PESTICIDE USAGE IN SCOTLAND

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Scottish Agricultural Science Agency

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SUMMARY

This is the fourth survey of chemicals used for control of ectoparasites of sheep in Scotland, the previous survey being in 1983. Unlike the period of the 1983 survey no Sheep Scab Orders were in force regulating the dipping of sheep. Compared to previous surveys this was conducted on a smaller scale in terms of the size of the sample, the main aim was to provide information on the major changes in the pattern of dip usage.

The sheep population in Scotland in 1993 was 9.55 million an increase of 19% on 1983. Dip usage was 24.9 tonnes of organophosphorus compounds (27 tonnes in 1983) and 0.2 tonnes of the synthetic pyrethroid flumethrin. In addition 0.3 tonnes of organophosphate active ingredients were applied as a spray. With these dip chemicals 40.7 tonnes of phenols were used. Pour-on usage was 1.4 tonnes of a triazine and 0.4 tonnes of pyrethroids. Formaldehyde usage in foot baths was 55.3 tonnes.

Waste dip discharged directly into the environment was 29% of that made up.

INTRODUCTION

Surveys of sheep dip usage were carried out in 1973, 1978 and 1983 (references 1 to 3). This is the fourth in the series and was widened to include pour-on formulations, formaldehyde foot bath usage and phenols that are co-formulated with many sheep dip active ingredients. Pour-on formulations have become more widely available since the last survey and are replacing some of the traditional plunge dipping in certain circumstances. Whilst formaldehyde is not used as a dip for the control of ectoparasites, it is widely used in foot baths to control foot rot. Information on the usage of phenols is also presented in this report as this group of chemicals is often present in dip formulations.

Sheep may be treated to control various ectoparasites, acarine and insect. Dipping to control the sheep scab mite (*Psoroptes communis*) has been compulsory but the order was revoked in July 1992. However the Agriculture (Miscellaneous Provisions) Act 1968 and the Welfare of Animals at Markets Order 1990 amongst other regulations provide sanctions against owners who cause unnecessary suffering to their sheep through failure to treat scab.

Insect ectoparasites of sheep fall broadly into three groups depending on the time of year when they are most prevalent. In the spring, ticks (*Ixodes ricinus*) are the main reason for applications, in summer, prevention and treatment of fly strike by blow flies (*Calliphora and Lucilia spp*) and in autumn and winter to control lice (*Damalinia ovis and Lignognathus ovillus*) and keds (*Melophagus ovinus*). In Scotland there is a second tick emergence in the autumn which can be severe locally. Additional treatments for headfly (*Hydrotaea irritans*) are now commonly carried out with pour-ons.

Considerable changes in chemical availability have occurred since the last survey. The number of individual organophosphates is much reduced and organochlorine use has ceased completely. Pyrethroids are now available both as dips and pour-ons and the insect growth regulator cyromazine, a pour-on formulation is now available. Since carrying out this survey an injectable form of ivermectin for use on sheep has also come on the market.

METHOD

Using the 1993 Agricultural Census (reference 4) a random sample, stratified by land-use region and size of holding, was drawn. The regions used were as shown in figure 1 (reference 5) and the holding size groups by numbers of sheep in table 1. Sampling was weighted so that the smaller size groups would not dominate the sample. The numbers of holdings visited in each region and size group cell are shown in table 1.

The sample data were raised to give national estimates of pesticide usage using the raising factors given in table 2. Adjustment factors were used to make regional adjustment in accordance with the census figures. Land-use regions 4 and 5 Aberdeen and Angus, were amalgamated due to low sample populations in these areas.

Dipping Pattern

Whilst there was no longer a compulsory scab dip during the period of this report the timing of dipping was similar to 1983 (tables 3 and 4). The volume of dip made up correlates with surplus discharged into the environment except for the winter months when there was a smaller percentage discarded because of more controlled conditions when dipping under cover (table 5).

In this as in earlier surveys a small amount of dip was found to be applied by means of a sprayer. In earlier surveys this usage was included as dip. As an indication of changing practices in the application of these veterinary medical products, dip applied by a sprayer is reported on separately as "spray" .

In 1983 the practice of dipping lambs by hand in small containers was found on a few holdings where tick born diseases were acute. During this survey none was found possibly due to the availability and convenience of pour-ons that confer protection against ticks.

Dip Usage

Total dip acaricide/insecticide usage had declined to 25.64 tonnes, a reduction of 28.7% on the previous survey. This continues the trend reported in the 1983 survey when usage had fallen from 59.59 tonnes in 1978 to 35.98 tonnes. The sheep population increase of 19% since the previous report compared to a 12% increase in the corresponding period reported on in 1983. However in the current survey period the use of pour-on formulations has become widespread.

The individual active ingredients used were diazinon (11.85 tonnes), propetamphos (9.49 tonnes), chlorfenvinphos (4.08 tonnes) and flumethrin (0.22 tonnes); (tables 6 to 7). Along with the organophosphorus compounds 40.29 tonnes of phenols were recorded as used.

In 1983 there were 11 different active ingredients in use of which HCH (8.92 tonnes), had the largest usage and which was subsequently taken off the market in 1984. The other main materials were chlorfenvinphos (6.18 tonnes), carbophenothion (4.13 tonnes) and dioxathion (3.66 tonnes).

Reasons For Dipping

Multiple reasons for use and the general reason "clean up" complicate the picture. Summer dipping against flies and scab were the main uses for which specific reasons for dipping were given. Against flies the four organophosphates recorded were used exclusively but for scab in addition to these there was minor usage of the pyrethroid flumethrin.

Winter dipping was the period of next largest chemical use for which the reasons were lice, keds, clean up, waterproof and winter pests.

The control of ticks was the main reason given for spring and autumn dipping indicating the severity of the problem in some localities. (tables 8 to 13).

Spray

The use of dip applied as a spray was recorded twice in the previous survey. In the current survey it was recorded in 4 different geographical regions. The apparent increase appears to be due to the need for less water, an attraction when water has to be carried and the process requiring less labour. Other reasons found reflect the draw backs of dipping, its arduous nature, the stress to the sheep, restrictions applied by River Purification Authorities on use of old dippers and reluctance to invest in a new dipper and waste disposal considerations. Only relatively minor quantities of chemical were applied by this method but it seems that only the advent of pour-on formulations has curtailed its increase.

Spray Usage

Total spray acaricide/insecticide applied by this means was 294 kg. The individual active ingredients used were diazinon (146 kg), chlorfenvinphos (142 kg) and propetamphos (2 kg). Co-formulated with these materials 448 kg of phenols was applied. The differences in the relative amounts used compared with dipping is the fact that most of the usage was for fly control in July. Whilst these are relatively small quantities the 113,000 sheep treated by this method indicates that a significant number of man days were involved in its use. (tables 15 to 19).

It had been expected that small quantities of dip applied by knapsack sprayer to combat headfly and fly strike found at shearing would be recorded. The fact that no such use was found in this survey may be due to the convenience of pour-on formulations now much more widely used than in 1983.

POUR-ON TREATMENT

Two groups of chemicals were in use, synthetic pyrethroids and a triazine insect growth regulator, cyromazine. They were applied by means of special applicators attached to the product container or by pouring directly from containers with a built in measuring device. The use of gloves is recommended when handling these concentrated materials. The applicator can leak from the mechanism and from its connection with the product container. Drips can run down the outside of pouring containers. Thin gloves were sometimes supplied with the product but these were soon damaged by other tasks the operator was carrying out at the same time. One farmer thought that the incorporation of a water soluble dyestuff in the product would be useful to show up contamination and "keep the place" indicating which animals had been treated. At present a momentary distraction from sheep moving through a race can result in an untreated animal or one double dosed. In some cases a dye might create marketing difficulties. Possible candidate materials are those currently used in shepherds' stock markers.

POUR-ON USAGE

Total usage using the pour-on method was 1.8 tonnes of active ingredient. This was mainly cyromazine of which 1.4 tonnes was applied, the bulk being applied in June and July, for fly control. Cypermethrin usage followed, 402 kg being applied, again nearly half of this was for fly control in June and July but being non-specific was used throughout the year. Deltamethrin usage (8 kg) was also largely used for fly control including established fly strike but was also favoured for use against ticks (tables 20 to 22).

The numbers of sheep treated with pour-ons bears out the usefulness of the method for tick control, particularly on lambs. The method is seen as offering an alternative to the dipping of young lambs in small containers found in the previous survey, sparing the animal a stressful experience early in life and early in the year and reducing operator exposure from direct contact with dipping solutions (tables 23 and 24).

Similarly the usage of pour-ons for control of headfly provides a more convenient alternative to the use of dip applied by sprayer.

FORMALDEHYDE FOOTBATH USAGE

Total usage recorded in this survey was 55.3 tonnes of formaldehyde. It was all used for prevention or control of foot rot. The Southern Uplands (13.6 tonnes), Tweed Valley (10.3 tonnes) and Central Lowlands (9.4 tonnes) were the regions where most was used. Whilst formaldehyde is widely used throughout Scotland it is thought that its use in remoter areas is constrained by the cost of transporting heavy drums of the chemical in aqueous solution. (table 25).

More detailed information on formaldehyde usage was difficult to obtain as it is in frequent use and records are generally not kept. In many areas sheep are run through a foot bath whenever they are handled leading to a rough estimate of numbers treated over the year. Quantities of chemical used over the year could in contrast be obtained with accuracy from supplier's invoices.

ACKNOWLEDGEMENTS

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Figure 1 Land-Use Regions of Scotland

TABLE 1 The number of holdings sampled in each region and size group.

Region/size group	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Total*
Aberdeen/Angus		1	4	3		1	1	10
Caithness/Orkney	1	1	1		1		1	5
Central Lowlands	1	3	3	3	3	6		19
East Fife	1		1	1		1		4
Highlands & Islands	2	2	1				4	9
Lothian	4	1	1	2	1	2	3	14
Moray Firth		3				1	1	5
Solway	1	2	4	7	3	2	1	20
Southern Uplands		1	3	2	9	10	6	31
Tweed Valley			2	1	2	4	4	13
Scotland	**10**	**14**	**20**	**19**	**19**	**27**	**21**	**130**

Size group	number of sheep
1	1 - 199
2	200 - 499
3	500 - 999
4	1000 - 1499
5	1500 - 1999
6	2000 - 2999
7	3000 +

TABLE 2 Raising factors

Region/size group	1	2	3	4	5	6	7	Adjustment factors
Aberdeen/Angus		470.23	75.61	30.21		23.39	8.37	1.2586
Caithness/Orkney	236.63	389.74	124.82		21.7		3.22	1.3801
Central Lowlands	1476.83	184.78	145.49	63.27	44.38	14.82		1.1255
East Fife	334.33		28.18	9.85		4.07		1.6709
Highlands & Islands	916.12	608.75	663.3				38.92	1.6799
Lothian	11.02	34.97	28.63	7.89	18.06	11.54	3.48	1.0003
Moray Firth		108.33				19.64	6.24	2.6254
Solway	1942.5	154.51	80.74	26.48	28.06	29.66	32.13	0.9999
Southern Uplands		121.51	84.26	92.7	17.72	20.67	22.84	1.0093
Tweed Valley			68.4	103.86	35.59	22.07	11.11	1.0697

TABLE 3 Estimated quantities of dip active ingredients (kg) by month

Active Ingredient	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Total
Chlorfenvinphos						219.8	2,943.7	58.9	234.7	627.4			4,084.5
Diazinon						712.6	5,874.1	693.6	1.273.9	3,218.8	73.0		11,846.0
Flumethrin		8.3	12.8	9.9					42.2	145.9			219.2
Phenols	1,961.7		38.5		108.3	2,251.5	16,820.6	1,873.5	4,661.4	10,625.5	1,953.5		40,294.3
Propetamphos	549.3		10.8		43.3	559.8	3,604.7	420.3	1,196.3	2,556.5	551.5		9,492.5

TABLE 4 Estimated quantities of dip active ingredient type (kg) applied by month

Type	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Total
Disinfectant	1,961.7		38.5		108.3	2,251.5	16,820.6	1,873.5	4,661.4	10,625.5	1,953.5		40,294.3
Organophosphorus	549.3		10.8		43.3	1,492.2	11,901.9	1,172.8	2,704.9	6,402.7	624.5		24,902.4
Pyrethroid		8.3	12.8	9.9					42.2	145.9			219.2

TABLE 5 Estimated volume of dip made up and the volume of surplus dip discharged into the environment (litres)

Month	Made up	Discard	% discarded
jan	1,961,687	89,168	5%
feb	2000,026	26,199	13%
mar	258,937	80,661	31%
apr	217,709	93,703	43%
may	119,732	53,395	45%
jun	2,583,489	661,368	26%
jul	22,329,606	7,753,942	35%
aug	2,388,252	603,764	25%
sep	7,260,993	2,343,397	32%
oct	14,501,333	3,657,749	25%
nov	1,681,553	366,607	22%
dec			
Total	**53,503,316**	**15,729,952**	**29%**

TABLE 6 Estimated quantities of dip active ingredient (kg) by region

Region size	Chlorfenvinphos	Diazinon	Flumethrin	Phenols	Propetamphos
Aberdeen/Angus	959.3	487.2		4,963.8	848.4
Caithness/Orkney		1,670.2		810.8	227.0
Central Lowlands	502.9	1,976.6	12.8	8,845.2	2.252.3
East Fife				591.7	273.8
Highlands & Islands	1,720.0	511.3	86.3	14,320.1	2,768.3
Lothian	122.5	158.3		907.6	159.3
Moray Firth		232.0	66.4	568.8	159.3
Solway		2,163.8	10.7	2,393.1	904.0
Southern Uplands	519.5	3,355.6	43.0	5,755.4	1,572.9
Tweed Valley	260.3	1,290.9		1,137.9	327.2
Scotland	**4,084.5**	**11,846.0**	**219.2**	**40,294.3**	**9,492.5**

TABLE 7 Estimated quantities of dip formulations (kg) by region

Region	Chlorfenvinphos/ Diazinon	Chlorfenvinphos/ Diazinon/Phenois	Chlorfenvinphos/ Phenois	Diazinon	Diazinon/ Phenois	Flumethrin	Propetamphos Phenois
Aberdeen/Angus	582.1	905.8	2,348.2	85.7			3,336.9
Caithness/Orkney				1,670.2			1,037.8
Central Lowlands		1,490.1	1,448.2	1,794.9		12.8	8,843.9
East Fife							865.6
Highlands & Islands		4,653.0	2,824.2			86.3	11,842.4
Lothian			496.0		229.6		622.1
Moray Firth				232.0		66.4	728.1
Solway				2,163.8		10.7	3,297.1
Southern Uplands	354.1		1,387.1	2,677.9	726.0	43.0	6,058.3
Tweed Valley	520.6			745.4	413.6		1,336.8
Scotland	**1,456.8**	**7,048.9**	**8,503.7**	**9,369.9**	**1,369.2**	**219.2**	**37,968.9**

TABLE 8 Estimated quantity of dip active ingredients (kg) by reason

Active Ingredient	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos	538.0	2,693.0	256.6			68.0	85.5		511.3
Diazinon	3,743.5	5,930.5			103.8	1,221.9	852.3		1,119.2
Flumethrin				10.7	23.1	20.7	61.3		135.4
Phenols	7,030.5	16,566.3	823.8	1,509.4	653.0	8,199.0	1,013.2	2,720.0	4,375.8
Propetamphos	1,993.8	3,543.8	16.4	422.6	208.2	2,297.4	130.8	761.6	852.6
Total	**13,305.8**	**28,733.6**	**1,096.8**	**1,942.7**	**988.1**	**11,807.0**	**2,143.0**	**3,481.6**	**6,994.3**

TABLE 9 Estimated quantities of dip formulations (kg) by reason

Formulation	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos/Diazinon	582.1	874.7							
Chlorfenvinphos/Diazinon/Phenols	1,022.6	2,823.9					875.9		2,326.5
Chlorfenvinphos/Phenols	596.1	6,868.1	44.6			275.6			
Diazinon	2,961.2	4,605.0			103.8	1,069.6	739.5		863.6
Diazinon/Phenols		1,360.5				220.9	8.6		
Flumethrin				10.7	23.1	20.7	61.3		135.4
Phenols/Propetamphos	7,777.2	12,567.8	57.4	1,932.0	861.2	10,220.3	457.7	3,857.4	3,668.9
Total	**12,939.3**	**29,100.1**	**102.1**	**1,942.7**	**988.1**	**11,807.0**	**2,143.0**	**3,857.4**	**6,994.3**

TABLE 10 Number of sheep treated with dip active ingredients by reason

Active Ingredient	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos	180,125	876,701	47,457			27,112	44,649		145,215
Diazinon	398,603	900,459			47,996	192,446	139,214		229,600
Flumethrin				28,916	80,092	49,778	251,477		258,495
Phenols	764,432	1,805,494	54,419	414,511	108,504	1,078,557	139,240	564,244	514,018
Propetamphos	641,376	1,052,879	6,962	414,511	108,504	1,023,395	94,150	564,244	368,803
Total	**1,984,536**	**4,635,533**	**108,838**	**857,938**	**345,096**	**2,371,288**	**668,730**	**1,128,488**	**1,516,131**

TABLE 11 Number of lambs treated with dip active ingredients by reason

Active Ingredient	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos	126,467	487,779	76,962			36,040	14,242		
Diazinon	186,678	978,675			14,165	88,399	130,222		46,407
Flumethrin				2,966	38,282	34,259	7,576		46,432
Phenols	443,671	1,600,350	83,576	83,571	61,034	547,798	14,242	132,788	189,875
Propetamphos	389,504	1,184,613	6,614	83,571	61,034	493,866		132,788	189,875
Total	**1,146,320**	**4,251,417**	**167,152**	**170,108**	**174,515**	**1,200,362**	**166,282**	**265,576**	**472,589**

TABLE 12 Estimated numbers of sheep treated with dip formulations by reason

Formulation	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos/Diazinon	57,069	189,351							
Chlorfenvinphos/Diazinon/Phenols	93,617	145,794					44,649		145,215
Chlorfenvinphos/Phenols	29,439	541,556	47,457			27,112			
Diazinon	247,917	500,049			47,996	164,396	94,124		84,385
Diazinon/Phenols		65,265				28,050	441		
Flumethrin				28,916	80,092	49,778	251,477		258,495
Phenols/Propetamphos	641,376	1,052,879	6,962	414,511	108,504	1,023,395	94,150	564,244	368,803
Total	**1,069,418**	**2,494,894**	**54,419**	**443,427**	**236,592**	**1,292,731**	**484,841**	**564,244**	**856,898**

TABLE 13 Estimated numbers of lambs treated with dip formulations by reason

Formulation	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos/Diazinon	72,300	144,996							
Chlorfenvinphos/Diazinon/Phenols	15,897	89,446					14,242		
Chlorfenvinphos/Phenols	38,270	253,337	76,962			36,040			
Diazinon	98,481	671,279			14,165	70,507	115,980		46,407
Diazinon/Phenols		72,954				17,892			
Flumethrin				2,966	38,282	34,259	7,576		46,432
Phenols/Propetamphos	389,504	1,184,613	6,614	83,571	61,034	493,866		132,788	189,875
Total	**614,452**	**2,416,625**	**83,576**	**86,537**	**113,481**	**652,564**	**137,798**	**132,788**	**282,714**

TABLE 14 Volume of dip formulation by reason (litres)

Formulation	Clean Up	Flies	Head Fly	Keds	Lice	Scab	Ticks	Waterproof	Winter Pests
Chlorfenvinphos/Diazinon	1,151,947	392,483							
Chlorfenvinphos/Diazinon/Phenols	479,974	1,122,719					427,262		1,022,639
Chlorfenvinphos/Phenols	294,422	4,308,357	20,018			153,910			
Diazinon	2,260,417	6,299,637			112,906	1,771,437	1,439,119		680,157
Diazinon/Phenols		403,559				155,294	14,992		
Flumethrin				143,837	389,760	343,822	1,231,366		1,316,045
Phenols/Propetamphos	5,326,103	8,727,123	50,243		537,478	6,722,646	208,110	251,734	2,196,795
Total	**9,512,864**	**21,253,878**	**70,261**	**143,837**	**1,040,144**	**9,147,108**	**3,320,848**	**251,734**	**5,215,636**

TABLE 15 Estimated quantities of spray active ingredients (kg) by month

Active Ingredient	Jul	Sep	Total
Chlorfenvinphos	142.2		142.2
Diazinon	145.6		145.6
Phenols	439.5	8.9	448.4
Propetamphos	2.3	3.6	5.9

TABLE 16 Estimated quantity of spray active ingredient (kg) by reason

Active Ingredient	Clean Up	Flies	Total
Chlorfenvinphos		142.2	142.2
Diazinon		145.6	145.6
Phenols	8.9	439.5	448.4
Propetamphos	3.6	2.3	5.9

TABLE 17 Estimated quantities of spray formulations (kg) by reasons

Formulation	Clean Up	Flies	Total
Chlorfenvinphos/Phenols		575.9	575.9
Diazinon		145.6	145.6
Phenols/Propetamphos	12.4	8.1	20.6

TABLE 18 Numbers of sheep and lambs with spray active ingredients by reason

Active Ingredient	Clean Up	Flies
Chlorfenvinphos		88,167
Diazinon		98,090
Phenols	60,549	108,350
Propetamphos	60,549	20,183

TABLE 19 Estimated numbers of sheep and lambs with spray formulations by reason

Formulation	Clean Up	Flies
Chlorfenvinphos/Phenols		88,167
Diazinon		98,090
Propetamphos/Phenols	60,549	20,183

TABLE 20 Estimated quantities of pour-on active ingredients (kg) by month

Active Ingredient	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Total
Cypermethrin	2.8	2.8	33.8	14.5	29.1	118.9	62.4	3.8	9.8	107.2		16.6	401.6
Cyromazine					24.0	380.2	792.3	71.1	29.1		76.4		1,373.0
Deltamethrin		1.6	0.3	1.8	1.4	0.4	2.1						7.6
Total	**2.8**	**4.4**	**34.1**	**16.3**	**54.4**	**499.4**	**856.8**	**74.9**	**38.9**	**107.2**	**76.4**	**16.6**	**1,782.2**

TABLE 21 Estimated quantities of pour-on active ingredients (kg) by region

Region	Cypermethrin	Cyromazine	Deltamethrin
Caithness/Orkney	195.2		1.6
Central Lowlands	47.0	41.1	
East Fife		25.3	
Highlands & Islands	2.5	461.7	
Lothian	6.8		
Moray Firth			0.7
Solway	46.6	219.1	
Southern Uplands	92.2	149.8	4.6
Tweed Valley	11.4	476.1	0.7
Scotland	**401.6**	**1,373.0**	**7.6**

TABLE 22 Estimated quantity of pour-on active ingredient (kg) by reason

Active Ingredient	Flies	Head Fly	Keds	Lice	Ticks	Winter Pests
Cypermethrin	277.5	7.1		22.2	77.2	14.8
Cyromazine	1,373.0					
Deltamethrin	3.5		1.6	1.6	2.5	
Total	**1,654.0**	**7.1**	**1.6**	**23.8**	**79.7**	**14.8**

TABLE 23 Numbers of sheep treated with pour-on active ingredients by reason

Active Ingredient	Flies	Head Fly	Keds	Lice	Ticks	Winter Pests
Cypermethrin	146,825	35,247		61,149	190,502	30,058
Cyromazine	435,809					
Deltamethrin	57,786		30,698	30,698	27,557	
Total	**640,420**	**35,247**	**30,698**	**91,847**	**218,059**	**30,058**

TABLE 24 Numbers of lambs treated with pour-on active ingredients by reason

Active Ingredient	Flies	Head Fly	Lice	Ticks	Winter Pests
Cypermethrin	257,857	37,324	9,811	126,608	5,838
Cyromazine	501,434				
Deltamethrin	27,214			22,284	
Total	**786,505**	**37,324**	**9,811**	**148,892**	**5,838**

TABLE 25 Estimated quantity of formaldehyde used in foot baths (kg) by region

Region	Formaldehyde
Aberdeen/Angus	3,290
Caithness/Orkney	1,278
Central Lowlands	9,399
East Fife	326
Highlands & Islands	7,133
Lothian	2,320
Moray Firth	569
Solway	7,149
Southern Uplands	13,558
Tweed Valley	10,267
Scotland	**55,290**

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