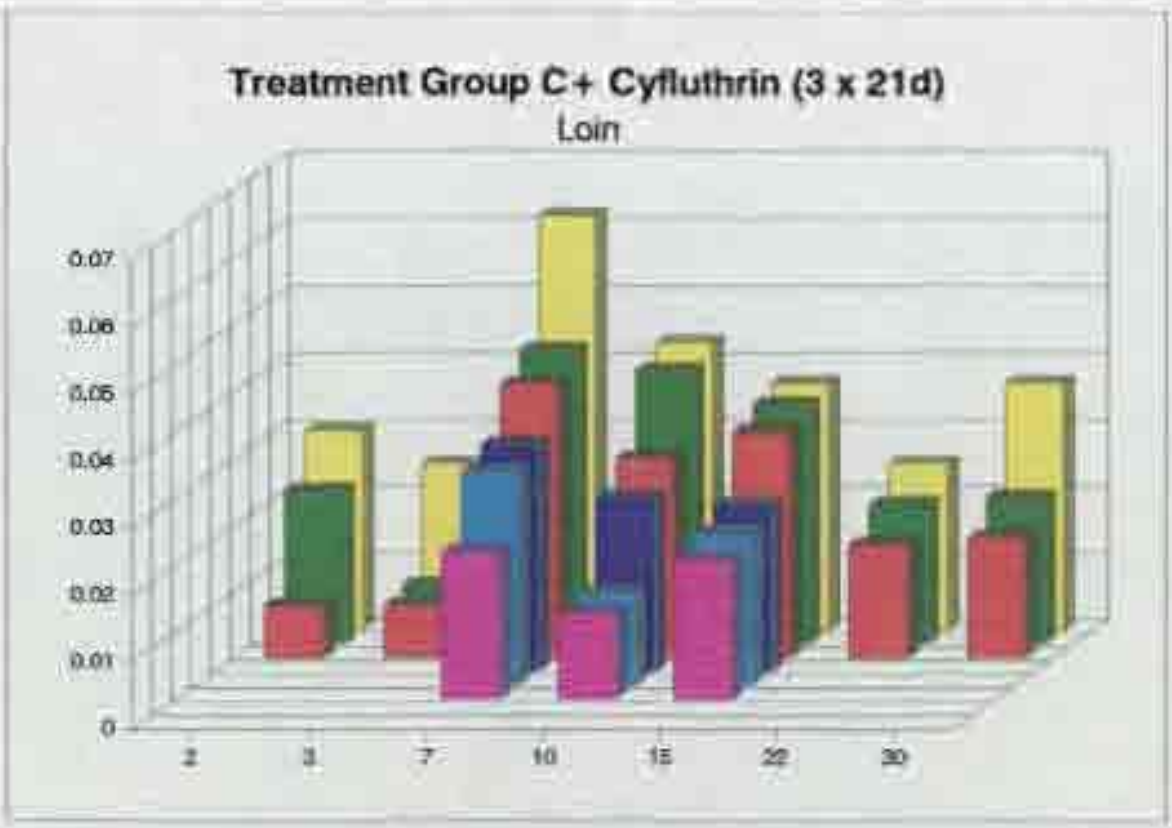
Concentration (mg/Kg)

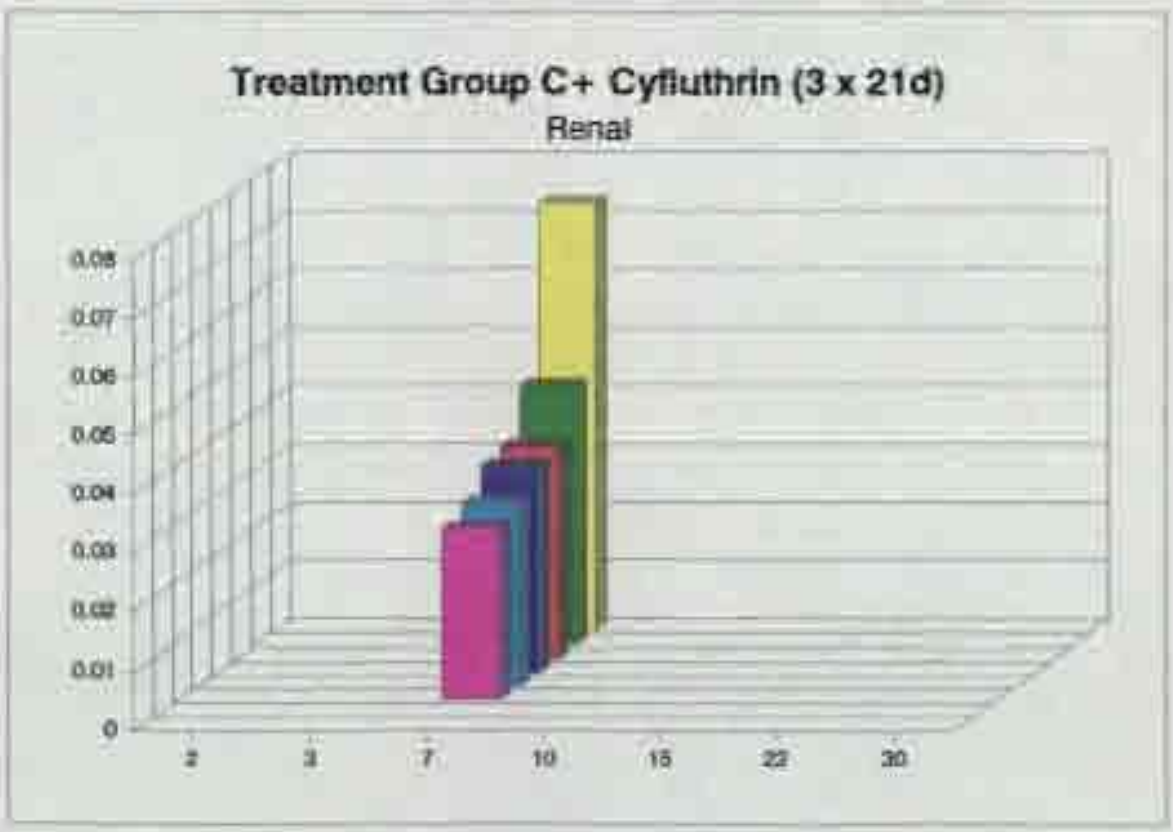
Time Between Treatment and Slaughter (Days)													
2		3		7		10		15		22		30	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.030[11]		0.025[8]		0.032[21]	0.031	0.043[13]		0.037[18]		0.021[22]		0.037[15]	
0.023[11]		0.009[13]		0.044[14]	0.044	0.026[20]		0.036[12]		0.025[10]		0.018[9]	
0.008[17]		0.008[8]		0.022[12]	0.029	0.030[11]		0.025[15]		0.017[17]		0.022[17]	
				0.034[15]	0.035	0.013[9]		0.034[19]					
				0.062[11]	0.073	0.014[17]		0.021[12]					
				0.041[12]	0.036	0.041[22]		0.023[28]					
				0.038*		0.041*							

* = Core pack

Superscript is P8 fat depth (mm).

† = Second treatment at half strength.


Treatment Group C+ Cyfluthrin (3 x 21d)
Loin
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2
3
7
10
15
22
30


Treatment Group C+ Cyfluthrin (3 x 21d)
Renal
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2
3
7
10
15
22
30

COOPAFLY

Composition: 25,000mg/L deltamethrin as "COOPAFLY"

Withholding period: NIL

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.5 (NSW) 0.1 (QLD)
USA	(0.01)
Codex	0.5

Sampling Schedule

Cattle (cows) owned by the Northern Co-Op Meat Co. were treated with the measured dose of pour-on chemical for the estimated weight of each animal. Company records verified no previous treatment during that buffalo fly season.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle.

The residues of deltamethrin did not fall to below 0.02 mg/kg until day 30 so an ESI of 30 days was set in order to comply with the USA market.The core pack samples had residue levels much lower than the residues in loin and renal samples.The slope obtained in the linear regression of loin residues had a relatively high standard error of 0.378 +/- 1.07.

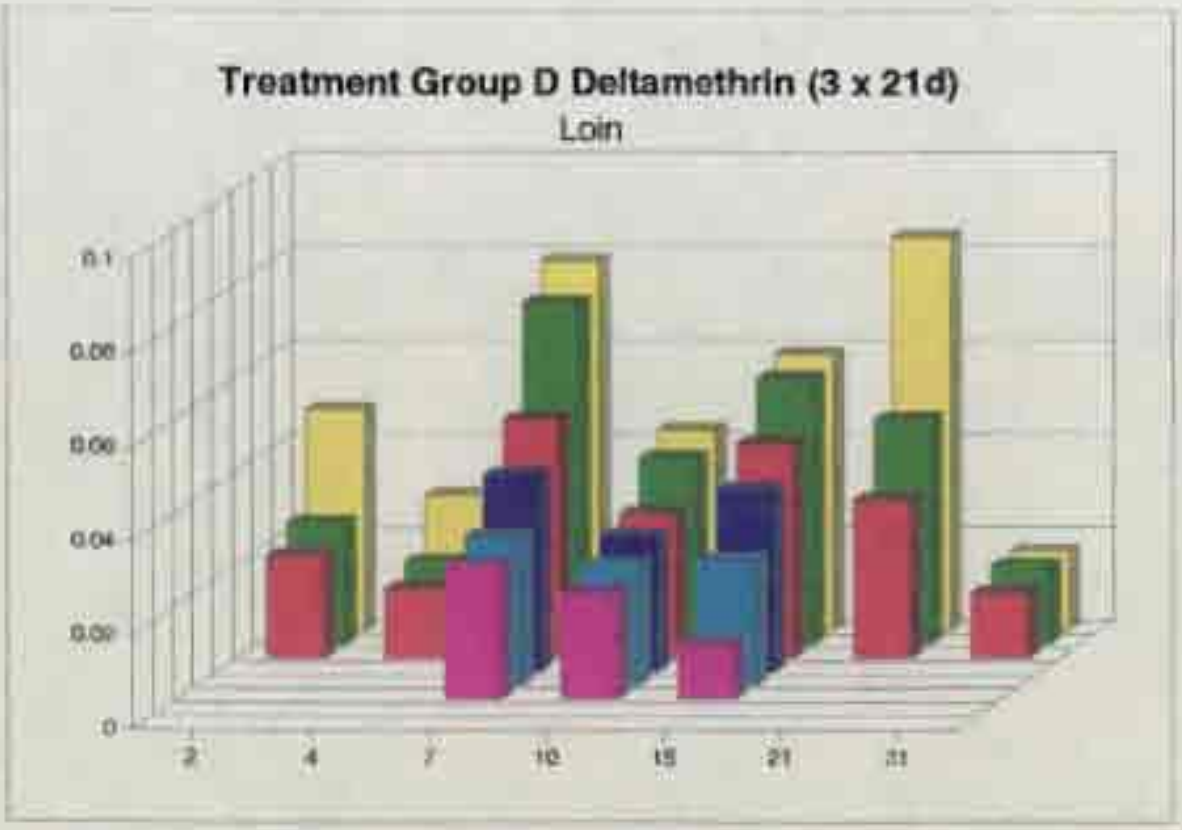
TREATMENT GROUP D
DELTAMETHRIN (x 21d)

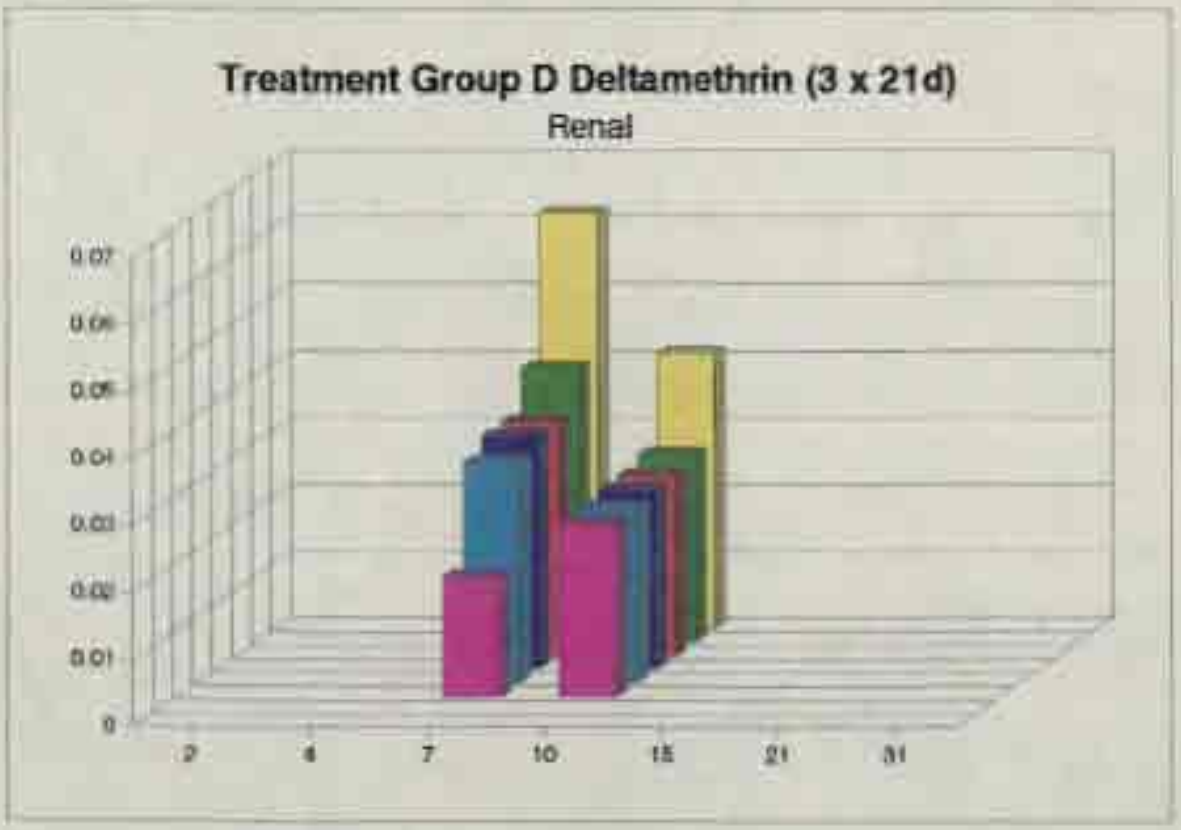
Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
2		4		7		10		15		21		31	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.026^{20}		0.015^{17}		0.073^{10}	0.033	0.043^{17}	0.041	0.027^{32}		0.084^{8}		0.017^{18}	
0.022^{15}		0.018^{15}		0.032^{13}	0.035	0.029^{6}	0.026	0.012^{24}		0.048^{16}		0.017^{24}	
0.047^{11}		0.029^{33}		0.079^{9}	0.062	0.023^{14}	0.027	0.039^{15}		0.034^{14}		0.014^{15}	
				0.029^{6}	0.035	0.026^{21}	0.026	0.059^{12}					
				0.042^{11}	0.018	0.040^{4}	0.027	0.057^{12}					
				0.051^{14}	0.041	0.031^{9}	0.028	0.046^{16}					
				0.010*		0.006*							

* = Core pack

Superscript is P8 fat depth (mm).


Treatment Group D Deltamethrin (3 x 21d)
Loin
0.1
0.08
0.06
0.04
0.02
0
2
4
7
10
15
21
31


Treatment Group D Deltamethrin (3 x 21d)
Renal
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2
4
7
10
15
21
31

GRENADE

Composition: 2,000mg/L cyhalothrin as "GRENADE".

Withholding period: NIL

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.5
USA	(0.02)
Codex	---

Sampling Schedule

Cattle were purchased at a local sale and were transferred to Pearces Creek substation of Wollongbar Agricultural Institute. The group comprised yearling and older crossbred steers in store condition. Six different properties provided cattle for the trial group which also included split treatment of the same mob for cypermethrin (Treatment group A2). No cyhalothrin was detected in hair samples. Treatment was with a battery (12V) powered pump and tank, "Silvan", with a 100ml metered dose, calibrated by time and checked post treatment by tank residual volume.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle

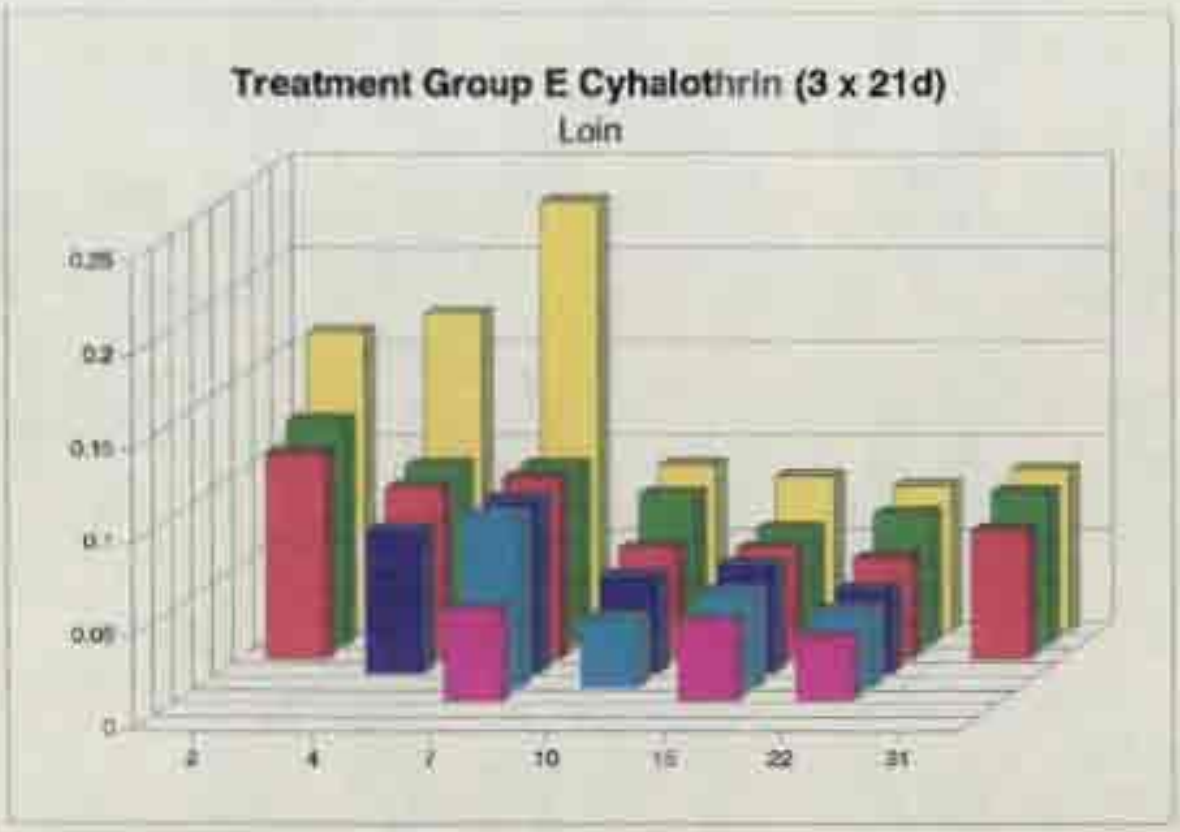
Residues plateaued between day 15 and day 30 well above the USA tolerance of 0.02 mg/kg so this perparation was designated 'Not Recommended ' for usage.The core pack residue sample was lower than the combined day 7 loin and renal residue average at 0.11 mg/kg.The linear regression of loin residues on renal gave a slope of 0.555 but with a standard error of 0.212.The loin axis intercept of the regression line was also quite high at 0.044 mg/kg.The average of renal sample residues on day 7 divided by the average for the matching loin samples was 1.03.

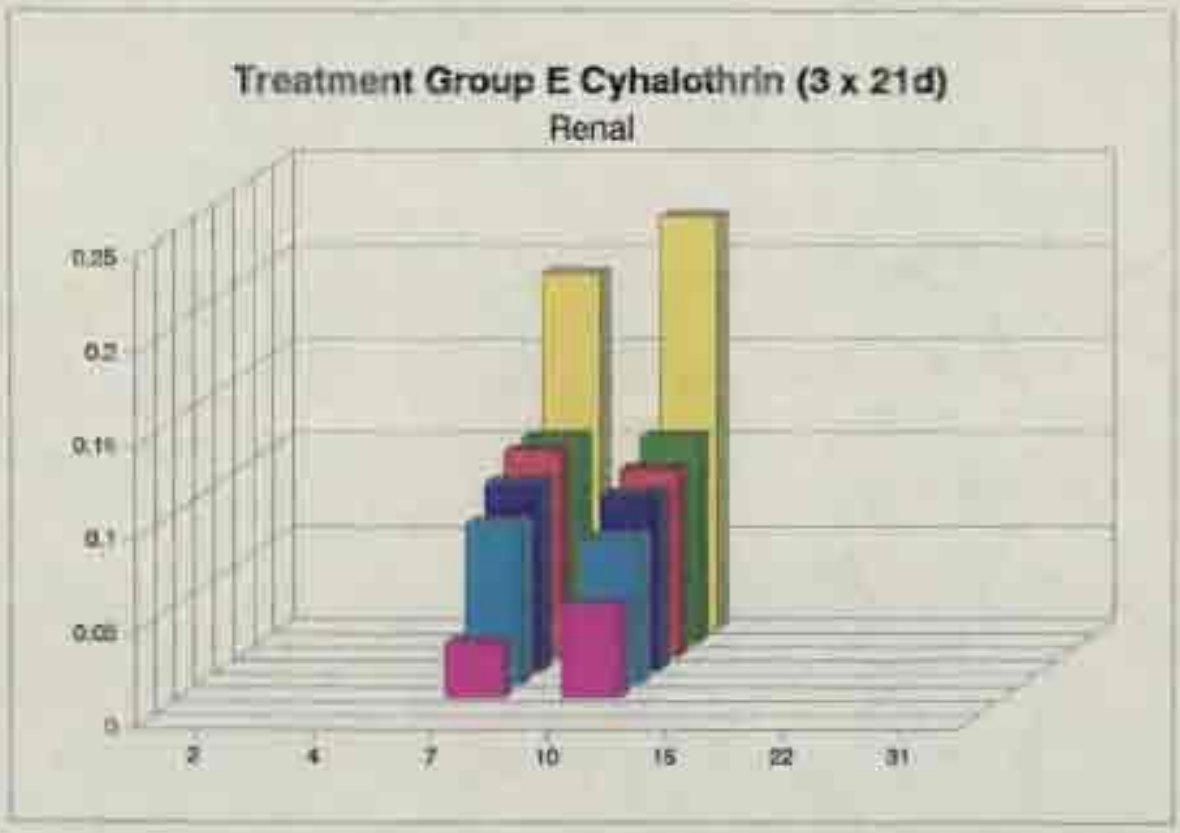
TREATMENT GROUP E
CYHALOTHRIN (x 20d, x 21d)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
2		4		7		10		15		22		31	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.11^{1}		0.092^{3}		0.092^{3}	0.030	0.088^{4}	0.078	0.083^{4}		0.054^{1}		0.087^{6}	
0.16^{3}		0.097^{1}		0.097^{2}	0.10	0.096^{2}	0.10	0.043^{3}		0.034^{1}		0.082^{5}	
0.12^{3}		0.077^{1}		0.049^{1}	0.11	0.12^{0}	0.11	0.051^{3}		0.041^{1}		0.069^{3}	
		0.17^{1}		0.097^{3}	0.086	0.12^{3}	0.22	0.060^{3}		0.045^{1}			
				0.23^{2}	0.19	0.10^{4}	0.094	0.058^{3}		0.071^{2}			
				0.093^{0}	0.11	0.050^{1}	0.050	0.063^{1}		0.078^{0}			
				0.073*									

* = Core pack
Superscript is P8 fat depth (mm).


Treatment Group E Cyhalothrin (3 x 21d)
Loin
0.25
0.2
0.15
0.1
0.05
0
2
4
7
10
15
22
31


Treatment Group E Cyhalothrin (3 x 21d)
Renal
0.25
0.2
0.15
0.1
0.05
0
2
4
7
10
15
22
31

NUCIDOL

Composition: 800mg/L diazinon as "NUCIDOL"

Withholding period: 3 days

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.7
USA	0.7
Codex	0.7
Canada	0.1
E.U.	0.5

Sampling Schedule

Cattle (steers) owned by the Northern Co-Op Meat Co. were treated once with a diaphragm pump powered by a petrol engine. Application rate was metered for delivery time and checked against residual container volume after treatment. Company records verified no previous treatment during that buffalo fly season.

See Appendix B for actual spray concentrations and recommended application rate.

See Appendix C for weights and age of cattle

Due to the large number of fat samples with diazinon levels below LOR the ESI was set at the witholding period of three days,for the spray.No other relationships could be determined.

TREATMENT GROUP F
DIAZINON SPRAY

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)													
2		4		7		10		14		16		Controls 14	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
$<0.05^{21}$		$<0.05^{16}$	<0.05	$<0.05^{18}$	<0.05	$<0.05^{15}$		$<0.05^{27}$		$<0.05^{20}$		$<0.05^{14}$	
$<0.05^{8}$		$<0.05^{33}$	<0.05	$<0.05^{19}$	<0.05	$<0.05^{13}$		$<0.05^{21}$		$<0.05^{25}$		$<0.05^{8}$	
$<0.05^{22}$		0.08^{38}	<0.05	$<0.05^{15}$	<0.05	$<0.05^{25}$		$<0.05^{15}$		$<0.05^{20}$		$<0.05^{19}$	
		$<0.05^{44}$	<0.05	$<0.05^{33}$	<0.05	$<0.05^{19}$							
		$<0.05^{14}$	<0.05	$<0.05^{30}$	<0.05	$<0.05^{20}$							
		$<0.05^{17}$	<0.05	$<0.05^{25}$	<0.05	$<0.05^{11}$							

Superscript is P8 fat depth (mm).

DIAZINON 200

Composition: 10,000mg/L diazinon as "DIAZINON 200"

Withholding period: 3 days

Mrl Or Tolerance Level (USA) See Diazinon Spray

Sampling Schedule

Animals slaughtered at 1 and 2 days post treatment were exposed to the backrubber for 10 days. All other animals were exposed for at least 19 days prior to slaughter. This trial was conducted at a time when buffalo numbers are traditionally low.
A salt lick was placed near the backrubber to ensure regular use. However this inducement was not required as the cattle were seen to be covered with oil soon after the backrubber was introduced to the paddock and used it regularly thereafter.
The animals were held in a paddock without access to a backrubber for the specified time period prior to slaughter. This trial was conducted at QDPI, Utchee Creek Research Station, Innisfail, North Queensland. Previously untreated stock were supplied.

See Appendix C for weights and age of cattle

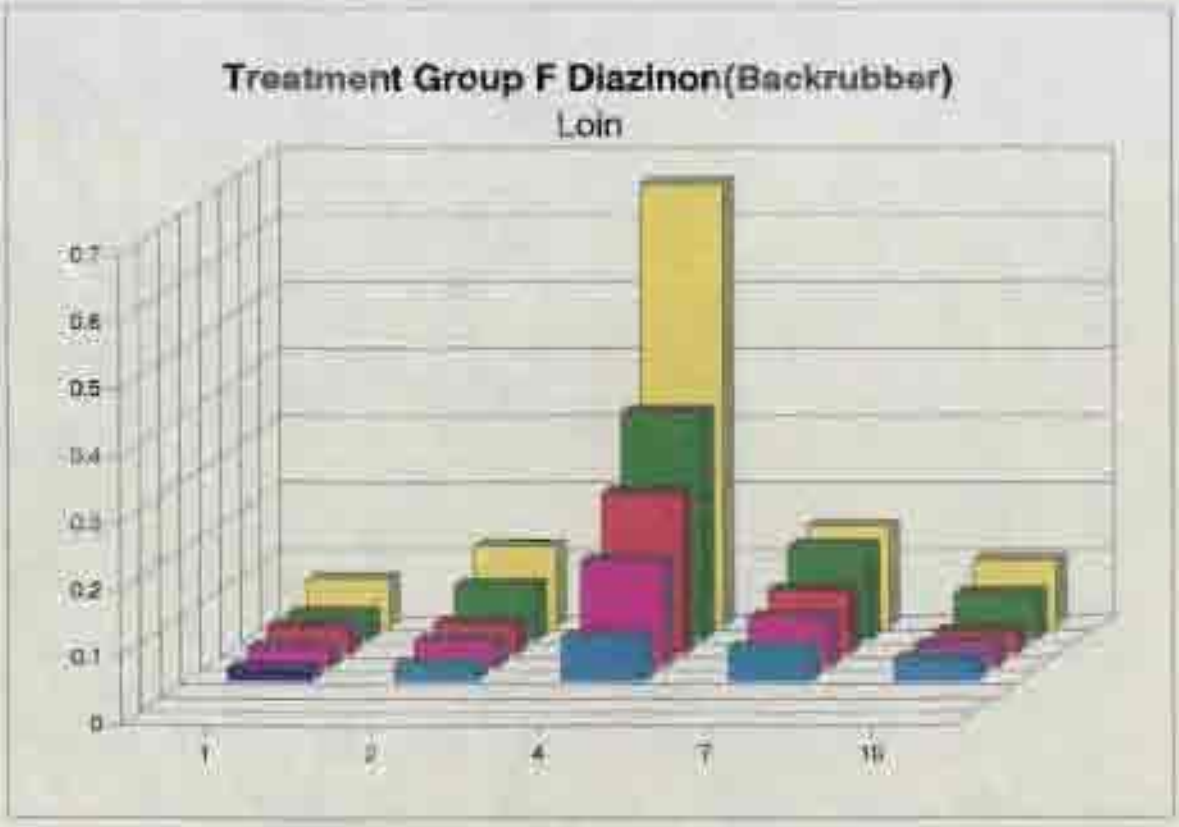
Residues of diazinon were well below all tolerances except the Canadian of 0.1 mg/kg and the ESI was set at 10 days only for the Canadian market,the witholding period still applied as the ESI for all other markets. Core pack samples were not taken as cattle were processed at a domestic abattoir.Loin sample residues were higher by a factor of more than two than renal samples,i.e. P/S of 0.43 which is not unexpected owing to the backrubber formulation being applied diectly to the loin in many instances at very high concentrations. There was no formulation sampling due to expected unreliability and variability within each applicator.

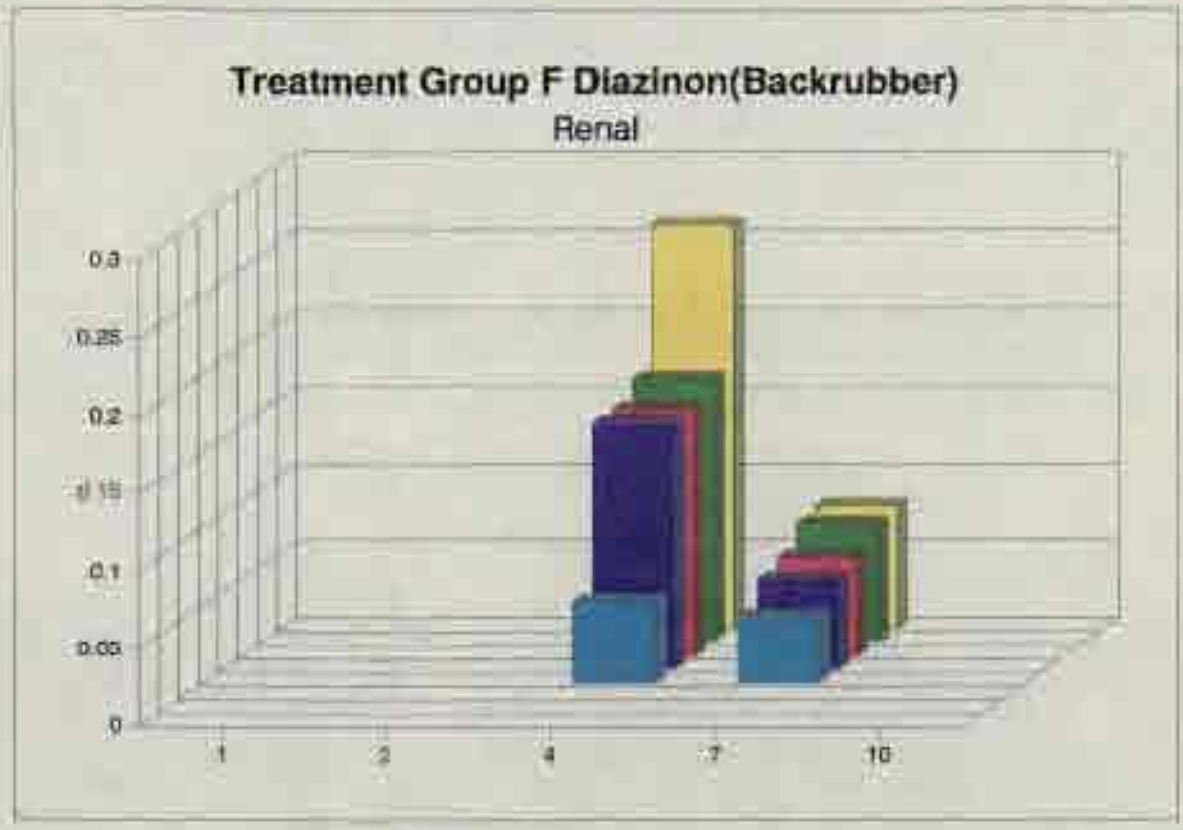
TREATMENT GROUP F
DIAZINON (BACKRUBBER)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)									
1		2		4		7		10	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.071^{6}		0.082^{12}		0.66^{8}	0.26	0.096^{8}	0.076	0.034^{7}	
0.041^{6}		0.046^{8}		0.24^{9}	0.16	0.050^{12}	0.079	0.034^{9}	
$<0.020^{7}$		0.041^{6}		0.066^{6}	0.052	0.14^{9}	0.058	0.034^{13}	
0.31^{6}		0.12^{10}		0.16^{6}	0.16	0.15^{10}	0.063	0.099^{10}	
0.041^{10}		0.026^{10}		0.34^{14}	0.17	0.076^{9}	0.043	0.070^{15}	

Superscript is P8 fat depth (mm).


Treatment Group F Diazinon(Backrubber)
Loin
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
4
7
10


Treatment Group F Diazinon(Backrubber)
Renal
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
4
7
10

SUPONA

Composition: 16,000mg/L chlorfenvinphos as "SUPONA"

Withholding period: NIL

MRL OR TOLERANCE LEVEL (USA)

	mg/Kg
Australia	0.2
USA	0.2
Codex	0.2

Sampling Schedule

All animals in the trial were exposed to the backrubber for a minimum of three weeks. The backrubber was then either removed or the animals were placed in an adjacent paddock prior to slaughter. The buffalo fly challenge was significantly high to ensure regular usage. This trial was conducted at QDPI, Utchee Creek Research Station, Innisfail, North Queensland. Previously untreated stock were supplied.

See Appendix C for weights and age of cattle

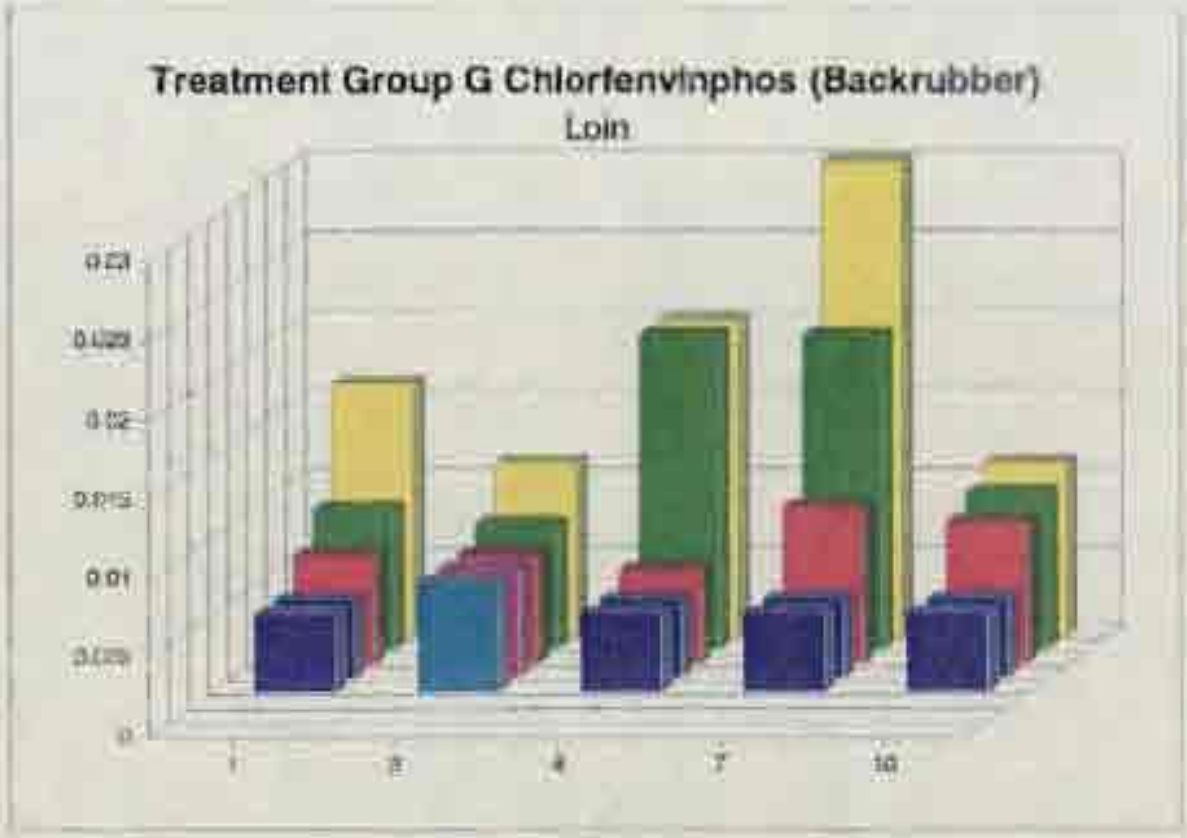
Residues of chlofenvinphos never approached even half of the internatinal tolerance at 0.2 mg/kg so the ESI was set at the witholding period of nil. Core pack samples could not be taken because cattle wwere processed at a domestic abattoir.Loin residues were ,not unexpectedly ,on average double the renal residues.

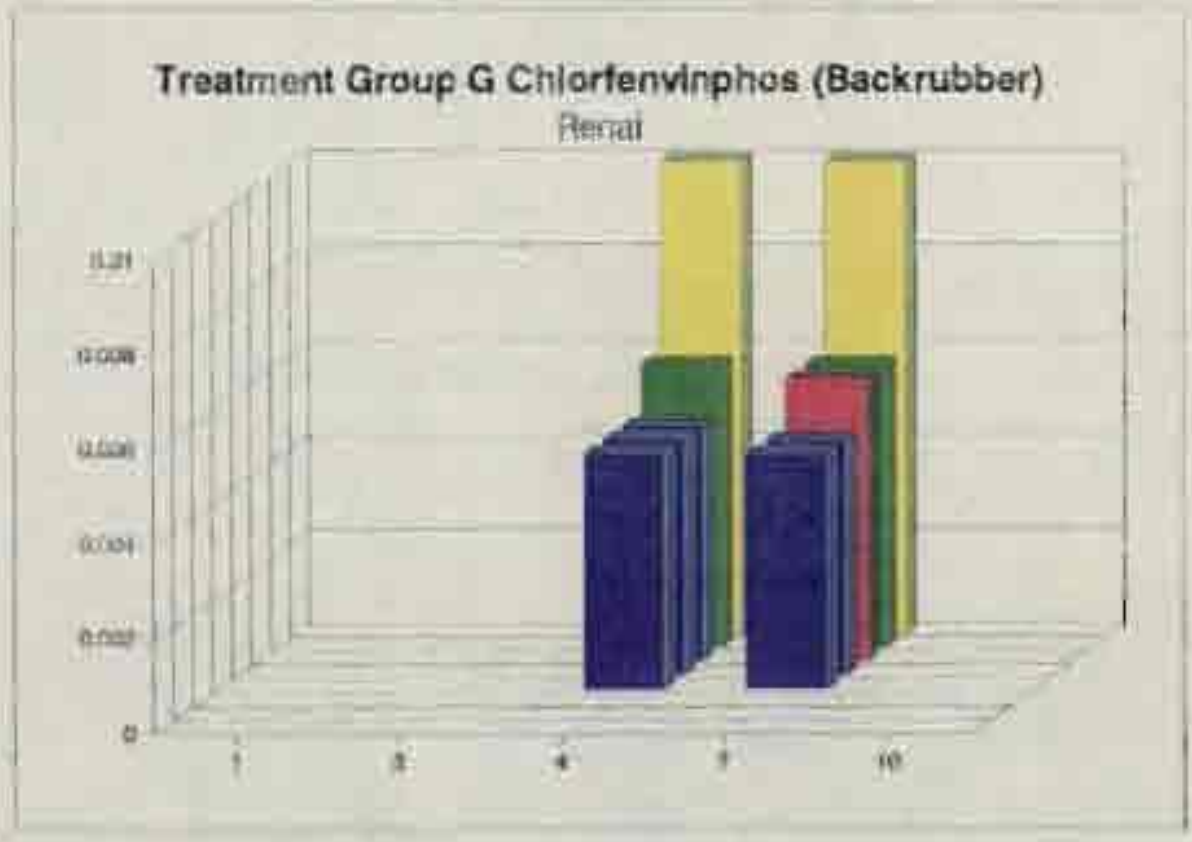
TREATMENT GROUP G CHLORFENVINPHOS (BACKRUBBER)

Concentration (mg/Kg)

Time Between Treatment and Slaughter (Days)									
1		2		4		7		10	
Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal	Loin	Renal
0.009[10]		0.008[12]		0.02[23]	0.006	0.01[12]	0.006	<0.005[16]	
0.016[16]		0.007[10]		0.006[14]	<0.005	0.02[17]	0.01	0.011[15]	
<0.005[20]		0.007[15]		<0.005[9]	<0.005	<0.005[14]	<0.005	<0.005[10]	
0.007[18]		0.007[16]		0.02[15]	0.01	0.03[10]	0.006	0.009[14]	
<0.005[8]		0.011[11]		<0.005[9]	<0.005	<0.005[13]	<0.005	0.01[8]	

Superscript is P8 fat depth (mm).


Treatment Group G Chlorfenvinphos (Backrubber)
Loin


Treatment Group G Chlorfenvinphos (Backrubber)
Renal

GENERAL DISCUSSION.

The promulgated ESIs are inluded in an MRC document listed in the DAQ.096 Report,Appendix A,"EXPORT SLAUGHTER INTERVALS for CATTLE ECTOPARASITICIDES,SEPTEMBER 1995". There has been wide acceptance by producers,agents and processors of the ESI concept. In general, corepack samples have been shown to have lower residues than the corresponding averages of loin and renal samples,but it would be advisable to treat this conclusion with caution. Individual samples could still provide spot levels unrelated to average values. In general this trial did not reveal a relatioship between residue and p8 depth of carcase weght,in contrast to the dip trial conducted in Queensland.Carcase weight and P8 depth,however demonstrated the expected high correlation. Good correlations between loin and renal residues were shown but in the absence of a consistent relationship for all pesticides it was not possible to recommend that loin be substituted for renal as the regulatory tissue for pesticide testing. Nevertheless for a particular pesticide it may be possible to predict loin residues from current renal sample results. Owing to the narrow range of ages,breeds and sex within each treatment it would not have been possible to derive any effect of these variables(covariates) on residue level.

APPENDIX A - STATISTICIANS REPORT

Prepared by Stephan Morris, Biometrician, NSW Agriculture.

1) Introduction.

In this study, 10 insecticide treatments were applied to cattle groups containing 25 to 36 cattle. At various times after application, subgroups of 3 to 6 animals were randomly selected from each treatment group and slaughtered. Carcass weights, P8 fat depth and residues in loin samples were recorded at each slaughter. Residues in renal samples were also recorded at two consecutive times during the slaughter schedule of each group.

The aim of the study was to determine the effect on residues of time elapsed after application, P8 fat and carcass weight. It was also of interest to examine correlations between loin and kidney (renal) residue levels.

2) Analyses.

2.1) Effects on loin residue levels.

A large proportion of the loin samples from the Cypafly, Sumifly and Nucidol back spray groups had residues that were below the limit of detection (76\%, 100\% and 96\% respectively) and no effect of the covariates on these insecticide residues could be determined.

A preliminary analysis of the relationship between P8 fat depth and carcass weight demonstrated significant positive correlations for six of the seven remaining treatment groups. Therefore the independent effects of these covariates on loin residues could not be determined.

The effect of time, P8 or carcass weight on loin residue levels was analysed by fitting the additive model (Hastie \& Tibshirani (1989)):

$$\text{residue} = s(\text{time}) + s(x) + e$$

where the function s() represents a smoothing spline, x is either P8 or carcass weight and e is an error term assumed to be normally and independently distributed about 0.

The additive effect of P8 and carcass weight was assessed by dropping their terms from the models and comparing the resulting change in model deviance to the appropriate chi-squared statistic. It was found that P8 and carcass weight had no effect on residues for all insecticides.

However, a significant trend with time was found for all treatments.

2.2) Loin Vs. Renal residues

The relationship between loin and renal residues was well fitted by a simple linear regression for each insecticide. However, it is important to note that this relationship may have changed if renal samples had been taken at every slaughter rather than on two consecutive occasions early in the trial.

Summaries of the model parameters are contained in table 1.

INSECTICIDE		INTERCEPT (se)	SLOPE (se)	R^2
A2	Cypafly (14d)	0.002 (0.008)	0.774 (0.116)	78%
C1	Bayofly(1/2 strength)	0.007 (0.006)	0.781 (0.140)	88%
C	Bayofly	0.024 (0.007)	0.952 (0.053)	96%
D	Coopafly	0.006 (0.013)	1.069 (0.378)	44%
E	Grenade	0.044 (0.025)	0.555 (0.212)	41%
F2	Nucidol backrub	-0.064 (0.052)	2.330 (0.394)	82%
G	Supona	0.002 (0.003)	2.183 (0.504)	71%

Table 1: Estimates of parameters from regressions of loin residues on renal residues for each treatment.

Reference:
Hastie, T. & Tibshirani, R. (1990) "Generalised Additive Models."
Chapman and Hall, London.
\end{document}

APPENDIX B - TREATMENT DATE AND FORMULATION CONCENTRATION

Treatment No.	Date Sprayed	Proprietary Chemical	Pesticide	Nominal (mg/L) Concentration	Calculated (mg/L) Concentration	Application Rate
A1	24/01/94 14/02/94 06/03/94	Cypafly	Cypermethrin	950	703 800 700	200ml
A2	20/12/94 03/01/95 16/01/95	Swot	Cypermethrin	950	960 850 870	"at least" 200ml
B	24/01/94 14/02/94 07/03/94	Sumifly	Fenvalerate	1000	1000 980 1140	200ml
C	19/12/94 09/01/95 30/01/95	Bayofly	Cyfluthrin	2000	1750; 1520 1960 1830	200ml
C+	24/01/94 14/02/94 07/03/94	Bayofly	Cyfluthrin	2000	1760 820[1] 1680	200ml
D	24/01/94 14/02/94 07/03/94	Coopafly	Deltamethrin	25000	26200 26100 22500	3-15ml
E	20/12/94 09/01/95 30/01/95	Grenade	Cyhalothrin	2000	1870 1440 1480	50-100ml
F	05/12/94	Nucidol	Diazinon	800	210 150 553[2]	500ml

1 Second Bayofly application at half strength (non compliant with experimental protocol), treatment repeated, reported as C+.

2 Two small subsamples of the diazinon (10ml in plastic vials) was taken as well as 250ml. There is some evidence for rapid aging of made up solutions.

N.B. Both backrubber treatment formulations were not sampled due to expected continuous variations in concentration.

APPENDIX C - RAW DATA

A1 - CYPAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cypermethrin Concentration Loin Fat	Cypermethrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
3	633	Mixed Breed	Female	Dent 8	228.6	9	<0.005		703
3	722	Mixed Breed	Female	Dent 8	211.8	24	<0.005		800
3	619	Mixed Breed	Female	Dent 8	230.8	30	<0.005		700
5	631	Mixed Breed	Female	Dent 8	236.2	17	<0.005		
5	230	Mixed Breed	Female	Dent 8	261.6	27	<0.005		
5	165	Mixed Breed	Female	Dent 8	218.6	29	<0.005		
8	400	Mixed Breed	Female	Dent 8	207.6	9	<0.005		
8	638	Mixed Breed	Female	Dent 8	292.8	8	<0.005		
8	612	Mixed Breed	Female	Dent 8	238.0	12	0.018	0.012	
8	614	Mixed Breed	Female	Dent 8	280.0	1	<0.005	0.020	

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cypermethrin Concentration Loin Fat	Cypermethrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
8	754	Mixed Breed	Female	Dent 8	237.8	20	<0.005	0.010	
8	671	Mixed Breed	Female	Dent 8	284.4	19	0.014		
11	640	Mixed Breed	Female	Dent 8	271.8	10	<0.005	0.009	
11	623	Mixed Breed	Female	Dent 8	237.4	12	<0.005	0.007	
11	632	Mixed Breed	Female	Dent 8	260.6	11	<0.005	<0.005	
11	700	Mixed Breed	Female	Dent 8	233.6	19	<0.005	<0.005	
11	634	Mixed Breed	Female	Dent 8	285.6	12	<0.005	0.027	
11	701	Mixed Breed	Female	Dent 8	271.2	12	0.013	<0.005	
16	838	Mixed Breed	Female	Dent 8	213.2	17	0.009		
16	620	Mixed Breed	Female	Dent 8	226.2	20	0.007		
16	637	Mixed Breed	Female	Dent 8	261.0	11	0.01		
16	629	Mixed Breed	Female	Dent 8	286.0	11	<0.005		
16	227	Mixed	Female	Dent 8	251.8	7	<0.005		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cypermethrin Concentration Loin Fat	Cypermethrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
		Breed							
16	384	Mixed Breed	Female	Dent 8	175.4	10	0.006		
22	392	Mixed Breed	Female	Dent 8	248.2	8	<0.005		
22	756	Mixed Breed	Female	Dent 8	206.2	7	<0.005		
22	642	Mixed Breed	Female	Dent 8	219.8	12	<0.005		
31	625	Mixed Breed	Female	Dent 8	275.4	19	<0.005		
31	758	Mixed Breed	Female	Dent 8	225.4	8	<0.005		
31	630	Mixed Breed	Female	Dent 8	221.6	18	<0.005		

A2 - SWOT

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cypermethrin Concentration Loin Fat	Cypermethrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
3	63	Crossbred	Male	1-2 years	167.6	4	0.036	0.055	960
3	446	Crossbred	Male	1-2 years	142.8	6	0.027	0.016	850
3	4	Crossbred	Male	1-2 years	169.2	10	0.042	0.039	870
4	31	Crossbred	Male	1-2 years	203.0	4	0.022		
4	68	Crossbred	Male	1-2 years	188.2	3	0.029		
4	32	Crossbred	Male	1-2 years	184.0	1	0.049		
8	5677	Crossbred	Male	1-2 years	189.6	5	0.031	0.055	
8	5678	Crossbred	Male	1-2 years	126.8	4	0.039	0.052	
8	5679	Crossbred	Male	1-2 years	148.0	4	0.042	0.072	
8	5680	Crossbred	Male	1-2 years	148.2	3	0.066	0.090	
8	5681	Crossbred	Male	1-2 years	125.0	2	0.081	0.11	
8	7411	Crossbred	Male	1-2 years	176.2	3	0.054	0.084	
11	7412	Crossbred	Male	1-2 years	149.0	4	0.045		
11	7413	Crossbred	Male	1-2 years	154.8	3	0.039	0.051	
11	7414	Crossbred	Male	1-2 years	127.0	3	0.066	0.071	
11	7415	Crossbred	Male	1-2 years	112.2	2	0.12	0.12	
11	7416	Crossbred	Male	1-2 years	161.2	3	0.057	0.060	
11	1008	Crossbred	Male	1-2 years	132.8	2	0.024	0.027	
16	1009	Crossbred	Male	1-2 years	164.2	2	0.034		
16	1010	Crossbred	Male	1-2 years	147.6	3	0.044		
16	1011	Crossbred	Male	1-2 years	121.8	4	0.015		
16	1012	Crossbred	Male	1-2 years	158.0	3	0.022		
16	1013	Crossbred	Male	1-2 years	161.2	2	0.026		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cypermethrin Concentration Loin Fat	Cypermethrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
16	3847	Crossbred	Male	1-2 years	132.8	1	0.039		
22	3848	Crossbred	Male	1-2 years	124.6	1	0.014		
22	3849	Crossbred	Male	1-2 years	127.6	3	0.029		
22	3850	Crossbred	Male	1-2 years	175.0	7	0.015		
22	3851	Crossbred	Male	1-2 years	150.6	2	<0.01		
22	3852	Crossbred	Male	1-2 years	162.6	2	<0.01		
22	587	Crossbred	Male	1-2 years	129.2	3	0.015		
29	588	Crossbred	Male	1-2 years	131.0	1	0.030		
29	589	Crossbred	Male	1-2 years	157.6	4	0.027		
29	7809	Crossbred	Male	1-2 years	171.2	3	0.019		
43	7810	Crossbred	Male	1-2 years	127.0	4	<0.01		
43	7811	Crossbred	Male	1-2 years	141.8	4	<0.01		
43		Crossbred	Male	1-2 years	130.6	1	<0.01		

B - SUMIFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Fenvalerate Concentration Loin Fat	Fenvalerate Concentration Renal Fat	Dip Conc. (mg/L) Fenvalerate
2	801	Mixed breed	Male	Dent 4	278.8	12	<0.01		1000
2	770	Mixed breed	Male	Dent 4	304.4	9	<0.01		980
2	861	Mixed breed	Male	Dent 4	276.0	19	<0.01		1140
4	184	Mixed breed	Male	Dent 4	264.8	16	<0.01		
4	861	Mixed breed	Male	Dent 2	277.8	16	<0.01		
4	365	Mixed breed	Male	Dent 4	301.0	18	<0.01		
7	31	Mixed breed	Male	Dent 4	271.0	11	<0.01	0.012	
7	7334	Mixed breed	Male	Dent 2	262.8	7	<0.01	0.012	
7	7335	Mixed breed	Male	Dent 4	282.0	9	<0.01	0.009	
7	363	Mixed breed	Male	Dent 4	253.2	18	<0.01	0.014	
7	857	Mixed breed	Male	Dent 4	289.4	12	<0.01	0.009	
7	7338	Mixed breed	Male	Dent 4	312.2	17	<0.01	0.008	
10	357	Mixed breed	Male	Dent 2	286.2	11	<0.01	<0.01	
10	138	Mixed breed	Male	Dent 4	248.0	12	<0.01	<0.01	
10	863	Mixed breed	Male	Dent 2	289.6	7	<0.01	<0.01	
10	364	Mixed breed	Male	Dent 4	291.6	14	<0.01	<0.01	
10	355	Mixed breed	Male	Dent 2	292.2	9	<0.01	<0.01	
10	198	Mixed breed	Male	Dent 4	281.2	12	<0.01	<0.01	
15	762	Mixed breed	Male	Dent 4	266.6	14	<0.01		
15	804	Mixed breed	Male	Dent 4	258.4	14	<0.01		
15	771	Mixed breed	Male	Dent 4	278.4	26	<0.01		
15	603	Mixed breed	Male	Dent 4	304.0	20	<0.01		
15	70	Mixed breed	Male	Dent 2	283.2	4	<0.01		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Fenvalerate Concentration Loin Fat	Fenvalerate Concentration Renal Fat	Dip Conc. (mg/L) Fenvalerate
15	58	Mixed breed	Male	Dent 4	278.4	10	<0.01		
21	779	Mixed breed	Male	Dent 4	254.2	20	<0.01		
21	342	Mixed breed	Male	Dent 4	297.0	9	<0.01		
21	647	Mixed breed	Male	Dent 2	219.2	13	<0.01		
30	207	Mixed breed	Male	Dent 4	299.2	10	<0.01		
30	75	Mixed breed	Male	Dent 4	292.8	15	<0.01		
30	359	Mixed breed	Male	Dent 6	295.4	14	<0.01		

C - BAYOFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyfluthrin Concentration Loin Fat	Cyfluthrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
2	1094	Hereford	Male	3.5-4 years	320.0	17	0.13		1750,1520
2	1095	Hereford	Male	3.5-4 years	359.2	18	0.34		1960
2	1096	Hereford	Male	3.5-4 years	260.4	11	0.092		1830
3	1873	Hereford	Male	3.5-4 years	321.0	20	0.13	0.10	
3	1874	Hereford	Male	3.5-4 years	295.0	16	0.36	0.35	
3	1875	Hereford	Male	3.5-4 years	298.5	18	0.15	0.13	
7	3185	Hereford	Male	3.5-4 years	311.6	28	0.077	0.026	
7	3186	Hereford	Male	3.5-4 years	307.4	22	0.13	0.095	
7	3187	Hereford	Male	3.5-4 years	328.6	22	0.096	0.081	
7	3188	Hereford	Male	3.5-4 years	302.0	14	0.18	0.16	
7	3189	Hereford	Male	3.5-4 years	304.8	21	0.095	0.071	
7	3597	Hereford	Male	3.5-4 years	312.4	27	0.095	0.11	
10	5591	Hereford	Male	3.5-4 years	340.8	14	0.11	0.090	
10	5592	Hereford	Male	3.5-4 years	341.4	20	0.067	0.060	
10	5594	Hereford	Male	3.5-4 years	307.4	19	0.097	0.081	
10	5595	Hereford	Male	3.5-4 years	316.8	28	0.060	0.052	
10	7422	Hereford	Male	3.5-4 years	287.2	18	0.056	0.037	
15	7423	Hereford	Male	3.5-4 years	324.0	25	0.075		
15	7424	Hereford	Male	3.5-4 years	308.8	17	0.053		
15	7425	Hereford	Male	3.5-4 years	317.2	21	0.11		
15	7426	Hereford	Male	3.5-4 years	324.4	22	0.036		
15	2711	Hereford	Male	3.5-4 years	338.8	25	0.098		
22	2712	Hereford	Male	3.5-4 years	313.4	29	0.0034		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyfluthrin Concentration Loin Fat	Cyfluthrin Concentration Renal Fat	Dip Conc. (mg/L) Cypermethrin
22	2713	Hereford	Male	3.5-4 years	340.4	22	0.024		
22	2714	Hereford	Male	3.5-4 years	302.4	25	0.021		
22	2715	Hereford	Male	3.5-4 years	336.6	31	0.025		
22	7806	Hereford	Male	3.5-4 years	310.6	17	0.041		
30	7807	Hereford	Male	3.5-4 years	313.2	19	<0.01		
30	7808	Hereford	Male	3.5-4 years	290.4	19	<0.01		
30		Hereford	Male	3.5-4 years	297.8	18	0.019		

C - BAYOFLY - HALF STRENGTH

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyfluthrin Concentration Loin Fat	Cyfluthrin Concentration Renal Fat	Dip Conc. (mg/L) Cyfluthrin
2	18		Male	Dent 2	308.2	11	0.030		1760
2	3		Male	Dent 2	294.6	11	0.023		820
2	802		Male	Dent 4	273.4	17	0.008		1680
4	335		Male	Dent 2	319.4	8	0.025		
4	13		Male	Dent 2	290.0	13	0.009		
4	343		Male	Dent 4	299.2	8	0.008		
7	371		Male	Dent 4	272.6	21	0.032	0.031	
7	360		Male	Dent 2	330.2	14	0.044	0.044	
7	130		Male	Dent 2	280.4	12	0.022	0.029	
7	907		Male	Dent 4	286.2	15	0.034	0.035	
7	10		Male	Dent 4	288.2	11	0.062	0.073	
7	544		Male	Dent 2	275.0	12	0.041	0.036	
10	872		Male	Dent 2	286.6	13	0.043		
10	36		Male	Dent 4	288.0	20	0.026		
10	30		Male	Dent 2	282.8	11	0.030		
10	73		Male	Dent 2	257.0	9	0.013		
10	776		Male	Dent 6	293.0	17	0.014		
10	41		Male	Dent 4	326.4	22	0.041		
15	3362		Male	Dent 4	301.6	18	0.037		
15	28		Male	Dent 2	282.6	12	0.036		
15	805		Male	Dent 2	278.6	15	0.025		
15	877		Male	Dent 6	265.8	19	0.034		
15	8		Male	Dent 4	299.8	12	0.021		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyfluthrin Concentration Loin Fat	Cyfluthrin Concentration Renal Fat	Dip Conc. (mg/L) Cyfluthrin
15	973		Male	Dent 4	261.2	28	0.023		
21	856		Male	Dent 6	284.0	22	0.021		
21	9		Male	Dent 4	258.4	10	0.025		
21	147		Male	Dent 2	256.6	17	0.017		
30	34		Male	Dent 4	311.2	15	0.037		
30	30		Male	Dent 4	317.2	9	0.018		
30	4		Male	Dent 4	293.0	17	0.022		

D - COOPAFLY

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Score (mm)	Deltamethrin Concentration Loin Fat	Deltamethrin Concentration Renal Fat	Dip Conc. (mg/L) Deltamethrin
2	909	Mixed breed	Female	Dent 8	254.4	20	0.026		26200
2	908	Mixed breed	Female	Dent 8	251.4	15	0.022		26100
2	981	Mixed breed	Female	Dent 8	186.0	11	0.047		22500
4	698	Mixed breed	Female	Dent 8	251.2	17	0.015		
4	728	Mixed breed	Female	Dent 8	229.0	15	0.018		
4	723	Mixed breed	Female	Dent 8	249.0	33	0.029		
7	395	Mixed breed	Female	Dent 8	252.2	10	0.073	0.033	
7	7346	Mixed breed	Female	Dent 8	219.0	13	0.032	0.035	
7	7347	Mixed breed	Female	Dent 8	212.6	9	0.079	0.062	
7	976	Mixed breed	Female	Dent 8	172.4	6	0.029	0.035	
7	394	Mixed breed	Female	Dent 8	205.2	11	0.042	0.018	
7	979	Mixed breed	Female	Dent 8	266.2	14	0.051	0.041	
10	228	Mixed breed	Female	Dent 8	244.8	17	0.043	0.041	
10	731	Mixed breed	Female	Dent 8	244.6	6	0.029	0.026	
10	730	Mixed breed	Female	Dent 8	262.8	14	0.023	0.027	
10	707	Mixed breed	Female	Dent 8	241.4	21	0.026	0.026	
10	759	Mixed breed	Female	Dent 8	204.6	4	0.040	0.027	
10	724	Mixed breed	Female	Dent 8	228.0	9	0.031	0.028	
15	667	Mixed breed	Female	Dent 8	247.2	32	0.027		
15	979	Mixed breed	Female	Dent 8	182.2	24	0.012		
15	974	Mixed breed	Female	Dent 8	191.4	15	0.037		
15	737	Mixed breed	Female	Dent 8	215.8	12	0.059		
15	944	Mixed breed	Female	Dent 8	214.4	12	0.057		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Score (mm)	Deltamethrin Concentration Loin Fat	Deltamethrin Concentration Renal Fat	Dip Conc. (mg/L) Deltamethrin
15	975	Mixed breed	Female	Dent 8	221.4	16	0.046		
21	760	Mixed breed	Female	Dent 8	239.2	8	0.084		
21	380	Mixed breed	Female	Dent 8	229.4	16	0.048		
21	804	Mixed breed	Female	Dent 8	205.6	14	0.034		
30	757	Mixed breed	Female	Dent 8	253.4	18	0.017		
30	725	Mixed breed	Female	Dent 8	259.4	24	0.017		
30	411	Mixed breed	Female	Dent 8	200.6	15	0.014		

E - GRENADE

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyhalothrin Concentration Loin Fat	Cyhalothrin Concentration Renal Fat	Dip Conc. (mg/L) Cyhalothrin
2	1014	Crossbred	Male	1-2 years	145.8	1	0.11		1870
2	1015	Crossbred	Male	1-2 years	155.8	3	0.16		1440
2	1016	Crossbred	Male	1-2 years	184.2	3	0.12		1480
4	2572	Crossbred	Male	1-2 years	153.8	3	0.092		
4	2573	Crossbred	Male	1-2 years	155.6	1	0.097		
4	2574	Crossbred	Male	1-2 years	161.4	1	0.077		
4	2575	Crossbred	Male	1-2 years	165.4	1	0.17		
7	3166	Crossbred	Male	1-2 years	152.6	3	0.092	0.030	
7	3167	Crossbred	Male	1-2 years	144.4	2	0.097	0.10	
7	3168	Crossbred	Male	1-2 years	151.6	1	0.049	0.11	
7	3169	Crossbred	Male	1-2 years	159.2	3	0.097	0.086	
7	3170	Crossbred	Male	1-2 years	157.0	2	0.23	0.19	
7	3171	Crossbred	Male	1-2 years	161.4	0	0.093	0.11	
10	5585	Crossbred	Male	1-2 years	199.8	4	0.088	0.078	
10	5586	Crossbred	Male	1-2 years	138.2	2	0.096	0.10	
10	5587	Crossbred	Male	1-2 years	134.8	0	0.12	0.11	
10	5588	Crossbred	Male	1-2 years	140.4	3	0.12	0.22	
10	5589	Crossbred	Male	1-2 years	192.6	4	0.10	0.094	
10	5590	Crossbred	Male	1-2 years	147.0	1	0.050	0.050	
15	7241	Crossbred	Male	1-2 years	155.4	4	0.083		
15	7242	Crossbred	Male	1-2 years	156.0	3	0.043		
15	7243	Crossbred	Male	1-2 years	195.2	3	0.051		
15	7244	Crossbred	Male	1-2 years	132.0	3	0.060		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Cyhalothrin Concentration Loin Fat	Cyhalothrin Concentration Renal Fat	Dip Conc. (mg/L) Cyhalothrin
15	7245	Crossbred	Male	1-2 years	144.0	3	0.058		
15	7246	Crossbred	Male	1-2 years	137.6	1	0.063		
22	2677	Crossbred	Male	1-2 years	120.6	1	0.054		
22	2678	Crossbred	Male	1-2 years	182.8	1	0.034		
22	2679	Crossbred	Male	1-2 years	160.4	1	0.041		
22	2680	Crossbred	Male	1-2 years	118.6	1	0.045		
22	2681	Crossbred	Male	1-2 years	101.2	2	0.071		
22	2682	Crossbred	Male	1-2 years	124.2	0	0.078		
31	7812	Crossbred	Male	1-2 years	163.6	6	0.087		
31	7813	Crossbred	Male	1-2 years	133.8	5	0.082		
31	7814	Crossbred	Male	1-2 years	162.2	3	0.069		

F - NUCIDOL

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Diazinon Concentration Loin Fat	Diazinon Concentration Renal Fat	Dip Conc. (mg/L) Diazinon
2		Hereford	Male	3.5-4 years	333	21	<0.05		210
2		Hereford	Male	3.5-4 years	348	8	<0.05		150
2		Hereford	Male	3.5-4 years	330	22	<0.05		553
4		Hereford	Male	3.5-4 years	312	16	<0.05	<0.05	
4		Hereford	Male	3.5-4 years	327	33	<0.05	<0.05	
4		Hereford	Male	3.5-4 years	326	38	0.08	<0.05	
4		Hereford	Male	3.5-4 years	315	44	<0.05	<0.05	
4		Hereford	Male	3.5-4 years	331	14	<0.05	<0.05	
4		Hereford	Male	3.5-4 years	338	17	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	338	18	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	327	19	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	291	15	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	305	33	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	315	30	<0.05	<0.05	
7		Hereford	Male	3.5-4 years	318	25	<0.05	<0.05	
10		Hereford	Male	3.5-4 years	300	15	<0.05		
10		Hereford	Male	3.5-4 years	310	13	<0.05		
10		Hereford	Male	3.5-4 years	339	25	<0.05		
10		Hereford	Male	3.5-4 years	313	19	<0.05		
10		Hereford	Male	3.5-4 years	333	20	<0.05		
10		Hereford	Male	3.5-4 years	326	11	<0.05		
14		Hereford	Male	3.5-4 years	283	27	<0.05		
14		Hereford	Male	3.5-4 years	301	21	<0.05		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Diazinon Concentration Loin Fat	Diazinon Concentration Renal Fat	Dip Conc. (mg/L) Diazinon
14		Hereford	Male	3.5-4 years	344	15	<0.05		
16		Hereford	Male	3.5-4 years	340	20	<0.05		
16		Hereford	Male	3.5-4 years	322	25	<0.05		
16		Hereford	Male	3.5-4 years	312	20	<0.05		
Control		Hereford	Male	3.5-4 years	349	14	<0.05		
Control		Hereford	Male	3.5-4 years	315	8	<0.05		
Control		Hereford	Male	3.5-4 years	329	19	<0.05		

F - NUCIDOL - BACKRUBBER

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Diazinon Concentration Loin Fat	Diazinon Concentration Renal Fat	Dip Conc. (mg/L) Diazinon
1	B8	Brahman X	Male	2 years	252	6	0.071		
1	B13	Brahman X	Male	2 years	272	6	0.041		
1	P23	Brahman X	Male	2.5 years	291	7	<0.020		
1	G2333	Brahman X	Male	3.5 years	276	6	0.31		
1	G2342	Brahman X	Male	3.5 years	284	10	0.041		
2	O95	Brahman X	Male	2 years	280	12	0.082		
2	Y237	Brahman X	Male	2 years	269	8	0.046		
2	O16	Brahman X	Male	2 years	252	6	0.041		
2	O17	Brahman X	Male	3 years	270	10	0.12		
2	Y073	Brahman X	Male	2 years	254	10	0.026		
4	Y10	Brahman X	Male	2 years	280	8	0.66	0.26	
4	Y58	Brahman X	Male	3 years	282	9	0.24	0.16	
4	Y207	Brahman X	Male	2.5 years	274	6	0.066	0.052	
4	G2318	Brahman X	Male	3 years	253	6	0.16	0.16	
4	O394	Brahman X	Male	2.5 years	319	14	0.34	0.17	
7	O525	Brahman X	Male	2 years	250	8	0.096	0.076	
7	O13	Brahman X	Male	3.5 years	279	12	0.050	0.079	
7	Y186	Brahman X	Male	2 years	284	9	0.14	0.058	
7	P8	Brahman X	Male	2.5 years	255	10	0.15	0.063	
7	R8	Brahman X	Male	2.5 years	278	9	0.076	0.043	
10	Y29	Brahman X	Male	2.5 years	285	7	0.034		
10	G19	Brahman X	Male	2 years	253	9	0.034		
10	O164	Brahman X	Male	2 years	290	13	0.034		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Diazinon Concentration Loin Fat	Diazinon Concentration Renal Fat	Dip Conc. (mg/L) Diazinon
10	O5752	Brahman X	Male	3 years	290	10	0.099		
10	R10	Brahman X	Male	2.5 years	280	15	0.070		

G - SUPONA

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Chlorfenvinfos Concentration Loin Fat	Chlorfenvinfos Concentration Renal Fat	Dip Conc. (mg/L) Chlorfenvinfos
1	W13	Brahman X	Male	3 years	247	10	0.009		
1	P6	Brahman X	Male	2 years	266	16	0.016		
1	G2344	Brahman X	Male	3 years	248	20	<0.005		
1	O406	Brahman X	Male	2 years	236	18	0.007		
1	O2369	Brahman X	Male	3 years	254	8	<0.005		
2	O14	Brahman X	Male	2.5 years	242	12	0.008		
2	P7	Brahman X	Male	2 years	249	10	0.007		
2	B12	Brahman X	Male	3 years	253	15	0.007		
2	G2357	Brahman X	Male	2 years	241	16	0.007		
2	G2370	Brahman X	Male	2 years	241	11	0.011		
4	B4560	Brahman X	Male	2.5 years	257	23	0.02	0.006	
4	W14	Brahman X	Male	2 years	235	14	0.006	<0.005	
4	O122	Brahman X	Male	2 years	223	9	<0.005	<0.005	
4	Y242	Brahman X	Male	2.5 years	237	15	0.02	0.01	
4	O113	Brahman X	Male	2 years	246	9	<0.005	<0.005	
7	G2301	Brahman X	Male	3 years	240	12	0.01	0.006	
7	G2341	Brahman X	Male	2.5 years	254	17	0.02	0.01	
7	B4566	Brahman X	Male	2 years	231	14	<0.005	<0.005	
7	W12	Brahman X	Male	2 years	260	10	0.03	0.006	
7	G2320	Brahman X	Male	3 years	263	13	<0.005	<0.005	
10	O6509	Brahman X	Male	2.5 years	235	16	<0.005		
10	G2295	Brahman X	Male	2.5 years	277	15	0.011		
10	Y250	Brahman X	Male	2.5 years	261	10	<0.005		

Days Post Treatment	Animal Number	Breed	Sex	Age	Weight (Kg)	Fat Scoore (mm)	Chlorfenvinfos Concentration Loin Fat	Chlorfenvinfos Concentration Renal Fat	Dip Conc. (mg/L) Chlorfenvinfos
10	G2338	Brahman X	Male	3 years	239	14	0.009		
10	R12	Brahman X	Male	2 years	255	8	0.01		