Bulletin No. 327R - Control Livestock Pests

University of Wyoming Agricultural Experiment Station
control

LIVESTOCK PESTS
## CONTENTS

Insecticides ................................................. 1

Hazards in Using Insecticides on Livestock .......................... 7

General Pests ................................................. 8
  Flies in Farm Buildings ...................................... 3
  Mosquitoes .................................................. 10
  Black Flies .................................................. 12
  Fleas ......................................................... 12

Cattle Parasites .............................................. 13
  Cattle Lice .................................................. 13
  Cattle Grubs, Heel Flies .................................... 16
  Horn Flies ................................................... 20
  Face Fly ...................................................... 23
  Stable Fly .................................................... 24
  Horse Flies, Deer Flies ...................................... 25
  Cattle Scab ................................................... 26
  Ticks ......................................................... 26
    Winter Tick ................................................ 26
    Rocky Mountain Wood Tick ................................ 27
    Ear Tick ................................................... 28

Sheep Parasites .............................................. 29
  Sheep Ked (Sheep Tick) ..................................... 29
  Sheep Lice .................................................. 33
  Wool Maggots .............................................. 33
  Sheep Scab .................................................. 34
  Sheep Bot Fly .............................................. 35

Horse Parasites .............................................. 36
  Horse Lice .................................................. 36
  Horse Mange ................................................ 36
  Horn Flies ................................................... 36
  Wood Ticks .................................................. 37
  Horse Bot Flies ............................................. 37

Hog Parasites ................................................ 39
  Hog Louse ................................................... 39
  Hog Mange ................................................... 40

Chicken Parasites ........................................... 40
  Lice ........................................................ 40
  Mites Of Chickens .......................................... 42
    Chicken Mite .............................................. 42
    Northern Fowl Mite ...................................... 43
    Scaly-Leg Mite ........................................... 43
    Depluming Mite .......................................... 43

Scientific Names ............................................. 45
Control Livestock Pests

By Robert E. Pfadt and T. R. Robb*

CONTROLLING INSECT PESTS of livestock is be-
coming a regular management practice of Wyoming
ranchers. The greater adoption of insect control can be
attributed to several facts: (1) wider recognition of
benefits and profits resulting from control; (2) avail-
ability of more effective insecticides; (3) easier and
faster methods of application; and (4) increased publicity
and dissemination of control information. While
modern insecticides and methods are efficient tools for
controlling livestock pests, their variety raises questions
of which to use to solve specific insect problems. This
bulletin provides livestock growers information on mod-
ern insecticides and current recommendations for con-
trolling pests of livestock. Because the information is
condensed, including only essentials, selected articles
are referred to at the end of each discussion. Consult
these for fuller information.

In general, arrangement here is based on the kind of
domesticated animal attacked. A number of pests injure
more than one kind of animal but are treated only under
the most important host. Each pest is discussed accord-
ing to the nature and extent of its injury, its life history,
and its control. Life histories are included because upon
them are based proper timing of treatments, successful
methods of application, and control by sanitation and
management practices.

Insecticides

Because a variety of insecticides are used for live-
stock-pest control, the more important ones are briefly
discussed in this bulletin to acquaint the grower with
their proper use. Most insecticides are not ready for
treating animals immediately after manufacture. They
must be combined with other chemicals or materials by
a process called formulation before being applied. For-
mulation puts the chemicals in a physical form which
permits uniform distribution of minute quantities over
a large area. Common formulations of insecticides are:
dusts, wettable powders, liquid suspensions, emulsifiable
concentrates, oil solutions and aerosol concentrates.

Dusts are usually purchased in a form and concentra-
tion ready for use. The percentage of the actual toxicant
will vary from one to 10 percent, according to the effi-
ciency of the insecticide and the susceptibility of the in-
sect to be poisoned. Dusts can be applied by several
kinds of equipment including quart jars with perforated
lids, burlap bags, hand dusters, manual blower dusters,
bellow dusters, and power dusters. Dusts are meant to
be applied as dusts and are never designed for mixing
with water to spray animals.

Granules are similar to dusts except for larger particle
size. A common size of granule is one slightly coarser
than salt or granulated sugar. In veterinary entomology
one use of insecticidal granules is application to the bed-
ding of swine. It is a convenient method of controlling
hog lice.

Wettable powders are designed to be mixed with water
and used as washes, sprays, or dips. In the dry form
in which they come they look like a dust, but during
manufacture they are treated with chemicals permitting
them to be mixed with water and to form suspensions of
minute particles that will not settle out rapidly. Concen-
tration of toxicant in wettable powders is greater than in
dusts, often ranging from 25 to 75 percent. Before using
a wettable powder, mix it with enough water to yield the
desired concentration of spray or dip. Table 1 shows
quantities needed to make 5, 25, or 100 gallons of spray
or dip. If other amounts are needed they can be easily
calculated from the table.

Liquid suspensions are mixtures containing finely
divided, insoluble particles of insecticide suspended in a
liquid. This formulation is designed for dilution with
water. Consult table 2 for dilution instructions.

Emulsifiable concentrates are solutions of toxicant
in petroleum oils or oily solvents to which has been added
a chemical known as an emulsifier. This allows oils and

* Respectively: entomologist, Agricultural Experiment Station; entomologist, Agricultural Extension Service.
### TABLE 1—Wettable Powder Amounts to be Added to Water for a Desired Spray Concentration (after Howell)

<table>
<thead>
<tr>
<th>If the percentage of wettable powder is:</th>
<th>6 pounds</th>
<th>10 pounds</th>
<th>12 pounds</th>
<th>20 pounds</th>
<th>25 pounds</th>
<th>40 pounds</th>
<th>50 pounds</th>
<th>75 pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>To make 100 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>7</td>
<td>4</td>
<td>3.5</td>
<td>2</td>
<td>1.67</td>
<td>1</td>
<td>0.83</td>
<td>0.56</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>70</td>
<td>40</td>
<td>35.0</td>
<td>20</td>
<td>16.7</td>
<td>10.4</td>
<td>8.3</td>
<td>5.6</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>280</td>
<td>160</td>
<td>140.0</td>
<td>84</td>
<td>67.0</td>
<td>42.0</td>
<td>33.0</td>
<td>22.0</td>
</tr>
<tr>
<td>To make 25 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>1.75</td>
<td>1</td>
<td>0.9</td>
<td>0.5</td>
<td>0.42</td>
<td>0.26</td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>17.5</td>
<td>10</td>
<td>8.75</td>
<td>5.2</td>
<td>4.2</td>
<td>2.6</td>
<td>2.1</td>
<td>1.4</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>70</td>
<td>40</td>
<td>35.0</td>
<td>20.0</td>
<td>16.7</td>
<td>11.0</td>
<td>8.3</td>
<td>5.6</td>
</tr>
<tr>
<td>To make 5 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>0.33</td>
<td>0.20</td>
<td>0.18</td>
<td>0.1</td>
<td>0.08</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>3.5</td>
<td>2.0</td>
<td>1.75</td>
<td>1.0</td>
<td>0.8</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>14.0</td>
<td>8.0</td>
<td>7.0</td>
<td>4.1</td>
<td>3.3</td>
<td>2.1</td>
<td>1.6</td>
<td>1.1</td>
</tr>
</tbody>
</table>

### TABLE 2—Amount of Emulsifiable Concentrate Insecticides to be Added to Water to Make Diluted Sprays for Fly Control (after Howell)

<table>
<thead>
<tr>
<th>If percentage of emulsifiable concentrate is:</th>
<th>18</th>
<th>20</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>To make 100 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>1.1 qt.</td>
<td>1 qt.</td>
<td>1.6 pt.</td>
<td>1 pt.</td>
<td>13 oz.</td>
<td>10½ oz.</td>
<td>8½ oz.</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>2¾ gal.</td>
<td>2½ gal.</td>
<td>2 gal.</td>
<td>10 pt.</td>
<td>1 gal.</td>
<td>6.6 pt.</td>
<td>5.3 pt.</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>11 gal.</td>
<td>10 gal.</td>
<td>8 gal.</td>
<td>5 gal.</td>
<td>4 gal.</td>
<td>3.3 gal.</td>
<td>2.6 gal.</td>
</tr>
<tr>
<td>To make 25 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>9 oz.</td>
<td>8 oz.</td>
<td>6.4 oz.</td>
<td>4 oz.</td>
<td>3.2 oz.</td>
<td>2.66 oz.</td>
<td>2.1 oz.</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>2½ qt.</td>
<td>2 qt.</td>
<td>2½ pt.</td>
<td>1 pt.</td>
<td>1.6 pt.</td>
<td>1.3 pt.</td>
<td></td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>2¾ gal.</td>
<td>2½ gal.</td>
<td>2 gal.</td>
<td>1¼ gal.</td>
<td>1 gal.</td>
<td>3½ qt.</td>
<td>2¾ qt.</td>
</tr>
<tr>
<td>To make 5 gallons of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>1¾ oz.</td>
<td>1.3/5 oz.</td>
<td>1¼ oz.</td>
<td>5 tsp.</td>
<td>3 4/5 tsp.</td>
<td>3¼ tsp.</td>
<td>2.5 tsp.</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>1.1 pt.</td>
<td>1 pt.</td>
<td>.8 pt.</td>
<td>½ pt.</td>
<td>.4 pt.</td>
<td>.½ pt.</td>
<td>.¼ pt.</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>4.4 pt.</td>
<td>4 pt.</td>
<td>3.2 pt.</td>
<td>2 pt.</td>
<td>1.6 pt.</td>
<td>1½ pt.</td>
<td>1 pt.</td>
</tr>
<tr>
<td>To make 1 gallon of spray, use:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 0.05% spray</td>
<td>2 tsp.</td>
<td>1¾ tsp.</td>
<td>1½ tsp.</td>
<td>1½ tsp.</td>
<td>1 tsp.</td>
<td>.6 tsp.</td>
<td>.½ tsp.</td>
</tr>
<tr>
<td>For 0.5% spray</td>
<td>3½ oz.</td>
<td>3 oz.</td>
<td>2½ oz.</td>
<td>2 oz.</td>
<td>1 2/3 oz.</td>
<td>1 oz.</td>
<td>5 tsp.</td>
</tr>
<tr>
<td>For 2.0% spray</td>
<td>13½ oz.</td>
<td>12 oz.</td>
<td>10 oz.</td>
<td>8 oz.</td>
<td>6 2/3 oz.</td>
<td>4 oz.</td>
<td>3½ oz.</td>
</tr>
</tbody>
</table>

Abbreviations: pt.—pint; qt.—quart; gal.—gallon; tsp.—teaspoon; oz.—fluid ounce.
water to mix and form emulsions. Emulsions are minute droplets of oil and insecticide distributed evenly throughout water. Emulsifiable concentrates are intended to be mixed with water before use. Amounts of toxicant in emulsifiable concentrates range from 12 to 75 percent and should be diluted with water, as indicated in table 2, to yield desired spray concentrations.

Oil solutions are formulations in which the insecticide has been dissolved in oil. Usual concentrations of the toxicant vary from a fraction of 1 percent to 30 percent. Insecticidal oil solutions are used for space sprays, on the burlap of cable-type self applicators, in household residual sprays, and in aircraft applications.

Aerosols are finely divided particles of insecticide in air. They are formed and propelled into the air in several ways, usually an aerosol bomb. Pressing a button on the bomb releases a solution of insecticide in liquefied gas through a small tube. Aerosol bombs often are used for producing space sprays to control house flies in homes and restaurants.

Surface-active insecticides. The majority of insecticides applied to livestock remain primarily on the surface of the animals—on the hair and skin—and kill insects by rubbing off or volatilizing on the pests or by directly contacting them. DDT, lindane, and malathion are examples of surface-active insecticides.

Systemic insecticides. A few newer phosphate insecticides act systemically, that is, they are taken up by the blood of the animal and circulate throughout the animal system. Insects are killed by feeding on or being bathed by blood containing small amounts of the insecticide. Systemic insecticides may be given to animals in feed, in minerals, orally by dose syringe, or they may be sprayed or poured onto the skin.

Table 3 lists the insecticides currently used in the United States to control livestock pests. The first column gives both the common name of the insecticide and the trade names. Some insecticides have common names that are in general use, making trade names unnecessary. Other insecticides have not yet received common names; only trade names identify them. In the table we have distinguished trade names by placing an ® at the end of the name. Those without the ® are common names.

Insecticides can be placed in different categories of mammalian toxicity—low, moderate, fairly high, and high. This information is given under characteristics in the second column. Also included as a standard toxicological measurement, the LD₅₀, based on rats. This figure is the number of milligrams of the insecticide per kilogram of body weight of the test animal that is required to kill 50 percent of the test animals. The higher the number of milligrams the less toxic is the insecticide. For example, methoxychlor has low mammalian toxicity and has an LD₅₀ of 6000 mg/kg, whereas nicotine sulfate has high mammalian toxicity and LD₅₀ of 30 mg/kg.
<table>
<thead>
<tr>
<th>Chemical</th>
<th>Characteristics</th>
<th>Use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allethrin</td>
<td>Synthetic compound related to botanical pyrethrum; low mammalian toxicity, LD₅₀—680 mg/kg; contact.</td>
<td>Especially for knockdown of house flies.</td>
<td>Infrequently used for livestock.</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>Carbamate; low mammalian toxicity, LD₅₀—500 mg/kg; good residual; surface-active.</td>
<td>Effective against a variety of external pests of cattle, sheep, swine, poultry, dogs, cats.</td>
<td>Controls some pests that have developed resistance to other insecticides. Do not apply to dairy animals. Seven days minimum to slaughter.</td>
</tr>
<tr>
<td>Sevin®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciodrin®</td>
<td>Organic phosphate; moderate mammalian toxicity LD₅₀—125 mg/kg; short residual; surface-active.</td>
<td>Controls several kinds of flies that attack livestock.</td>
<td>Application permitted on lactating dairy animals. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Coumaphos</td>
<td>Organic phosphate; moderate mammalian toxicity LD₅₀—90 mg/kg; long residual; both systemic and surface-active.</td>
<td>Highly effective against a large number of livestock pests.</td>
<td>Do not apply to dairy animals. Do not treat animals younger than three months of age. Spray lightly animals three to six months old. No waiting period to slaughter except sheep and goats—15 days minimum.</td>
</tr>
<tr>
<td>Co-Ral®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDT</td>
<td>Chlorinated hydrocarbon; moderate mammalian toxicity LD₅₀—113 mg/kg; long residual, surface-active.</td>
<td>Less useful for livestock pests than formerly because of unwanted storage in fat of animals and development of resistance by certain pests.</td>
<td>Still effective as residual spray to areas infested with mosquitoes and ticks. Do not apply to dairy animals. Thirty days minimum to slaughter.</td>
</tr>
<tr>
<td>Diazinon</td>
<td>Organic phosphate; moderate mammalian toxicity, LD₅₀—76 mg/kg; long residual; surface-active.</td>
<td>Good for control of sheep lice, ticks, and keds; also good for control of flies in barns and sheds.</td>
<td>Direct application to livestock for sheep only. Fourteen days minimum to slaughter.</td>
</tr>
<tr>
<td>Dimethoate</td>
<td>Organic phosphate; moderate mammalian toxicity, LD₅₀—100 mg/kg; long residual; both systemic and surface-active.</td>
<td>Highly effective for control of flies in barns and sheds.</td>
<td>Remove animals from buildings before spraying. Do not apply directly to livestock.</td>
</tr>
<tr>
<td>Cygon®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical</td>
<td>Characteristics</td>
<td>Use</td>
<td>Remarks</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Diethylhexyl</td>
<td>Chlorinated hydrocarbon; fairly high mammalian toxicity, LD_{50} = 46 mg/kg; long residual; surface-active.</td>
<td>Dust of 1.5 percent good for control of sheep lice and keds; residual spray effective against flies in sheds and barns.</td>
<td>Do not spray dieldrin in dairy barns. For direct application to sheep only. Ninety days minimum to slaughter.</td>
</tr>
<tr>
<td>Dichlorvos</td>
<td>Organic phosphate; moderate mammalian toxicity, LD_{50} = 56 mg/kg; short residual; both systemic and surface-active.</td>
<td>Useful for controlling flies on livestock and in processing rooms.</td>
<td>Application permitted on dairy animals. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Vapona®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dioxathion</td>
<td>Organic phosphate; fairly high mammalian toxicity LD_{50} = 45mg/kg; long residual; surface-active.</td>
<td>Useful in controlling external parasites of beef cattle, sheep, horses and swine.</td>
<td>No waiting period after treatment to slaughter. Do not apply to dairy animals.</td>
</tr>
<tr>
<td>Delnav®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQ 335</td>
<td>A combination of three parts lindane, 35 parts pine oil, 42 parts mineral oil, 10 parts emulsifier, 10 parts silica aerogel.</td>
<td>Apply full strength with one inch brush or dilute one part to nine parts water as wash to control wool maggots.</td>
<td>It is a screw-worm remedy. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Fenthion Baytex®</td>
<td>Organic phosphate; moderate mammalian toxicity LD_{50} = 190 mg/kg; long residual; systemic and surface-active.</td>
<td>Effective for controlling mosquitoes and house flies.</td>
<td>Do not spray dairy barns or poultry houses.</td>
</tr>
<tr>
<td>Tiguvon®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lethane 384®</td>
<td>Organic thiocyanate; moderate mammalian toxicity LD_{50} = 90 mg/kg; short residual.</td>
<td>For fly control on dairy animals.</td>
<td>Apply as mist spray to animal but do not wet hide. Often used in conjunction with other materials. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Lindane</td>
<td>Chlorinated hydrocarbon; moderate mammalian toxicity LD_{50} = 88 mg/kg; moderate residual; surface-active.</td>
<td>Useful in controlling lice, scab or mange mites, ticks, and fleeceworms.</td>
<td>Do not use on emaciated animals or on milk animals; do not dip animals less than three months old. Do not spray within 30 days of slaughter. Do not dip within 60 days of slaughter.</td>
</tr>
<tr>
<td>Malathion</td>
<td>Organic phosphate; low mammalian toxicity LD_{50} = 1000 mg/kg; moderate residual; surface-active.</td>
<td>Effective against lice, horn flies, sheep keds, ticks, and mange mites.</td>
<td>Can be used as a dust for control of horn flies on dairy cattle. Do not dust within five hours of milking. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>Chlorinated hydrocarbon; low mammalian toxicity LD_{50} = 6000 mg/kg; moderate residual; surface-active.</td>
<td>Effective for controlling lice and horn flies on livestock.</td>
<td>Can be used as a dust on dairy cattle to control horn flies. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Chemical</td>
<td>Characteristics</td>
<td>Uses</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Naled Dibrom®</td>
<td>Organic phosphate; low mammalian toxicity, LD₅₀—430 mg/kg; short residual; contact action.</td>
<td>Good as a space spray for control of house flies.</td>
<td>Do not apply directly to livestock.</td>
</tr>
<tr>
<td>Nicotine sulfate</td>
<td>Botanical insecticide derived from tobacco; high mammalian toxicity, LD₅₀—30 mg/kg; contact and fumigant action.</td>
<td>Used as a roost paint to control lice and mites on poultry.</td>
<td>As it is readily absorbed through the skin, be careful not to spill on yourself. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Pyrethrum</td>
<td>Botanical insecticide derived from Chrysanthemum flower; low mammalian toxicity, LD₅₀—200 mg/kg; short residual; contact and fumigant action.</td>
<td>Useful in controlling ectoparasites of dairy cattle.</td>
<td>Repellents, such as Stabilene, Tabatrex, MGK Repellents 11 or 326, are often added to provide increased control of biting flies. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Ronnel Korlan® Trolene®</td>
<td>Organic phosphate; low mammalian toxicity, LD₅₀—1700 mg/kg; long residual; contact and systemic.</td>
<td>In feed or mineral blocks, it controls cattle grubs. Good as spray or dip for external parasites of livestock.</td>
<td>Do not use on dairy animals or poultry. Twenty-one to 84 days minimum to slaughter.</td>
</tr>
<tr>
<td>Rotenone</td>
<td>Botanical insecticide derived from roots of certain legumes; moderate mammalian toxicity, LD₅₀—132 mg/kg; short residual.</td>
<td>Useful in controlling lice, ticks, and cattle grubs on dairy animals.</td>
<td>Other insecticides are more effective for beef cattle. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Ruelene®</td>
<td>Organic phosphate; low mammalian toxicity, LD₅₀—770 mg/kg; moderate residual; surface-active and systemic.</td>
<td>Effective as pour-on or spray for control of cattle grubs.</td>
<td>Do not use on lactating dairy animals or within 28 days of freshening. Twenty-eight days minimum to slaughter.</td>
</tr>
<tr>
<td>Thanite®</td>
<td>Organic thiocyanate; low mammalian toxicity, LD₅₀—1603 mg/kg; short residual; contact, surface-active.</td>
<td>Fly control on dairy animals; also used in space sprays.</td>
<td>Apply as mist spray to animal but do not wet hide. Often used in conjunction with other materials. No waiting period to slaughter.</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>Chlorinated hydrocarbon; moderate mammalian toxicity LD₅₀—90 mg/kg; good residual; surface-active.</td>
<td>Effective against external parasites of livestock—lice, horn flies, ticks, mites.</td>
<td>Do not use on milk animals. Twenty-eight days minimum to slaughter.</td>
</tr>
<tr>
<td>Trichlorfon Anthon® Dipterex® Neguvon®</td>
<td>Organic phosphate; low mammalian toxicity, LD₅₀—450 mg/kg; systemic, and surface-active.</td>
<td>Good against cattle grubs applied as a spray or pour on. Effective against horse bots when given in feed. Useful in a bait for control of house flies.</td>
<td>Do not use on calves less than three months old or on colts less than four months old. Do not use on dairy animals. Fourteen days minimum to slaughter.</td>
</tr>
</tbody>
</table>
Hazards in Using Insecticides on Livestock

All insecticides are more or less toxic to man and warm-blooded animals and should always be handled with care. Pyrethrum, allethrin, and rotenone are comparatively non-toxic to man and animals. Of the chlorinated hydrocarbons, methoxychlor is low in mammalian toxicity, toxaphene and DDT are intermediate, and dieldrin and lindane are more highly toxic to warm-blooded animals. The chlorinated hydrocarbons very greatly, however, in their acute and chronic toxic levels and in their toxicity to different animals. For example, DDT has low acute toxicity, but it is eliminated from the body more slowly than are most other insecticides.

Certain precautions should be taken in handling and applying any insecticide:

1. As much as possible, avoid breathing dust, spray mist, or vapors.
2. Avoid spilling spray and liquid on the skin.
3. Wear protective clothing and change clothes as soon as you finish the job.
4. Wash thoroughly with soap and water after handling insecticides.
5. Read all labels on packages and follow directions explicitly.
6. Comply with pure-food laws by not treating animals too near slaughter. Insecticide labels will give the minimum number of days permissible from last application to slaughter. The length of this period depends on the animal’s ability to reduce insecticide residues in the fat and other tissues to tolerable levels.

Persons using insecticides should stop work immediately if any symptoms of poisoning appear. Call a physician at once. Frequently the first symptoms are headache and nausea. While awaiting arrival of a physician, apply the following measures:

If the poison has been inhaled, remove the patient to open air and give artificial respiration if needed.

If the poison has been spilled on the skin, wash immediately with large amounts of warm, soapy water. Drops or particles in the eyes should be removed by flushing with clear water.

If the insecticide has been swallowed, induce vomiting by giving a tablespoon of salt in a glass of warm water. Repeat until vomited fluid is clear. Vomiting also may be induced by sticking a figure down the throat.

If poisoning is by lindane, toxaphene, or DDT, give hot tea or coffee and one ounce of epsom salts after the stomach has been emptied. The physician may administer phenobarbital.

If poisoning is by dieldrin, have victim lie down and remain quiet until arrival of physician. Medical authorities advise administering phenobarbital immediately and repeating as often as symptoms require.

Organic phosphate insecticides are poisonous when swallowed, inhaled, or absorbed through the skin. Even though the ones recommended for livestock use are not highly toxic, avoid getting them in the eyes, on the skin, on clothing, or breathing the mist.

Warning symptoms of phosphate insecticide poisoning are headache, blurred vision, weakness, nausea, cramps, diarrhea, and pain or tightness in the chest.

In case of phosphate insecticide poisoning, have patient lie down and keep quiet. If insecticide has been swallowed, induce vomiting by giving a tablespoonful of salt in a glass of warm water. Give milk or water freely and again induce vomiting until vomit fluid is clear. If insecticide is on skin, remove contaminated clothing and wash skin with soap and warm water. If insecticide is in eyes, wash them with flowing water for at least 15 minutes.

Antidote for poisoning by phosphate insecticide is atropine sulfate.

Carbamate insecticides such as carbaryl (Sevin®) act like organic phosphate insecticides and in case of poisoning patients are treated in the same manner as described for poisoning by phosphate insecticides.

Before using any insecticide, read the instructions on the label carefully and follow them. Dosages used should absolutely not exceed those recommended on the label. The theory “If a little is good, more is better” is not safe when dealing with poisons.

There are two Poison Control Centers located in Wyoming where help can be obtained for cases of poisoning.
1. Laramie County Memorial Hospital, 23rd & House Streets, Cheyenne, Phone 634-3341, Ext. 238; L. J. Cohen, M.D. and Rachel Garlick, R.N. This is an information and treatment center.
2. Natrona County Hospital, 1233 East 2nd Street, Casper. Phone 234-2277; D. L. Becker, M.D. This is an information center.
Several kinds of flies are a nuisance in and around farm buildings. The house fly is best known of these because of its wide distribution and its ability to carry disease. Flies help spread mastitis, pink-eye, anthrax, typhoid fever, amoebic and bacillary dysentery, tuberculosis, and many other human and animal diseases. Their mere presence annoys most people. House flies are most abundant in Wyoming in late July, August, and September.

The lesser house fly is a smaller species which builds up large numbers on poultry farms. A behavioral characteristic of this fly is its tireless flying in circles. Bright, metallic-green blow flies and false stable flies, which closely resemble house flies, frequently are abundant in the early part of the summer before house flies appear. Blow flies are attracted especially by molasses-sweetened feeds. In addition to these non-blood-sucking flies, stable flies frequently are carried into buildings by animals and are found in large numbers resting on inside surfaces of open sheds or inside barns. They are primarily an annoyance to livestock and are discussed in another section of this bulletin.

Life History

Adult house flies live for about a month during the summer or slightly longer if the weather is relatively cool. They feed on many things from fecal wastes and garbage to the daintiest dishes prepared for human consumption. They may pass back and forth between these media. The mouthparts consist of a fleshy lobe for sponging up liquids. Hardened material must be dissolved by regurgitated saliva before flies can ingest it.

The house fly, like other kinds of flies, goes through four stages of development—egg, larva, pupa, and adult. Each female can lay 400 to 600 eggs, which she deposits in batches of 100 to 150 at intervals of about two weeks. Manure, garbage, and decaying vegetable matter attract egg-laying flies. Under favorable conditions, eggs hatch within 24 hours, and young larvae or maggots become full grown in one to two weeks. They then cease feeding and enter the pupal stage, from which the adult fly emerges four or five days later. There are probably two or three generations each season in Wyoming.

The life cycles of the other flies found on ranches are quite similar to that of the house fly. Blow flies breed in fresh or decaying flesh, manure, and human excrement, while false stable flies breed in decaying fruit and vegetables, manure, carcasses, dead insects, and a variety of other substances.

Control by Sanitation

Stop them from breeding! That is the most important part of good fly control. Comparatively dry climate and great distance between ranches in Wyoming are distinct advantages in achieving lowered fly production on individual farms. Sites which might be suitable for fly breeding under more humid conditions are normally too dry, and there is less migration of flies from ranch to ranch. Nevertheless, a little effort can greatly improve on the start that nature has provided.

Remove and spread manure at least weekly—twice weekly if possible, so that fly larvae will be killed by heat and drying. If manure must be stored, keep it in fly-tight concrete pits or boxes. Lacking this, put it in compact piles, where surface layers will dry quickly and become unattractive to egg-laying females.

Spilled feeds attract adult flies seeking food. If wet, spilled feeds serve as excellent breeding media. Sweep up and re-use or remove spilled feeds. When not disposed of properly, garbage is also an important source of flies on the farm. Stable flies can be reduced by removing decaying straw and weeds in which these flies breed.

Feedlots often breed an abundance of flies, but good management practices can reduce their numbers. Grade corral surfaces to permit adequate drainage, dispose of animal wastes frequently, and construct float valves on water troughs properly to minimize overflow or leakage.
**Control by Insecticides**

While good sanitation is usually not enough to control flies completely, it will greatly increase the effectiveness of insecticides. Insecticides alone will not do a satisfactory job.

Resistance by house flies to most chlorinated insecticides and restrictions by the Food and Drug Administration limit the insecticides that can be used for fly control, especially in dairy barns. All insecticides listed below, except Korlan and dimethoate, have been tested under Wyoming conditions. They can be used in dairy barns as well as most other types of livestock shelters.

**Dairy Barns**

Residual sprays are generally the most effective method of killing flies in barns. They can be made from wettable powders or from liquid emulsifiable concentrates mixed with water and applied to walls, ceilings, and stanchions to the point of run-off. Cover feed and water troughs and remove animals from buildings before applying the spray.

To make a residual fly spray, mix one of the following amounts of insecticide in 10 gallons of water:

**Spray Formulas**

(1) Dimethoate 1 percent.  
1½ pt. of dimethoate (Cygon 4E) emulsifiable concentrate, OR

(2) Diazinon 1 percent.  
1½ lb. of diazinon 50 percent wettable powder, OR  
1½ pt. of diazinon 50 percent emulsifiable concentrate, OR

(3) Ronnel 1 percent.  
3 lb. of Ronnel 25 percent wettable powder, OR  
3 pt. of Ronnel 24 percent emulsifiable concentrate, OR

(4) Methoxychlor 2.5 percent.  
4 lb. of methoxychlor 50 percent wettable powder OR  
Methoxychlor 5 percent.  
2 gal. of methoxychlor 24 percent emulsifiable concentrate, OR

(5) Lindane 0.3 percent.  
1 lb. of lindane 25 percent wettable powder, OR  
1¼ pt. of lindane 20 percent emulsifiable concentrate, OR

(6) Malathion 2 percent.  
4 lb. of malathion 25 percent wettable powder plus 2 lb. of sugar, OR  
1½ pt. of malathion 55 percent emulsifiable concentrate plus 2 lb. of sugar.

All these insecticides except malathion (and methoxychlor and lindane in areas where flies are resistant to them) should give at least a month of good control in dairy barns. If the control period proves shorter, try another insecticide. Some, notably diazinon, may give control for the entire season with a single application.

**Milk Rooms**

To control flies in the milk room, hang Vapona strands or vaporizers from the ceiling or walls. Install in June when fly numbers begin to increase. Use 30 linear feet of the strand or one vaporizer (20 percent Vapona) per 100 square feet of room area. Do not use residual sprays in the milk room.

**Supplementary Measures**

There are several baits that can be used alone or as supplementary measures with residual sprays. When used alone, repeated applications are necessary. Their most effective use is supplementary to sprays where fly numbers are unusually high. Dry baits usually contain one percent of a phosphate compound, such as malathion, Dipterex, Vapona, diazinon, or Korlan impregnated on an attractant in flake form or mixed with granulated sugar.

Sprinkle dry baits thinly from the shaker-can in narrow strips on floors, walkways, window sills, and other places where flies gather, but not where the bait will contaminate animal feed, water, human food, or utensils. Wet baits are mixed by the user and are prepared from emulsifiable concentrates of one of the phosphate compounds. The proper formulation for baits is usually given on the insecticide label.

Apply these liquid baits with an ordinary sprinkling can. Plug about half the holes so that the bait will spread in strips four to six inches wide on floors. If the floors are covered with dirt or litter, sprinkle the bait on sheets of tin, wood, or paper.

Paint-on baits of a phosphate insecticide, mixed in syrup and applied with a brush, are quite effective.

**Livestock Sheds**

On and in sheds and farm buildings other than dairy barns or poultry houses, stockmen can use stronger concentrations of residual insecticides to control flies. Spray the surfaces of walls, the outside of buildings, and fences but do not contaminate feed or drinking water.

**Spray Formulas for Sheds**

1. 5 percent DDT. 2½ gal. of 25 percent DDT emulsifiable concentrate in 10 gal. water, OR
2. 5 percent toxaphene. 1 gal. of 60 percent toxaphene emulsifiable concentrate in 10 gal. water.

Paint-on baits are effective in animal sheds. Use a
paint brush and apply to suitable surfaces where flies rest but where the stock can not reach the bait. When applying bait to a fence around a pen, paint only the outside.

**Paint-on Bait Formulas**

1. 4 fluid oz. Diazinon 50 percent emulsifiable concentrate in one gallon of corn sirup or blackstrap molasses, OR
2. 4 oz. of Diazinon 50 percent wettable powder in one gallon of corn sirup or blackstrap molasses, OR
3. 4 fluid oz. malathion 55 percent emulsifiable concentrate in one gallon corn sirup or blackstrap molasses, OR
4. 8 oz. of malathion 25 percent wettable powder in one gallon of corn sirup or blackstrap molasses.

**Poultry Houses**

Poultry raisers can control house flies and other common species found around poultry, particularly the lesser house fly, by using the same methods but not always the same insecticides recommended to protect cattle. The number of insecticides available are fewer since DDT and lindane create residue problems in eggs and meat, and Diazinon and Vapona are toxic to birds.

Ronnel is safe. (Use spray formula 3, p. 9.) Apply the spray to all surfaces—walls, ceilings, and roosts, but do not treat inside nest boxes. Do not spray birds or contaminate feed or water. For additional control install Geigy Snip Fly Bands in the poultry house.

**Selected References**


**MOSQUITOES**

Mosquitoes constitute a severe nuisance to both man and animals in many areas. The problem is largely, although not entirely, rural. Annoyance to livestock most often results in refusal of the animals to graze normally. Instead, they tend to bunch together on high ground or mill around in circles. Handling may be very difficult under such circumstances. The mosquito nuisance to human beings, especially in mountain recreational areas and in some irrigated areas, is thoroughly familiar to most people. Although they annoy mainly through their vicious bites, mosquitoes are also the transmitters of encephalitis in Wyoming, as well as many other diseases in other parts of the world.

**Life History**

Most of Wyoming mosquitoes belong to the genus *Aedes*. Like all other mosquitoes, they breed in water. Breeding places include permanent and semipermanent ponds, river flood-plain pools, irrigated meadows, snow-melt pools, marshes, and bogs.

*Aedes* mosquitoes do not lay their eggs directly in water. They deposit eggs singly in depressions subject to inundation. Eggs are the overwintering stage, and the larvae appear after the eggs have been flooded. The rate of development depends on temperature, but at least a week is required to complete the larval (wriggler) and pupal (tumbler) stages. Several weeks are required at cooler temperatures.

The number of generations per year varies with species and with environmental conditions, but most Wyoming species of *Aedes* have only one generation a year. Adults usually appear in May or June and may persist throughout the summer. They are capable of distant migrations, some species being known to fly from five to 20 miles from their breeding grounds.

**Control**

Mosquitoes can be controlled in several ways: (1) elimination of breeding areas, (2) chemical destruction of larvae, and (3) chemical destruction of adults. Although the first two methods are cheaper and more effective in the long run, community action is generally necessary for their success.

Chemical destruction of adult mosquitoes by residual sprays is frequently more practical when dealt with on an individual basis. Annoyance can be greatly reduced by applying DDT or dieldrin sprays to surfaces of buildings and on surrounding vegetation where mosquitoes rest. DDT is used at rate of 4 lb. of 50 percent wettable powder or 2½ gallons of 25 percent emulsifiable concentrate in 10 gal. of water. Dieldrin is used at rate of one pound of 50 percent wettable powder or one quart
of 18 percent emulsifiable concentrate in 10 gallons of water. Such treatments should provide relief during daylight hours for at least one week. Do not treat areas where food or feed crops are grown. Do not use on range or pasture.

Temporary relief from mosquitoes during picnics or in the evening hours can be obtained by using an aerosol bomb, but it gives no lasting effect. Repellents applied to exposed parts of the body also will give temporary relief. Diethyl toluamide is more effective and pleasant to use than other repellents commercially available.

As yet there is no material that can be applied directly to livestock that will give them lengthy protection from mosquitoes. A spray containing one percent pyrethrins and 10 percent piperonyl butoxide, or MGK 264 diluted with nine parts of water, affords some relief if applied at two day intervals.

**Selected References**


Black flies are small, bloodsucking flies which in some areas may be exceedingly annoying to man and animals. They are sometimes called buffalo gnats because of their peculiar humped backs. The immature stages, i.e., egg, larva, and pupa, are always found in running water. Swift mountain streams or the rapids of large rivers are ideal places for their development. Large area control may be accomplished by treating with DDT the streams which act as breeding places. Such an undertaking should be under direct supervision of a qualified entomologist. Otherwise, harm to fish or other aquatic life may result.

For fishermen, campers, or laborers who may be subjected to black fly bites, repellents will give some relief. In field tests 612 has generally given the best protection, but indalone, dimethylphthalate, or a mixture of these with 612, are nearly as good. None of the repellents will last for more than a few hours, so frequent applications on all exposed areas are necessary for complete protection. Blue clothing is particularly attractive to black flies and should be avoided in areas where they are annoying.

Selected Reference

Fleas are small, dark brown, and wingless. Unlike other insects mentioned in this bulletin, they are compressed laterally or from side to side. Blood is the only food of the adult fleas although they can live for a long period without feeding. They primarily torment dogs and cats but may also bother swine. Only infrequently do they become numerous enough to rank as household pests. From the standpoint of public health, fleas are of great potential importance as transmitters of bubonic plague.

Control
For direct application to dogs, dusts containing five to 10 percent DDT, 10 percent methoxychlor, or four to five percent malathion, are effective when about 1 tablespoonful is dusted thoroughly in the hair along the back from head to tail. DDT kills fleas slowly and causes a short period of greatly increased flea activity (and consequently dog activity) immediately after treatment.

DDT should not be used on puppies or cats. During the process of cleaning themselves, cats can ingest enough poison to cause death. On puppies and cats, flea powders whose active principle is either pyrethrum, rotenone, or malathion, are satisfactory.

Particular attention should always be given to mats and areas where pets sleep. Either an insecticidal dust, liquid emulsion, or household spray is suitable.

A recent recommendation for controlling both fleas and dog ticks is five percent Sevin dust. Apply the dust...
liberally over the dog or cat and rub it into the skin. Treat legs and feet between the toes. Dust in and around sleeping quarters and in any other areas inhabited by the ticks and fleas. Do not use Sevin on kittens under four weeks old.

To rid a house of flea infestation, household sprays formulated with DDT, methoxychlor, or malathion in highly refined oils, can be purchased for treating floors, rugs, overstuffed furniture, and basements. Apply with small hand sprayers. One quart of spray will cover about 1,000 square feet of surface.

When a flea buildup occurs under a house or in the yard, a five percent DDT or chlordane spray will give good control. A 10 percent DDT dust or five percent chlordane dust will also give good results.

Selected References


Cattle Parasites

CATTLE LICE

Four species of lice infest cattle in Wyoming. Three—the short-nosed louse, the little blue louse, and the long-nosed louse—have sucking mouth parts with which they puncture the skin of the host and suck blood. The short-nosed louse is the largest of the three and is gray. The others are blue.

The fourth species found on cattle is the biting louse, easily distinguished from the sucking species by its reddish-brown color, broad head, and chewing mouthparts. Biting lice do not suck blood, but when numerous they are just as injurious as the sucking lice. Although nearly all untreated cattle harbor lice to some extent, the heaviest infestations are generally found on a few especially susceptible individuals. Why some animals are more susceptible to infestation than others is not known.

A fifth species of cattle louse, the cattle tail louse, has been recently reported in eastern Wyoming near Torrington. It is a large sucking louse that superficially looks like the short-nosed cattle louse. This species prefers to inhabit the long-hair region of the tail, but it may infest the region around the eyes, the neck, and other areas. It reaches greatest abundance in late summer and early fall and is scarce in winter.

Heavy louse infestations may result in lowered milk production, loss of flesh, stunted growth, general unthriftiness, and anemia. Anemia may weaken an animal so seriously that moving it short distances, even a few hundred yards, causes exhaustion and death. Cows in

Three Species of Sucking Lice of Cattle. Left to right: Short-nosed Cattle Louse, Little Blue Cattle Louse, Long-Nosed Cattle Louse. Enlarged. Courtesy Cornell University
advanced stages of anemia abort their calves. The blood condition of an animal begins to improve immediately after lice are destroyed by an effective insecticide.

Heavy lice infestations adversely affect weight gains, lowering them by about a half pound per animal per day.

Life History

Cattle lice spend their entire life on cattle, and under Wyoming winter conditions quickly succumb if removed from the host. Similarly, eggs usually will not hatch if they become detached from the hairs and fall to the ground, unless the weather is unusually warm. In this event young lice must find a suitable host within two or three days or die. Cattle lice are never found on other animals, and lice from other animals cannot live on cattle.

Normally, the oval-elongate eggs, either blue or opaque white, depending on the species, are glued singly to the hairs, and hatch in one or two or more weeks. The young lice or nymphs are similar to adults except for smaller size and lighter color. The nymphs molt three times after hatching and become adults in two or three weeks. The life cycle, or period from egg to egg representing one complete generation, lasts approximately one month for each species. This fact simplifies control procedures, since measures effective for one species are also effective against the others.

Lice infestations fluctuate greatly during the season and vary from animal to animal. They are normally so low during the summer as to be indiscernible, but they begin to increase with approach of cool weather during fall and reach maximum numbers in late winter and early spring. When the weather warms and cattle are again on green pastures, the number of lice declines rapidly. Seasonal fluctuations are probably influenced by temperature variations. During spring and summer skin temperature of a cow may go well over 100°F., above the maximum temperature at which lice can live and produce eggs. Light intensity, host-diet, length of hair, and other factors probably also play a role in regulating populations.

CONTROL ON BEEF CATTLE

It is best to treat beef cattle for lice in October or November before cold weather, but lice should be controlled whenever they are numerous. Treatment in fall prevents heavy winter infestation.

If thoroughly applied, one application of Co-Ral or malathion will usually provide good control for the entire season. Co-Ral also controls cattle grubs (see page 16), so one application of the insecticide controls two major parasites. Most other insecticides used for cattle lice control require two applications. The following treatment schedules are suggested:

(a) Spray or dip, preferably twice, at an interval of 14 to 18 days, in October or November before cold weather. It may be necessary to treat a few animals individually in late winter or spring.

(b) Spray or dip once in October or November with a second treatment about February. A second treatment sometimes will not be necessary.

(c) If the herd is not available for treatment until December or January, treat once, and if treatment is thorough, control should last until lice numbers normally decline in the spring.

The following insecticides can be used on beef cattle as sprays: Dilute the amounts indicated in parenthesis with 100 gallons of water:

Spray Formulas

(1) Co-Ral 0.06 percent.
   2 lb. of 25 percent wettable powder, OR
   2 quarts of 11.6 percent emulsifiable concentrate, OR

(2) Malathion 0.5 percent.
   16 lb. of 25 percent wettable powder, OR
   1 gal. of 57 percent emulsifiable concentrate, OR

(3) Lindane 0.03 percent.
   1 lb. of 25 percent wettable powder, OR
   1 ¼ pints of 20 percent emulsifiable concentrate, OR

(4) Toxaphene 0.5 percent.
   10 lbs. of 40 percent wettable powder, OR
   5 ½ pints of 60 percent emulsifiable concentrate, OR

(5) Methoxychlor 0.5 percent.
   8 lb. of 50 percent wettable powder, OR
   2 gal. of 25 percent emulsifiable concentrate, OR

(6) Korlan 0.125 percent.
   4 lb. of 25 percent wettable powder, OR
   2 quarts of 24 percent emulsifiable concentrate, OR

(7) Rotenone 0.006 percent.
   1 lb. of cube or derris containing 5 percent rotenone.

Pyrethrum sprays are also effective. Dilute a one percent pyrethrum—10 percent piperonyl butoxide mix-
ture with 40 parts of water.

Do not treat calves less than one month old with malathion, or calves less than three months old, with Co-Ral. Do not use lindane on emaciated or lactating animals. Do not spray or dip recently weaned calves in bad weather.

None of the above insecticides except rotenone or pyrethrum may be used on producing dairy cattle.

If a power sprayer is used, the spray should be applied at 200 to 400 pounds per square inch nozzle pressure and at a rate of about two gallons per adult animal, or whatever is necessary to soak the animal completely. The spray stream should be directed to every part of the body with particular attention to the head and underline. No more than seven or eight cows should be enclosed in the spraying pen at one time since more make it difficult to do a thorough job on each animal.

The tail louse is harder to control and requires repeated treatments. Spray the infested tail altogether three times at intervals of 14 to 18 days.

For individual treatment of heavily infested animals during cold weather, apply thoroughly 10 percent methoxychlor dust or four to five percent malathion dust. Treat twice at interval of 14 to 18 days.

A rapid, economical, and thorough method of treating beef cattle for lice control is by dipping. Dilute the amounts indicated in parenthesis per 100 gallon of water.

Dip Formulas
(1) Toxaphene 0.5 percent.  
10 lb. of 40 percent wettable powder, OR  
3 qt. of 60 percent emulsifiable concentrate, OR
(2) Co-Ral 0.06 percent.  
2 lb. of 25 percent wettable powder, OR

Spray Formulas
(1) Ciodrin 0.1 percent (3 pt. Ciodrin emulsifiable concentrate of the 2 lb. per gal. formulation or 1½ pt. Ciodrin emulsifiable concentrate of the 4 lb. per gal. formulation), OR
(2) Pyrethrins + synergist (2½ gal. of 1 percent pyrethrin —10 percent synergist concentrate), OR
(3) Rotenone (2 lb. of 5 percent wettable powder).

Selected References


DeFoliart, G. R. 1957. Lice control on northern range herds with residual sprays. Jour. Econ. Ent. 50(5) 618-621.


CATTLE GRUBS AND HEEL FLIES

Cattle grubs and heel flies are among the most destructive pests that attack cattle. Grubs, or warbles, commonly found in cysts on the backs of cattle from December to July in Wyoming, are the larval or immature stage of heel flies. Both larvae and adults injure cattle. Grubs in the backs of cattle cause much irritation and allow the secondary invasion of bacteria, which produce large amounts of pus and poison. Sometimes the grubs, in migrating through the animal's body, enter the spinal canal, injure the nerve cord, and thereby cause paralysis. Besides the losses sustained on live animals, losses also are encountered at slaughter. Hides of grubby cattle are peppered with holes. Hides having five or more grub holes are classed as No. 2 and are discounted one cent per pound. Another slaughter loss results from trimming backs of grubby carcasses. About 12,000,000 pounds of the choicest meat are lost in this way annually.

Much injury also is caused by the adult stage. Heel flies in attempting to lay their eggs on the hairs of cattle produce an uncontrolled fear which causes animals to run wildly. Cattle constantly attacked by heel flies do not graze or feed properly and lose weight. Many animals injure themselves in mad attempts to escape attacks of flies. Animals being chased have a characteristic way of holding their tails high in the air as they run. During the heel fly season, herding cattle becomes impossible except in early morning or evening when flies are inactive.

Cattle of all breeds are normal 'hosts of cattle grubs. There are two kinds of cattle grubs—the common cattle grub and the northern cattle grub. The former is found widely in the United States and Canada, but the latter is found only in northern United States and Canada. Both occur in Wyoming.

Heel flies are true flies belonging to the insect order Diptera. They look more like small bumble bees, however, than flies. They are hairy and black with yellow or orange bands. The grubs are tiny and white when they emerge from eggs. They do not have legs, nor do they have a noticeable head. When full grown, grubs are about one inch long and black.

Life History

The life histories of the two species are similar, although there are some important differences. The common heel fly appears earlier in the season than the northern species, emerging and becoming active in April and May. Individual flies live a short time, usually less than a week. During this time the females lay eggs on the hairs of the flanks and legs of cattle. Although no injury or pain is caused during oviposition, cattle become frightened and try to escape when the flies advance to lay eggs. Eggs of the common heel fly are laid in groups of about seven and are arranged neatly in a row along the hair. Eggs hatch in three to six days and the minute larvae bore through the skin. Underneath the skin, grubs migrate in several directions, but eventually, after a period of eight months, all that survive reach the back.

As soon as the grubs arrive at this site, they perforate the skin to make holes through which they obtain air and later make their exit. In Wyoming, time of arrival of grubs in the backs of cattle varies with altitude—the higher the elevation, the later the grubs appear. Around 5,000 feet larvae reach the back in December.

Larvae develop rapidly within the cyst formed underneath the skin and become full grown in approximately 55 days.

On reaching full growth, they crawl through the holes and drop to the ground, take shelter in ground litter, and form a pupal case or puparium within a day or two. The pupal stage lasts 40 to 50 days. Flies emerge from the puparia in April and May and are ready to seek cattle for the purpose of laying eggs. These eggs are the beginning of the next generation.

The northern cattle grub appears later in the season than the common cattle grub. The first northern cattle grubs appear in backs of cattle in February at altitudes around 5,000 feet. Other grubs arrive later, resulting in the presence of northern cattle grubs in the backs for approximately 150 days. This extends the period of grub presence in the backs to mid-July.

Control

Control recommendations for cattle grubs have changed rapidly in recent years, resulting from the discovery of systemic insecticides. Treatment of cattle with systemic insecticides kills grubs before they reach the
Back of Hereford Showing Raised Positions of Cattle Grubs.

back, thereby preventing damage to both carcass and hide. This damage was not prevented by the old standard treatment with rotenone, since it could not be used until after the grubs had arrived in the back and had cut holes in the hide. Another advantage of the new systemics is that they are most effective if applied early in the fall while weather is still pleasant.

Ranchers should generally be very cautious in dosing their cattle with systemic insecticides until they have had experience using them. Try a new material or a new method on a few cattle before treating an entire herd or a very valuable animal.

CONTROL FOR BEEF CATTLE

CO-RAL

Co-Ral, a systemic insecticide of moderate mammalian toxicity, is used as a spray or dip in controlling not only cattle grubs but ectoparasites such as lice and ticks on beef cattle. Cattle should be treated during September or October if possible while hair is short and it is easier to get the insecticide through the hair to the skin. Treatments later than this increase chances for bad side reactions.

When spraying cattle with Co-Ral, use pressures of 250 to 350 pounds per square inch and a pencil-type spray pattern in order to allow the spray to penetrate to the skin. Wet all parts of the animal's body including neck and legs. About one gallon of spray will treat a mature animal, but dosage may vary from two to six quarts, depending on size of animal and length of hair coat. Only one treatment is needed for control.

Spray Formula

Co-Ral 0.5 percent spray.
16 lb. of 25 percent wettable powder per 100 gal. of water, OR
Co-Ral 0.375 percent spray.
12 quarts of 11.6 percent emulsifiable concentrate per 100 gal. of water.

Dipping is a fast method of treating cattle for grubs. Although Co-Ral dips of 0.25 percent have been generally recommended in the United States, tests and practical experience in Wyoming have shown this concentration is insufficient to provide adequate control. Experimental data indicate that 0.5 percent dips of Co-Ral are effective, but this higher concentration is not recommended for general use.

If Co-Ral is used as a dip, it should be thoroughly mixed with water in the dip vat before each use to assure uniform treatment.

Dip Formula

Co-Ral 0.25 percent dip.
8 lb. of 25 percent wettable powder per 100 gal. of water.

Pour-on Formula

Co-Ral is available for use as a pour-on treatment in a ready-to-use liquid formulation. This product contains four percent Co-Ral in liquid solvents. Apply the solution onto the back line at a rate of ½ fluid ounce per 100 pounds of body weight, with a maximum of four fluid ounces per animal. For an animal 800 pounds or over, use four fluid ounces. For an animal less than 800 pounds, measure out the correct amount for the animal's weight. Do not apply pour-on to animals with wet hair, since effectiveness of treatment may be reduced.

A measuring dipper is supplied with this formulation of Co-Ral for dipping directly from the container or from any clean bucket or pail and for pouring the solution on the back line of each animal.

An advantage of the spray or dip treatment for grub control is that it also provides excellent control of lice. Pour-on treatments for grubs are easier to apply but do not provide much control of lice.
Rancher applying systemic insecticide by the pour-on method to control cattle grubs.

**Precautions In Using Co-Ral**

Do not treat lactating dairy animals, animals less than three months old, sick, convalescent, or stressed animals.

Do not spray young animals 10 days before or after weaning.

Do not spray animals for 10 days before or after shipping.

Do not apply in conjunction with oral drenches or other internal medications, or with allethrin or pyrethrum and their synergists.

No time limitation after treatment until slaughter.

**NEGUVON**

Neguvon, the newest systemic insecticide approved for cattle grub control, is recommended for use either as a spray or as a pour-on. The best time to treat is in September or October. The spray treatment should wet the skin. Spray pressures of 250 to 350 pounds are advisable. About one gallon of spray will treat a mature animal.

**Spray Formula**

Neguvon 1 percent spray.

10 lb. of 80 percent Neguvon soluble powder per 100 gal. of water.

Neguvon pour-on insecticide is a ready-to-use preparation containing eight percent of the active ingredient. A single application to the backline of an animal provides grub control. Apply the Neguvon pour-on to the backline at the rate of \( \frac{1}{2} \) fluid ounce per 100 pounds of body weight, with a maximum of four fluid ounces per animal. For an animal 800 pounds or over, use four fluid ounces. For an animal less than 800 pounds, measure out the correct amount for the animal’s weight. A measuring dipper is supplied with Neguvon pour-on. Do not apply pour-on to animals with wet hair, since effectiveness of treatment may be reduced.

**Precautions in Using Neguvon**

Do not spray within 14 days of slaughter or treat with pour-on within 21 days of slaughter.

Do not treat dairy animals, animals less than three months old, sick, convalescent, or stressed livestock.

Do not treat animals for 10 days before or after shipping or weaning.

Do not spray in a confined, non-ventilated area.

Do not apply in conjunction with oral drenches, other internal medications, or other organic phosphate sprays.

**RUELENE**

Ruelene is an effective systemic insecticide for several livestock pests. Applied by the pour-on method, it controls grubs; applied as a spray it controls both grubs and lice. This insecticide is obtainable as a 25 percent emulsifiable concentrate and as a 9.4 percent ready-to-use pour-on. Treat animals in September or October with Ruelene.

In spraying, apply insecticide at 250 to 350 pounds of pressure and wet entire body of animals to skin. Use a maximum of one gallon of spray on each mature animal, less on younger stock.

**Spray Formula**

Ruelene 0.5 percent spray.

Mix 1 1/2 gal. of 25 percent emulsifiable concentrate per 100 gal. of water.

The pour-on Ruelene formulation 8R is a ready-to-use product. Take the insecticide directly from container and pour it along the backline of the animal with a long-handled dipper. Apply at the rate of \( \frac{3}{4} \) fluid ounce per 100 pounds of body weight with a maximum of eight fluid ounces per animal. For an animal over 800 pounds, use eight fluid ounces. For an animal 800 pounds or less, measure out the correct amount for the animal’s weight. Do not apply pour-on to animals with wet hair, since effectiveness of treatment may be reduced.

**Precautions in Using Ruelene**

Do not treat sick animals or animals under stress from castration, dehorning, over-exertion, or excitement.

Do not treat animals within 10 days after shipping, weaning, or exposure to diseases.

Provide cattle with free access to water and feed be-
before and after treatment. If cattle react abnormally, encourage exercise.

Do not apply within 28 days of slaughter.

Do not apply to lactating dairy cows or to dry dairy cows within 28 days of freshening.

**RONNEL (TROLENE)**

Ronnel (Trolene) was the first systemic insecticide approved for controlling cattle grubs. It is now available in three forms: (1) a 40 percent granular feed mix, (2) 5.5 percent mineral granules, and (3) 5.5 percent mineral block.

The feed mix formulation, Trolene FM, is designed for treating feedlot cattle. Blend Trolene FM thoroughly with feed ingredients.

**Blend Formulas for One Ton of Medicated Feed**

Trolene 0.60 percent.

Mix 30 lb. Trolene FM with 1970 lb. feed ingredients.

Feed 0.3 pounds of medicated feed per 100 pounds body weight per day for seven days. Start only when cattle are “on feed” and after heel fly activity ceases in August. Do not treat later than November 1.

Mineral granules and mineral blocks of Trolene are designed for grazing cattle. These products (Rid-Ezy and Steer-Klear) are purchased in ready-to-use form. Provide one mineral feed box or one block for each 15 head of cattle. Place these near watering or loafing areas. Feed continuously during summer for at least 75 days. Do not feed salt or other mineral when cattle are being fed these medicated minerals. This method will provide control not only of cattle grubs but also of horn flies.

Recommended consumption of medicated mineral is ¼ pound per 100 pounds of body weight per head per month. In some Wyoming pastures cattle will not consume this amount. Encourage even consumption of mineral granules by keeping bunks clean and putting out only a five to seven day supply at one time.

**Precautions in Feeding Ronnel**

Do not feed to sick animals or to animals under stress, such as those just shipped, dehorned, castrated, or weaned.

Do not feed to producing dairy animals.

Do not feed the Trolene FM mixture within 60 days of slaughter.

Do not feed the medicated mineral block or mineral granules within 21 days of slaughter.

**CONTROL FOR DAIRY CATTLE**

Rotenone is still the recommended insecticide for treating lactating dairy animals. The systemic insecticides are not approved for use with milking cows because residues get into the milk, but one can treat young dairy animals, bulls, and dry cows with Co-Ral, Ruelene, and Trolene as described for beef cattle. Do not treat dry cows with Co-Ral within 14 days of freshening, with Ruelene within 28 days of freshening, with Trolene FM within 60 days of freshening, or with Ronnel mineral blocks or granules within 21 days of freshening.

Rotenone powders are formulated and used as dusts, washes, or sprays. Dusts are applied with a shaker and rubbed by hand into the cysts. Washes are likewise applied by hand, but usually a stiff brush or a sponge is used to work the liquid into the cysts.

Where large numbers of cattle need treatment, sprays are best. They are applied with power sprayers at pressures of 400 to 450 pounds per square inch. Cattle are most conveniently run into chutes, for the operator can then stand on a platform built at the side and direct the spray at close quarters onto the backs of the infested animals. The spray gun should deliver a solid stream and should be held no further than 12 inches from the backs. Disc openings should be 4/64 inch on multiple-nozzle guns and 5/64 inch on single- or double-nozzle guns. About one gallon of spray is required per head.

Formulas which have proved effective are:

1. Formulas for dusts.
   (a) 1 part cubé or derris powder (5 percent rotenone content) 2 parts pyrophyllite or tripoli earth, OR
   (b) Livestock rotenone dust 1 ½ percent ready-to-use formulation.

2. Formula for a wash.
   12 oz. cubé or derris powder (5 percent rotenone content) ½ oz. wetting agent (optional) 1 gallon of water.

3. Formula for a spray.
   7 ½ lb. cubé or derris powder (5 percent rotenone content) 1 lb. polyphosphate or other wetting agent (optional) 100 gallons of water.

**TABLE 4—Cattle-Grub Spray Formula**

<table>
<thead>
<tr>
<th>Percentage of rotenone</th>
<th>Amount of powder per 100 gal. of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.15</td>
<td>.7 lb. 5 oz.</td>
</tr>
<tr>
<td>5.10</td>
<td>.7 lb. 6 oz.</td>
</tr>
<tr>
<td>5.05</td>
<td>.7 lb. 7 oz.</td>
</tr>
<tr>
<td>5.00</td>
<td>.7 lb. 8 oz.</td>
</tr>
<tr>
<td>4.95</td>
<td>.7 lb. 9 oz.</td>
</tr>
<tr>
<td>4.90</td>
<td>.7 lb. 10 oz.</td>
</tr>
<tr>
<td>4.85</td>
<td>.7 lb. 12 oz.</td>
</tr>
<tr>
<td>4.80</td>
<td>.7 lb. 13 oz.</td>
</tr>
<tr>
<td>4.75</td>
<td>.7 lb. 14 oz.</td>
</tr>
</tbody>
</table>
Cubé and derris powders often vary in rotenone content from the usually recommended five percent quality. Table 4 shows several strengths of these materials and amounts to be mixed with 100 gallons of water. When mixing cubé or derris powders with water, first make a slurry by adding only a small amount of water; then add the slurry slowly to the balance of water in the spray tank while the agitator is in operation.

Proper timing of treatment is essential for satisfactory results and should be based upon knowledge of the seasonal occurrence of grubs in the backs of cattle. From research conducted in the Rocky Mountain Region on the life cycle of cattle grubs, a schedule of at least four insecticidal applications is recommended. Make the first treatment 45 days after the first appearance of grubs, the second 30 days later, the third 45 days later, and the fourth 30 to 45 days later if grubs are still present. Another recommended schedule spaces all the intervals at 40 days. In either case, small variations in timing can be expected because of interference from stormy or extremely cold weather. To follow this schedule of treatment, dairymen need to examine their cattle regularly to establish the date of first appearance of grubs in the back. When a grub first arrives in the back it makes a small hole in the skin of the host, causing a small amount of serum to exude. This serum hardens and can be detected by running one’s hands slowly over the back. Within a few days the cysts enlarge and can be felt as small bumps. Proper timing of treatments is illustrated for the Wheatland area (elev. 4,735 feet) in Fig. 1. The importance of the late treatments can not be over-emphasized, since they are designed to control the northern grub, a more injurious pest than the common grub.

Selected References


Horn Flies

Horn flies worry cattle during the summer. Like most other flies on cattle, they are bloodsuckers. When the flies are numerous, cattle may spend much of their time fighting flies and consequently do not make normal weight gains. Studies in nearby states show that cattle treated for horn flies may gain an average of 15 to 50 pounds more per head during the grazing season than untreated cattle.

Life History

Despite their misleading name, horn flies are not often found on horns but rather on backs or bellies of cattle. Adult flies remain always on the host except when they deposit eggs on fresh cattle droppings. Oviposition lasts only a few minutes, after which the flies hurry back to the host. During warm weather the life cycle is very short. Eggs hatch in less than 24 hours and the larvae complete their development in the droppings in four to five days. Pupation occurs usually in the ground, and the pupal period lasts about five days. When the weather is unusually cool or dry, the cycle from egg to adult may be somewhat longer.

Control on Beef Cattle

There are four ways to control horn flies—(1) sprays, (2) dusts, (3) rubbing devices and (4) feeding systemic insecticides in minerals.

Sprays

To spray for horn flies, crowd as many cattle as possible into a small pen. Spraying only the backs will give as long protection as spraying the complete animal. The following insecticides formulations can be used:
Spray Formulas

(1) Methoxychlor 0.5 percent.
   8 lbs. of 50 percent wettable powder, OR
   2 gals. of 24 percent emulsifiable concentrate in
   100 gallons of water, OR
(2) Toxaphene 0.5 percent.
   10 lbs. of 40 percent wettable powder, OR
   3 qts. of 60 percent emulsifiable concentrate,
   OR
   1 gal. of 45 percent emulsifiable concentrate in
   100 gallons of water, OR
(3) Malathion 0.5 percent.
   16 lbs. of 25 percent wettable powder, OR
   1 gal. of 57 percent emulsifiable concentrate in
   100 gallons of water, OR
(4) Co-Ral 0.06 percent.
   2 lbs. of 25 percent wettable powder, OR
   2 qts. of 11.6 percent emulsifiable concentrate
   per 100 gallons of water, OR
(5) Korlan 0.25 percent.
   8 lbs. of 25 percent wettable powder, OR
   1 gal. of 24 percent emulsifiable concentrate per
   100 gallons of water, OR
(6) Carbaryl 0.5 percent.
   8 lbs. of 50 percent wettable powder per 100
   gallons of water.

Dusts

Dust or dry wettable powder can be applied either
by hand or with a hand-duster. Sprinkle a tablespoon
of five percent Korlan dust or dry methoxychlor 50 per-
cent wettable powder, or three tablespoons of four or
five percent malathion dust on the back and shoulders
of each animal. Apply dust every three weeks and rub
in lightly.

Large numbers of beef cattle can be treated rapidly
if they are run into a corral and a puff of dust deposited
on the back of each by a hand-duster. A hand-operated
rotary duster is convenient for such applications if a
flexible hose is attached between the fan case and dis-
charge tube and if the nozzles are removed. Metho-
xychlor 50 percent wettable powder or toxaphene 50
percent dust or 40 percent wettable powder can be
used on beef cattle.

Backrubbers

Rubbing devices provide excellent control of horn flies and are inexpensive. They must be located where cattle will use them—near water or other natural loafing areas. The cable type developed in South Dakota is used by many Wyoming ranchers and is constructed as follows:

Backrubber, a self-applicating device for controlling horn flies on cattle.

Courtesy South Dakota State College
Securely set and brace two posts about 16 feet apart. A cable of three strands of barbed wire wrapped with a fourth strand is attached about 4 feet high on the posts and allowed to hang about 18 inches from the ground at the center. Wrap 12 to 14 burlap sacks around the cable so their edges overlap and tie in place with binder twine. Use enough sacks to hide the barbs well within the sacking.

For beef cattle, saturate the rubbing devices with a five percent solution of DDT, methoxychlor, or toxaphene, or a two percent solution of malathion, or a one percent solution of Korlan. These solutions are made by diluting emulsifiable concentrates of insecticides with No. 2 furnace oil or No. 2 diesel fuel. One gallon of solution will saturate 20 feet of cable. Pour the insecticide solution on the sacks slowly and evenly. Backrubbers should be examined every two weeks to keep them in operating order and they should be resaturated every three to six weeks.

### Formulas for Backrubbers

1. **DDT.**
   - Mix 2 gals. of 25 percent emulsifiable concentrate with 8 gals. of fuel oil, OR

2. **Methoxychlor.**
   - Mix 2 gals. of 25 percent emulsifiable concentrate with 8 gals. of fuel oil, OR

3. **Toxaphene.**
   - Mix 1 gal. of 45 percent emulsifiable concentrate with 9 gals. of fuel oil, OR
   - Mix 3 qts. of 60 percent emulsifiable concentrate with 9 gals. of fuel oil, OR

4. **Co-Ral.**
   - Mix 1 gal. of 11.6 emulsifiable concentrate with 13 gals. of fuel oil, OR

5. **Korlan.**
   - Mix 1 qt. of 24 percent emulsifiable concentrate with 6 gals. of fuel oil, OR

6. **Malathion.**
   - Mix 1 qt. of 57 percent emulsifiable concentrate with 7 gals. of fuel oil.

See directions under cattle grub control for use of medicated minerals—also effective against horn flies.

### CONTROL ON DAIRY CATTLE

Horn flies can be controlled on dairy cattle with dusts, sprays, or backrubbers.

Good control of horn flies can be obtained by applying a tablespoonful of methoxychlor 50 percent wettable powder to the back of each cow. Rub this amount into the hair along the back and repeat treatment every three weeks. To avoid contamination of milking utensils and milk, it is advisable to make the treatment in a corral rather than in the milking parlor. Malathion five percent dust may also be used in the same way to control horn flies. Apply three tablespoons of five percent dust every 10 to 14 days. Ciodrin three percent dust is also effective. Apply one to two tablespoons every 14 days if needed. Do not apply Ciodrin dust more often than every 14 days.

One spray method is to mist spray stanchioned cattle with refined oil solutions of Ciodrin two percent or pyrethrins-synergist 0.1 percent. Apply one to two fluid ounces per animal of one of these each day, wetting the hair coat but not the skin. These formulations are purchased ready to use and can be applied with a hand sprayer or small compressed air sprayer.

Another spray method is to drive the cows into a pen or corral and apply Ciodrin with a power sprayer once a week. For this treatment use emulsifiable Ciodrin diluted with water to make a 0.5 percent spray and apply one to two quarts per animal. One may also double the concentration of Ciodrin, that is, use a one percent spray and reduce the amount applied per animal to one to two pints.

### Spray Formulas

1. **Ciodrin 0.5 percent.**
   - Mix 3 pts. Ciodrin emulsifiable concentrate (2 lbs. per gal. formulation) with 20 gallons of water, OR

2. **Ciodrin 0.5 percent.**
   - Mix 2 pts. Ciodrin emulsifiable concentrate (3.2 lbs. per gal. formulation) with 20 gallons of water, OR

3. **Ciodrin 0.5 percent.**
   - Mix 1½ pt. Ciodrin emulsifiable concentrate (4 lbs. per gal. formulation) with 20 gallons of water.

Dairymen can also put up backrubbers for all of their cattle—milkers, dry cows, bulls, and young animals—and saturate them with one percent Ciodrin. To make this solution, mix emulsifiable Ciodrin with fuel oil according to the following formulas:

### Formulas for Backrubbers

1. **Ciodrin 1 percent.**
   - Mix 1 qt. of 2 lb./gal. Ciodrin emulsifiable concentrate with 6 gals. diesel or fuel oil No. 2, OR

2. **Ciodrin 1 percent.**
   - Mix 1½ pt. of 3.2 lb./gal. Ciodrin emulsifiable concentrate with 7 gals. of diesel or fuel oil No. 2, OR

3. **Ciodrin 1 percent.**
   - Mix 1 pt. of 4 lb./gal. Ciodrin emulsifiable concentrate with 6 gals. of diesel or fuel oil No. 2.
The face fly is a recent invader of Wyoming. Introduced to America from the Old World, the fly was first discovered in Nova Scotia in 1952. It spread rapidly and arrived in Wyoming in 1961.

Although this fly has developed into the worst summertime cattle pest in the East, it has yet to become abundant or troublesome in Wyoming.

The face fly is an annoying cattle pest, resembling an oversized house fly. It has distinguishing habits that provide a practical method for identification in the field. It swarms about the head of an animal, alighting in and around the eyes, nostrils and muzzle. The insect clings to the face of cattle and flits in and out of the eyes, causing profuse tear formation. It feeds on the mucus of eyes, nose, and mouth and on blood oozing from insect bites and open cuts. It also gathers on the withers, neck, brisket, legs, and sides, feeding on saliva deposits. The face fly itself does not bite, resembling in this respect its close relative, the house fly.

Irritation resulting from fly infestations may cause cattle to huddle or seek shade and refuse to feed. The irritation interferes with normal grazing, thus decreasing milk and beef production.

The face fly also may spread pinkeye and certain other eye diseases. It is primarily a pest of cattle but will attack horses and sheep.

**Life History**

Face flies like sunshine and bright light and usually leave an animal when it enters a building or dense shade. The adult flies often rest on buildings, fences, equipment, trees, weeds, and other plants. Animals are annoyed only by the female face fly. Male face flies are content with a diet of nectar and pollen, but the females need animal secretions—apparently for producing eggs.

The life history of the pest is becoming better understood in this country. The flies are active from mid-July to mid-September. Face flies lay their eggs in fresh manure—drippings less than two hours old. Yellow maggots develop in the manure, pupate in adjacent soil, and emerge as adult flies a few days later. A female fly lays from 30 to 230 eggs as compared with 200 or 300 in the case of the house fly. The total life cycle may take from 15 to 25 days. Generation follows generation during the warm months.

**CONTROL ON BEEF AND DAIRY CATTLE**

The face fly is difficult to control, and much research is being conducted to develop practical, effective methods. To date greater success has been achieved in developing means of controlling this pest on dairy cattle.

One method of control is to daily paint a stripe of 0.5 percent Vapona in corn syrup base on the forehead of animals. Using a one-inch wide brush, apply the bait with a six-inch stroke. About 1/7 fluid ounce per cow is an adequate single dose.

A second method is to spray 0.5 percent Vapona syrup bait on the forehead. Using a plunger-type hand sprayer and holding it one to two feet from the cow's head, apply about 1/6 fluid ounce in a coarse-droplet cone.

Hand sprayers specifically made for face fly control are available. A single stroke ejects the correct amount for one cow.

Make applications in the morning. After a week's daily use of Vapona, reduce treatment to every other day. Vapona liquid baits rapidly lose strength. Purchase only fresh baits and do not store for lengthy periods.

It is preferable to buy dry Vapona baits—concentrations of less than one percent of the insecticide on sugar—and add water the day before application.

To control face flies on beef cattle, some measure of reduction has been achieved by using backrubbers charged with five percent toxaphene in oil. Beef cattle that can be treated regularly should be power sprayed.
The stable fly is a serious pest of livestock. It is usually found annoying cattle on the lower parts of the legs. Severe pain caused by the flies' biting or piercing the skin causes cattle to stamp their feet incessantly. The stable fly looks somewhat like a robust house fly but can be distinguished easily by the proboscis, which is held forward bayonet-like when the fly is at rest, and by the seven dorsal spots on the abdomen.

The stable fly reaches highest and most damaging numbers in the central section of the United States. It is troublesome in Wyoming around barns and sheds, where livestock gather and where straw accumulates in yards and corrals. The fly is usually not a problem on open ranges.

Flies injure cattle by their painful bites, consumption of blood, and annoyance. Animals attacked by large numbers of stable flies do not feed properly and fail to gain and sometimes even lose weight. The fly can be a factor in disease transmission, although actual proof of this has been obtained in the case of a few diseases only.

Eggs hatch in about two days, and larvae complete development in about seven days. At full growth, larvae enter the pupal stage for about seven days. Adults have a life span of approximately 21 days.

Control

Control of the stable fly depends largely upon elimination of breeding sites. Manure should be hauled from barns and stables and scattered over the fields every three or four days. Precautions should be taken to prevent straw piles from becoming soggy and wet by stacking straws properly on dry ground. If straw piles become soggy, they should be scattered like manure or plowed under.

Residual sprays are effective against stable flies, and sprays suggested for controlling house flies can be used. Since stable flies generally remain outdoors and rest on fences and on the sides of barns and sheds, such places should be sprayed.

To the outside of barns and sheds and to fences, apply one of the following: five percent DDT, five percent toxaphene, one percent Korlan, one percent diazinon, or one percent dimethoate (Cygon). The latter three insecticides can be sprayed inside dairy barns as well.

Because stable flies have biting mouth-parts and feed on blood, they are not attracted to house fly baits.

When stable flies become particularly bad, protect animals with an insecticidal mixture containing 0.5 percent Ciodrin or pyrethrin and synergist such as piperonyl butoxide. Emulsifiable concentrates diluted in water can be sprayed at the rate of approximately one to two quarts per animal, with special attention to wetting the legs. Treatments should be made weekly with Ciodrin and twice weekly with pyrethrins.

**Spray Formulas**

1. **Ciodrin 0.5 percent.**
   - Mix 3 pt. Ciodrin emulsifiable concentrate (2 lb. per gal. formulation) with 20 gal. water, OR

2. **Ciodrin 0.5 percent.**
   - Mix 2 pt. Ciodrin emulsifiable concentrate (3.2 lb. per gal. formulation) with 20 gal. water, OR

3. **Ciodrin 0.5 percent.**
   - Mix 1.5 pt. Ciodrin emulsifiable concentrate (4 lb. per gal. formulation) with 20 gal. water.

Exact dilutions of pyrethrins can be obtained from the label.
Ready-to-use oil solutions of Ciodrin, Vapona, pyrethrins, Lethane 384, or Thanite applied as mist sprays also give some measure of control.

Selected References


HORSE FLIES AND DEER FLIES

More than 300 species of horse flies and deer flies (family Tabanidae) have been recorded in North America. Several dozen occur in Wyoming. Only the females suck blood and they are the most annoying of livestock pests. They take large amounts of blood from their hosts, inflict punctures that worry the animals to the extent that grazing time is materially reduced, and leave wounds whereby undesirable organisms may enter.

It has been shown that horse flies consume more than their own weight at each feeding. When the flies are abundant the daily blood loss may amount to 100 to 300 cc., not including the blood which exudes from the bite after the fly leaves. In addition horse flies are known or suspected of transmitting several diseases of livestock, including anthrax and anaplasmosis. Cases of tularemia due to the bites of a deer fly, Chrysops discalis, have been reported from Wyoming and other western states. Deer flies more commonly attack man than do horse flies.

Adults are generally robust, compact-looking flies with large, brightly colored eyes and antennae composed of three parts, the third being long and having several rings plus a thumblike projection at its base. They are active on warm, sunlit days when the temperature is above 70° F. On dark, cloudy, or rainy days, or when it is windy, they seek shelter in woods or other secluded places. Adults are on the wing from June to September, the peak population of the various species occurring early and then tapering off gradually.

Each female lays several hundred eggs in a wedge-shaped mass protected by a gluey, waterproof material. Since the larvae develop in an aquatic or semi-aquatic environment, the eggs of most species are deposited on foliage or other objects projecting over water or moist ground. Eggs usually hatch within a week, and the larvae immediately burrow into the ground beneath. Larvae, mostly carnivorous and cannibalistic, grow to maturity in slightly less than a year, although a few species require two years or more. Mature larvae measure up to about two inches in some species, are tapered at both ends, and have a fleshy ring on each body segment. After reaching maturity the larvae pupate, and the adults emerge one to two weeks later.

Control

At present there is no satisfactory control for horse flies, particularly under Wyoming conditions. Some degree of repellency can be obtained for two or three days after applying a spray mixture of 0.1 percent pyrethrins and one percent piperonyl butoxide. Use of this mixture may benefit dairymen or small herd owners in areas of heavy local infestation.

Applying Ciodrin as a two percent mist-oil spray daily or as a 0.5 percent water-emulsion spray once a week may bring relief. The two percent oil spray of Ciodrin is purchased ready to use. To make 0.5 percent Ciodrin, see spray formulas for stable fly control. Spray the entire body of the animal, paying particular attention to the areas most frequented by the horse flies.

Use a hand sprayer or compressed air sprayer to apply the mist spray of Ciodrin. Do not apply more than two fluid ounces per animal per day and do not wet hide.

Selected Reference

Use a power sprayer to apply the 0.5 percent Ciodrin water emulsion. Spray with high pressure and at rates of one to two quarts per animal. Repeat treatment weekly.

Both pyrethrin and Ciodrin sprays can be applied to beef or dairy animals including lactating cows. Sprays of Vapona, Lethane 334, or Thanite also are recommended.

**CATTLE SCAB**

Scab or mange of cattle is a contagious skin disease caused by minute parasitic mites. Four kinds of mites attack cattle. They vary in habits and in ways they cause injury. Symptoms of the disease are somewhat similar in that the first signs appear as small raised areas, about the size of a pinhead, on the surface of the skin. As the infestation progresses, the raised areas coalesce and form large lesions, which become denuded of hair and covered with yellow or gray crusts or scabs.

Because symptoms of mange can be confused with symptoms of ringworm, louse infestation, X disease, and several other skin diseases, positive diagnosis is made by taking deep skin scrapings and examining these for presence of mites.

Cattle mange is most serious and evident in winter. After cattle are placed on green pasture in spring, the symptoms of mange usually disappear without treatment. Nevertheless, infestation remains dormant over summer and the disease appears again next winter.

**Control**

On beef cattle and nonlactating dairy cattle, mange is controlled by dipping twice with special scab-approved toxaphene at a 10- to 14-day interval.

**Dip Formulas**

Toxaphene (special scab-approved formulation) to make a 0.5 percent dip.

- 3 qt. of 60 percent emulsifiable concentrate per 100 gal. water, OR
- 1 gal. of 45 percent emulsifiable concentrate per 100 gal. water.

Although dipping is preferred, one may also apply treatments with a spray-dip machine, holding each animal in the spray for no less than one minute. Maintain a constant high pressure.

Do not slaughter animals within 28 days after last treatment with toxaphene.

For producing dairy cattle infested with mange, lime-sulphur dips effectively control this disease with no need to discard milk because of insecticidal residues.

When using lime-sulfur, hold the temperature of the dip between 95° and 105° F. Directions for making dips from proprietary solutions of lime-sulfur are given on the container label.

**Selected References**


**TICKS**

Fourteen or more kinds of ticks inhabit Wyoming, but only three are important to livestock health. These are the winter tick, the Rocky Mountain wood tick, and the ear tick.

Ticks are eight-legged animals with complex life cycles. All have four developmental stages: (1) egg, (2) six-legged seed or larval stage, (3) eight-legged nymphal stage, and (4) eight-legged adult stage.

Variations in life cycles frequently result from the marked host preferences of ticks. Some species in their developmental stages attack only certain large wild or domestic animals, while others in the larval or nymphal stages attack small mammals such as rabbits and ground squirrels and in the adult stage attack large mammals such as cattle and elk.

**WINTER TICK**

As the name implies, this tick is found on its hosts mainly during the winter. It is seldom found on hosts in fall earlier than September or in spring later than June. Preferred hosts are horses, elk, and moose, but cattle and deer are often infested. This tick causes injury by feeding and withdrawing large amounts of blood. One of the chief factors of mortality in moose and elk is gross infestation by the winter tick, combined with feed shortages in late winter and early spring. Colts are especially vulnerable to attack, succumbing to heavy infestations. Although definite proof is lacking, this tick is considered a potential vector of anaplasmosis of cattle.

**Life History**

The winter tick has a comparatively simple life histo-
ry, for it is a one-host tick. An individual tick will complete its larval and nymphal development and become an adult on one and the same host. During late fall, winter, and spring adult females become engorged and swollen with blood, mate, and drop from the host to the ground. In spring each female produces and deposits about 4,000 eggs in a single mass over a period of several weeks. Eggs hatch in about six weeks into larval ticks, which remain bunched together and in a torpid state during summer. With cold weather the larval ticks become active. They crawl high on vegetation, assume a characteristic waiting position, and when a host brushes by they attach themselves. Each young tick remains on the host for six or eight weeks, feeding on blood and growing to an adult.

**CONTROL ON BEEF CATTLE**

Thoroughly spraying or dipping infested beef cattle with a recommended insecticide provides good control of the winter tick. A single treatment is usually sufficient, but if ticks are numerous, two treatments at intervals of six to eight weeks may be required. Also, if the first treatment is made early in the season, reinfestation may occur, necessitating a second treatment.

**Spray Formulas**

1. Toxaphene 0.5 percent.
   - 3 qt. of 60 percent emulsifiable concentrate, OR
   - 10 lb. of 40 percent wettable powder per 100 gal. of water, OR

2. Lindane 0.03 percent.
   - 1¼ pt. of 20 percent emulsifiable concentrate, OR
   - 1 lb. of 25 percent wettable powder per 100 gal. of water, OR

3. Malathion 0.5 percent.
   - 1 gal. of 57 percent emulsifiable concentrate, OR
   - 16 lb. of 25 percent wettable powder per 100 gal. of water, OR

4. Korlan 0.75 percent.
   - 3 gal. of 24 percent emulsifiable concentrate, OR
   - 24 lb. of 25 percent wettable powder per 100 gal. of water, OR

5. Co-Ral 0.125 percent.
   - 4 lb. of 25 percent wettable powder, OR
   - 1 gal. of 11.6 percent emulsifiable concentrate.

Dips can be made of these insecticides using the same formulas given above. Follow label precautions when using any of these materials.

**CONTROL ON DAIRY CATTLE**

To control winter ticks on milk cows, use sprays of Ciodrin, pyrethrins, or rotenone. See spray formulas of these under cattle lice.

**ROCKY MOUNTAIN WOOD TICK**

This tick is found on domestic livestock in spring and is of economic importance because it feeds heavily on blood of the host and it transmits several disease agents. Rocky Mountain spotted fever, tick paralysis, tularemia, Q-fever and anaplasmosis are some of the diseases with which the Rocky Mountain wood tick has been incriminated.

**Life History**

Since the Rocky Mountain wood tick requires three different hosts to reach maturity, its life cycle is more complex than the winter tick's. Adults infest large mammals—cattle, horses, sheep, and deer—during spring and early summer. Females, which are fully engorged with blood and mated, drop to the ground from these hosts and lay eggs two to four weeks later in some protected place. Each female lays about 6,000 eggs in one mass over a period of a month. After one to two months of incubation the eggs hatch into small larval ticks. These infest rodents, upon which they are particularly numerous during July of the same year. After becoming engorged with blood in about a week, the larval ticks drop to the ground to enter a quiescent period of one to four weeks. Then they molt to the nymphal stage and go into a dormant state lasting until the following spring.

In spring of the second season nymphs become active, climb up vegetation, and assume waiting positions for hosts. Hosts of nymphal ticks are also rodents, upon which they engorge blood for about a week before drop-
Enlarged
courtesy U.S.D.A.

The ear tick lives in ears of cattle, horses, sheep, dogs, a number of wild mammals, and, occasionally, man. Original distribution of this tick was probably confined to southwestern states and Mexico, but sale and movement of cattle resulted in its spread to other areas.

This tick causes injury by puncturing the tender skin within the ear and sucking blood. Wounds may become infested with bacteria, giving rise to a condition known as "ear canker." Plugs formed by accumulation of ticks, their excretions, and ear wax may close the ear passage completely. In this condition an infested animal shakes its head and repeatedly turns it from side to side. When irritation is more intense on one side, the animal often turns its head toward that side, and the more seriously affected ear is held lower than the other. A ten-

Control

Insecticides recommended to be used against the winter tick are effective also against the Rocky Mountain wood tick. The time of treatment, however, should be spring, when livestock become infested, rather than fall or winter. Because Rocky Mountain wood ticks concentrate on the brisket and lower part of the neck, pay particular attention to these areas when applying sprays.

Spot treatment of beef cattle with toxaphene sprays will control Rocky Mountain wood ticks and aid in controlling anaplasmosis. In spot treatment the animal is sprayed on areas of the body where the pests concentrate. In the case of Rocky Mountain wood ticks this is the brisket and neck region of cattle. By spot treating, you can apply a two percent concentration of toxaphene which is four times the usually recommended concentration sprayed on animals. No more of the insecticide is put on each animal than in treating the whole animal with the usual 0.5 percent spray.

Be careful in treating calves under three months of age as they are more susceptible to toxaphene than older animals. You can use as much as two quarts of two percent toxaphene spray on yearlings and older stock; but use proportionately less on calves. Since calves are not so adversely affected by anaplasmosis as mature animals, you may want to avoid spraying the younger calves altogether.

To make a two percent spray for spot treatment, mix three gallons of 60 percent emulsifiable concentrate toxaphene or four gallons of 45 percent emulsifiable concentrate toxaphene per 100 gallons of water. Be sure you purchase toxaphene concentrate that has been specially formulated for livestock use.

Several treatments at 21-day intervals may be needed when ticks are abundant. Read the label for other directions and precautions.
dency for the animal to rub and scratch affected ears may result in extensive lacerations.

Life History

The adult ear tick lives on the ground away from the host. Only during the larva and nymphal stages does this species inhabit ears. Larval ticks which catch a host crawl to the ears, where they attach themselves to the tender inner skin. After engorging with blood for five to ten days, they enter a quiescent state for one to five weeks. The larval ticks then molt to the nymphal stage. Within the ear the nymphs engorge themselves with blood for two or more months. When they become completely engorged, they drop to the ground and rapidly seek cover under litter for the final molt. The adults mate on the ground. Soon afterward females commence to lay eggs. Each female deposits about six separate masses of approximately 1,400 eggs.

Control

For the control of ear ticks infesting beef cattle, horses or sheep, apply a five percent Co-Ral dust lightly inside ears. A plastic bottle duster with five percent Co-Ral can be purchased and is convenient for making the application. Shake squeeze bottle, then exert sharp pressure to apply two puffs into each ear.

Another method of controlling ear ticks, approved for all stock including lactating dairy cows, is to squirt a small amount of insecticidal solution into each ear. Make the solution according to the following formula:

- 4 fluid oz. lindane 20 percent emulsifiable concentrate
- 12 fluid oz. xylol
- 1 gal. pine oil

An ordinary metal spring-bottom (press bottom) oiler of about one-pint capacity is the most suitable equipment for applying the solution. The spout should be cut off to two inches long, thereby forming a spout opening about $\frac{3}{8}$ inch in diameter. A piece of flexible soft-rubber tubing $2\frac{1}{2}$ inches long and with a $\frac{3}{8}$ inch inside diameter should be slipped over the oiler spout. The tubing will guard against injury to the delicate inner-lining of the ear by the sharp edges of the metal spout tip.

To apply the medicament, grasp the ear with the left hand, insert the oiler spout into the opening of the ear canal, and inject $\frac{1}{2}$ ounce into each ear. While the injection is being made, manipulate the ear with the left hand to spread the solution over the entire inner surface. Then hold the ear in an upright position for a few seconds, to allow the fluid to settle into the canal.

One treatment of either dust or solution usually controls an infestation, but examine animals regularly and repeat the treatment when necessary.

Selected References


Sheep Parasites

SHEEP KED (SHEEP TICK)

The sheep ked, often called sheep-tick, is a common sheep pest in Wyoming. Although many observations have been made on the damage caused by this insect, few exact studies have been carried out.

At the Torrington Agricultural Substation the writers have investigated the effect of keds on weight gains of feeder lambs. Results indicate no significant difference in gains between ked-infested and ked-controlled lambs. The number of keds infesting untreated lambs markedly decreased during the period of feeding. Evidently lambs on a fattening diet can in some way control ked infestations themselves.

On the other hand, sheep grazed through the year on ranges acquire heavy infestations during the winter and early spring months. Damage, most evident at these times, may result from consumption of blood and from irritation caused by the bites. Many ranchers attribute "back loss" to heavy infestations of this parasite. Also, injury may occur after transfer of large numbers of keds from ewes to new-born lambs.

Life History

The sheep ked is a wingless fly which, for an insect, has a remarkable way of reproducing. Eggs hatch within the uterus of the female ked, and young larvae develop to maturity on food material secreted by nutritive glands of the mother. Only a single larva develops at a time,
the full-grown larva being born after eight days of feeding and growing in the uterus.

The larva is cemented to the sheep's wool and forms the red-barrel-shaped puparium, sometimes confused with eggs or nits. The pupal period averages 22 days, after which the young keds emerge.

Females live about 100 days and produce 15 or more larvae during a lifetime. Males live about 80 days.

The entire life of a ked is spent on the host. Keds that fall off the host usually survive less than a week and present little danger of infesting a flock. Ked populations build up during winter and decline during summer.

Control

Several insecticides effectively control infestations of sheep ked. Wool growers have a choice of applying these as either sprays, dips, sprinkles, or dusts. The most convenient time to treat is in spring after shearing, when wool is short.

Sprays

One can apply sprays at low pressures (50 to 75 pounds per square inch) or at high pressures (300 to 350 pounds per square inch.) When wool is long, spray penetration is more satisfactory at high pressures. Depending on wool length, from two to eight quarts of spray will be required to completely soak a sheep. Adding a pound of household detergent to each 100 gallons of spray will aid penetration and wetting and thereby enhance effectiveness of the insecticide.

Tractor-mounted and other low-pressure sprayers are satisfactory equipment for applying sprays at low pressure. Apply one qt. of spray per sheep. This will not soak a sheep but is sufficient to eliminate sheep keds when you apply the proper insecticide and concentration. Low-gallonage spraying is a fast, economical method of treatment.

Dips

Dipping has proved highly effective in eradicating sheep keds. A successful yet inexpensive material for a dip is ground cube or derris root. Use at the rate of twelve ounces of powder five percent rotenone content to each 100 gallons of water. Convert the dry powder to a paste in a small amount of water before adding to water in the vat. After filling the vat with water and...
An entomologist conducts a test on the effectiveness of powder dusting to control a heavy population of sheep keds infesting a farm flock of sheep.

insecticide, mix the contents well. A good method of stirring is to take a five gallon pail, punch holes near the top, insert a wire for a bail, allow the can to fill and partially sink, then drag it with a dipping fork rapidly from one end of the vat to the other. Repeat several times. Adding a detergent or wetting agent to the dip assists penetration of the fleece.

Application of rotenone imposes no slaughtering restrictions. Lindane and toxaphene wettable powders are effective materials for dips. Use lindane at 0.025 percent and toxaphene at 0.25 percent concentrations.

Dip Formulas

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<tr>
<th>Formula</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>¾ lb. of 5 percent rotenone powder per 100 gal. of water, OR</td>
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<tr>
<td>2</td>
<td>¾ lb. of 25 percent wettable powder lindane per 100 gal. of water, OR</td>
</tr>
<tr>
<td>3</td>
<td>5 lb. of 40 percent powder toxaphene per 100 gal. of water, OR 3 pt. of 60 percent emulsifiable toxaphene per 100 gal. of water.</td>
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Sheep are dipped most conveniently in spring after shearing, or in fall when making up winter bands. If sheep are dipped in spring, allow at least 10 days after shearing for wounds to heal. Also, do not dip ewes and lambs together, as the danger of drowning lambs is greater than when they are dipped separately. Do not dip lambs less than three months old in lindane. Minimum days from dipping to slaughter are: rotenone—0, lindane—60, toxaphene—28.

Ranchers who plan to dip should obtain a copy of USDA Farmers' Bulletin 2057 for complete instructions.

Sprinkler-Can Method

To control sheep keds infesting small farm flocks, a simple and inexpensive method is to apply diazinon or Korlan with a sprinkler can.

Dilute one fluid ounce of 25 percent emulsifiable diazinon in three gallons of water, or dilute one cupful eight fluid ounces of 24 percent emulsifiable Korlan with each three gallons of water. Using an ordinary garden sprinkler can, apply the diluted insecticide over the heads, necks, tops, and sides of the sheep. Apply one quart per sheep. A convenient arrangement is to crowd about 25 head in a pen and, as you walk among them, sprinkle six gallons of diluted insecticide over them. Turn these out and treat successive batches of 25 in the pen.

Minimum days from treating to slaughter are: diazinon—14, Korlan—84. Do not use diazinon if there are lambs less than two weeks old in the flock.

Dusts

Among sheep growers in Wyoming, power dusting is the most popular method of controlling sheep keds. There are several reasons for the popularity of this method.

1. Dusting fits well into management practices in spring. After the sheep are shorn and branded, they run through the dust as they are turned out on the range.
2. Dusting is rapid. 2,000 sheep can be treated per hour.
3. Dusting is safe. Sheep are not wetted and exposed in vulnerable condition to storms and cold nights. None are lost by drowning or poisoning.
4. Cost is low, amounting to one cent per head for the
In spring time, a Wyoming wool grower dusts his recently shorn sheep to control keds.

Woolgrowers usually employ commercially made sheep dusters for treating sheep, but it is possible to convert row-crop dusters for the purpose. To power-dust sheep, set up the duster and steel dusting chute at the end of a sheep chute. Drive the sheep from a holding corral through the chute and through the curtain of dust as fast as they will go.

A single dusting of shorn sheep in spring with 1½ percent dieldrin dust or two percent diazinon dust will eliminate an infestation of keds. One should make sure to dust all sheep—lambs, ewes, and bucks. If new sheep are purchased after dusting, isolate and treat them before putting them with the flock.

Sheep also may be dusted in fall with two percent diazinon dust to control keds. Although eradication of infestations may not be accomplished at this time of year because of five months’ wool growth, reductions of 98 percent can be expected. Employ the maximum dust rate of three pounds per minute. The 1½ percent dieldrin dust is ineffective in fall.

Do not slaughter dieldrin-dusted sheep sooner than 90 days after treatment, or Diazinon dusted sheep 14 days after treatment.

For easy dusting, woolgrowers should give attention to several details:

1. Use a dust formulated for treating sheep, not crops. The right dust will contain pyrophyllite as the main diluent and 2 percent light motor oil to reduce fluffiness.

2. Do not apply excessive rates of dust since this will stop sheep from passing through the chute. Rates of 2.5 to three pounds per minute are sufficient.

3. Concentrate the sheep in the panel chute, squeeze pen, and adjacent section of the corral before starting duster engine.

4. Do not run sheep against the wind because dense clouds of dust will form in the chute and stop the sheep. Set up chutes in the open away from buildings so the wind will blow excess dust away from operators and sheep coming down the chute. Wind blowing in the direction the sheep are moving in the chute is most favorable, but a cross wind will do.

5. Keep sheep moving in one direction. If sheep turn after passing through the dusting chute and come around to the outside of the corral where the undusted sheep are bunched, the latter will often break away.

6. Keep sheep moving without breaks in the line. Sheep pass through the dusting chute readily when trailing one another.

Hand Dusting

A simple way to treat a few sheep for keds, ticks, and lice is to hand dust. Use a four or five percent malathion dust at a rate of one to two ounces per head, depending on size of animal. Catch each sheep, place it on its side, sift dust onto the wool from the neck down the side to the breach and on the belly; then rub the wool lightly with the hand to work the dust down to the skin. Treat the opposite side similarly. A one-cup flour sifter is an efficient device to apply the dust. Two
men dusting sheep confined in a corral can treat a flock at a rate of one sheep per minute. One treatment in spring or fall is sufficient to eradicate infestations of sheep ked. Do not treat animals under one month old with malathion.

Selected References


SHEEP LICE

In the United States, sheep are hosts to one biting louse and to three sucking lice—sheep biting louse, African sheep louse, sheep foot louse, and goat sucking louse. Their distribution and abundance in different areas of this country is not well known.

Like cattle lice, they appear worse in winter and early spring. Heavy infestations are a serious drain on the vitality of sheep. Sheep often denude areas of skin by rubbing against posts and fences to relieve irritation.

Recommendations suggested for control of sheep ked also will control sheep lice.

WOOL MAGGOTS

In spring and early summer, sheep are sometimes infested with vast numbers of maggots, larvae of certain species of blowflies. Infestations begin most often in the crutch area or where neglected wounds exude offensive discharges. Literally thousands of maggots may be found on a single sheep. After hatching from eggs, maggots spread extensively over the body and feed on the skin surface, causing severe irritation.

Infested animals show characteristic symptoms. Sheep become restless, stamp their feet, constantly wag their tails, and bite at the site of the trouble. As the condition worsens, sheep frequently leave the flock to hide in secluded places. Badly infested sheep, if untreated, become weak and may die.

Life History

Life histories of the several species of wool maggots are similar. The usual breeding places are in carrion, but under certain conditions they find favorable environment for development on living sheep. Attracted by foul odors emanating from soiled, wet wool, or running wounds, female blow flies deposit hundreds of eggs on an animal.

Eggs hatch in a few hours and maggots develop rapidly, completing growth in three to four days. They then drop from the host and enter the ground, where they transform to the pupal stage. After seven to ten days adult flies emerge from pupal cases. Several generations develop each year. Depending on the species, blow flies overwinter as larvae, pupae, or adults.

Control

Much can be done to avoid maggot infestation of animals through flock management. Keep sheep as clean as possible. If the breech area becomes saturated with urine and feces during the blow fly season, “crutch” the animals by clipping wool from the crutch and from the area above the tail down the back of the hind legs to the hocks.

Prevent wounds by handling sheep gently and by
providing safe chutes and corrals. Remove all protruding nails and sharp splintered boards.

Shearing early in spring before the blow fly season is a good practice. It removes soiled or fermenting wool, making sheep unattractive to blow flies. It also permits shear cuts to heal before the blow fly season.

Lambing early is advisable for protection of both ewes and lambs, since soiled wool of ewes from afterbirth and exposed umbilical cords of lambs may attract flies. When lambing occurs early, docking and castrating often can be performed before blow flies become abundant.

Insecticides are useful not only to control maggot infestations but also to prevent them. When sheep have accidental wounds or when necessary operations are performed during the blow fly season, timely application of a smear called EQ 335 will do much to prevent blow fly injury. The dressing is a liquid, conveniently applied with a one inch brush. Korlan smear also is recommended and used the same way.

If sheep are unshorn in late spring, or if they scour during the warm months, preventive applications of insecticidal sprays or dips may be advisable. Spraying or dipping with Korlan, or with Co-Ral, effectively prevents blow fly injury.

Spray or Dip Formulas
(1) Co-Ral 0.125 percent.
   4 lb. of 25 percent wettable powder per 100 gal. water, OR
(2) Korlan 0.5 percent.
   16 lbs. of 25 percent wettable powder per 100 gal. water, OR
   2 gal. of 24 percent emulsifiable concentrate per 100 gal. water.

Minimum days from spray application to slaughter are: Korlan—84, Co-Ral—15.

Frequently a woolgrower will have only a few infested animals in a flock. Treat these animals by hand with so called "washes." Dilute EQ 335 or Korlan smear, one part to nine parts of water, and wet the infested area and three inches around it. In order for a woolgrower to take advantage of this recommendation, he will have to purchase the material in advance of the blow fly season and be prepared!

Minimum days from treating with washes to slaughter are: EQ 335—0, Korlan—21.

Selected References

SHEEP SCAB

Common or psoroptic scab is a highly contagious and serious skin disease caused by scab mites.

Sheep scab has prevailed in certain farming areas in the United States, but in recent years it has been inadvertently introduced onto western ranges. Although the disease has been eradicated in Wyoming sheep, there is constant danger of its introduction from outside the State.

Positive diagnosis of scab is made by examining the sheep for scab mite. Scrape lesions with a knife, place them on a black cloth, warm, and observe for mites. They are small—about one-fourtieth of an inch long—but they can be seen by the unaided eye. The body is white or light yellow and the legs are brownish. Indications of the disease are usually first noticed by the disturbed appearance of the wool. Where mites are active, the wool looks uneven, picked, and thin.

Life History

Sheep scab mite has four life stages, all confined to the host. They include the egg, larva, nymph, and adult stages. Both males and females occur. Mites live close to the skin and feed by puncturing the epidermis and sucking up skin juices.

Adult females live for 30 to 40 days and lay about 90 eggs during this time. The eggs are laid on the skin at the edges of lesions and normally hatch in one to three days. The larval stage lasts two to three days, the nymphal stage three to four days. Adult males live up to 34 days.
Control

For many years dipping sheep in water mixtures of lime-sulfur or nicotine sulfate at dip temperatures of 95° to 105° F. was the usual practice to control scab. Two dippings were required at intervals of 10 to 14 days.

These materials are still recommended, but recent research shows that toxaphene is more effective and simpler to use. The dip does not need to be heated. By state and federal regulation, sheep infected with or exposed to scabies must be treated twice in dips of recommended materials. An interval of 10 to 14 days between treatments should be followed. In dipping sheep, ordinary emulsions of toxaphene may be harmful. They are likely to break, that is, the toxicant in oil separates from the water and floats to the top of the dip. Products specially formulated for treating livestock should be used in dip vats. Animals should not be slaughtered sooner than 28 days after toxaphene dips.

Dip Formulas

Toxaphene (special scab approved formulation) 0.5 percent.
(1) 3 qt. of 60 percent emulsifiable per 100 gal. of water, OR
(2) 1 gal. of 45 percent emulsifiable per 100 gal. of water.

Selected References


SHEEP BOT FLY

In some parts of the country, notably Southwestern United States, more than 90 percent of the sheep may be infested with larvae or grubs of the sheep bot fly. Goats are equally subject to infestation. Grubs are found in nearly all parts of the world where sheep are raised.

The grubs do not cause considerable death loss but are detrimental to health, and persistence of the fly in depositing larvae in the nostrils interferes with the proper handling and grazing of the animals. Presence of a fly excites the sheep. They shake their heads, keep their noses against each other or next to the ground, and in other ways indicate they are attempting to escape something trying to enter the nostrils.

The grubs irritate membranes lining the nasal cavities they inhabit and predispose the sheep to bacterial infection. This causes a mucopurulent discharge often referred to as “snotty nose.” The discharge becomes viscous, making it difficult for the animal to breathe freely. Under such conditions older or weak sheep may die.

Life History

Very small, first-stage larvae are deposited in the

Life Stages of the Sheep Bot Fly.
Left to right, young larvae, full-grown larva, puparium from which the adult has emerged, and the adult.

Picture of adult, courtesy of U.S.D.A.
nostrils by female flies, each of which produces up to 500 larvae. These small larvae remain in the nasal passages for a time, then migrate to the frontal sinuses for further development. After reaching full growth in the sinuses, larvae, now over one inch long, work their way out of the nostrils and drop to the ground, where they bury themselves and pupate within a few hours. Pupal period lasts about one month.

In northern states such as Wyoming grubs overwinter in the sheep as larvae and the larval period lasts from eight to ten months. In warm climates, where at least two generations are produced each year, the developmental cycle may be completed in as short a time as two to three months.

Control
Research has disclosed several systemic insecticides that are effective in ridding sheep of head bots. To date only one material has been registered for this use. It is a formulation of Rueiene called “Rulex”. The product is marketed primarily to control roundworms. It is available in a ready-to-use-oral drench. Read label for complete directions and precautions.

For sheep bot control it is advisable to give one treatment as soon as cold weather in fall causes fly activity to cease. At this time of year the bots are small and easier to kill with Rulex.

Repellent materials such as pine tar applied to the noses of sheep usually do not prevent larvi-position by the female flies.

Selected References

Horse Parasites

HORSE LICE

Horses are occasionally infested with two species of lice, the horse-sucking louse and the horse-biting louse. Horse lice may be controlled by spraying with Co-Ral, malathion, or Sevin.

Spray Formulas

(1) Co-Ral 0.06 percent.
2 lb. of 25 percent wettable powder Co-Ral per 100 gal. water, OR
2 quarts of 11.6 percent emulsifiable Co-Ral per 100 gal. water, OR

(2) Malathion 0.5 percent.
16 lb. of 25 percent wettable powder malathion per 100 gal. of water, OR
1 gal. of 57 percent emulsifiable malathion per 100 gal. water, OR

(3) Sevin 0.5 percent.
8 lb. of 50 percent wettable powder Sevin per 100 gal. water, OR
5 lb. of 80 percent wettable powder Sevin per 100 gal. water.

HORSE MANGE

Spray Formula
Toxaphene 0.5 percent. Mix three quarts of 60 percent toxaphene emulsifiable concentrate in 100 gallons water.

HORN FLIES

Horn flies are very troublesome on horses. These pests can be controlled with sprays of Co-Ral, malathion, and Sevin. Use the spray formulas given under horse lice.

Horn flies can also be controlled by applying five percent Sevin dust. Rub two ounces per animal into the hair on back and neck.
WOOD TICKS

Horses often become heavily parasitized with the winter tick. Colts are especially vulnerable to attack and may be killed by heavy infestations. The Rocky Mountain wood tick attacks horses in spring of the year. To control either of these pests, spray horses thoroughly with Co-Ral, malathion, or Sevin. Pay particular attention to the areas where the ticks attack.

Spray Formulas

1) Co-Ral 0.125 percent.
   4 lb. of 25 percent wettable powder Co-Ral per 100 gal. water, OR
   1 gal. of 11.6 percent emulsifiable Co-Ral per 100 gal. water, OR

2) Malathion 1.0 percent.
   2 gal. of 57 percent emulsifiable malathion per 100 gal. water, OR

3) Sevin 0.5 percent.
   8 lb. of 50 percent wettable powder Sevin per 100 gal. water, OR
   5 lb. of 80 percent wettable powder Sevin per 100 gal. water.

Ear ticks can be controlled with a five percent Co-Ral dust. A plastic squeeze-bottle duster containing five percent Co-Ral can be purchased and is convenient for making the application. Shake squeeze bottle, then exert sharp pressure to apply two puffs into each ear.

HORSE BOT FLIES

Three different kinds of bot flies infest horses in Wyoming. Two of them have received common names after the egg-laying habits of the female flies. The nose bot fly lays its eggs on the hairs of the lips, while the throat fly lays the majority of eggs under the lower jaw. The third species is called simply the horse bot fly. It is less specific in laying eggs on any particular part of the horse, but the hairs of the legs usually bear most of them.

Horse bots cause injury in several ways. Flies in laying eggs annoy and terrorize horses and cause them to mill and run around, thus interfering with work or grazing. Because of this annoyance, horses may lose weight and lose vitality. Young larvae penetrate and irritate tender tissues of the inner lip, mouth, and tongue and induce horses to rub the mouth on hard objects with resulting sores. The older larvae attach to the lining of the stomach and intestines, causing inflammation of these organs. Heavy infestations seriously hinder passage of food through the alimentary canal.

Life History

Although there are differences in the life cycles of the three species of bot flies they are, in general, similar. Only the life cycle of the horse bot fly will be reviewed here.

Females of this species lay eggs most often on hairs of the front legs, but also on hairs of other parts of the animal. Each female lays about 550 eggs. Upon stimulation from being rubbed and licked by the horse, hatching of eggs takes place, usually nine to 11 days after deposition. The young larvae are taken into the mouth, where they burrow into the surface of the tongue or into the mucosa between the teeth. Here they develop for three or four weeks. They then pass to the stomach, where they attach themselves and remain for about ten months. At full growth they pass with the dung. Pupation takes place in the soil or ground litter, the pupal period lasting from 40 to 60 days. Individual adult flies live for about three weeks, but because larvae continue to drop from the host over a long period of time, flies can be found annoying horses from June through September. As the mouthparts of adult flies are non-functional, they do no feeding in this stage.

Control

Control is directed against larvae attached to the
lining of the stomach and intestines and against the adults. Mechanical devices to protect the horse from egg-laying females are often recommended. These devices consist of fabric or leather to cover the lips and the area of the lower jaw for protection against two species, the nose bot fly and the throat bot fly. A piece of leather 4 to 6 in. wide and long enough to cover the entire lips, suspended beneath the mouth from the bit rings, will protect and calm a horse from attack of the nose bot fly. Canvas or burlap suspended beneath the jaw from the throat latch to the bit rings affords a great deal of protection from the throat bot fly. No mechanical protection is feasible against the horse bot fly, which lays its eggs rather widely on the animal.

To kill larvae infesting the horse’s alimentary canal, administer carbon disulfide in capsules. The dose is computed on the basis of weight of the horse at the rate of 1.5 fluid drams for each 250 pounds. Horses should be fasted for 18 hours before given the capsules and withheld from feed and water for three hours after treatment. Only veterinarians or ranchers experienced in use of a balling gun should administer the drug.

An advance in treating horses for bots has been the discovery and development of a piperazine—carbon disulfide complex with phenothiazine known as Parvex Plus. This drug is safer than carbon disulfide alone and controls both bots and roundworms infesting the intestinal tract.

Parvex Plus is supplied as a liquid suspension containing 5 grams of piperazine-carbon disulfide and 0.83 gram of phenothiazine per fluid ounce. The suspension should be given to the horse at the rate of 1.5 fluid ounces per 100 pounds of body weight. It may be administered with a stomach tube or dose syringe, followed by warm water to clear the instruments. To obtain the greatest efficiency of the drug, withhold feed overnight or for eight to ten hours before treatment. Horses should be treated several times a year to control roundworms thoroughly, though fewer treatments are needed to control horse bots. One of the best times to treat for bots is December, when the greatest number of larvae are present in the stomach and intestines and subject to the drug.

Do not treat mares the last month of pregnancy, or sick animals. Follow other precautions included on label.

Another advance in treating horses for bots and roundworms is the use of Anthon. This material is given at a rate of five grams per 250 pounds of body weight. The proper dose may be administered at one time in the feed. Mix the required dose, either dry or dissolved in water, with the amount of feed to be consumed at one feeding. Allow the horse to consume all of the medicated feed before additional feed is given. Remove and destroy any medicated feed not consumed within 12 hours. Anthon should not be given to horses used for food, to sick or weak horses, to colts under four months old, or to mares in the last month of pregnancy.

The most effective time for treating for bots with Anthon is December.

Read labels on packet for further directions and precautions.

For most effective control, all horses, mules, and donkeys in an area should be treated. In this way, a substantial reduction of bot flies may be brought about the following summer.

Selected References

The hog louse, the largest louse affecting domestic animals, is found wherever hogs are raised. It feeds on the blood of the host and causes irritation and itching in gross infestations, for each louse makes a new puncture in the skin every time it feeds. The constant rubbing of the hog to relieve the irritation results in additional injury, and restlessness results in failure of the animals to make normal weight gains. Hogs infested with large numbers of lice have low vitality and a general unthrifty condition, which renders them more susceptible to attacks by other parasites and diseases. Hog lice themselves carry the germ of swine pox.

Normally hog lice are found only on hogs. Lice spread readily from one animal to another because of the hogs’ habit of remaining close together.

Life Cycle
The life cycle is similar to that of cattle lice. Eggs usually hatch in 12 to 14 days and females reach maturity and begin laying eggs about 12 days later. The life cycle from egg to egg is 24 to 32 days. They are most abundant during cold weather.

Control
One thorough treatment with a spray, dip, or dust is usually sufficient to control an infestation. Sprayed or dipped animals should be kept out of cold, inclement weather to prevent chilling, and out of sunlight to prevent skin blistering until they are completely dry.

Spray or Dip Formulas
(1) Lindane 0.06 percent.
   2 lb. of 25 percent wettable powder lindane per 100 gal. of water, OR
   1 qt. of 20 percent emulsifiable lindane per 100 gal. of water, OR
(2) DDT 0.5 percent.
   8 lb. of 50 percent wettable powder DDT per 100 gal. of water, OR
   2 gal. of 25 percent emulsifiable DDT per 100 gal. of water, OR
(3) Methoxychlor 0.5 percent.
   8 lb. of 50 percent wettable powder methoxychlor per 100 gal. of water, OR
   2 gal. of 25 percent emulsifiable methoxychlor per 100 gal. of water.

Spray Formulas
(1) Toxaphene 0.5 percent.
   10 lb. of 40 percent wettable powder toxaphene per 100 gal. of water, OR
   5½ pints of 60 percent emulsifiable toxaphene per 100 gal. of water, OR
(2) Co-Ral 0.06 percent.
   2 lb. of 25 percent wettable powder Co-Ral per 100 gal. of water, OR
(3) Korlan 0.25 percent.
   8 lb. of 25 percent wettable powder Korlan per 100 gal. of water, OR
   1 gal. of 24 percent emulsifiable Korlan per 100 gal. of water, OR
(4) Malathion 0.5 percent.
   16 lb. of 25 percent wettable powder malathion per 100 gal. of water, OR
   1 gal. of 57 percent emulsifiable malathion per 100 gal. of water.

Dust Formulas
(1) 1 percent lindane dust, OR
(2) 4 to 5 percent malathion dust, OR
(3) 10 percent DDT dust.

A simple method of hog louse control, which requires no spray equipment, is the spreading of five percent granular Korlan over the bedding of swine. Spread the granules evenly with a can or scoop at the rate of ½ pound per 100 square feet of bedding. This treatment will also help in controlling flies. Clean out all treated bedding at least two weeks before sale of hogs for slaughter.

Do not treat with lindane dust or any DDT formulation more than once. Other insecticides may be repeated after two to three weeks if needed. Minimum time from the last application to slaughter is 0 days for Co-Ral, 28 days for toxaphene, 30 days for DDT, 30 days for lindane spray or dust, 60 days for lindane dip, and 42 days for Korlan.
HOG MANGE

Hogs are susceptible to infestation by two kinds of mange mites—itch mite, by far the most common, and hog follicle mite.

The itch mite is a small (1/50th of an inch), whitish, round-bodied parasite. It lives for the most part in tunnels it makes in the skin of hogs, though adult females and newly hatched larvae regularly leave the burrows to move over the body and spread the disease. Eggs, laid in the tunnels, hatch in three to 10 days. The young mites pass through one larval and one nymphal stage in 10 to 12 days before becoming an adult.

The burrowing and feeding of mites cause intense itching, irritation, inflammation, and swelling in affected areas. Early stages of the disease begin around the eyes, ears, and nose and can be recognized by nodules and vesicles which the mites cause. The nodules and vesicles eventually rupture and ooze serum, which hardens to form gray or yellow scabs. Hair often falls out in the affected areas. In advanced cases the skin becomes thickened and wrinkled. Transmission is usually by direct contact with infected animals or with objects that infected animals have rubbed against. Mange spreads slowly during summer but rapidly during winter.

Control

Accurate diagnosis of hog mange is made by examining deep skin scrapings and discovering and identifying mites. To cure mange, dip or spray twice with lindane at an interval of 14 days. In spraying, one must cover each animal thoroughly and use about two quart of spray for each hog 200 pounds or larger. A nozzle pressure of at least 350 pounds per square inch is desirable. Also, carefully spray the inside of the ears, but at a reduced pressure of about 40 pounds per square inch.

A good practice is to apply preventive treatments to breeding stock regularly in early fall, thereby protecting the fall and spring pig crop from infestation with both mange and lice.

Do not slaughter any animals for meat before 30 days have elapsed from last treatment with lindane spray and 60 days with lindane dip.

Spray or Dip Formulas

Lindane 0.06 percent.
2 lb. of 25 percent wettable powder lindane per 100 gal. of water, OR
1 qt. of 20 percent emulsifiable lindane per 100 gal. of water.
Sprays of Co-Ral and Korlan as described under hog lice will also control hog mange.

Selected References


Chicken Parasites

LICE

In North America, chickens are hosts to several kinds of biting lice, three of the most important being the chicken body louse, the shaft louse, and the head louse. Other lice infesting chickens include the fluff louse, wing louse, large chicken louse, and brown chicken louse. In Wyoming the chicken body louse is the most common and injurious species.

In heavily infested birds parting the feathers will reveal small, yellow-colored insects which run rapidly over the skin to seek protection. A favored position of body lice is the region below the vent. Feathers in this area often bear clusters of louse eggs near the base of the shaft.

The effect of the body louse on mature chickens has been studied at the Alabama Agricultural Experiment Station. Moderate infestations of this louse over an 11-month period depressed egg-laying by 11 percent. In terms of net income this represented a monetary loss of
Chicken Body Louse
Enlarged
Courtesy U.S.D.A.

30 to 40 percent or 75 to 85 cents per louse-infested bird. Mortality was slightly greater and body weights less among infested birds.

Poultry lice do not suck blood but feed on skin scales and feathers. They irritate the skin and cause scabbing. Young chickens are highly susceptible to lice injury, becoming droopy and ruffled. Diarrhea and death frequently follow.

Life History
Although life histories of chicken lice have not been extensively studied, some information concerning them is available. Eggs of the chicken body louse hatch in about a week and young nymphs take about two weeks to reach the adult stage. All stages are confined to the chicken and lice cannot survive away from the host.

Control
Recommendations for controlling lice and other pests of chickens have changed considerably in recent years. Depending on the chicken raiser's preference and his housing method, he has several choices: (1) directly treating birds with sprays or dusts, (2) treating floor litter of floor-managed birds, (3) providing insecticidal dust baths for floor-managed birds or for birds kept in large, wire-bottom cages (30 or more birds), or (4) painting insecticide on wire floors of caged birds.

Sprays for Caged Birds
You can control lice by directly spraying caged birds with malathion, Sevin, or Co-Ral. Use a power sprayer for large flocks and a compressed-air sprayer for small flocks. Direct the spray to the vent and fluff areas from below the bird. Employ pressures up to 50 pounds per square inch and use 1 gallon of spray per 100 birds. If your sprayer does not have a mechanical agitator, shake the spray mixture frequently.

Precautions: Do not repeat applications of Sevin within four weeks of each other. Allow a minimum of seven days from last application of Sevin to slaughter. Do not use Co-Ral more often than once a week. Do not contaminate feed or water or water containers of feed troughs.

Spray Formulas
(1) Malathion 0.5 percent.
Mix 27 fluid oz. of 57 percent emulsifiable concentrate in 25 gal. water, OR
(2) Sevin 0.5 percent.
Mix 2 lb. 50 percent wettable powder in 25 gal. water, OR
Mix 1 1/4 lb. 80 percent wettable powder in 25 gal. water, OR
Mix 25 fluid oz. of 55 percent liquid suspension in 25 gal. water, OR
(3) Co-Ral 0.25 percent.
Mix 2 lb. of 25 percent wettable powder in 25 gal. water.

These sprays may also be used to treat birds individually by applying them with a plastic squeeze bottle. Using one of the sprays above, apply 1/2 fluid ounce per bird or about five jet squirts. Direct the jet stream to vent and fluff areas.

Dusts for Caged Birds
Dusting chickens is an effective method for controlling lice. Use a hand puff duster. Direct the dust to vent and fluff areas. Apply 1/2 ounce of dust per bird (two puffs of dust per bird). Purchase one of the following ready-to-use dusts: (1) Malathion—four or five percent. (2) Sevin—five percent, or (3) Co-Ral—1/2 percent. Follow same precautions as for sprays.

Paint Method for Caged Birds
The wire floors of cages can be treated with nicotine sulfate 40 percent in oil. Use a paint roller and keep it moist while doing the job. Reapply in 10 to 14 days or when needed. Nicotine sulfate volatilizes from the wire and kills lice by fumigant action.

This insecticide is very poisonous. Workers should wear protective clothing, particularly long-sleeved rubber gloves. If nicotine sulfate is spilled on skin, wash off with plenty of warm, soapy water. If it is spilled on clothing or shoes, remove them immediately.

Sprays for Birds on Litter Floors
Poultry lice can be controlled merely by spraying the litter surface. When chickens scratch and dust themselves in the treated dry litter, they get enough insecticide in their plumage and on their skin to destroy the infesting lice.

Use a power sprayer and apply the insecticide evenly to the litter surface. Malathion, Sevin, or Co-Ral are
effective materials for this method. Follow the same precautions as given above for direct spraying of birds.

**Sprays Formulas for Litter Floors**

(1) Malathion 2 percent.
Mix 7 pt. of 57 percent emulsifiable concentrate in 25 gal. water. Apply 12.5 gal. of the spray per 1000 sq. ft. of floor, OR

(2) Sevin 1 percent.
Mix 4 lb. of 50 percent wettable powder in 25 gal. water. Apply 3 1/3 gal. of the spray per 1000 sq. ft. of floor, OR
Mix 3 pt. of 55 percent liquid suspension in 25 gal. water. Apply 3 1/3 gal. of the spray per 1000 sq. ft. of floor, OR

(3) Co-Ral 0.25 percent.
Mix 2 lb. of 25 percent wettable powder in 25 gal. water. Apply 1 gal. of the spray per 1000 sq. ft. of floor.

**Dusts for Birds on Litter Floors**

Insecticidal dusts applied to litter floors are effective in controlling lice. Scatter the dust evenly over the floor area with a grain scoop or large can. Dust under roosts, feeders, and nest boxes. For accuracy one should figure the square footage to be treated, then weigh out the amount of dust necessary for this area. Ready-to-use dusts are available. Obtain 0.5 or five percent Co-Ral dust, or four or five percent malathion dust, or five percent Sevin dust. Apply dusts to litter floors at the following rates:

1. 0.5 percent Co-Ral dust—50 lb. per 1,000 sq. ft.
2. 5.0 percent Co-Ral dust—4 lb. per 1,000 sq. ft.
3. 4 to 5 percent malathion dust—25 lb. per 1,000 sq. ft.
4. 5 percent Sevin dust—25 lb. per 1,000 sq. ft.

**Dust-Bath Boxes**

Another self-treatment method is the use of insecticidal dust baths. Dust boxes are useful for birds confined to large cages as well as those on litter floors. In cages use a box 18 by 18 by six inches deep and charge it with three pounds of dust. On litter floors use a larger box two by three by one foot deep and charge it with five pounds of dust. Employ one dust box for each 100 birds. Purchase one of the following ready-to-use dusts: (1) Malathion—4 or 5 percent, (2) Sevin—5 percent, or (3) Co-Ral—½ percent. Follow same precautions as for sprays.

**Selected References**


**mites of chickens**

Although many different kinds of mites infest poultry, there are only two of importance in the West—the chicken mite and the northern fowl mite. Mites of lesser importance are the scaly-leg mite and the depluming mite. Habits of these mites vary as well as the nature of the injuries they cause. The one most commonly infesting poultry in Wyoming is the chicken mite.

**chicken mite**

The chicken mite is small—no more than 1/32 inch long. They are somewhat pear-shaped, gray when unfed, and red when engorged with blood.

Chicken mites inhabit crevices, cracks, and spaces between boards in the chicken house and infest chickens only for a blood meal. The mites feed mainly at night, but in heavy infestations mites can be found on birds during the day. You can spot infestations of mites crawling on newly laid eggs. To identify an infestation further, look for masses of mites in cracks and underneath objects near the roost.

Each female lays 25 to 35 eggs during her lifetime and deposits them singly in hiding places in the chicken house. In warm weather eggs hatch in 24 hours, and young mites develop rapidly, passing through one larval and two nymphal stages in about a week.

**control**

The basic control method is thorough cleaning and...
treat the inside of nest boxes.

**Spray Formulas**

(1) Malathion 1 percent.
Mix 54 fluid oz. of 57 percent emulsifiable concentrate in 25 gal. water. Apply 1 to 2 gal. per 1000 sq. ft., OR

(2) Sevin 1/2 percent.
Mix 2 lb. of 50 percent wettable powder in 25 gal. of water. Apply 1 to 2 gal. per 1000 sq. ft., OR
Mix 25 fluid oz. of liquid suspension in 25 gal. of water. Apply 1 to 2 gal. per 1000 sq. ft., OR

(3) Co-Ral ¼ percent.
Mix 2 lb. of 25 percent wettable powder in 25 gal. water. Apply 1 gal. per 1000 sq. ft.

Dusts may be used to control chicken mites. Apply the dusts to external surfaces as suggested for sprays. Use a hand duster. Do not treat inside of nest boxes. Apply four to five percent malathion or five percent Sevin dust at rates of 25 pounds per 1000 square feet, or 1/2 percent Co-Ral dust at a rate of 50 pounds per 1000 square feet, or five percent Co-Ral dust at a rate of four pounds per 1000 square feet.

Do not reapply Sevin sprays or dusts within four weeks and do not treat within seven days of slaughter. Do not apply Co-Ral sprays or dusts more often than weekly.

These insecticidal recommendations can also be used in occupied poultry houses. Be careful not to contaminate feed and water.

**NORTHERN FOWL MITE**

Northern fowl mites commonly spend their entire life on chickens and other birds. They prefer the region of the vent and accumulate on a few feathers, matting them and coloring them grey or black. When infestations are heavy, mites spread to all parts of the body.

Sucking blood for food, northern food mites produce anemia in birds, causing a droopy appearance with pale combs and wattles. Large numbers may cause death of infested birds.

**Control**

Recommendations for controlling chicken lice are also effective against the northern fowl mite. See directions above.

**SCALY-LEG MITE**

The scaly-leg mite is a microscopic, burrowing parasite which attacks legs of poultry and causes the scales to lift and legs and feet to swell. Scaly-leg is easily transmitted from bird to bird and therefore all infested birds should be segregated.

Predisposing causes are unhygienic conditions, running birds of all ages together, and overcrowding.

**Control**

Control this mite by dipping the feet and legs of infested birds in crude petroleum. Do not splash oil on upper parts of the legs or on feathers. Usually one treatment is sufficient, but a second treatment 30 days later may be necessary in bad cases.

**DEPLUMING MITE**

This mite is closely related to the scaly-leg mite, but it burrows into the skin at the base of feathers instead of the scales of the legs. The mites produce an irritation and itching which cause the infested bird to pluck its feathers.
Control

Applying sulfur dust or dipping in a sulfur bath effectively controls this mite. A dip can be made by mixing two ounces of wettable sulfur per gal. of water. A tub is satisfactory for holding the mixture and dipping the birds.

Infested birds may also be treated successfully by thoroughly dusting them with 100 percent sulfur dust.

Selected Reference

Scientific Names

The common and scientific names of parasites discussed are:

1. House fly—*Musca domestica* L.
4. Face fly—*Musca autumnalis* De G.
5. Fleas—*Ctenocephalides* spp.
6. Short-nosed cattle louse—*Haematopinus eurysternus* (Nitz.)
7. Long-nosed cattle louse—*Linognathus vituli* (L.)
8. Little blue cattle louse—*Solenopotes capillatus* Enderl.
9. Cattle biting louse—*Bovicola bovis* (L.)
10. Common cattle grub—*Hypoderma lineatum* (De Vill.)
11. Northern cattle grub—*Hypoderma bovis* (L.)
12. Horn fly—*Haematobia irritans* (L.)
13. Stable fly—*Stomoxys calcitrans* (L.)
14. Horse flies—*Tabanus* spp.
15. Deer flies—*Chrysops* spp.
16. Winter tick—*Dermacentor albipictus* (Pack.)
17. Rocky Mountain wood tick—*Dermacentor andersoni* Stiles
18. Ear tick—*Otobius megnini* (Duges)
19. Sheep ked—*Melophagus ovinus* (L.)
20. Sheep biting louse, *Bovicola ovis* (Linnaeus)
22. Sheep foot louse, *Linognathus pedalis* (Osborn)
24. Wool maggots—*Phormia regina* (Meig.)
25. Protophormia terrae novae (R.-D.)
26. Sheep scab mite—*Psoroptes ovis* (Her.)
27. Sheep bot fly—*Oestrus ovis* L.
28. Horse sucking louse—*Haematopinus asini* (L.)
29. Horse biting louse—*Bovicola equi* (L.)
30. Nose bot fly—*Gasterophilus haemorrhoidalis* (L.)
31. Throat bot fly—*Gasterophilus nasalis* (L.)
32. Horse bot fly—*Gasterophilus intestinalis* (De G.)
33. Hog louse—*Haematopinus suis* (L.)
34. Hog itch mite—*Sarcoptes scabiei suis* (Ger.)
35. Hog follicle mite—*Demodex phylloides* Csokor
36. Chicken body louse—*Menacanthus stramineus* (Nitz.)
37. Chicken head louse—*Cyclotogaster heterographus* (Nitz.)
38. Shaft louse—*Menopon gallinae* (L.)
39. Wing louse—*Lipeurus caponis* (L.)
40. Fluff louse—*Goniocotes gallinae* (De G.)
41. Large chicken louse—*Goniodes gigas* (Tasch.)
42. Brown chicken louse—*Goniodes dissimilis* Denny
43. Chicken mite—*Dermanyssus gallinae* (De G.)
44. Scallic-leg mite—*Knemidokoptes mutans* (R & L.)
45. Depluming mite—*Knemidokoptes gallinae* (Raill.)
46. Northern fowl mite—*Ornithonyssus sylviarum* (C. & F.)
Use Pesticides Safely
FOLLOW THE LABEL

N. W. HILSTON, Director
Agricultural Experiment Station
University of Wyoming, Laramie 82070
6-66-6M-25