Handbook of Toxicity of Pesticides to Wildlife
HANDBOOK OF TOXICITY OF
PESTICIDES TO WILDLIFE
SECOND EDITION

By Rick H. Hudson
Richard K. Tucker
M. A. Haegele

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Resource Publication 153
Washington, D.C. • 1984
Contents

Preface to the Second Edition ........................................ iii
Acknowledgments ......................................................... iv
Introduction .............................................................. 1
Use of Acute Toxicity Figures .......................................... 1
Signs of Intoxication ..................................................... 2
Methodology ................................................................... 2
Source of Animals .......................................................... 3
Selection and Treatment of Test Animals ............................ 3
Source of Chemicals ......................................................... 3
Chemical Administration Methods ..................................... 3
Acute Toxicity Determinations ......................................... 6
Subacute Toxicity Determinations ...................................... 6
Acetylcholinesterase Activity Determinations ...................... 6
Arrangement of the Handbook .......................................... 6
Summaries of Toxicological Data for Wildlife ...................... 7
References .................................................................... 86
Glossary ....................................................................... 87
Index to Species Tested ................................................... 88
Preface to the Second Edition

This second edition of the *Handbook of Toxicity of Pesticides to Wildlife* is a product of the wildlife research portion of the Environmental Contaminant Evaluation Program of the U.S. Fish and Wildlife Service. The toxicity tests summarized here were performed over a number of years at the Denver Wildlife Research Center. When all responsibility for contaminant research on wildlife was consolidated at the Patuxent Wildlife Research Center in 1975, we decided that an effort should be made to publish the large volume of toxicity data that had accumulated at the Denver Center since the first edition of the handbook was issued in 1970. Financial support for the compilation and publication of this work was provided by the Patuxent Wildlife Research Center during the years 1976–1982. R. H. Hudson has remained with this task throughout the years; this edition has been compiled largely through his efforts.

The original edition of this handbook has stood the test of time; it has become a useful and often-cited reference on what is probably the most basic estimator of chemical hazard, the acute toxicity test; it is used as much today as when it was first released more than a decade ago. This new edition should be even more useful than the earlier one because of its expanded scope and its presentation of additional data supporting toxicity estimates presented in the first edition. The handbook provides toxicity estimates of nearly 200 different chemicals or formulations, each tested on one or more of more than 30 different species. Toxicity estimates for different chemicals may not always be directly comparable, and I emphasize that the results presented here are not to be regarded as the result of a single study; rather, they summarize a large number of studies conducted for a variety of purposes. Although these data are exceedingly useful, like all toxicological data, they should be used with caution for comparative purposes.

The value of acute toxicity tests performed on wildlife has prompted much debate in the past. Even within the Fish and Wildlife Service, researchers at one time were divided over whether short-term (acute) or longer term (subacute) tests were more appropriate. The judgment derived from our cumulative experience in this area is that both types of tests are necessary if the toxicity of a chemical is to be evaluated adequately. Early experimentation showed that acute tests greatly underestimated the hazard posed by chemicals that accumulate in animals through the intake of small amounts in the diet; the subacute test was conceived to deal with this problem. Experience with the subacute test showed that it often gives misleading results with chemicals that are highly labile. Also, the subacute test gives inaccurate results when used with chemicals that tend to produce anorexia (loss of appetite), as do certain pesticides. Each type of test thus provides vital information on the hazards posed by certain types of chemicals; with chemicals for which both types of tests are appropriate, two “benchmarks” are desirable to help in predicting lethal and sublethal effects in the environment. The Patuxent Center’s commitment to both types of testing is evidenced by this volume and another on subacute toxicities that will be available soon.

We expect this handbook to be useful to researchers, to government regulators, and to those managing data banks for the benefit of these groups. It is, however, primarily meant to benefit fish and wildlife resource managers. The indications of acute toxicity provided by the handbook constitute one means by which managers can assess potential contaminant threats to wildlife resources. This handbook and others like it, together with the technical and interpretative services provided by the research laboratories, should make somewhat easier the tasks of those charged with conserving the nation’s wildlife populations.

Russell J. Hall  
*Assistant Director*  
*Patuxent Wildlife Research Center*
Acknowledgments

We thank the following for assistance during the testing phase: Morris C. Abeysa, C. Harold Bäer, Walter A. Bowlus, Jr.; Mary Ellen Cameron, Truman J. Fergin, Stan E. Gaddis, Eugene A. Hillard, Brad B. Johns, Kirke A. King, Donald B. Knapp, C. Edward Knittle, Christine A. Mitchell, Kurt W. Moore, Richard E. Pilkmore, Mark Ray, Michael Recktenwald, Merle L. Richmond, Earl C. Schafer, Joseph G. Zinkl, and Linda D. Zion.


We also thank the Max McGraw Wildlife Foundation in Dundee, Illinois, for providing the mallards used in many of the tests.
Handbook of Toxicity of Pesticides to Wildlife
Second Edition

By

Rick H. Hudson, Richard K. Tucker, and M. A. Haegele

U.S. Fish and Wildlife Service
Patuxent Wildlife Research Center
Laurel, Maryland 20708

Introduction

Although the problems resulting from the use of pesticides in wildlife habitats have continued to receive considerable attention in recent years, the relations involved are highly complex and knowledge in many areas is still limited. Research, operational, and administrative personnel concerned with the use of pesticides have had a long-standing need for compendia of pesticide toxicity data for wildlife species that would provide, if not final answers, at least a basis for comparison of one pesticide with another. We believe that the first edition of the Handbook of Toxicity of Pesticides to Wildlife (Tucker and Crabtree 1970) helped fill that need, and hope that this second edition will be even more helpful.

When the first edition of this handbook appeared, many compilations of pesticide toxicity data for laboratory animals were already available, notably for rats (Kerr and Brogden 1959; Gaines 1960, 1969; Hayes 1963; Dauterman and Guthrie 1963), but also for dogs (Lehman 1965), fish (Henderson et al., 1960:76-88), snails (Dowdon and Bennett 1965), frogs (Kaplan and Overpeck 1964), and cladocerans (Anderson 1959:94-95; Sanders and Cope 1960). None of these compilations were (or have attempted to be) complete, but they represent ready references to help answer certain simple questions about the acute or chronic toxicity and the hazards of given pesticides. Other compilations of toxicity data for wildlife have recently appeared, notably Heath et al. (1972), Hill et al. (1975), Johnson and Finley (1980), Fimentel (1971), Schafer (1972), Schafer and Cunningham (1972), and Schafer (1983). During the 13 years since the first edition of this handbook was published, the fields of environmental and comparative toxicology have matured greatly. For a recent review of the literature of comparative fish and wildlife toxicology, see Tucker and Leitzke (1979).

Sensitivity to toxicants varies greatly from species to species, even within the same genus. Although toxicity figures for albino rats are often used for wildlife purposes, they are at best poor indicators of the sensitivity, for example, of pheasants. Recognizing that toxicity figures based on experiments with any one species are inadequate, we have presented data for two or more species whenever possible; birds are almost always represented. To allow the broadest use of these data, we have conducted most tests with species that are common and widely distributed in the United States. The ring-necked pheasant (Phasianus colchicus) and northern bobwhite (Colinus virginianus), for instance, are among the most frequently bagged upland game birds in this country, and the mallard (Anas platyrhynchos) is probably the waterfowl most commonly taken. Often, however, additional species with more restricted ranges, such as the fulvous whistling-duck (Dendrocygna bicolor) or the sandhill crane (Grus canadensis), have been included. To enable ready comparison among pesticides, nearly all the chemicals we studied were tested on one species, the mallard.

The chemicals chosen for testing included 181 pesticides, 15 other environmental pollutants, and many mixtures and formulations of pesticides. Generally, the pesticide pollutants were those to which wildlife are most likely to be exposed. Most are widely used or represent common families of chemicals used in thousands of pesticide formulations applied to forests, rangeland, aquatic habitat, or agricultural areas lived in or frequented by wildlife. Acute toxicity data and a list of the clinical signs of intoxication observed are presented for each pollutant. For some, particularly those that are likely to be applied repeatedly or to persist for a long time after single application, the results of 30-day repeated oral toxicity or feeding tests are included. Some of the pollutants were also tested for percutaneous (through the skin) toxicity.

Use of Acute Toxicity Figures

The degree of hazard presented by a pesticide depends on many complex factors. Although no single way of ex-
pressing potential hazard is completely reliable, a rapid and convenient indicator of hazard as represented by a compound's inherent toxicity is the acute oral toxicity test (the single dosage necessary to result in death). Additionally, for granular material, this test is directly applicable for the hazard evaluation.

The usual way of expressing acute toxicity is by means of an LD50 (median lethal dosage) value. The LD50 is a bioassay-based statistical estimate of the dosage (in mg chemical/kg of body weight of the animal exposed) that would be lethal to 50% of the experimental population of the test species. It is also possible to calculate such values as the LD5 or LD99, but they are (for statistical reasons) less precise than the corresponding LD50 and more difficult to determine. Although LD50's give no information on the dosage that would be lethal to every individual of the species, nor on treatment given in some other way than in the test, the LD50 value, with its confidence limits, is probably the most convenient and reliable means available for comparing the inherent toxicity of chemicals.1

How the LD50 figures in this handbook are used is largely a matter for the reader to decide, but they should be regarded only as guides or benchmarks. They are meaningful only in the context of other information on the pesticide's physicochemical and biological properties and the rates and methods of application, most of which can readily be found in the scientific literature or in technical bulletins provided by the manufacturers.

When the LD50 is used to evaluate the safety or hazard of a pesticide used in the field, many factors must be considered. To span the gap between the sensitivity of a species in the laboratory (pharmacological vulnerability) and its vulnerability in the field (ecological vulnerability), such factors as the following must be taken into account:

- The amount of pesticides applied per unit area or unit time.
- The degree of contamination of different environmental components such as air, water, vegetation, as influenced by such factors as the carrier in the pesticide formulation, the evenness of application, wind, temperature, vegetative composition, and other possible variables.
- The various species present in the habitat when the pesticide is applied.
- Routes by which the animals contact the pesticide (oral, dermal, inhalation), as well as the amount and duration of contact with different components of the environment (e.g., fish contact water but not trees).
- Persistence of the pesticide (chemical breakdown rates, transfer between environmental components, and other variables).
- Formation of biologically active metabolites and their distribution.
- Degree of accumulation of the pesticide or its active metabolites in the animals.

For a more detailed discussion of the factors involved in extrapolating the field hazard of a chemical from laboratory data, see Dewitt (1966), Kenaga (1968), and Tucker and Leitzke (1979).

Although the acute toxicity figure is the basic one and the one most easily compared from chemical to chemical, it is not always the most sensitive measure of potential hazard. Compounds that are poorly absorbed or are cumulative in action are better tested by long-term feeding (if the chemical does not break down in feed or produce aversion) or by repeated oral doses.

Finally, although mortality is a conveniently measured effect, it should be recognized that levels of pesticide that do not kill may nevertheless produce subtle, yet damaging, effects on animals, such as inhibition of reproduction or impairment of ability to escape from predators. These sublethal effects must be considered in conjunction with the LD50 in any comprehensive evaluation of a pesticide's potential safety.

**Signs of Intoxication**

The pattern of clinical signs of intoxication produced by a toxic chemical is often helpful in diagnosis and as a starting point in studies of the mode of action. Therefore, in addition to the acute oral LD50 for each pesticide, the signs and behavioral changes observed in the test animals after dosing are listed (and defined in a glossary when not self-explanatory). We hope that this information will help biologists in the field to know what signs to look for when assessing short-term effects of pesticides on wild populations. The signs may also aid workers to arrive at a tentative identification of the pesticide involved when only a few known pesticides have been applied to an area. Although it is unlikely that signs alone can ever definitively identify a toxicant, they can sometimes eliminate certain known toxicants from further consideration. When the development of toxic signs produced a clear-cut pattern, we have also included notes on the timing of the toxic effects, because such factors as the time of onset, duration, and time of remission (disappearance of toxic signs and recovery of the test animal) can have implications for the speed and thoroughness of absorption, the rate of metabolism or elimination and the accumulation of residues in the tissues.

**Methodology**

Data reported in this handbook resulted from research conducted at the Denver Wildlife Research Center, Denver, Colorado, under the program of Pesticide-Wildlife Studies; therefore, at least one source of bias—interlaboratory variation—has been avoided.

1Much of the wording in this paragraph has been paraphrased from Hayes (1963:3–4), whose lucid explanation of acute toxicity seemed clearer than any discussion we could produce independently.
Source of Animals

Healthy pen-reared or captivity-conditioned animals were used for all determinations. The use of biologically active chemicals was avoided on or near the animals during rearing and holding.

The following species, listed in phylogenetic order, were pen-reared from stock lines:

Anas platyrhynchos
Tympanuchus cupido
Tympanuchus phasianellus
Colinus virginianus
Callipepla californica
Coturnix japonica
Phasianus colchicus
Alectoris chukar
Larus delawarensis
Striopus pavia
Odocoileus hemionus
Capra hircus

The following species, listed in phylogenetic order, were live-trapped, donated, or purchased from various sources:

Rana catesbeiana
Branta canadensis
Dendrocopos bicolor
Anas platyrhynchos
Anas acuta
Aquila chrysaetos
Colinus virginianus

Phasianus colchicus
Perdix perdix
Meleagris gallopavo
Grus canadensis
Columba livia

Zenaida asiatica
Zenaida macroura
Eremophila alpestris
Passer domesticus
Agelaius phoeniceus
Carpodacus mexicanus
Junco hyemalis
Zonotrichia leucophrys
Rattus norvegicus
Mustela putorius

An index to the species of animals and the toxicants tested with each is provided at the end of this handbook. Bird names are according to the Thirty-fourth Supplement to the American Ornithologists' Union Check-list of North American Birds (1982).

Selection and Treatment of Test Animals

On the evening before testing, or earlier if necessary, the animals to be tested were taken from a holding pen and placed in the test pens; weak or injured individuals were culled at this time. All test animals underwent a pretreatment fasting period to avoid the effects of variable stomach contents on absorption and to bring each near the basal metabolic state. Fasting periods were 24 h for deer and goats; 2 to 4 h for doves, sparrows, finches, and junco; and 16 to 20 h for all other species.

On the morning of the test (after the pretreatment fasting period), all animals were weighed. They were then assigned to treatment groups on the basis of body weight, with each toxicant dosage level to be administered to groups including individuals of low, medium, and high body weight. Test animals for feeding studies and water concentration exposure studies were randomly assigned to treatment groups.

Water was available ad libitum in the swimming ponds used for tests on waterfowl, or in appropriate watering devices. Except during the pretreatment fasting periods, food was available ad libitum.

Source of Chemicals

The tested materials—technical, analytical, or reagent grade samples of known (and generally high) purity—were received directly from their manufacturers, whom we thank for making them available, or from various cooperators. The purities are given in the chemical summaries. Trivial and trade names, as well as chemical names (nomenclature after Chemical Abstracts, 9th Chemical Index) and common synonyms of the materials tested, are also given to facilitate identification. In recent years an effort has been made to use the common name for a pesticide, rather than a brand name, whenever possible. Thus, in this edition of the handbook, we have attempted to use the commonly accepted names for the pesticides. Where possible, these and the chemical names have been taken from Blaurock et al. (1979). Other names have been taken from technical bulletins, Spencer (1973), and Berg (1975).

Chemical Administration Methods

Oral administration was accomplished by inserting gelatin capsules containing the test chemical through glass tubing to the level of the crop, proventriculus, or stomach. The capsules were administered to goats and deer orally with a balling gun into the upper esophagus. The test
materials were accurately weighed or microsyringed into the
capsules from precisely diluted acetone solutions. The
acetone was evaporated at room temperature before the
capsules were closed. Some liquid toxicants or suspensions
or solutions of toxicants (denoted in the tables by “st”) were
administered into the esophagus with ball-tipped oral
intubation needles.

Pure materials were administered whenever possible. We
used carriers (such as distilled water, corn oil, or acetone)
only when absolutely necessary for accurate administration
of the toxicant. When a stomach tube was used for toxicant
administration, usually the pure material was in liquid form
already or was a technical material with a carrier that was
of toxicological interest. Toxicants that were administered
in a carrier solution are listed in Table 1.

The following methods were used for the percutaneous
toxicity determinations with mallards. On the evening
before treatment, the feet of the birds were inspected for

<table>
<thead>
<tr>
<th>Chemical and test animal</th>
<th>Type of test</th>
<th>Carrier</th>
<th>Final volume (mL/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Ceresan L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>0.11</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>po</td>
<td>Distilled water</td>
<td>0.75</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard duckling</td>
<td>po</td>
<td>4% Gum acacia in distilled water</td>
<td>6.63</td>
</tr>
<tr>
<td>Rock dove</td>
<td>po</td>
<td>3% Gum acacia in distilled water</td>
<td>2.69</td>
</tr>
<tr>
<td>Albino rat</td>
<td>po</td>
<td>4% Gum acacia in distilled water</td>
<td>8.82</td>
</tr>
<tr>
<td>Cyolane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>0.11</td>
</tr>
<tr>
<td>D.M. 7537</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>4% Gum acacia in distilled water</td>
<td>6.87</td>
</tr>
<tr>
<td>Northern pintail</td>
<td>po</td>
<td>1% Gum acacia in distilled water</td>
<td>2.91</td>
</tr>
<tr>
<td>House sparrow</td>
<td>po</td>
<td>Acetone</td>
<td>0.08</td>
</tr>
<tr>
<td>Albino rat</td>
<td>po</td>
<td>4% Gum acacia in distilled water</td>
<td>5.74</td>
</tr>
<tr>
<td>Fenthion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mourning dove</td>
<td>po</td>
<td>Acetone and 5% Gum acacia in distilled water</td>
<td>0.20</td>
</tr>
<tr>
<td>House sparrow</td>
<td>po</td>
<td>Acetone</td>
<td>8.84</td>
</tr>
<tr>
<td>House finch</td>
<td>po</td>
<td>Acetone</td>
<td>0.39</td>
</tr>
<tr>
<td>Mestranol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red-winged blackbird</td>
<td>po</td>
<td>Distilled water</td>
<td>12.00</td>
</tr>
<tr>
<td>Mexacarbate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard duckling</td>
<td>po</td>
<td>4% Gum acacia in distilled water</td>
<td>3.66</td>
</tr>
<tr>
<td>Mourning dove</td>
<td>po</td>
<td>Acetone</td>
<td>0.35</td>
</tr>
<tr>
<td>House finch</td>
<td>po</td>
<td>Acetone</td>
<td>0.26</td>
</tr>
<tr>
<td>Methamidophos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>0.05</td>
</tr>
<tr>
<td>Nosema locustae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>4.72</td>
</tr>
<tr>
<td>Ring-necked pheasant</td>
<td>po</td>
<td>Distilled water</td>
<td>10.20</td>
</tr>
<tr>
<td>Nucleopolyhedral virus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House sparrow</td>
<td>po</td>
<td>Distilled water</td>
<td>17.70</td>
</tr>
</tbody>
</table>
Table 1. Continued.

<table>
<thead>
<tr>
<th>Chemical and test animal</th>
<th>Type of test*</th>
<th>Carrier</th>
<th>Final volume (μL/g)</th>
<th>Mean</th>
<th>Upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphamidon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>1.20</td>
<td>2.02</td>
<td></td>
</tr>
<tr>
<td>Japanese quail</td>
<td>po</td>
<td>Distilled water</td>
<td>1.01</td>
<td>2.15</td>
<td></td>
</tr>
<tr>
<td>Ring-necked pheasant</td>
<td>po</td>
<td>Distilled water</td>
<td>0.47</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>White-winged dove</td>
<td>po</td>
<td>Distilled water</td>
<td>1.08</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Albino rat</td>
<td>po</td>
<td>0.1% Yuma Chemical &quot;Spreader A&quot; in distilled water</td>
<td>3.86</td>
<td>4.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polychlorinated biphenyls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aroclor 1254</td>
<td>po</td>
<td>Corn oil</td>
<td>0.75</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>Albino rat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aroclor 1268</td>
<td>po</td>
<td>Corn oil</td>
<td>2.84</td>
<td>3.99</td>
<td></td>
</tr>
<tr>
<td>Albino rat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starlicide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>0.65</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Corn oil</td>
<td>0.84</td>
<td>1.73</td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Propylene glycol</td>
<td>0.40</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strychnine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring-necked pheasant</td>
<td>po</td>
<td>Distilled water</td>
<td>1.11</td>
<td>2.40</td>
<td></td>
</tr>
<tr>
<td>Mourning dove</td>
<td>po</td>
<td>Distilled water</td>
<td>1.77</td>
<td>3.20</td>
<td></td>
</tr>
<tr>
<td>House sparrow</td>
<td>po</td>
<td>Distilled water</td>
<td>6.91</td>
<td>12.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCDD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Corn oil</td>
<td>-</td>
<td>7.20</td>
<td></td>
</tr>
<tr>
<td>Northern bobwhite</td>
<td>po</td>
<td>Corn oil</td>
<td>0.94</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Ringed turtle-dove</td>
<td>po</td>
<td>Corn oil</td>
<td>-</td>
<td>54.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc phosphide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horned lark</td>
<td>po</td>
<td>Corn oil</td>
<td>9.18</td>
<td>35.70</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>2.00</td>
<td>3.22</td>
<td></td>
</tr>
<tr>
<td>Mallard duckling</td>
<td>po</td>
<td>Distilled water</td>
<td>0.56</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td>Mallard</td>
<td>po</td>
<td>Distilled water</td>
<td>0.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>California quail</td>
<td>po</td>
<td>Distilled water</td>
<td>0.42</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Japanese quail</td>
<td>po</td>
<td>Distilled water</td>
<td>7.54</td>
<td>14.40</td>
<td></td>
</tr>
<tr>
<td>Ring-necked pheasant</td>
<td>po</td>
<td>Distilled water</td>
<td>0.80</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td>Chukar</td>
<td>po</td>
<td>Distilled water</td>
<td>0.71</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>Rock dove</td>
<td>po</td>
<td>Distilled water</td>
<td>3.62</td>
<td>7.99</td>
<td></td>
</tr>
<tr>
<td>Mourning dove</td>
<td>po</td>
<td>Distilled water</td>
<td>0.48</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>House sparrow</td>
<td>po</td>
<td>Distilled water</td>
<td>1.18</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Domestic ferret</td>
<td>po</td>
<td>Distilled water</td>
<td>2.50</td>
<td>4.00</td>
<td></td>
</tr>
</tbody>
</table>

*po = acute oral; spo = subacute oral.

cuts, cracks, or abrasions; only those with feet in good condition were used. The feet were then rinsed in warm water to remove any foreign particles. The next morning, before treatment, the crura were shaved with an electric clipper to facilitate taping of plastic bags which were used to cover the exposed areas. The chemicals were dissolved or suspended by ultrasonic dispersion in corn oil or propylene glycol in quantities to enable application of about 0.6 mL of solution to each foot. This amount was found to be the minimum amount which would wet the entire surface area. The area covered included the tarso-metatarsus, phalanges, and webbing, which constitutes approximately 12% of the body surface area of a full-grown mallard. Each foot was then covered with a plastic bag which extended midway up the crus. After 24 h, the bags were removed and the feet washed with mild soap and warm water. Control birds were
concurrently sham treated with the carriers. The quantity of toxicant administered was based on the body weight of each individual treated.

**Acute Toxicity Determinations**

After initial range-finding dosages were administered, two to seven animals at each of several (usually four) dosage levels were used for each LD50 determination. The number of animals at the dosage levels for each test was kept constant to enable computation of the acute oral LD50 or percutaneous LD50 by the methods of Thompson (1947) and Weil (1952).

Final mortality counts were made after a 14-day observation period following treatment, except that when animals were still showing outward evidence of intoxication at 14 days, the observation period was extended until death or remission occurred. This period was never more than 36 days, although with chlorinated organics and mercury it frequently lasted up to 28 days.

Usually the observations were made continually for 3–4 h after dosing, several more times during the first day of the test, and once daily thereafter. Gross necropsies were performed at the end of the observation period or at death. Survivors were sacrificed by CO₂ asphyxiation.

**Subacute Toxicity Determinations**

An empirical value that represented the minimum repeated oral dosage (in mg/kg per day) that was lethal in 30-day tests, was determined for some pesticides. This value was found by orally administering the chemical daily for 30 days to three males and three females of the test species. Such groups of six were treated at geometrically spaced dosage levels until levels were found that produced the following: in 30 days, no deaths, one or two deaths, and three to six deaths. The lowest daily oral dosage that produced one or two deaths by the end of the 30-day period was called the 30-day empirical minimum lethal dosage (30-day EMLD). Controls for these tests were run concurrently and were sham dosed with empty gelatin capsules.

Dietary LC50 studies were performed using the methods of Heath et al. (1972).

**Acetylcholinesterase Activity Determinations**

When brain acetylcholinesterase (AChE) activity was measured, we used a modification of the method of Michele (1949) (Hawkins and Knittle 1972). Determinations of AChE activity were made on the brains of birds tested with carbaryl (ring-necked pheasant), carbofuran (ring-necked pheasant), dimethoate (ring-necked pheasant), disulfoton (ring-necked pheasant), EPN (mallard), fenitrothion (ring-necked pheasant), leptocephalos (northern bobwhite), malathion (horned lark), methiocarb (horned lark), methyl parathion (mallard, northern bobwhite, red-winged blackbird), and phorate (ring-necked pheasant).

**Arrangement of the Handbook**

In the following summaries, toxicity information is given separately for each pesticide. Chemicals are arranged alphabetically by their common names whenever possible, or by their most commonly used trade names. Other names (common, trade, and trivial) are also included in the alphabetical sequence for easy cross-reference.

Under each chemical heading are listed any alternative names, the chemical name, the pesticide's primary usages, and the purity of the samples tested. Chemical names follow the current system of nomenclature of Chemical Abstracts, 9th Chemical Index. The Chemical Abstract Service (CAS) number, when known, follows the chemical name.

The next entry is a summary table of acute oral toxicity values. The test animals are arranged in the first column according to phylogenetic order. When different samples of the pesticide were tested, the purity of the sample used on each test animal is denoted by a superscript number that refers to the "Sample Purity" preceding the table. Such superscript numbers are also used to indicate sample purity associated with alternative names given for some chemicals and in some discussions under "Other Toxicity Data."

The number of animals included in the statistical calculation of the LD50 is given in the second column. Commonly, more individuals were tested than were used in the calculation.

The sex of the animals tested is given in the third column. Although sex-related differences in susceptibility to pesticides often appear among mammals, notably rats (Kerr and Brogden 1959), our work and that of others (Dahlen and Haugen 1954) indicate that pronounced sex-related differences in acute toxicity are uncommon among birds.

The fourth column gives the age of the test animals in months. When age was not known, a dash appears. Estimated ages were sometimes used; abbreviations appearing in the tabular data are J for juvenile, I for immature, A for adult; and h for hours, d for days, wk for weeks. Differences in sensitivity due to age can be expected, but our work indicates that these are generally small. Immature and senescent animals were avoided in favor of young but sexually mature (or nearly sexually mature) test animals, thus lessening the chance of death unrelated to the treatment. For further discussion of age-sensitivity relations, see Hudson et al. (1972). Unless specifically mentioned in the toxicity tables as a footnote to the age, the test animals were not in active breeding condition, either because they were young of the year and not yet sexually mature, or they were tested at times of the year when they were reproductively inactive and reproductive organs were regressed.

The fifth column gives the LD50 value in milligrams (or milliliters) of toxicant per kilogram of body weight (mg/kg;
mL/kg). Each LD50 is followed by the 95% confidence limits (CL). When confidence limits were not calculable because of an all-or-none effect at the dosages used, either a dash is placed in the parentheses, or the confidence limits have been replaced by the range from the highest dosage producing no mortality to the lowest dosage producing 100% mortality and this range has been given in brackets instead of parentheses. When no LD50 was calculable because of either heterogeneity of the dose-response data or the limited number of animals available, the two figures bracketing the range where we estimated the LD50 would lie are given (e.g., "200–400"). No confidence limits are shown when (1) few, if any, animals died at the highest dosage given and the LD50 is given as "greater than" (> the highest dosage; (2) no toxic signs were produced even at the highest level and the LD50 is given as "much greater than" (>> the highest level administered; and (3) no animals survived at any treatment level and the LD50 value is given as "less than" (< the lowest dosage tested. The conventions described (giving confidence limits in parentheses and estimated ranges in brackets) are followed in the sections on "Other Toxicity Data" as well as in the "Acute Oral Toxicity" summaries.

A list of the toxic signs and behavioral changes in the test animals is given after the summary table. These are the characteristic signs that occurred when the animals were given lethal or near-lethal dosages; they were observed in one or more, but not necessarily all, of the species tested. When pronounced signs occurred at levels much lower than the lethal level, the minimum sign-producing dosage is given. The signs have been listed in their approximate order of onset, but the order can vary from species to species and from individual to individual. A glossary of technical terms used in describing signs of intoxication is given after the references section, near the end of the handbook.

The section on "Other Toxicity Data" lists any additional observations about acute toxicity that may be of value, and gives the results of percutaneous toxicity tests, 30-day repeated oral tests, and chronic feeding tests with the pesticide when those were conducted. The 30-day repeated oral results are expressed as a 30-day EMLD value (this terminology is explained in the section on "Methodology—Subacute Toxicity Determinations"). When too few animals were available for a complete EMLD series, as often happened with mule deer, we have given the two figures that bracket the range in which we would expect the 30-day EMLD to lie.

The value of the 30-day oral test, or similar measurements of chronic toxicity (Hayes 1967), lies in showing the cumulative action of the test chemical. A useful index of cumulation is the ratio of the single oral LD50 (mg/kg) to the 30-day EMLD (mg/kg per day). This ratio, which we have called the "cumulative toxicity index," is also included, along with a few words indicating how the pesticide compares with others in its chemical group. For example, mexacarbide, with an index of 3.00/1.25 = 2.40, shows practically no cumulative action, whereas dieldrin, with an index of 381/5.00 = 76.2, is highly cumulative, even for a chlorinated organic insecticide.

Other information on a given chemical has been included in a "Notes" section which follows the section on "Other Toxicity Data." For example, the "Notes" section may discuss the results of gross necropsies, or give the results of brain acetylcholinesterase activity measurements.

**Summaries of Toxicological Data for Wildlife**

A-33: see Airkem A-33 Dry  
A 353: see aminocarb  
AAT: see parathion  
AAtrex: see atrazine  
Abaphos: see temephos  
Abar: see leptofothe  
Abate: see temephos  
Abathion: see temephos  
AC-3422: see parathion  
AC-3911: see phorate  
AC-4049: see malathion  
AC-12880: see dimethoate  
AC-18133: see thionazin  
AC-18682: see dimethoate  
AC-38023: see famphur  
AC-47031: see Cylone  
AC-52160: see temephos  
Acarin: see dicofof  
Acarol: see bromopropylate  
Accelerate: see endofothe  
Accothion: see fenitrofothe  
Acenaphthene: see Panasol AN-2

**ACEPHATE**

**Alternative Names:** ENT 27822, Orthene, Ortho 12420, Ortran  
**Chemical Name:** Acetylphosphoromidothioic acid, O, S-dimethyl ester (CAS-30560-19-1)  
**Primary Use:** Insecticide  
**Sample Purity:** 93.2%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg) 95% CL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>4-6</td>
<td>234 (186-295)</td>
<td></td>
</tr>
</tbody>
</table>
mL/kg). Each LD50 is followed by the 95% confidence limits (CL). When confidence limits were not calculable because of an all-or-none effect at the dosages used, either a dash is placed in the parentheses, or the confidence limits have been replaced by the range from the highest dosage producing no mortality to the lowest dosage producing 100% mortality and this range has been given in brackets instead of parentheses. When no LD50 was calculable because of either heterogeneity of the dose-response data or the limited number of animals available, the two figures bracketing the range where we estimated the LD50 would lie are given (e.g., "200–400"). No confidence limits are shown when (1) few, if any, animals died at the highest dosage given and the LD50 is given as "greater than" (> ) the highest dosage; (2) no toxic signs were produced even at the highest level and the LD50 is given as "much greater than" (≫) the highest level administered; and (3) no animals survived at any treatment level and the LD50 value is given as "less than" (< ) the lowest dosage tested. The conventions described (giving confidence limits in parentheses and estimated ranges in brackets) are followed in the sections on "Other Toxicity Data" as well as in the "Acute Oral Toxicity" summaries.

A list of the toxic signs and behavioral changes in the test animals is given after the summary table. These are the characteristic signs that occurred when the animals were given lethal or near-lethal dosages; they were observed in one or more, but not necessarily all, of the species tested. When pronounced signs occurred at levels much lower than the lethal level, the minimum sign-producing dosage is given. The signs have been listed in their approximate order of onset, but the order can vary from species to species and from individual to individual. A glossary of technical terms used in describing signs of intoxication is given after the references section, near the end of the handbook.

The section on "Other Toxicity Data" lists any additional observations about acute toxicity that may be of value, and gives the results of percutaneous toxicity tests, 30-day repeated oral tests, and chronic feeding tests with the pesticide when those were conducted. The 30-day repeated oral results are expressed as a 30-day EMLD value (this terminology is explained in the section on "Methodology—Subacute Toxicity Determinations"). When too few animals were available for a complete EMLD series, as often happened with mule deer, we have given the two figures that bracket the range in which we would expect the 30-day EMLD to lie.

The value of the 30-day oral test, or similar measurements of chronic toxicity (Hayes 1967), lies in showing the cumulative action of the test chemical. A useful index of cumulation is the ratio of the single oral LD50 (mg/kg) to the 30-day EMLD (mg/kg per day). This ratio, which we have called the "cumulative toxicity index," is also included, along with a few words indicating how the pesticide compares with others in its chemical group. For example, mexacarbate, with an index of 3.00/1.25 = 2.40, shows practically no cumulative action, whereas dieldrin, with an index of 381/5.00 = 76.2, is highly cumulative, even for a chlorinated organic insecticide.

Other information on a given chemical has been included in a "Notes" section which follows the section on "Other Toxicity Data." For example, the "Notes" section may discuss the results of gross necropsies, or give the results of brain acetylcholinesterase activity measurements.

**Summaries of Toxicological Data for Wildlife**

A-33: see Airkem A-33 Dry
A 363: see aminocarb
AAT: see parathion
AAtrex: see atrazine
Abaphos: see temephos
Abar: see leptoephos
Abate: see temephos
Abathion: see temephos
AC-3422: see parathion
AC-3911: see phorate
AC-4049: see malathion
AC-12880: see dimethoate
AC-18133: see thionizin
AC-18682: see dimethoate
AC-38023: see fampur
AC-47031: see Cyloline
AC-52160: see temephos
Acarin: see dicofol
Acarol: see bromopropylate
Accelerate: see endothall
Accothion: see fenitrothion
Acenaphthene: see Panasol AN-2

**ACEPHATE**

**Alternative Names:** ENT 27822, Orthene, Ortho 12420, Ortran

**Chemical Name:** Acetylphosphoramidothioic acid, O, S-dimethyl ester (CAS-30560-19-1)

**Primary Use:** Insecticide

**Sample Purity:** 93.2%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>4-6</td>
<td>234 (186-295)</td>
</tr>
</tbody>
</table>
Signs of Intoxication: Ataxia, imbalance, hopping and falling, jerkiness, mild spasms in the legs and feet, immobility, wings spread, and intermittent tremors. Signs appeared as soon as 25 min and mortalities usually occurred 2-18 h after treatment. Treatment levels as low as 124 mg/kg produced signs.

Note: In the environment, acephate may rapidly degrade to methamidophos (Bull 1979).

Acetylated mexacarbate: see mexacarbate (acylated)
Acetylated Zectran: see mexacarbate (acylated)
ACP M-728: see chloramben
Acraldehyde: see acrolein

**ACROLEIN**

**Alternative Names:** Aqualin, acrylaldehyde, acrylic aldehyde, acraldehyde, Magnacide H

**Chemical Name:** 2-Propenal (CAS 107-02-8)

**Primary Use:** Aquatic herbicide, fungicide

**Sample Purity:** 92%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-5</td>
<td>9.11 (6.32-13.1)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, reluctance to leave the swimming pond, slow responses, ataxia, geotaxis, imbalance, phonation, wing tremors, running and falling, asthenia, myasthenia, and withdrawal. Treatment levels as low as 3.33 mg/kg produced signs. Signs appeared as soon as 10 min and persisted up to 36 days after treatment. Mortalities occurred as soon as 32 min; however, several mortalities occurred several days after treatment.

Acrylaldehyde: see acrolein
Acrylic aldehyde: see acrolein
Acti-Aid: see cycloheximide
Actidione: see cycloheximide
Actispray: see cycloheximide
AG-500: see Diazinon
Agriilp: see coumaphos
Agrisol: see trichloronat
Agritol: see Bacillus thuringiensis (Berliner)
Agrotox: see trichloronat
Agrosan: see PMA
Agrotect: see 2,4-D
Agrothion: see fenithrothion

**AGROX**

**Alternative Names:** None found

**Chemical Name:** Formulation containing phenyl ureato-\(N(N)\)mercury and inert carrier materials (CAS 2279-64-3)

**Primary Use:** Fungicide, seed disinfectant

**Sample Purity:** 6.70% (4.0% mercury)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Only occasional mild ataxia between 1st and 4th day following treatment. Profuse regurgitation occurred within 5-10 min of single oral administration.

**AIRKEM A-33 DRY**

**Alternative Names:** A-33; for active ingredient: benzonium chloride, BTC, Roccal, Zephiran chloride

**Chemical Name:** Mixture of n-alkyl (93% C\(_14\), 4% C\(_12\), 3% C\(_6\)) dimethyl benzyl ammonium chloride, tetrasodium ethylene diamine tetraacetate, and essential oils

**Primary Use:** Industrial detergent — bactericide, fungicide, disinfectant, and odor counteractant

**Sample Purity:** 14% Active

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,262</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Profuse regurgitation, polydipsia, hypoactivity, wings crossed over back, and ataxia. Treatment levels as low as 200 mg/kg produced signs, but no mortalities occurred at levels up to 2,262 mg/kg. Signs appeared as soon as 13 min after treatment and persisted up to 1 week.

**AKTON**

**Alternative Names:** Axiom, ENT 27102, SD 9098

**Chemical Name:** Phosphorothioic acid, \(O\)-[2-chloro-1-(2,5-dichlorophenyl)ethenyl] \(O,O\)-diethyl ester (CAS 1757-18-2)
Primary Use: Insecticide

Sample Purity: 98.5%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>23</td>
<td>M</td>
<td>3–5</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Goose-stepping ataxia, walking on toes, tails pointed sharply upward, wing droop or wings crossed high over back, dyspnea, falling. Signs were noticeable by 15–30 min but not at 24 h. Treatment levels as low as 10 mg/kg produced definite signs; levels greater than 900 mg/kg produced moderate weight losses.

Note: Gross necropsies showed petechiation on heart surface, gastrointestinal hyperemia, and congestion of pancreas in some sacrificed birds.

AL-50: see Dicloran

**ALACHLOR**

Alternative Names: CP 50144, Lasso, Lazo

Chemical Name: 2-Chloro-N-(2,6-dimethylphenyl)-N-(methoxyethyl)-acetamide (CAS 15972-60-8)

Primary Use: Preemergence herbicide

Sample Purity: 88.5%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, goose-stepping ataxia, imbalance, slowness, and tenseness. Signs appeared as soon as 25 min and persisted up to 2 days after treatment.

**ALDICARB**

Alternative Names: Ambush, ENT 27093, OMS-771, Temik, UC 21149, WHO OMS-771

Chemical Name: 2-Methyl-2-(methylthio)propanal O-[(methylamino) carbonyl]oxime (CAS 116-06-3)

Primary Use: Insecticide, acaricide, nematicide

Sample Purity: 95%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>3.40</td>
</tr>
<tr>
<td>California quail</td>
<td>20</td>
<td>M</td>
<td>10$^a$</td>
<td>2.58 (2.70–4.28)</td>
</tr>
<tr>
<td>California quail</td>
<td>15</td>
<td>F</td>
<td>10$^a$</td>
<td>4.67 (1.96–3.40)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>3.34 (3.32–6.36)</td>
</tr>
</tbody>
</table>

$^a$These birds were in the early stages of reproductive gonadal development.

Signs of Intoxication: Signs observed in one or more of the above species after acute oral administration of aldicarb included ataxia, imbalance, shakiness, wing-drop, wings spread, running and falling, regurgitation, sitting, hyperreactivity, tremors, convulsions, tetany, ptosis, foamy salivation, immobility, and opisthotonos. Signs were produced in mallards by treatment levels as low as 0.45 mg/kg and in pheasants by levels as low as 2.00 mg/kg. Signs appeared as soon as 3 min and mortalities usually occurred between 15 and 40 min after treatment.

Other Toxicity Data: The calculated percutaneous LD$_{50}$ for eight 1-year-old mallard drakes after a 24-h dermal foot exposure was 60.0 (CL 30.0–120) mg/kg. Signs observed after percutaneous treatment, in addition to several of those listed above, included slowness, tenseness, nasal exudate, penile extrusion, and terminal wing-beat convulsions. Mortalities usually occurred between 15 and 85 min after the initiation of percutaneous treatment, and signs persisted up to 2 days after the end of treatment. Mild dermal irritation occurred after percutaneous exposure to aldicarb. When the percutaneous LD$_{50}$ is compared with the acute oral LD$_{50}$, aldicarb appears to have a relatively low degree of dermal hazard in mallards.

The 30-day EMLD for mallards (n = 12) is 1.20 mg/kg per day for both sexes. The resulting cumulative toxicity index is 3.4/1.2 = 2.8, indicating little cumulative action for aldicarb in mallards.

Notes: For data on the effects of age on the sensitivity of mallards to aldicarb, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

**ALDRIN**

Alternative Names: Aldrite, Aldrosol, Compound 118, ENT 15949, HHDN, Octalene, Seedrin
Chemical Name: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-
hexahydro-1,4:5,8-dimethanonaphthalene (CAS 309-
00-2)

Primary Use: Insecticide

Sample Purity: 95%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
</table>
| Fulvous whistling-
  duck               | 8   | M   | 3-6          | 29.2 [22.2-38.4]   |
| Mallard              | 16  | F   | 3-4          | 520                |
| (229-1,210)          |     |     |              |                     |
| Bobwhite             | 12  | F   | 3-4          | 6.59 [5.00-8.66]   |
| Pheasant             | 12  | F   | 3-4          | 16.8               |
| (14.1-20.0)          |     |     |              |                     |
| Mule deer            | 4   | M   | 12-18        | 18.8-37.5          |

Signs of Intoxication: Ataxia, circling, low carriage, nictitating membrane closed for long periods, fluffed feathers, tremors, phonation, violent wing-beat convulsions, seizures, opisthotonus. Deaths occurred 30 min to 10 days after treatment. Weight losses occurred among survivors of the higher treatment levels. Signs observed in deer included several of those listed above, as well as tenseness, fasciculation, eyes opened wider than normal, salivation, falling, sternal recumbency, thrashing of the head, and violent convulsions.

Other Toxicity Data: The 30-day EMLD for mallards 17 to 23 weeks old (n = 12) is about 5.0 mg/kg per day for both sexes. The resulting cumulative toxicity index is 520/5 = 104, indicating an extremely high degree of cumulative action, even for an organochlorine compound.

Rice seed treated with 2.5 g/kg of 44.2% aldrin and 1.56 g/kg of a 3.51% active formulation of Ceresan L was administered to adult fulvous whistling-ducks (n = 8). The calculated acute oral LD50 for the treated seed is 7.94 (CL 5.83-10.8) g/kg, or about 4 g of dry rice per duck (about 166 seeds). This amount is much less than such ducks would ingest in one feeding. The LD50 amount is equivalent to 8.77 mg/kg aldrin and 0.279 mg/kg Ceresan L—thus most of the toxic action could apparently be attributed to aldrin.

A 2:1 mixture of aldrin (95%) and Ceresan M (7.7% active) was administered to gray partridge cocks (n = 12), 9 to 20 months old. The calculated acute oral LD50 is 33.1 [26.2-41.6] mg/kg; this dosage is 22.1 mg/kg aldrin and 11.0 mg/kg Ceresan M, Aldrin apparently contributed predominantly to the toxicity of this mixture, since the LD50 for Ceresan M has been determined to be 550 mg/kg.

Note: Gross necropsies revealed liver adhesions to the parietal peritoneum in some birds.

Aldrine: see aldrin
Aldrosol: see aldrin
Alfa-tox: see Diazinon
Aliphatic amine, primary: see Armeen OD
Akron: see parathion
Alkylbenzenes: see Panasol AN-2
Alleron: see parathion

**ALLETHRIN**

Alternative Names: Allyl homologue of cinerin I, ENT 17510, pallethrine, Pyranin

Chemical Name: 2,2-Dimethyl-3-(2-methyl-1-propenyl)-cy-
clopropanecarboxylic acid, 2-methyl-4-oxo-3-(2-prop-
enyl)-2-cyclopenten-1-yl ester (CAS 584-79-2)

Primary Use: Insecticide

Sample Purity: 90%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: None.

Note: Allethrin is the allyl homologue of cinerin I, which is one of the constituents of pyrethrum, the oldest known insecticide.

Allisan: see dicrolan
Alltex: see toxaphene
Allyl homologue of cinerin I: see allethrin
Altosid: see methoprene
Alvit: see dieldrin
Ambush: see aldicarb
Amchem 66-206: see chloramiben
American Cyanamid 3422: see parathion
American Cyanamid 3911: see phorate
American Cyanamid 18133: see thionazin
American Cyanamid 38023: see fapamphur
American Cyanamid 43064: see Cyclone
Amerol: see amitrole
Amiben: see chloramiben
Amine, primary aliphatic: see Armeen OD
**AMINOCARB**

Alternative Names: A 363, BAY 44646, ENT 25784, Mata-cil

Chemical Name: 4-(Dimethylamino)-3-methyl-phenol, meth-ylcarbamate(ester) (CAS 2032-59-9)

Primary Use: Insecticide

Sample Purity: 97%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>8</td>
<td>22.5 (17.8-28.3)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>42.4 (33.7-53.4)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>M</td>
<td>13-15</td>
<td>7.50-15.0</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, tenseness, lacrimation, sali-vation, tachypnea, feathers fluffed or drawn tightly against body, piloerection, diarrhea, dyspnea, tracheal congestion, wing-beat convulsions or opisthotonos. Mortality among birds usually occurred in the first hour after treatment.

**6-AMINONICOTINAMIDE**

Alternative Names: DID 764, DRC-3492

Chemical Name: 6-Aminonicotinamide

Primary Use: Experimental rodenticide

Sample Purity: 100%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>7.95 (6.35-10.1)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, imbalance, ptosis, falling, and tremors. Signs appeared as soon as 30 min and mortalities usually occurred 1-2 days after treatment; however, one drake died 12 days after treatment. Signs persisted up to 3 or 4 weeks after treatment. Weight losses in the survivors 30 days after treatment were substantial.

Aminotriazole: see amitrole
Amino Triazole: see amitrole

**AMITROLE**

Alternative Names: Amerol; aminotriazole; Amino Tri-azole; Amizol; 3-A-T; ATA; Cytral; ENT 25445; Herbizole; Weedazol

Chemical Name: 1,2,4-Triazol-3 amine (CAS 61-82-5)

Primary Use: Herbicide

Sample Purity: 90%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, weakness, slight wing-drop during the first 3 days after single oral administration.

Amizol: see amitrole
Amoben: see chloramben
Amoxone: see 2,4-D

**ANILAZINE**

Alternative Names: B-622, Direz, Dyrene, Kemate, Triasyn

Chemical Name: 4,6-Dichloro-N-(2-chlorophenyl)-1,3,5-triazin-2-amine (CAS 101-05-3)

Primary Use: Fungicide

Sample Purity: 95.5%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, ataxia, weakness, falling when walking. The weakness and ataxia persisted from the 1st through the 10th day.

Anofex: see DDT
Anthon: see trichlorfon
4-AP: see Avitrol 200
Aphamite: see parathion
Aphoxide: see tepa
APO: see tepa
Appex: see tetrachlorvinphos
Aprocarb: see Baygon
Aquacide: see diquat dibromide
Aqua-Kleen: see 2,4-D
Aqualin: see acrolein
Aquathol: see endothall
Aqua-Vex: see silvex
Aran: see thiram
Arkotine: see DDT

ARMEEN OD

Alternative Names: None found

Chemical Name: Primary aliphatic amine of high molecular weight

Primary Use: Mosquito control agent (pre-imago stage), wetting and dispersing adjuvant, ingredient in 492 Mosquito Larvicide Oil

Sample Purity: Undetermined

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>12</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Slowness, ataxia, asthenia, and sitting. Signs appeared on the 2nd day after treatment and remission had occurred by the 5th day.

Aroclor: see polychlorinated biphenyls
Aromatic solvent: see Panasol AN-2
Arpocarb: see Baygon
Arsan: see Silvisar-S10
Aspon: see chlor dane
Aspor: see zineb
Asutol: see coumaphos
3,A-T: see amitrole
ATA: see amitrole
Atlas "A": see sodium arsenite
Atratol: see atrazine

ATRAZINE

Alternative Names: AAtrex, Atratol, ENT 28244, G-30027, Gesaprim, Primatol A

Chemical Name: 6-Chloro-N-ethyl-N’-(1-methylethyl)-1,3, 5-triazine-2,4-diamine (CAS 1912-24-9)

Primary Use: Herbicide

Sample Purity: 80% Wetable powder

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>6</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Weakness, hyperexcitability, ataxia, tremors; weight loss occurred in mallards. Signs appeared in mallards 1 h after treatment and persisted up to 11 days. In pheasants, remission had occurred by 5 days after treatment.

Avicol: see PCNB

AVITROL 200

Alternative Name: 4-AP

Chemical Name: 4-Pyridineamine (CAS 504-24-5)

Primary Use: Avian chemical frightening agent

Sample Purity: 95%¹ and 99.9%²

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%-CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard¹</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>4.36 (3.36-5.60)</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>5.19 (4.00-6.73)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Polydipsia, ataxia, stumbling, running and falling, high stance, wing-drop or wings crossed high over back, wing shivers, tremors, rapid nictitating membrane flicker, circling, dyspnea, loss of righting reflex, convulsions and wing-beat convulsions, and tetany. Signs appeared as soon as 10 min and mortalities occurred between 21 and 125 min after treatment. Some survivors displayed signs up to 2 weeks after treatment.

Axiom: see Akton
Azide: see potassium azide

AZINPHOS-METHYL

Alternative Names: 17/147, BAY 9027, BAY 17147, Carfen, Cotinio-Methyl, DDB, ENT 23233, Gusathion, Gusathion M, Guthion, Methyl Guthion, metiltriazolion, R-1582

Chemical Name: Phosphorodithioic acid, O,O-dimethyl S-
Primary Use: Insecticide

Sample Purity: 90% and 240 g/L formulation

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>136 (97.8-188)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>4</td>
<td>M</td>
<td>24</td>
<td>60.0-120 (200-400)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-5</td>
<td>74.9 (59.5-94.3)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>8</td>
<td>M</td>
<td>3-4</td>
<td>283 (200-400)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>84.2 (53.0-134)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>2</td>
<td>M</td>
<td>15-16</td>
<td>32.0-64.0</td>
</tr>
</tbody>
</table>

Signs of Intoxication: No noticeable effects on appearance, behavior, or body weight at treatment levels up to 2,000 mg/kg.

Bactospeine WP: see *Bacillus thuringiensis* (Berliner)
Bakthane: see *Bacillus thuringiensis* (Berliner)

**BALAN**

Alternative Names: Balfin, Banafine, benfien (a close analog of trifluralin), Benfluranil, Bethrodine, Binnell, Blulan, Bonalan, Carpidor, EL-110, Quilan

Chemical Name: N-butyl-N-methyl-2,6-dinitro-4-(tri-fluoromethyl)-benzenamine (CAS 1861-40-1)

Primary Use: Herbicide

Sample Purity: 97.2%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, weakness, falling. Regurgitation also occurred in the first 2 h after treatment. The other signs occurred 2 to 14 days after treatment. Although no birds died, considerable weight losses had occurred by the end of the 14-day observation period.

Balfin: see Balan
Banafine: see Balan
Barbasco: see rotenone
Basanite: see dinoseb
Basudin: see Diazinon
BAY 13/59: see trichlorfon
BAY 5505: see ethaphenphon
BAY 8173: see detemton
BAY 9010: see Baygon
BAY 9027: see azinphos-methyl
BAY 10756: see demeton
BAY 17147: see azinphos-methyl
BAY 19639: see disulfoton
BAY 21097: see oxydemetonmethyl
BAY 21116: see oxydemetonmethyl
BAY 21199: see coumaphos
BAY 25141: see fensulfothion
BAY 25648: see clonotralid
BAY 29492: see fenithion
BAY 37289: see trichloronat
BAY 37344: see methiocarb
BAY 38819: see Gophacide
BAY 39007: see Baygon
BAY 41831: see fenitrothion
BAY 44646: see aminocarb
BAY 68138: see Nemacur
BAY 69469: see ethamphenphon
BAY 71628: see methamidophos
BAY 77488: see phoxin
BAY 78418: see edifenphos

### BAY 93820

**Alternative Name:** None found

**Chemical Name:** 2-[(Aminomethoxyphosphinothioi)oxy] benzoic acid, 1-methylethyl ester (CAS 24353-61-5)

**Primary Use:** Insecticide

**Sample Purity:** 89%

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
<th>95%CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>12</td>
<td>353</td>
<td>(196-637)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, ataxia, sitting, wing-drop, fear-threat displays, ataxia, fluffed feathers, using wings for pedestrian locomotion, slowness, falling, asthenia, dyspnea, spasms, emprosthotonos-type spasms, ptosis, lacrimation, clonic convulsions, bradypnea, immobility, and emprosthotonos. Signs appeared as soon as 1 h, and mortalities occurred up to 22 h after treatment.

BAY E-605: see parathion
Bayer 73: see clonitralid
Bayer E-601: see methyl parathion

### BAYGON

**Alternative Names:** aprocarb, arprocarb, BAY 9010, BAY 39007, Blattanex, ENT 25671, OMS-33, propoxur, Sendoan, Suncide, Tendex, Unden

**Chemical Name:** 2-(1-Methylethoxy)phenol methylcarbamate (CAS 114-26-1)

**Primary Use:** Insecticide

**Sample Purity:** 97%¹ and 98%²

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
<th>95%CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog¹</td>
<td>8</td>
<td>M</td>
<td>—</td>
<td>595</td>
<td>[500-707]</td>
</tr>
<tr>
<td>Canada goose¹</td>
<td>20</td>
<td>M,F</td>
<td>—</td>
<td>5.95</td>
<td>(4.89-7.24)</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>F</td>
<td>4-6</td>
<td>11.9</td>
<td>[10.0-14.1]</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>F</td>
<td>4-6</td>
<td>9.44</td>
<td>(7.49-11.9)</td>
</tr>
<tr>
<td>Sharp-tailed grouse¹</td>
<td>12</td>
<td>F</td>
<td>12-48</td>
<td>120</td>
<td>[84.8-170]</td>
</tr>
<tr>
<td>California quail¹</td>
<td>12</td>
<td>F</td>
<td>3-7</td>
<td>25.9</td>
<td>(14.9-45.0)</td>
</tr>
<tr>
<td>Japanese quail¹</td>
<td>8</td>
<td>F</td>
<td>20</td>
<td>28.3</td>
<td>[20.0-40.0]</td>
</tr>
<tr>
<td>Pheasant³</td>
<td>8</td>
<td>M</td>
<td>3-5</td>
<td>20.0</td>
<td>(10.0-40.0)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Stumbling, falling, immobility, and terminal wing-beat convulsions. Signs appeared as soon as 15 min and mortalities usually occurred between 30 and 90 min after treatment.
**BENZENE HEXACHLORIDE**

**Alternative Names:** 666, Benzahex, Benzex, BHC, DBH, Del, Dolmix, ENT 8601, FBHC, HCCH, HCH, hexachlor, hexachloran, hexachlorocyclohexane, Hexafor, Hexyclan, Isotox, Lintox, Soprocide

**Chemical Name:** 1,2,3,4,5,6-Hexachlorocyclohexane (CAS 608-73-1)

**Primary Use:** Insecticide

**Sample Purity:** 88 to 90%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>15</td>
<td>F</td>
<td>3</td>
<td>≥1,414</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>118</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Polydipsia, regurgitation, hyperventilation, ataxia, ptosis, fluffed feathers, hyporeactivity, imbalance, slowness, stumbling, phonation, tenseness, shakiness, jitteriness, sitting, ataxia, withdrawal, tremors, masseter tenseness, spasms, aggressiveness, fear-threat displays, backing, circling, asthenia, tongue protruding sideways from the bill (mallards), and immobility. Prolonged signs included falling, sitting, using wings for pedestrian locomotion, ataxia, and withdrawal. Signs appeared as soon as 30 min in mallards and 2 h in pheasants, and mortalities usually occurred between 2 and 5 days in mallards and between 4 and 9 days after treatment in pheasants. Remission took up to 20 days.

**Note:** Emaciation, enlarged livers, and small spleens were observed on necropsy of mortalities and sacrificed survivors.

Benzex: see benzene hexachloride
Benzo trifluoride: see resmethrin
Benthroline: see Balan
BHC: see benzene hexachloride
Bidrin: see dicrotophos
Binnell: see Balan
BIO-5462: see endosulfan
Bioethanomethrin: see RU 11-679
Bioresmethrin: see resmethrin

---

**Test animal** | **No.** | **Sex** | **Age (months)** | **LD50 95% CL (mg/kg)**
---|---|---|---|---
Chukar | 12 | M,F | 4–6 | 23.8 [20.0–28.3]
Sandhill crane | 14 | M,F | — | >60.0
Rock dove | 20 | M,F | — | 60.4 [38.0–96.1]
Mourning dove | 8 | M,F | — | 4.2 [3.54–5.00]
House sparrow | 12 | F | — | 12.8 [9.26–17.8]
House finch | 12 | M,F | A | 3.55 [2.25–5.69]
Dark-eyed junco | 8 | M | A | 4.76 [4.00–5.70]
Mule deer | 2 | F | 11 | 100–350
Domestic goat | 4 | M | 12 | >800

*Except as noted.

**Signs of Intoxication:** Naution, lacrimation, ataxia, miosis, lethargy, asyn ery, imbalance, salivation, hypoactivity, goose-stepping ataxia, falling, tachypnea, dyspnea, fasciulation, ptosis, diarrhea, immobility, tremors, convulsions, wings spread in tetany, and opisthotonos. Depending on the species, signs appeared as soon as 5 min, mortalities occurred between 5 and 45 min or overnight, and remission occurred from 90 min to several days after treatment.

**Other Toxicity Data:** The 30-day EMLD for pheasants (n = 6) is greater than 6.0 mg/kg per day for both sexes. For mallards (n = 12) the 30-day EMLD is 6.0 mg/kg per day. The resulting cumulative toxicity index for mallards is 11.9/6.0 = 2.0, indicating little or no cumulative action. Mallard and pheasant survivors of the treatment level at 6.0 mg/kg per day showed normal fertility, and their eggs hatched at the same rate as those of controls.

**Notes:** For a discussion of the comparative toxicity of Baygon, see Tucker and Haegele (1971).

For effects of age on the sensitivity of mallards to Baygon, see Hudson et al. (1972).

BAY H-321: see methiocarb
BAY L-13/59: see trichlorfon
Bayulsid: see clonitralid
Baymix: see coumaphos
Baytex: see fenclon
Baythion: see phoxim
BBC 12: see Nemagon
BDH 1031: see mestranol
Belt: see chlor dane
Benefin: see Balan
Benfluralin: see Balan
Benzabor: see TBA

Benzac: see TBA
Benzac 1281: see TBA
Benzahex: see benzene hexachloride
Benzalkonium chloride: see Airkem A-33 Dry
Biophen: see temephos
Biotrol: see Bacillus thuringiensis (Berliner)
Biotrol BTB: see Bacillus thuringiensis (Berliner)
Bird clean-up agent: see Shell Sol 70
Birlane: see chlorfenviphos
Black Leaf 40: see nicotine sulfate
Bladan: see parathion, TEPP
Bladex: see cyanazine
Blattanex: see Baygon
Blulan: see Balan
Bo-Ana: see famphur
Bonalan: see Balan

BORDEAUX MIXTURE

Alternative Names: None found

Chemical Name: Mixture of copper sulfate solution and suspension of calcium hydroxide

Primary Use: Fungicide

Sample Purity: 12.75% as copper

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>3</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Tachypnea, ataxia, imbalance, and hyperexcitability. Signs appeared as soon as 15 min and generally persisted for a few hours after treatment.

Brush Killer: see 2,4,5-T
Brush-Rhap: see 2,4,5-T
BTC: see Airkem A-33 Dry
BTV: see Bacillus thuringiensis (Berliner)

BUFENCARB

Alternative Names: Bux, ENT 27127, metalkamate, Ortho 5353, RE-5353

Chemical Name: 3-(1-Ethylpropyl)phenylmethylcarbamate and 3-(1-methybutyl)phenyl methylcarbamate (CAS 8065-36-9)

Primary Use: Insecticide

Sample Purity: 68.9%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>10.5 [8.84–12.5]</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>88.0 (61.6–126)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, dyspnea, wing-drop, tremors, regurgitation, ptosis, and wing-beat convulsions or tetany. Signs appeared as soon as 15 min and mortalities usually occurred between 20 min and 1 h after treatment.

BROMOPROPYLATE

Alternative Names: Acarol, ENT 27552, GS-19851, Neoron

Chemical Name: 4-Bromo-α-(4-bromophenyl)-α-hydroxy benzenacetic acid, 1-methylethyl ester (CAS 18181-80-1)

Primary Use: Acaricide

Sample Purity: 97.5%

BUTYLATE

Alternative Names: R-1910, Sutan

Chemical Name: Bis(2-methylpropyl)-carbamothioic acid, S-ethyl ester (CAS 2008-41-5)

Primary Use: Herbicide

Sample Purity: 98%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Notes: C-12 trichlorfon differs from trichlorfon by the addition of a long carbon chain in place of the hydroxyethyl group. Four birds of the same species and sex and approximately the same ages were tested with both trichlorfon and C-12 trichlorfon. The acute oral LD50 for C-12 trichlorfon is 15.4, 16.7, 8.3, and 1.6 times the acute oral LD50 for trichlorfon to mallards, pheasants, bobwhites, and California quail, respectively. Thus, the addition of the carbon chain to trichlorfon substantially decreased the toxicity of that compound to mallards, pheasants, and bobwhites, and appeared to decrease the toxicity of the compound to California quail. See trichlorfon for comparative data.

C-570: see phosphamidon
C-1983: see chloroxuron
C-2059: see fluometuron

C-2307

Alternative Name: ENT 27625
Chemical Name: (E) phosphoric acid, 3-(methoxymethylamino)-1-methyl-3-oxo-1-propanoyl dimethyl ester (CAS 25601-84-7)
Primary Use: Insecticide, acaricide
Sample Purity: 75%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>3.86 (2.97-5.00)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>24</td>
<td>M</td>
<td>3-4</td>
<td>2.37 (1.83-3.08)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Goose-stepping ataxia, regurgitation, polydipsia, miosis, lacrimation, salivation, ataraxia, dyspnea, tremors, wing-drop, wing-beat convulsions, and opisthotonus. Signs appeared in less than 10 min and mortalities usually occurred between 15 and 57 min after treatment.

C-6980: see fluorodifen
Calcium hydroxide: see Bordeaux Mixture
Camphechlor: see toxaphene

CAPSULE WALL MATERIAL

Alternative Names: None found
Chemical Name: Poly-amide compound

**Primary Use:** Encapsulating material for an encapsulated formulation of methyl parathion

**Sample Purity:** Technical grade

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>12</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia and shakiness were observed on the day of treatment.

### CAPTAN

**Alternative Names:** Captane, ENT 26538, Merpan, Orthocide, Orthocide 406, SR 406, Vancide 95RE, Vondcapitan

**Chemical Name:** 3α,4,7,7α-Tetrahydro-2-[(trichloromethyl)thio]-1H-isindole-1,3(2H)-dione (CAS 133-06-2)

**Primary Use:** Fungicide

**Sample Purity:** 91%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, tremors. Remission took up to 1 week.

Captane: see captan

### CARBARYL

**Alternative Names:** Carin,1 ENT 23969, Hexavin, Karbaspray, Ravyon, Septene, Sevin, Sevin-4-Oil,4 Tricarnam, UC 7744

**Chemical Name:** 1-Naphthalenyl methylcarbamate (CAS 63-25-2)

**Primary Use:** Insecticide

**Sample Purity:** 50%,1 85%,2 95%,3 480 g/L formulation,4 240 g/L formulation,4 and 98%6

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog1</td>
<td>3</td>
<td>M</td>
<td>-</td>
<td>&gt;4,000</td>
</tr>
<tr>
<td>Canada goose</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>&gt;1,790</td>
</tr>
<tr>
<td>Mallard2</td>
<td>4</td>
<td>F</td>
<td>3</td>
<td>&gt;2,564</td>
</tr>
<tr>
<td>Sharp-tailed grous2</td>
<td>10</td>
<td>M,F</td>
<td>-</td>
<td>&lt;1,000</td>
</tr>
<tr>
<td>California quail (st)4</td>
<td>7</td>
<td>M</td>
<td>10a</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>California quail (st)</td>
<td>4</td>
<td>M</td>
<td>10a</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>24</td>
<td>M</td>
<td>2</td>
<td>2,290</td>
</tr>
<tr>
<td>Pheasant3</td>
<td>3</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant (st)4</td>
<td>8</td>
<td>F</td>
<td>3-4</td>
<td>707</td>
</tr>
<tr>
<td>Chukar6</td>
<td>12</td>
<td>M,F</td>
<td>4</td>
<td>1,888</td>
</tr>
<tr>
<td>Rock dove2</td>
<td>32</td>
<td>M,F</td>
<td>-</td>
<td>(1,498-2,378)</td>
</tr>
<tr>
<td>Mule deer3</td>
<td>2</td>
<td>F</td>
<td>11</td>
<td>200-400</td>
</tr>
</tbody>
</table>

2 These birds were in the early stages of reproductive gonadal development.

**Signs of Intoxication:** Signs observed in one or more species included inactivity, ataxia, regurgitation, weakness, fluffed feathers, salivation, slowness, lethargy, tachypnea, tremors, ataxia, tetany, paralysis, coma, and convulsions. Signs appeared as soon as 25 min after treatment. Mortalities occurred from 26 min to 3 days after treatment. Remission typically took up to 1 week, but in one species required up to 12 days.

**Other Toxicity Data:** The 30-day EMLD for the 85% formulation in mallards of both sexes (n = 12) is about 125 mg/kg per day. Survivors of this 30-day EMLD test reproduced normally. The 30-day EMLD for the 480 g/L formulation in pheasants of both sexes (n = 12) appears to be greater than 350 mg/kg per day. The resulting cumulative toxicity index is 707/350 > 2, indicating little or no cumulative action for Carbaryl in ring-necked pheasants.

**Notes:** Necropsies of the sacrificed survivors of the 30-day EMLD test in pheasants (480 g/L formulation) revealed several small spleens. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.029, range = 1.299-1.365), the pheasants that were sacrificed after receiving the dosage of 175 mg/kg per day for 30 days showed a brain cholinesterase inhibition of 1% (n = 6, ΔpH/45 min = 1.318, s = 0.070, range = 1.234-1.401). When compared with their controls (n = 6, ΔpH/45 min...
= 1.097, s = 0.068, range = 0.996-1.159), the pheasants that had received the dosage of 350 mg/kg per day for 30 days showed no brain cholinesterase inhibition (n = 6, ΔpH/45 min = 1.261, s = 0.067, range = 1.142-1.327).

For information on the eggshell-thinning effects of carbaryl, see Haegele and Tucker (1974).

Carbiclon: see dicretophos
Carbofos: see malathion

**CARBOFURAN**

**Alternative Names:** Curaterr, D 1221, ENT 27164, FMC-10242, Furadan, NIA 10242

**Chemical Name:** 2,3-Dihydro-2,2-dimethyl-7-benzofuranol methylcarbamate (CAS 1563-66-2)

**Primary Use:** Insecticide, miticide, nematocide

**Sample Purity:** 98.8%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulvous whistling-duck</td>
<td>8</td>
<td>F</td>
<td>3-6</td>
<td>0.238</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.200-0.283)</td>
</tr>
<tr>
<td>Mallard</td>
<td>20</td>
<td>M</td>
<td>12</td>
<td>0.480</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.381-0.604)</td>
</tr>
<tr>
<td>Mallard</td>
<td>20</td>
<td>F</td>
<td>12b</td>
<td>0.510</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.410-0.635)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>0.397</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.315-0.500)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>5.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(3.64-6.99)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>4.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.38-7.22)</td>
</tr>
</tbody>
</table>

These drakes were either in active breeding condition or had gonads in the early stage of regression.

aMost of these hens were in active egg-laying condition.

**Signs of Intoxication:** Ataxia, wings crossed high over back, rotation, diarrhea, phonation, salivation, lacrimation, immobility with wings spread, dyspnea, miosis, terminal wing-beat convulsions or opisthotonos. Signs in survivors persisted up to 7 days. Mortalities occurred as soon as 5 min after treatment.

**Other Toxicity Data:** The 30-day EMLD is 0.2 mg/kg per day for mallards of both sexes (n = 12), indicating little or no cumulative toxicity. The 30-day EMLD for pheasants of both sexes (n = 12) is 4.2 mg/kg per day. The resulting cumulative toxicity index is 4.15/0.2 = 0.99, indicating no cumulative action for carbofuran in pheasants. As little as 2 mg/L carbofuran in the drinking water of fulvous whistling-ducks (n = 15) was lethal in 7-day exposures, and 1 mg/L produced signs of intoxication.

**Notes:** Acetylcholinesterase activity measurements were made on the brains of the mortalities and sacrificed survivors of the pheasant EMLD determination. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.029, range = 1.299-1.366), pheasants that had received 2.10 mg/kg per day for 30 days showed 4.9% inhibition (n = 6, ΔpH/45 min = 1.266, s = 0.124, range = 1.025-1.363). When compared with their controls (n = 6, ΔpH/45 min = 1.097, s = 0.068, range = 0.996-1.159), sacrificed survivors that had received 4.20 mg/kg per day for 30 days showed no inhibition (n = 4, ΔpH/45 min = 1.209, s = 0.177, range = 1.065-1.446), whereas mortalities from the treatment level at 4.20 mg/kg per day showed 47.6% inhibition (n = 2, ΔpH/45 min = 0.575, s = 0.016, range = 0.564-0.586).

For data on the effects of age on the sensitivity of mallards to carbofuran, see Hudson et al. (1972).

The 1-year-old mallards reported in the preceding table were in active breeding condition. Thus, it appears that the breeding condition of mallards has little effect on their sensitivity to acute oral administration of carbofuran.

**CARBOPHENOTHION**

**Alternative Names:** Dagadip, ENT 23708, Garrathion, R-1303, Stauffer R-1303, Triathion

**Chemical Name:** Phosphorodithioic acid, S-[[4-chlorophenyl]thio]methyl]O,O-diethyl ester (CAS 786-19-6)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 94.65%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>121 (95.9-152)</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>5</td>
<td>M</td>
<td>A</td>
<td>75.6-170</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>269 (194-373)</td>
</tr>
</tbody>
</table>

*Except as noted.*
**Signs of Intoxication:** Rubber-legged goose-stepping ataxia, wing-drop; ataxia, imbalance, high carriage, using wings to aid pedestrian locomotion, jitteriness, hyperexcitability, falling, nutation, lacrimation, tremors, immobility with wings spread, convulsions, and dyspnea. Signs appeared as soon as 25 min and mortalities usually occurred between 1 and 3 h or overnight after treatment. Signs persisted up to 34 days in pheasants and 14 days in mallards.

Carfene: see azinphos-methyl  
Carin: see carbaryl  
Carpidor: see Balan  
Casoron: see dichlobenil  
Casoron 133: see dichlobenil  
CCC: see chlorimequat chloride  
CD-68: see chlordane  
Cekufon: see trichlorfon  
Cekusan: see DDVP

**CERESAN L**

**Alternative Names:** Granosan (Granosan also refers to Ceresan M, Ceresan M-DB, and Ceresan Red)

**Chemical Name:** (3-Mercapto-1,2-propanediolato-S) methylmercury and (Aceto-O) methylmercury (CAS 8003-37-0)

**Primary Use:** Seed disinfectant, fungicide

**Sample Purity:** 2.89% of the first ingredient and 0.62% of the second (2.25% mercury)

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulvous whistling-duck (st)</td>
<td>8</td>
<td>M</td>
<td>3-6</td>
<td>1,680 [1,414-2,000]</td>
</tr>
<tr>
<td>Mallard (st)</td>
<td>6</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000 [841-1,330]</td>
</tr>
<tr>
<td>Bobwhite (st)</td>
<td>12</td>
<td>M</td>
<td>2-3</td>
<td>1,060</td>
</tr>
<tr>
<td>Japanese quail (st)</td>
<td>12</td>
<td>F</td>
<td>4</td>
<td>1,498 [1,190-1,888]</td>
</tr>
<tr>
<td>Pheasani (st)</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1,190 [1,000-1,414]</td>
</tr>
</tbody>
</table>

**Acute Oral Toxicity Summary**

**Other Toxicity Data:** The 30-day EMLD for mallards of both sexes (n = 18) is about 30 mg/kg per day. The resulting cumulative toxicity index is >2,000/30 = >66, indicating a high degree of cumulative action for Ceresan L in mallards.

Notes: Surviving Japanese quail that were sacrificed showed enlarged spleens at gross necropsies.

For data on rice seed treated with Ceresan L, see the “Other Toxicity Data” section for aldrin.

See also the “Notes” section for PMA.

**CERESAN M**

**Alternative Names:** Granosan (Granosan also refers to Ceresan L, Ceresan M-DB, and Ceresan Red)

**Chemical Name:** Ethyl (4-methyl-N-phenylbenzenesulfonylimidato-N) mercury (CAS 517-16-8)

**Primary Use:** Seed disinfectant, fungicide

**Sample Purity:** 7.7% formulation (3.2% mercury)

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>18</td>
<td>F</td>
<td>3</td>
<td>&gt;2,262</td>
</tr>
<tr>
<td>Mallard duckling</td>
<td>15</td>
<td>M,F</td>
<td>6-8 d</td>
<td>&gt;2,262</td>
</tr>
<tr>
<td>Prairie chicken</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>360</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>F</td>
<td>2³</td>
<td>668</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>12</td>
<td>360</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>4</td>
<td>841</td>
</tr>
<tr>
<td>Gray partridge</td>
<td>12</td>
<td>F</td>
<td>9-20</td>
<td>550</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>714</td>
</tr>
</tbody>
</table>

*Except as noted.

Several of these hens were in egg-laying condition.

**Signs of Intoxication:** Mallards displayed regurgitation, polydipsia, salivation, goose-stepping ataxia, and slow reactions, but no deaths. Other species showed blinking, eyes closed, feathers fluffed, neck pulled in (giving the animal the appearance of a “ball”), anorexia, diminished righting reflex, lethargy, diarrhea, ataxia. Mortalities usually occurred a few days to a few weeks after treatment.
Other Toxicity Data: Pheasant survivors of 30-day exposures to repeated oral treatment at 20 mg/kg per day (n = 3) produced eggs with slightly less hatchability than did controls treated with empty gelatin capsules. For toxicity data on a mixture of aldrin with Ceresan M see the section on "Other Toxicity Data" for aldrin.

Notes: For information on the effects of Ceresan M on eggshell thickness, see Haegel and Tucker (1974) and Haegel et al. (1974).

See also the "Notes" section for PMA.

CHE 1843

Alternative Names: Preseed, Vancide PA

Chemical Name: (E)-1,1’-[1,2-EthenediyIbis(sulfoniyI)]bis-propane (CAS 1113-14-0)

Primary Use: Fungicide

Sample Purity: 96%

Chipco Thiram 75: see thiram
Chipco Turf Herbicide "D": see 2,4-D

CHLORAMBEN

Alternative Names: ACP M-728, Amchem 66-206, Amiben, Amoben, Vegaben, Vegiben, Verbigen

Chemical Name: 3-amino-2,5-dichloro benzoic acid (CAS 133-90-4)

Primary Use: Herbicide

Sample Purity: 94.86%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95% CL</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>F</td>
<td>3</td>
<td>&gt;1,500</td>
</tr>
</tbody>
</table>

Signs of Intoxication: None.

Chlordane: see chlordane

CHLORDANE

Alternative Names: Aspon, Belt, CD-68, chlordan, Chlor Kil, Corodane, ENT 9932, Kypchlor, Niran, Octachlor, Octa-Klor, Ortho-Klor, Synklor, Topiclor 20, Velsicol 1068

Chemical Name: 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene (CAS 57-74-9)

Primary Use: Insecticide

Sample Purity: 100% Active (60% of named compound and 40% related compounds)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95% CL</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>4-5</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(954-1,510)</td>
<td></td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>M</td>
<td>12</td>
<td>14.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(9.14-21.7)</td>
<td></td>
</tr>
<tr>
<td>Pheasant</td>
<td>4</td>
<td>F</td>
<td>3</td>
<td>24.0-72.0</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Hypoactivity, ataxia, imbalance, tall up, use of wings for balance in walking, falling, ataxia, fear-threat displays, ptosis, phonation, neck muscle twitches, tremors, wing-beat convulsions, and tetany. Signs appeared as soon as 5 min and mortalities occurred.
usually between 1 and 8 days after treatment. Remission took up to 4 weeks in some birds.

Note: The acute oral LD50 reported above for California quail may be the lowest oral LD50 on record for chlor-dane in any vertebrate species.

**CHLORDECONE**

**Alternative Names**: dechlorotetracyclodecane, ENT 16391, GC-1189, Kepone

**Chemical Name**: 1,1a,3,3a,4,5,5a,5b,6 Decachlorooctahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalen-2-one (CAS 143-50-0)

**Primary Use**: Insecticide, fungicide

**Sample Purity**: 93.1%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>167 (120-231)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication**: Jerky gait, miosis, intermittent tremors, use of the wings to aid locomotion, immobility, and myasthenia. Signs appeared within 1 h and mortalities occurred usually between 1 and 8 days after treatment. Remission took up to 35 days.

**Other Toxicity Data**: Chlordecone caused no significant eggshell thinning in tests with mallards. For a discussion of this study, see Haegle and Tucker (1974).

**CHLORFENVINPHOS**

**Alternative Names**: Birlane, Compound 4072, ENT 24969, Sapecon, SD 7859, Supona

**Chemical Name**: Phosphoric acid, 2-chloro-1-(2,4-dichlorophenyl)ethenyl diethyl ester (CAS 470-90-6)

**Primary Use**: Insecticide

**Sample Purity**: 91% β, 8% α isomers

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>85.5 (44.5-164)</td>
</tr>
</tbody>
</table>

**CHLORMEQUAT CHLORIDE**

**Alternative Names**: CCC, chlormequat, chlorocholine chloride, Cyocel

**Chemical Name**: 2-Chloro-N,N,N-trimethylethanaminium chloride (CAS 999-81-5)

**Primary Use**: Plant growth regulator

**Sample Purity**: 98%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>265 (211-334)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication**: Ataxia, miosis, falling, sitting, using wings for pedestrian locomotion, tremors, tetanic seizures, immobility, opisthotonos, and frequent spasms. Signs appeared as soon as 5 min and mortalities usually occurred between 15 and 40 min after treatment. Remission took up to 3 days.

Chlorocholine chloride: see chlormequat chloride
CHLOROXURON

Alternative Names: C-1983, chloroxifenidim, Norex, Tenoran

Chemical Name: \(N'-(4-\text{(4-chlorophenoxy)phenyl})-N,N\text{-dimethyl urea}\) (CAS 1982-47-4)

Primary Use: Herbicide

Sample Purity: 50% Wettable powder

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard duckling (st)²</td>
<td>9</td>
<td>M,F</td>
<td>15-19</td>
<td>112 (11.5-1,089)</td>
</tr>
<tr>
<td>California quail¹</td>
<td>12</td>
<td>F</td>
<td>5-7</td>
<td>68.3 (40.7-115)</td>
</tr>
<tr>
<td>Japanese quail¹</td>
<td>12</td>
<td>M</td>
<td>2.5</td>
<td>15.9 (10.5-24.0)</td>
</tr>
<tr>
<td>Japanese quail¹</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>17.8 (15.0-21.2)</td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>12</td>
<td>M</td>
<td>4-12</td>
<td>8.41 (2.77-25.5)</td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>16</td>
<td>F</td>
<td>3-5</td>
<td>17.7 (12.5-25.0)</td>
</tr>
<tr>
<td>Chukar²</td>
<td>24</td>
<td>M</td>
<td>3-5</td>
<td>61.1 (47.5-78.6)</td>
</tr>
<tr>
<td>Chukar²</td>
<td>16</td>
<td>F</td>
<td>3-5</td>
<td>60.7 (43.8-84.1)</td>
</tr>
<tr>
<td>Sandhill crane¹</td>
<td>3</td>
<td>M</td>
<td>-</td>
<td>25-50</td>
</tr>
<tr>
<td>Rock dove (st)¹</td>
<td>16</td>
<td>M,F</td>
<td>-</td>
<td>26.9 (19.0-38.1)</td>
</tr>
<tr>
<td>House sparrow¹</td>
<td>20</td>
<td>M</td>
<td>-</td>
<td>21.0 (5.59-79.1)</td>
</tr>
<tr>
<td>Albino rat (st)²</td>
<td>12</td>
<td>M</td>
<td>-</td>
<td>151 (179-252)</td>
</tr>
<tr>
<td>Domestic goat¹</td>
<td>2</td>
<td>F</td>
<td>-</td>
<td>500-1,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, weakness, sideways walking, falling. Signs were not apparent until the third day after single oral administration, then persisted for up to 14 days.

CHLORPYRIFOS

Alternative Names: Dowco 179, Dursban, ENT 27311, Lorsban, Trichlorpyrphos

Chemical Name: Phosphorothioic acid, \(O,O\text{-diethyl }O-(3,5,6\text{-trichloro-2-pyridinyl})\text{ ester} (CAS 2921-88-2)

Primary Use: Insecticide

Sample Purity: 94.5%¹ and 99%²

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog¹</td>
<td>2</td>
<td>M</td>
<td>-</td>
<td>&gt;400</td>
</tr>
<tr>
<td>Canada goose²</td>
<td>3</td>
<td>M,F</td>
<td>-</td>
<td>40-80</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>F</td>
<td>-</td>
<td>75.6 (35.4-161)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Excessive blinking, hypoactivity, hyperecitability, polydipsia, ataxia, tachypnea, myasthenia, exophthalmia, epistaxis, tremors, pilorection or fluffed feathers, salivation, lacrimation, diarrhea, polyuria, prostration, loss of righting reflex, clonic spasms, tetany, coma, convulsions. Mortalities usually occurred between 1 h and 9 days after treatment.

Other Toxicity Data: The 30-day EMLD for mallards is less than 2.5 mg/kg per day for both sexes (\(n = 20\)). The resulting cumulative toxicity index is \(75/2.5 = >30\), indicating a high degree of cumulative action for an organophosphate.

Notes: Numerous gross pathological changes were seen at necropsy in tissues of sacrificed survivors.

For most species, the slope of the acute dose-response curve was low (decreasing dosage levels did not produce proportional decreases in the response). This finding would indicate a reduced safety margin for the chemical because mortalities frequently occurred at levels much lower than the calculated LD50's.

For a discussion of the comparative toxicity of chlorpyrifos, see Tucker and Haegel (1971). For a discussion of the effects of age on the sensitivity of mallards to chlorpyrifos, see Hudson et al. (1972).
Chlordiepin: see endosulfan
Chrysanthemum cinerariafolium: see pyrethrum
Chriscon: see resmethrin
CIBA 709: see dichlorophos
CIBA 1414: see monocrotophos
Cijordin: see crotoxyphos

CIPC

Alternative Names: Chloro-IPC, chlorophorham, chlorophorham, Furloex, Sprout Nlp, Spud-Nlc, Taterpex, Triherbicide-CIPC, Y-3

Chemical Name: (3-Chlorophenyl)-carbamic acid, 1-methyl-ethyl ester (CAS 101-21-3)

Primary Use: Herbicide

Sample Purity: ≥99%

Signs of Intoxication: Ataxia, use of wings to aid in locomotion from the 5th to 8th day after administration.

Cismethrin: see resmethrin
CL 38023: see famphur
CL 47031: see Cyclone
CL 47676: see Starlicide

CLONITRALID

Alternative Names: BAY 25648, Bayer 73, Baylucide, M73, Molluscicide Bayer 73, SR 73, Yomesan

Chemical Name: 5-Chloro-N-(2-chloro-4-nitrophenyl)-2-hydroxy benzamide compd. with 2-aminoethanol (1:1) (CAS 1420-04-8)

Primary Use: Lampricide, piscicide, molluscicide

Sample Purity: 70%

Signs of Intoxication: Masseter tenseness, regurgitation, high carriage, polydipsia, sitting, hyporeactivity, abnormal reactivity, ataxia, ataxia, wing-drop, imbalance, tachypnea, dyspnea, tremors, and tetanic seizures followed by death. Signs appeared as soon as 15 min and mortalities occurred usually between 30 min and 3 h after treatment. Remission took up to 24 h.

Other Toxicity Data: No mortalities were caused by clonitrallid in a 48-h water concentration test when the chemical was introduced into the drinking and swimming water of mallards (n = 5 M and 5 F in each treatment group) at concentrations of 0.01, 0.1, and 1.0 mg/L.

Studies of a mixture of clonitrallid (0.7%) with TFM in dimethyformamide indicated that clonitrallid contributed only slightly to the toxicity of the mixture. See the discussion under TFM.

Note: For a more detailed discussion of these data, see Hudson (1979).

Clor Chem T-590: see toxaphene
Compound 118: see aldrin
Compound 269: see endrin
Compound 497: see dieldrin
Compound 604: see dichlor
Compound 1080: see sodium monofluoroacetate
Compound 3956: see toxaphene
Compound 4049: see malathion
Compound 4072: see chlorfenvphos
Copper sulfate: see Bordeaux Mixture
Co-Ral: see coumaphos
Corodane: see chlordane
Corothion: see parathion
Cotnion-Methyl: see azinphos-methyl
Cotoran: see fluometuron

COUMAPHOS

Alternative Names: Aggridip, Asuntol, BAY 21199, Baymix, Co-Ral, ENT 17957, Meldane, Muscateox, Resistox, Ristox

Chemical Name: Phosphorothioic acid, O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) O,O-diethyl ester (CAS 56-72-4)

Primary Use: Insecticide

Sample Purity: 95%

Signs of Intoxication: Masseter tenseness, regurgitation, high carriage, polydipsia, sitting, hyporeactivity, abnormal reactivity, ataxia, ataxia, wing-drop, imbalance, tachypnea, dyspnea, tremors, and tetanic seizures followed by death. Signs appeared as soon as 15 min and mortalities occurred usually between 30 min and 3 h after treatment. Remission took up to 24 h.

Other Toxicity Data: No mortalities were caused by clonitrallid in a 48-h water concentration test when the chemical was introduced into the drinking and swimming water of mallards (n = 5 M and 5 F in each treatment group) at concentrations of 0.01, 0.1, and 1.0 mg/L.

Studies of a mixture of clonitrallid (0.7%) with TFM in dimethyformamide indicated that clonitrallid contributed only slightly to the toxicity of the mixture. See the discussion under TFM.

Note: For a more detailed discussion of these data, see Hudson (1979).

Clor Chem T-590: see toxaphene
Compound 118: see aldrin
Compound 269: see endrin
Compound 497: see dieldrin
Compound 604: see dichlor
Compound 1080: see sodium monofluoroacetate
Compound 3956: see toxaphene
Compound 4049: see malathion
Compound 4072: see chlorfenvphos
Copper sulfate: see Bordeaux Mixture
Co-Ral: see coumaphos
Corodane: see chlordane
Corothion: see parathion
Cotnion-Methyl: see azinphos-methyl
Cotoran: see fluometuron

CLONITRALID

Alternative Names: BAY 25648, Bayer 73, Baylucide, M73, Molluscicide Bayer 73, SR 73, Yomesan

Chemical Name: 5-Chloro-N-(2-chloro-4-nitrophenyl)-2-hydroxy benzamide compd. with 2-aminoethanol (1:1) (CAS 1420-04-8)

Primary Use: Lampricide, piscicide, molluscicide

Sample Purity: 70%

Signs of Intoxication: Ataxia, use of wings to aid in locomotion from the 5th to 8th day after administration.

Cismethrin: see resmethrin
CL 38023: see famphur
CL 47031: see Cyclone
CL 47676: see Starlicide

CLONITRALID

Alternative Names: BAY 25648, Bayer 73, Baylucide, M73, Molluscicide Bayer 73, SR 73, Yomesan

Chemical Name: 5-Chloro-N-(2-chloro-4-nitrophenyl)-2-hydroxy benzamide compd. with 2-aminoethanol (1:1) (CAS 1420-04-8)

Primary Use: Lampricide, piscicide, molluscicide

Sample Purity: 70%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>24</td>
<td>F</td>
<td>A</td>
<td>2,000</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>24</td>
<td>M</td>
<td>4-6</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Ring-billed gull</td>
<td>12</td>
<td>F</td>
<td>A</td>
<td>500</td>
</tr>
</tbody>
</table>

*Except as noted.

COUMAPHOS

Alternative Names: Aggridip, Asuntol, BAY 21199, Baymix, Co-Ral, ENT 17957, Meldane, Muscateox, Resistox, Ristox

Chemical Name: Phosphorothioic acid, O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) O,O-diethyl ester (CAS 56-72-4)

Primary Use: Insecticide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>29.8</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>(21.5-41.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5.73-11.0)</td>
<td></td>
</tr>
</tbody>
</table>
Signs of Intoxication: Spraddle-legged walking, wing twitching, slowness, hypoaactivity, ataxia, wing-drop, falling, mutation, prostration with wings spread, lacrimation, immobility, wing-beat convulsions, and tetany. Signs appeared as soon as 40 min in mallards and 90 min in pheasants and mortalities usually occurred between 2 and 3 h after treatment. Remission took up to 14 days.

CP-14957: see isobenzan
CP-47114: see fenitrothion
CP-30144: see alachlor
Crop Rider: see 2,4-D

CROTOXYPHOS

Alternative Names: Clodrin, ENT 24717, SD 4294

Chemical Name: (E)-3-[(Dimethoxyphosphinyl)oxy]-2-butenolic acid, 1-phenylethyl ester (CAS 7700-17-6)

Primary Use: Insecticide

Sample Purity: 85%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>790 (411-1,520)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, leg weakness, wings cross high over back, opisthotonos. Most mortalities occurred about 1 h after administration.

CRUFOMATE

Alternative Names: Dowco 132, ENT 25602, Ruelene

Chemical Name: Methylphosphoramidic acid, 2-chloro-4-(1,1-dimethylethyl)phenyl methyl ester (CAS 299-86-5)

Primary Use: Insecticide, helminthicide

Sample Purity: 92%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>20</td>
<td>M</td>
<td>12</td>
<td>265 (170-414)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, imbalance, geotaxia, polydipsia, regurgitation, penile extrusion, stumbling, falling, sitting, wing-drop, wings spread, lacrimation, fluid exuding from nares, tremors, dyspnea, clonic convulsions, immobility, mutation, and ataxia. Prolonged signs included unkemptness, myasthenia, and slowness; penile extrusion persisted in some survivors for up to 13 days after treatment. Signs appeared as soon as 5 min and mortalities usually occurred between 1 and 3 h after treatment; some mortalities, however, occurred overnight after treatment.

Note: One survivor was never able to retract his penis and it eventually dropped off.

Cubé: see rotenone
Cubé extractives: see rotenone
Cubé resins: see rotenone
Curaterr: see carbofuran

CYANAZINE

Alternative Names: Bladex, DW 3418, Pazyre, SD 15418, WL 19805

Chemical Name: 2-[[4-Chloro-6-(ethylamino)-s-triazin-2-y]amino]-2-methylpropanenitrile (CAS 21725-46-2)

Primary Use: Herbicide

Sample Purity: >95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>9</td>
<td>F</td>
<td>3-5</td>
<td>&gt;2,400</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>9</td>
<td>F</td>
<td>3</td>
<td>445 (281-707)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Loss of balance, goose-stepping ataxia, fluffed feathers, wing shivers, wings cross high over back, falling when walking, tremors. Remission took up to 2 to 4 weeks after treatment. Although no mallard mortalities occurred at levels below 2,400 mg/kg, as little as 150 mg/kg produced signs.

Note: Regurgitation of part of the dosage given, the low dosage that produced toxic signs, and the prolonged recovery period may be indications that the acute toxicity of this material is greater than the LD50 indicates and its toxic action on mallards might be cumulative.

Cyclodan: see endosulfan

CYCLOHEXIMIDE

Alternative Names: Acti-Aid, Actidione, Actispray, ENT 15541, naramycin A
Chemical Name: 4-[2-(3,5-Dimethyl-2-oxocyclohexyl)-2-hydroxyethyl]-2,6-piperidinedione (CAS 66-81-9)

Primary Use: Fungicide, growth regulator (abscission agent)

Sample Purity: 88.7%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>82.5 (54.3-126)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>4</td>
<td>9.38 (6.91-12.7)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Goose-stepping ataxia, polydipsia (in mallards), regurgitation (in mallards), ataxia, imbalance, wing-drop, wings crossed over the back, wing slivers, tremors, slowness, hypoactivity, periodic falling, ataxia, prostration. Signs appeared as soon as 10 min and mortalities usually occurred overnight after treatment. Remission took up to 1 month.

Note: Necropsies frequently revealed congestion of various organs.

Cycoce1: see chlormequat chloride
Cygon: see dime thoate
Cy nem: see thionazin

2,4-D


Chemical Name: (2,4-Dichlorophenoxy)-acetic acid (CAS 94-75-7)

Primary Use: Herbicide

Sample Purity: Technical grade acid (>99%),1 technical grade sodium salt,2 and 480-g acid equivalent per liter of the amine3

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>3.18 (2.52-4.00)</td>
</tr>
<tr>
<td>Mallard</td>
<td>5</td>
<td>M</td>
<td>3-5</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mallard</td>
<td>1</td>
<td>M</td>
<td>7</td>
<td>&lt;525</td>
</tr>
<tr>
<td>Mallard</td>
<td>2</td>
<td>F</td>
<td>3-5</td>
<td>&gt;1,000</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>668 (530-842)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>472 (340-654)</td>
</tr>
<tr>
<td>Chukar</td>
<td>4</td>
<td>M,F</td>
<td>4</td>
<td>200-400</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>668 (330-842)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>M,F</td>
<td>8-11</td>
<td>400-800</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Polydipsia, ataxia, imbalance, slowness, fluffed feathers, tachypnea, tremors, prostration, ptosis, salivation.

Other Toxicity Data: The acid was orally administered to 2 mule deer does daily for 30 days. One survived 80 mg/kg per day and the other 240 mg/kg per day; they showed only slight toxic effects, but no weight loss. Combinations of 1,000 mg/kg 2,4-D amine and 1,000 mg/kg
Tordon 22K or 2,000 mg/kg of each, administered by stomach tube, were not lethal to two mallard drakes.

**Notes:** Gastrointestinal and endocardial hemorrhages were seen at necropsy.

For 2,4-D effects on eggshell thickness, see Haegel and Tucker (1974).

D 1221: see carbofuran
Dacalone: see 2,4-D; 2,4,5-T
Dagadin: see carbophenothion
Dalp: see methyl parathion
Dalmation Insect Flowers: see pyrethrum
Danex: see trichlorfon
Daphene: see dimethoate
Dasanit: see fenthion
Dazzel: see Diazinon
DBCP: see Nemagon
DBD: see azinphos-methyl
DBH: see benzene hexachloride
2,6-DBN: see dichlobenil
DCMU: see diuron
DCNA: see dicloran
DDD: see TDE

### DDT

**Alternative Names:** Anofex, Arkotine, chlorophenoethane, Dedolo, dichlorodiphenyltrichloroethane, Diphenate, Didimac, DND, ENT 1506, Genitox, Gesapon, Gesarex, Gesarol, Guesapon, Guesarol, Gyron, Idodex, Kopsol, Neocid, Pentachlorin, p,p'-DDT, Rukseam, Zerdane

**Chemical Name:** 1,1′-(2,2,2-Trichloroethylidene)bis[4-chlorobenzene] (CAS 50-29-3)

**Primary Use:** Insecticide

**Sample Purity:** >99% (set point, 105.4°C), 77.2%, technical grade

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog²</td>
<td>3</td>
<td>F</td>
<td>–</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mallard²</td>
<td>8</td>
<td>F</td>
<td>3</td>
<td>2,240</td>
</tr>
<tr>
<td>California quail³</td>
<td>12</td>
<td>M</td>
<td>6</td>
<td>595</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(430-825)</td>
<td></td>
</tr>
<tr>
<td>Japanese quail²</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>841</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(607-1,760)</td>
<td></td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>15</td>
<td>F</td>
<td>3–4</td>
<td>1,334</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(894-1,990)</td>
<td></td>
</tr>
<tr>
<td>Sandhill crane²</td>
<td>5</td>
<td>M,F</td>
<td>A</td>
<td>&gt;1,200</td>
</tr>
<tr>
<td>Rock dove²</td>
<td>20</td>
<td>M,F</td>
<td>–</td>
<td>&gt;4,000</td>
</tr>
</tbody>
</table>

¹Except as noted.

**Signs of Intoxication:** Ataxia, wing-drop, jerkiness in gait, continuous whole-body tremors, falling, convulsions. Mortalities usually occurred from 1 to 2 days after single oral administration.

**Other Toxicity Data:** The acute tests reported above were based on DDT administered orally in gelatin capsules. However, DDT in corn oil was given by stomach tube to another group of cranes and was not lethal at 1,200 mg/kg, the highest level tested.

The 30-day EMLD² for male or female mallards (n = 6) is 50 mg/kg per day. The resulting cumulative toxicity index for mallards is >2,240/50 = >44.8, indicating a high degree of cumulative action.

A single female adult sandhill crane given 1,000 mg/kg per day¹ showed toxic signs by the 10th day and died after 12 dosages.

Adult mallards were fed 100 ppm DDT in the diet. The first mortality occurred at 43 days and the last at 417 days after treatment began. Median lethal time was about 1 year.

In a 90-day feeding study doses of 30 ppm were not lethal to mallards or bobwhites of either sex. Two California quail cocks, 1 bobwhite cock, and 1 bobwhite hen survived a 60-day feeding exposure to 100 ppm technical grade³ DDT; no signs of intoxication were observed, and eggshell thickness appeared to be normal.

**Notes:** DDT is more readily absorbed from materials with a high lipid content.

One of the primary metabolites of DDT is DDE [2,2-bis (p-chlorophenyl)-1,1-dichloroethylene], a widespread environmental contaminant. It has been shown to cause eggshell thinning in several species of birds. For information on eggshell thinning and other reproductive effects in birds caused by DDT and DDE, see Haegel et al. (1974), Haegel and Tucker (1974), and Haegel and Hudson (1973, 1974, 1977).

DDVF: see DDVP

### DDVP

**Alternative Names:** Cekusan, DDVF, Dedevap, dichlorophos, dichlorvos, Divipan, ENT 20738, Herkol, Mafu, Marvex, Nogos, No-Pest, Nuvan, Oko, Phosvit, Vapona

**Chemical Name:** Phosphonic acid, 2,2-Dichloroethenyl dimethyl ester (CAS 62-73-7)

**Primary Use:** Insecticide

**Sample Purity:** 93%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>5-7</td>
<td>7.78 (6.00-10.1)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>11.3 (8.99-14.3)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Goose-stepping ataxia, use of wings to aid in balance, tremors, convulsions.

**Note:** Various internal hemorrhages were found at necropsy in sacrificed survivors of both species.

Decachlorotetracyclocdecane: see chlordecone
Dechlorane: see mirex
Dedelo: see DDT
Dedevep: see DDVP
Ded-Weed: see 2,4-D; silvex
Ded-Weed Brush Killer: see 2,4,5-T

**DEF**

**Alternative Names:** B-1776, Chemagro 1776, Chemagro B-1776, De-Green, E-Z-Off D, Fos-Fall "A," Ortho Phosphate Defoliant, tributyl phosphorothioate

**Chemical Name:** Phosphorothioic acid, S,S,S-tributyl ester (CAS 78-48-8)

**Primary Use:** Defoliant

**Sample Purity:** 92% & 99%

---

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog¹</td>
<td>8</td>
<td>M</td>
<td>—</td>
<td>562 (176-1,780)</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>7.19 (5.19-9.97)</td>
</tr>
<tr>
<td>Sharp-tailed grouse¹</td>
<td>8</td>
<td>M,F</td>
<td>A</td>
<td>4.76 (4.00-5.66)</td>
</tr>
<tr>
<td>California quail¹</td>
<td>12</td>
<td>M</td>
<td>6</td>
<td>10.6 (8.41-13.4)</td>
</tr>
<tr>
<td>Japanese quail¹</td>
<td>12</td>
<td>F</td>
<td>2⁺</td>
<td>8.48 (6.73-10.7)</td>
</tr>
<tr>
<td>Pheasant²</td>
<td>12</td>
<td>F</td>
<td>2</td>
<td>8.21 (5.69-11.9)</td>
</tr>
<tr>
<td>Chukar¹</td>
<td>12</td>
<td>M,F</td>
<td>3</td>
<td>15.1 (12.0-19.0)</td>
</tr>
<tr>
<td>Rock dove¹</td>
<td>12</td>
<td>M,F</td>
<td>—</td>
<td>8.48 (6.73-10.7)</td>
</tr>
<tr>
<td>House sparrow¹</td>
<td>12</td>
<td>F</td>
<td>—</td>
<td>9.52 (6.87-13.2)</td>
</tr>
<tr>
<td>House finch¹</td>
<td>6</td>
<td>F</td>
<td>—</td>
<td>2.38 (2.00-2.83)</td>
</tr>
<tr>
<td>Mule deer¹</td>
<td>1</td>
<td>F</td>
<td>A</td>
<td>&lt;10.0</td>
</tr>
<tr>
<td>Domestic goat¹</td>
<td>4</td>
<td>M,F</td>
<td>—</td>
<td>8.00-18.0</td>
</tr>
</tbody>
</table>

¹Except as noted.
²Several of these hens were in active egg-laying condition.

**DEMETHON**

**Alternative Names:** BAY 8173, BAY 10756, demeton O + demeton S, Demox, E-1059, ENT 17295, ISO-Systox, mercaptofos, mercaptophos, Systemox, Systox

**Chemical Name:** Phosphorothioic acid, O,O-diethyl O-[2-(ethylthio)ethyl] ester; and O,O-diethyl S-[2-(ethylthio) ethyl] phosphorothioate (CAS 8065-48-3)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 92% & 99%

---

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-Fend: see dimethoate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deflubenzon: see difluron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De-Green: see DEF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delnav: see dioxathion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delsan: see thiram</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Jerkiness, neck-stretching, lacrimation, limited regurgitation (in mallards), slowness, wing-drop, fluffed feathers, and greatly prolonged ataxia. Signs appeared as soon as 1 h and mortalities usually occurred between 1 and 4 days after treatment. Remission took up to 30 days.

**Note:** Although the LD50 for mallards is 2,934 mg/kg, some mortalities occurred at treatment levels as low as 800 mg/kg, and treatment levels as low as 200 mg/kg produced signs of intoxication.
all species except bullfrogs, for which 2 days were required.

**Other Toxicity Data:** The 30-day EMLD for mallards is 2.5–5.0 mg/kg per day for both sexes (n = 12). The resulting cumulative toxicity index is 7.19/2.5–5.0 = 1.4–2.9, indicating little cumulative action for mallards.

The calculated percutaneous LD50 for 10-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 24.4 (CL 7.3–19.0) mg/kg. Signs observed after dermal treatment included, in addition to several of the above, running and falling, hyporeactivity, myasthenia, slowness, ataxia, asthenia, and sitting. Signs appeared as soon as 1 h and mortalities usually occurred from 5 to 20.5 h after the initiation of treatment; however, one mortality occurred between 6 and 7 days after treatment. Mild dermal irritation occurred after percutaneous exposure to demeton. Dead mallards exhibited penile extrusion. When the percutaneous LD50 is compared with the acute oral LD50, demeton appears to have a moderate degree of dermal hazard in mallards.

**Notes:** For a discussion of the comparative toxicity of demeton, see Tucker and Haegele (1971).
For a discussion of the effects of age on the sensitivity of mallards to demeton, see Hudson et al. (1972).
For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Demeton methyl: see oxydemetonmethyl
Demeton O + demeton S: see demeton
Demeton-S-methyl sulfoxide: see oxydemetonmethyl
Demos-L40: see dimethoate
Demox: see demeton
Derrin: see rotenone
Derris: see rotenone
Derris extractives: see rotenone
Des-I-Cate: see endothall
Dextron: see diquat dibromide
Dextrone X: see paraquat dichloride
Dianisyltrichloroethane: see methoxychlor
Diazaet: see Diazinon
Diazide: see Diazinon

**DIAZINON**

**Alternative Names:** AG-500, Alfa-tox, Basudin, Dazzel, Diazaet, Diazide, Diazol, ENT 19507, G-24480, Garden-tox, Neocidol, Nicosulf, Spectracide

**Chemical Name:** Phosphorothioic acid, O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] ester (CAS 333-41-5)

**Primary Use:** Insecticide, nematicide

**Sample Purity:** 89%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>4</td>
<td>F</td>
<td>—</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mallard</td>
<td>16</td>
<td>M</td>
<td>3–4</td>
<td>3.54</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3–4</td>
<td>4.33 (2.37–5.27)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Goose-stepping ataxia, wing spasms, wing-drop, hunched back, dyspnea, tenesmus, diarrhea, salivation, lacrimation, ptosis, prostration, opisthotonos-like seizures or wing-beat convulsions.

Diazol: see Diazinon
Dibrom: see naled
Dibromochloropropane: see Nemagon

**DICHLOBENIL**

**Alternative Names:** Casoron, Casoron 133, 2,6-DBN, Duprexe, ENT 26665, NIA 5996

**Chemical Name:** 2,6-Dichlorobenzonitrile (CAS 1194-65-6)

**Primary Use:** Herbicide

**Sample Purity:** 98.7%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>9</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>9</td>
<td>M</td>
<td>8–9</td>
<td>1,189 (446–3,165)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** In both species ataxia and fluffed feathers with the neck pulled in were typical at levels as low as 500 mg/kg. Birds tended to stand in place for prolonged periods with the eyes closed. Mortalities typically occurred 10 to 16 days after single oral administration. Survivors suffered extreme weight losses in the first few weeks after treatment.

**Note:** Hemorrhaging of the intestinal mucous membrane was noted at necropsy.

**DICHLOLINE**

**Alternative Names:** Compound 604, ENT 3776, Phygon, Phygon XL, Phygon Seed Protectant
Chemical Name: 2,3-Dichloro-1,4-naphthalenedione (CAS 117-80-6)

Primary Use: Fungicide

Sample Purity: 90%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>M</td>
<td>3–4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, ataxia, falling under stress. Signs lasted up to 19 days, and some birds lost weight.

Dichloran: see dicloran
Dichlorfenidim: see diuron
Dichloro diphenyl dichloroethane: see TDE
Dichlorodiphenyltrichloroethane: see DDT
Dichlorophos: see DDVP
Dichlorvos: see DDVP

DICLORAN

Alternative Names: AL-50, Allisan, Botran, DCNA, Dichloran, ditanil, U-2069

Chemical Name: 2,6-Dichloro-4-nitrobenzamine (CAS 99-30-9)

Primary Use: Fungicide

Sample Purity: 97%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>3–4</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>6</td>
<td>F</td>
<td>3–4</td>
<td>500–1,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation (in mallards), hyporeactivity, ataxia, asthenia, imbalance, slowness, wingdrop, falling when walking, withdrawal, and ataxia. Regurgitation occurred as soon as 20 min; other signs appeared as soon as 1.5 h after treatment in mallards. In pheasants, signs appeared the day after treatment, and mortalities occurred between 2 and 4 days after treatment. Remission took up to 5 weeks for both species.

DICOFOL

Alternative Names: Acarint, DTMC, ENT 23648, FW-293, Kelthane, Mitilgan, R and H FW-293

Chemical Name: 4-Chloro-α-(4-chlorophenyl)-α-(trichloromethyl)benzenemethanol (CAS 115-32-2)

Primary Use: Acaricide

Sample Purity: 87.8%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>4</td>
<td>265 (211–334)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Imbalance, ptosis, ataxia, fluffed feathers, low carriage, tremors, wing-beat convulsions, and emprosthotonos. Signs appeared on the day following treatment and mortalities usually occurred between 1 and 8 days after treatment. Remission took up to 1 week.

Dicophane: see DDT

DICROTOPHOS

Alternative Names: Bidrin, Carbicron, CIBA 709, Ektafos ENT 24482, SD 3562

Chemical Name: (E)-Phosphoric acid, 3-(dimethylamino)-1-methyl-3-oxo-1-propenyl dimethyl ester (CAS 141-66-2)

Primary Use: Insecticide

Sample Purity: 98% α Isomer\(^1\) and 80%\(^2\)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog(^1)</td>
<td>8</td>
<td>M</td>
<td>–</td>
<td>2,000 (602–6,640)</td>
</tr>
<tr>
<td>Canada goose(^1)</td>
<td>12</td>
<td>M,F</td>
<td>–</td>
<td>2.28 (1.36–3.83)</td>
</tr>
<tr>
<td>Mallard(^1)</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>4.24 (3.06–5.88)</td>
</tr>
<tr>
<td>Sharp-tailed grouse(^1)</td>
<td>12</td>
<td>M</td>
<td>24–36</td>
<td>2.31 (1.78–3.00)</td>
</tr>
<tr>
<td>California quail(^1)</td>
<td>12</td>
<td>M</td>
<td>18</td>
<td>1.89 (1.50–2.38)</td>
</tr>
<tr>
<td>Japanese quail(^1)</td>
<td>12</td>
<td>M</td>
<td>2.5</td>
<td>4.32 (3.18–5.86)</td>
</tr>
<tr>
<td>Pheasant(^1)</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>3.21 (2.45–4.21)</td>
</tr>
<tr>
<td>Chukar(^1)</td>
<td>12</td>
<td>M,F</td>
<td>12–24</td>
<td>9.63 (7.35–12.9)</td>
</tr>
</tbody>
</table>
**Primary Use:** Insecticide

**Sample Purity:** 100% (85% HEOD)

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock dove</td>
<td>16</td>
<td>M,F</td>
<td></td>
<td>2.00 (1.53–2.61)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>16</td>
<td>M</td>
<td></td>
<td>3.00 (1.59–5.64)</td>
</tr>
<tr>
<td>House finch</td>
<td>8</td>
<td>M,F</td>
<td></td>
<td>2.83 (1.06–7.54)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>M</td>
<td>8–17</td>
<td>12.5–25.0</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Goose-stepping ataxia, asthenia, miosis, salivation, lacrimation, diarrhea, tachypnea, anorexia, prostration, tetany with wings outstretched, convulsions. As little as one-tenth of a lethal dose produced signs.

**Other Toxicity Data:** The 30-day EMLD for mallards (n = 12) is about 0.25 mg/kg per day for both sexes. The resulting cumulative toxicity index is \( 4.24 / 0.25 = 17 \), indicating moderate high cumulative toxicity.

One mule deer buck that received 0.75 mg/kg per day (80% orally) for 30 days displayed only tremors and salivation. Another buck received 3.00 mg/kg per day (80% orally) for 7 days and died.

The calculated percutaneous LD50 for 1-year-old mallard drakes (n = 12) after a 24-h dermal foot exposure is 14.2 (CL 4.56–43.8) mg/kg. Signs observed after percutaneous treatment included, in addition to several of the above, nasal exudate, mydriasis, ataxia, tremors, falling, using wings to aid pedestrian locomotion, and immobility. Mortalities occurred between 3 and 24 h after the initiation of treatment, and remission took up to 3 days after exposure ended. When the percutaneous LD50 is compared with the acute oral LD50, dicrotophos appears to have a moderate degree of dermal hazard in mallards.

**Notes:** For a discussion of the comparative toxicity of dicrotophos, see Tucker and Haegle (1971).

For a discussion of the effects of age on the sensitivity of mallards to dicrotophos, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

DID 764: see 6-aminonicotinamide
Didimac: see DDT

---

**DIELDRIN**

**Alternative Names:** Alvit, Compound 497, Dieldrite, ENT 16225, HEOD, Octalox, Panoram D-31

**Chemical Name:** 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7,3,6-dimethanopaphth[2,3-b]oxirene, (1aα,2β,2aα,3β,6β,6aα,7β,7aα) (CAS 60-57-1)

---

**Other Toxicity Data:** The 30-day EMLD for mallards (n = 6) is 5.0 mg/kg per day for both sexes. The resulting cumulative toxicity index is 381/5 = 76 for mallards, indicating a high degree of cumulative action.

An approximation of the 30-day EMLD for fulvous whistling-ducks (n = 3) is about 2.5; for gray partridges (n = 2) it appears to be between 1.25 and 5.00 mg/kg per day.

In 60-day feeding tests, 2.5 ppm was not lethal to a male gray partridge nor a male fulvous whistling-duck.

The 8-day dietary LC50 for mallard ducklings (MM—15 days old at the start of treatment) is 91.0 (CL 70.3–118) ppm. The 8-day dietary LC50 for bobwhite chicks (HGF —11 to 13 days old) is 31.8 (CL 26.7–37.8) ppm. Consumption of the treated diets was less than normal, and weight gains in survivors were depressed.

Dieldrin did not cause eggshell thinning in studies with mallards and coturnix (Haegle and Tucker 1974).
Note: For a discussion of the comparative toxicity of dieldrin, see Tucker and Høegel (1971).

Dieldrin: see dieldrin

**DIESEL OIL #1**

**Alternative Names:** None found

**Chemical Name:** A petroleum fraction

**Primary Use:** Adjuvant, pesticide carrier, fuel

**Sample Purity:** Technical grade

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mL/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>5</td>
<td>M,F</td>
<td>&gt;12</td>
<td>&gt;20</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Transient weakness, diarrhea, and regurgitation.

**Note:** The LD50 of 20 mL/kg is far more than any mallard is likely to encounter in normal pesticide applications.

**Diethion:** see ethion

**Diethyl ethlythioethyl dithiophosphate:** see disulfoton

**Difenthos:** see temephos

**Diflubenzuron:** see difluron

**DIFLURON**

**Alternative Names:** desflubenzon, diflubenzuron, Dimilin,
DU 112307, ENT 29054, Largon, OMS 1804, Pn 60-40,
TH-6040

**Chemical Name:** N-[[[(4-chlorophenyl)amino]carbonyl]-
2,6-difluorobenzamide (CAS 35367-38-5)

**Primary Use:** Insecticide (interferes with cuticle development)

**Sample Purity:** 95%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (MM)</td>
<td>6</td>
<td>M</td>
<td>5</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Possible anorexia on the day after treatment.

**Dimethoate**

**Alternative Names:** AC-12880, AC-18682, Cygon, Daphene, De-Fend, Demos-L40, Dimethogen, ENT 24650,
Postion MM, Le-Kuo, Perfekthion, Rebelate, Rogor,
Roxion, Trimetion

**Chemical Name:** Phosphorodithioic acid, O,O-dimethyl S-
[2-(methylamino)-2-oxoethyl] ester (CAS 60-51-5)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 99.8%¹ and 97%²

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>41.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(30.1-57.8)</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>63.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(45.8-88.1)</td>
</tr>
<tr>
<td>Pheasant²</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(15.9-25.2)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Feathers drawn tightly to the body, mild tachypnea, ataxia, tenseness, fluffed feathers, imbalance, running and falling, tremors, clonic convulsions, immobility, myasthenia. Signs appeared as soon as 13 min and mortalities occurred overnight after treatment. Remission had occurred by 1 day after treatment.

**Other Toxicity Data:** The 30-day EMLD² for mallards of both sexes (n = 6) is 6.0 mg/kg per day. The resulting cumulative toxicity index is 41.7/6 = 7, indicating a moderate degree of cumulative action in mallards.

The 30-day EMLD² for 20- to 25-week-old pheasants of both sexes (n = 12) appears to lie between 4.00 and 10.0 mg/kg per day. The resulting cumulative toxicity index is 20.0/4.0-10.0 = 2.0-5.0, indicating a slight degree of cumulative action in pheasants.

**Notes:** Acetylcholinesterase measurements were made on the brains of the mortalities and the survivors of the pheasant 30-day EMLD test. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.029, range = 1.299–1.366), survivors which were sacrificed on the day following the final treatment showed 71.7% inhibition (n = 6, ΔpH/45 min = 0.377, s = 0.080, range = 0.310–0.489). When compared with their controls (n = 6, ΔpH/45 min = 1.097, s = 0.068, range = 0.996–1.159), mortalities showed 88.0% inhibition (n' = 6, ΔpH/45 min = 0.131, s = 0.085, range = 0.076–0.303).

**Dimethoate:** see dimethoate

**Dimethoxy-DT:** see methoxychlor
DIMETHYLFORMAMIDE

Alternative Names: DMF, DMFO

Chemical Name: N,N'-dimethylformamide (CAS 68-12-2)

Primary Use: Solvent, carrier for the lampricide TFM

Sample Purity: Reagent grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>4</td>
<td>M</td>
<td>12$^{b}$</td>
<td>$&gt;$2,000</td>
</tr>
<tr>
<td>Bobwhite (st) (HGF)</td>
<td>6</td>
<td>M</td>
<td>5</td>
<td>$&gt;$460</td>
</tr>
<tr>
<td>Ring-billed gull (st)</td>
<td>6</td>
<td>M,F</td>
<td>A</td>
<td>$&gt;$185</td>
</tr>
</tbody>
</table>

$^{a}$Except as noted.
$^{b}$These drakes may have been in breeding condition.

Signs of Intoxication: Jitteriness, slowness, ataxia, go- taxia, and falling. Signs appeared as soon as 20 min after treatment. Remission had occurred by the day after treatment.

Dimethyl parathion: see methyl parathion
Dimilin: see diflufenzuron
Dinaphthene + napthene benzenes: see Panasol AN-2
Dinitro: see dinoseb
Dinitrobutylphenol: see dinoseb
Dinitrocreosol: see DNOC

DINOSEB

Alternative Names: Basanite, Chemox General, Chemox P.E., dinitro, dinitrobutylphenol, DN-289, DNBP, DNOBP, DNBSP, Dow General Weed Killer, Elgetol 318, ENT 1122, Gebutox, Kiloseb, Nitropone C, Premerge, Sinox General, Subitex

Chemical Name: 2-(1-Methylpropyl)-4,6-dinitrophenyl (CAS 88-85-7)

Primary Use: Herbicide, has also been used as an insecticide

Sample Purity: 97.6%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>27.0 (21.4-34.0)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, imbalance, weakness, slowness, immobility, wing-beat convulsions and tetany. Signs appeared as soon as 30 min and mortalities usually occurred between 1.5 and 4 h after treatment. Remission took up to 2 weeks.

Dipel: see Bacillus thuringiensis (Btlinercr)
Dipterex: see trichlorfon
Diptetes: see trichlorfon

DIOXATHION

Alternative Names: Delnav, ENT 22897, Hercules AC 528, Hercules 528, Navadel, Ruphos

Chemical Name: Phosphorodithioic acid, S,S'-1,4-dioxane-2,3-diy1 O,O',O'-tetraethyl ester (CAS 78-34-2)

Primary Use: Insecticide, acaricide

Sample Purity: 72% (C17.47%, trans-25%)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pheasant</td>
<td>9</td>
<td>M</td>
<td>3-7</td>
<td>240 (190-302)</td>
</tr>
</tbody>
</table>

DIPUAT DIBROMIDE

Alternative Names: Aquacide, Dextrone, FB/2, Reglone

Chemical Name: 6,7-Dihydrodipryrido[1,2-a:2',1'-c] pyrazinediimid dibromide (CAS 2764-72-9)

Primary Use: Herbicide
Sample Purity: 30%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>564 (324-982)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia (both rubbery-legged and tense-legged), nutation, wing-drop, wing shivers, immobility. Survivors took as long as 14 days to recover. Mortalities occurred 1 to 2 days after treatment.

Direz: see anilazine

**DISPARLURE**

**Alternative Names:** Disparmone, Pherocon GM

**Chemical Name:** 2-Decyl-3-(5-methylhexyl)-cis-oxirane (CAS 29804-22-6)

**Primary Use:** Male gypsy moth sex attractant (female-produced pheromone)

**Sample Purity:** Technical grade

**Acute Oral Toxicity Summary:** None

**Signs of Intoxication:** No signs were observed in dietary tests on mallards and bobwhites.

**Other Toxicity Data:** The 8-day dietary LC50 for 15-day-old mallard ducklings (n = 50) is >5,000 ppm. The 8-day dietary LC50 for 11- to 13-day-old bobwhite chicks (n = 40) is >5,000 ppm. Food consumption and body weight gains in the ducklings and the chicks in these studies appeared to be normal.

Disparmone: see disperslure

**DISULFOTON**

**Alternative Names:** BAY 19639, diethyl ethylthioethyl dithiophosphate, Di-Syston, Dithiodemeton, Dithiosystox, EN'T 23437, Fumin AL or G, M-74, S 276, Solvirex, thiodemeton

**Chemical Name:** Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester (CAS 298-04-4)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 97%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>6.54 (3.76-11.4)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>11.9 (8.58-16.5)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>F</td>
<td>10</td>
<td>2.50-5.00</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>1</td>
<td>M</td>
<td>&gt;60</td>
<td>&lt;15.0</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, goose-stepping ataxia, falling, wing-drop, tremors, slowness, hesitation in walking, immobility, nictitating membrane flicker, wing-beat convulsions, and tetany. One pheasant survivor was blind and several others may have had visual difficulty. Signs appeared as soon as 10 min and mortalities usually occurred between 1 and 3 h after treatment. Remission took up to 1 day in mallards and 10 days in pheasants.

Other Toxicity Data: The 30-day EMLD for 5- to 6-month old pheasants of both sexes (n = 12) is 3.00 mg/kg per day. The resulting cumulative toxicity index is 11.9/3.0 = 4.0, indicating a slight degree of cumulative action for disulfoton in pheasants.

The calculated percutaneous LD50 for 9- to 11-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 192 (CL 96.0-384) mg/kg. Signs observed after percutaneous treatment included, in addition to several of the above, high carriage, dyspnea, using wings to aid pedestrian locomotion, wing shivers, and penile extrusion. Mortalities occurred between 5 and 24 h after the initiation of treatment. Remission took up to 2 days after the end of treatment. Mild dermal irritation was caused by exposure to disulfoton. When the percutaneous LD50 is compared with the acute oral LD50, disulfoton appears to have a relatively low order of dermal hazard in mallards.

Notes: Acetylcholinesterase activity measurements were made on the brains of pheasant mortalities and sacrificed survivors of the 30-day EMLD test. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.029, range = 1.299-1.366), survivors sacrificed on the day after the final dosage of 6.00 mg/kg per day for 30 days showed 53.6% inhibition (n = 3, ΔpH/45 min = 0.617, s = 0.098, range = 0.520-0.724), whereas mortalities showed 91.7% inhibition (n = 3, ΔpH/45 min = 0.110, s = 0.080, range = 0.029-0.188). When compared with their controls (n = 6, ΔpH/45 min = 1.097, s = 0.068, range = 0.996-1.159), sacrificed survivors of the 3.00 mg/kg per day treatment level showed 31.7% inhibition (n = 5, ΔpH/45 min = 0.749, s = 0.140, range = 0.573-0.903); the single mortality showed only 18.1% inhibition (n = 1, ΔpH/45 min = 0.898).
For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Di-Syston: see disulfoton
Dithane D-14: see nabam
Dithane Z-78: see zineb
Dithiodemeton: see disulfoton
Dithiosystox: see disulfoton
Ditrinanil: see dicloran
Diurex: see diuron

**DIURON**

**Alternative Names:** DCMU, dichlorfenidim, Di-on, Diurex, DMU, Karmex, Marmer, Vonduron

**Chemical Name:** \(N'-(3,4-Dichlorophenyl)-N,N\text{-}dimethylurea\) (CAS 330-54-1)

**Primary Use:** Herbicide

**Sample Purity:** 95%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia and frequent falling persisted for up to 11 days.

Divipan: see DDVP

**D.M. 7537**

**Alternative Names:** M & T Chemicals RS150

**Chemical Name:** \(5-(p\text{-}Chlorophenyl)\)silatrane

**Primary Use:** Experimental rodenticide

**Sample Purity:** ≥95%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>6</td>
<td>M</td>
<td>--</td>
<td>467 (94.4-2,310)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>21.7 (12.5-37.9)</td>
</tr>
<tr>
<td>Mallard (st)</td>
<td>6</td>
<td>M</td>
<td>3-4</td>
<td>8.41 (5.00-14.1)</td>
</tr>
<tr>
<td>Pintail (st)</td>
<td>3</td>
<td>M</td>
<td>--</td>
<td>&lt;2.50</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** None.

DMDT: see methoxychlor
DMF: see dimethylformamide
DMFO: see dimethylformamide
DMTP: see fenthion
DMU: see diuron
DN-289: see dinoseb
DNBP: see dinoseb

---

**Test animal | No. | Sex | Age (months) | LD50 95% CL (mg/kg) | Pheasant |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>M</td>
<td>3-4</td>
<td>34.8 (25.5-47.4)</td>
<td></td>
</tr>
<tr>
<td>Chukar</td>
<td>8</td>
<td>M,F</td>
<td>3-4</td>
<td>3.54 (2.50-5.00)</td>
<td></td>
</tr>
<tr>
<td>House sparrow (st)</td>
<td>6</td>
<td>M,F</td>
<td>--</td>
<td>0.282 (0.0245-3.25)</td>
<td></td>
</tr>
<tr>
<td>Albino rat (st)</td>
<td>4</td>
<td>M</td>
<td>--</td>
<td>~45</td>
<td></td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Miosis, ataxia, tachypnea, dyspnea, phonation, circling, tenesmus, tremors, violent convulsions, terminal opisthotonos. This compound acts very quickly, producing signs in as few as 2 min and mortalities in 15 min. Remission usually took place by 2 h after treatment.

**Other Toxicity Data:** Secondary hazard appears to be minimal. Rats ingesting other albino rats that succumbed to about 5 times the lethal dose did not show signs of intoxication.

In a hulled-millet diet 80 ppm of DM 7537 was lethal to a single house sparrow after 3 days of treatment, whereas five sparrows survived a 40-ppm diet for 14 days of treatment. Three of five white-crowned sparrows died after receiving a hulled-millet diet containing 5 ppm for 17 days.

**D.M. 7597**

**Alternative Names:** None found

**Chemical Name:** 5-(p-Chlorophenyl)-3,7,10-trimethyl silatrane

**Primary Use:** Experimental rodenticide

**Sample Purity:** Unknown

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albino rat</td>
<td>2</td>
<td>M</td>
<td>--</td>
<td>&gt;500</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** None.
DNC: see DNOC
DND: see DDT

**DNOC**

**Alternative Names:** dinitroresol, DNC, Elgetol 30, ENT 154, Nitradol, Selinon, Sinox, Trifocide

**Chemical Name:** 2-Methyl-4,6-dinitrophenol (CAS 534-52-1)

**Primary Use:** Herbicide

**Sample Purity:** 95%

---

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>M</td>
<td>9-11</td>
<td>334 (265-421)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>6</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, wings crossed high over the back, tail tremors or shivering, falling when walking, slowness, tachypnea, dyspnea, hyporeactivity, ptosis, ruffled or unkempt feathers, tetany, and opisthotonos. Signs appeared as soon as 15 min and mortalities usually occurred between 1 and 3 h after treatment in mallards and between 2 and 21 h in pheasants. Remission took up to 2 weeks.

DNOSBP: see dinoseb
DNSBP: see dinoseb
DNTP: see parathion
Dodecachloropentacyclodecane: see mirex
Dog button: see strychnine
Dol: see benzene hexachloride
Dolnix: see benzene hexachloride
Dreamone: see 2,4-D
Dovlp: see famphur
Dowco 132: see crufoamate
Dowco 139: see mexcarbate
Dowco 179: see chlorpyrifos

---

**DOWCO 214**

**Alternative Names:** ENT 27520, OMS-1155

**Chemical Name:** Phosphorothioic acid, O,O-dimethyl O-(3,5,6-trichloro-2-pyridinyl) ester (CAS 5598-13-0)

**Primary Use:** Insecticide

**Sample Purity:** 99.3%

---

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>12a</td>
<td>1,682</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1,030-2,746)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>356</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(185-685)</td>
</tr>
</tbody>
</table>

*These drakes were in active reproductive condition.*

---

**DUOMEEN T-E-9**

**Alternative Names:** None found

**Chemical Name:** N-tallow-trimethylene diamines

**Primary Use:** Mosquito control agent (pre-imago stage), wetting and dispersing adjuvant

**Sample Purity:** ~99%

---

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>12a</td>
<td>1,682</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1,030-2,746)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>356</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(185-685)</td>
</tr>
</tbody>
</table>

*These drakes were in active reproductive condition.*
Signs of Intoxication: Polydipsia (in mallards), regurgitation, slowness, ataxia, fluffed feathers, goose-stepping ataxia, stumbling, imbalance, falling, sitting, hyporeactivity, ptosis, mydriasis, withdrawal, using wings to aid pedestrian locomotion, tremors, spasms, loss of righting reflex, mild tetanic seizures, ataxia, myasthenia, asthenia, immobility, and emaciation. Polydipsia and regurgitation occurred in mallards as soon as 20 min after treatment. Other signs appeared on the day following treatment and mortalities usually occurred between 1 and 11 days after treatment. Remission took up to 18 days.

Note: Small spleens were observed on gross necropsies of the pheasant mortalities.

Duphar: see tetradifon
Dupont 4179: see methomyl
Dursban: see chlorpyrifos
Du-Sprex: see dichlobenil
DW 3418: see cyanazine
Dyfonate: see fonofos
Dylox: see trichlorfon
Dylox derivative: see C-12 trichlorfon
Dyrene: see anilazine
E-601: see methyl parathion
E-605: see parathion
E-1059: see demeton
E-3314: see heptachlor
Ectoral: see rennel

**EDIFENPHOS**

**Alternative Names:** BAY 78418, edifenphos, Hinosan

**Chemical Name:** Phosphorodithioic acid, O-ethyl S,S-diphenyl ester (CAS 17109-49-8)

**Primary Use:** Fungicide

**Sample Purity:** 93.4%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>10</td>
<td>M</td>
<td>3</td>
<td>&gt;2,715</td>
</tr>
<tr>
<td>Pheasant</td>
<td>6</td>
<td>M</td>
<td>3-4</td>
<td>500-1,000</td>
</tr>
</tbody>
</table>

*Signs of Intoxication: Polydipsia, goose-stepping ataxia, geotaxia, ataxia, imbalance, wide stance, asthenia, falling, hypoactivity, poor reactions, ptosis, using wings to aid pedestrian locomotion. Signs appeared as soon as 30 min and mortalities occurred between 4 and 44 h after treatment. Remission took up to 8 days.*

*Note: Signs of intoxication were induced in mallards at treatment levels as low as 60 mg/kg. This finding may indicate that long-term exposure to this chemical could be more hazardous than the acute oral LD50 indicates.*

Edifenphos: see edifenphos
E.I. 47031: see Cydlone
E.I. 47300: see fenithrothion
Ektafos: see dicrotophos
EL-110: see Balan
Elancolan: see trifluralin
Elgetol 30: see DNOC
Elgetol 318: see dinoseb
Emmatos: see malathion
Emmatos Extra: see malathion
EN-18133: see thionazin

**ENDOSULFAN**

**Alternative Names:** BIO-5462, Chlorthiopl, Cycloidan, ENT 23979, FMC-5462, HOE 2671, Insectophene, Kop, Thiodan, Malix, NIA 5462, Thifor, Thimul, Thiodan, Thionex

**Chemical Name:** 6,7,8,9,10,10-Hexachloro-1,5,5a,6,7,9a-hexahydro-6,9-methano-2,4,6-benzodioxathiepin 3-oxide (CAS 115-29-7)

**Primary Use:** Insecticide

**Sample Purity:** 96%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>33.0 (23.8-45.8)</td>
</tr>
<tr>
<td>Mallard</td>
<td>20</td>
<td>M</td>
<td>12a</td>
<td>45.0 (36.2-56.0)</td>
</tr>
<tr>
<td>Mallard</td>
<td>20</td>
<td>F</td>
<td>12b</td>
<td>31.2 (20.8-46.6)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>7</td>
<td>M</td>
<td>3-4</td>
<td>80-160</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>190 (137-263)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>16</td>
<td>F</td>
<td>12b</td>
<td>&gt;320</td>
</tr>
</tbody>
</table>

*Most of these drakes were in active breeding condition or in the beginning stages of gonadal regression.*

*Most of these hens were in egg-laying condition or in the beginning stages of gonadal regression.*

**Signs of Intoxication:** Ataxia, goose-stepping ataxia, slowness, high carriage, jerkiness, wings crossed high over the back, dyspnea, tremors, wing shivers, and falling. Terminal signs were not observed. Signs appeared as soon as 10 min in mallards and 1 h in pheasants, and mortalities usually occurred between 0.5 and 2 h after treatment in mallards and between 2 and 4 days in pheasants. Remission took up to 1 month.
Notes: Endosulfan is a lipid-soluble compound; it could therefore follow the pattern shown for DDT of being eliminated from the body in the eggs of a laying hen. Since mortalities occur several days after treatment in pheasants, but occur rapidly in mallards, the egg elimination mechanism could serve to protect the individual laying hen pheasant by giving it an additional route of toxicant metabolism. Most of the survivors of the acute oral LD50 test on 1-year-old hen pheasants either were laying or had recently been laying. This could explain the apparently reduced sensitivity of 1-year-old hen pheasants to the toxic effects of endosulfan. However, another explanation could be that this apparent difference in hen pheasant sensitivity is due to some effect of maturation, perhaps an increased ability of the older pheasants to detoxify the chemical.

The above data provide no evidence of significant difference in the susceptibility of mature male and female mallards to the toxic effects of endosulfan. For further data and discussion of the effects of age on the sensitivity of mallards to this compound, see Hudson et al. (1972).

ENDOTHALL

Alternative Names: Accelerate, Aquathol, Des-1-Cate, Herbicide 273, Herbicide 282, Herbicide 283, Hydout, Hydrothol 47, Hydrothol 191, Niagrathal, Tri-Endothol

Chemical Name: 7-Oxadicyclo[2.2.1]heptane 2,3-dicarboxylic acid] (CAS 145-73-3)

Primary Use: Herbicide, defoliant

Sample Purity: 83.6%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>12</td>
<td>5.64 (2.71-11.7)</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>12</td>
<td>F</td>
<td>-</td>
<td>1.06 (0.552-2.04)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>9-10b</td>
<td>1.19 (0.857-1.65)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1.78 (1.12-2.83)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>16</td>
<td>M,F</td>
<td>-</td>
<td>2.0-5.0</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>F</td>
<td>10</td>
<td>6.25-12.5</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>2</td>
<td>F</td>
<td>12-24</td>
<td>25.0-50.0</td>
</tr>
</tbody>
</table>

Most of these hens were in egg-laying condition.

Signs of Intoxication: Ataxia, slowness, drowsiness, tremors, trachael congestion, prostration, convulsions, wing-beat convulsions, and opisthotonos. Signs appeared as soon as 1 h and mortalities usually occurred between 1 h and 5 days after treatment. Remission took up to 1 week.

Other Toxicity Data: The 30-day EMLD for mallards (n = 12) is 0.250 mg/kg per day for both sexes. The resulting cumulative toxicity index is 5.64/0.25 ≈ 22, indicating a moderately high degree of cumulative action.

The percutaneous LD50 for 10-month-old mallard drakes (n = 2) after a 24-h dermal foot exposure to the 97% sample appears to be >140 mg/kg. Signs observed after percutaneous treatment included hyperexcitability, tenseness, shakiness, jerking, ataxia, goose-stepping ataxia, slowness, and stumbling. These signs appeared as soon as 3 h after the initiation of treatment. Remission took up to 4 days after the end of treatment. Mild dermal irritation was caused by exposure to endrin. When the percutaneous LD50 is compared with the acute oral LD50, endrin appears to have a relatively low order of dermal hazard in mallards.

ENDRIN

Alternative Names: Compound 269, ENT 17251, Experimental Insecticide 269 (J. Hyman & Co.), Hexadrin, Mendrin

Chemical Name: 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7,3,6-dimethanonaphth [2,3-b] oxyrene (CAS 72-20-8)

Primary Use: Insecticide

Sample Purity: 96%1 and 97%2

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>12</td>
<td>5.64 (2.71-11.7)</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>12</td>
<td>F</td>
<td>-</td>
<td>1.06 (0.552-2.04)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>9-10b</td>
<td>1.19 (0.857-1.65)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1.78 (1.12-2.83)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>16</td>
<td>M,F</td>
<td>-</td>
<td>2.0-5.0</td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>F</td>
<td>10</td>
<td>6.25-12.5</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>2</td>
<td>F</td>
<td>12-24</td>
<td>25.0-50.0</td>
</tr>
</tbody>
</table>

These hens were in the beginning stages of reproductive gonadal development.

Signs of Intoxication: Ataxia, slowness, drowsiness, tremors, trachael congestion, prostration, convulsions, wing-beat convulsions, and opisthotonos. Signs appeared as soon as 1 h and mortalities usually occurred between 1 h and 5 days after treatment. Remission took up to 1 week.

Other Toxicity Data: The 30-day EMLD for mallards (n = 12) is 0.250 mg/kg per day for both sexes. The resulting cumulative toxicity index is 5.64/0.25 ≈ 22, indicating a moderately high degree of cumulative action.

The percutaneous LD50 for 10-month-old mallard drakes (n = 2) after a 24-h dermal foot exposure to the 97% sample appears to be >140 mg/kg. Signs observed after percutaneous treatment included hyperexcitability, tenseness, shakiness, jerking, ataxia, goose-stepping ataxia, slowness, and stumbling. These signs appeared as soon as 3 h after the initiation of treatment. Remission took up to 4 days after the end of treatment. Mild dermal irritation was caused by exposure to endrin. When the percutaneous LD50 is compared with the acute oral LD50, endrin appears to have a relatively low order of dermal hazard in mallards.

Notes: For data and discussion on the effects of age on the sensitivity of mallards to endrin, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).
ENT 92: see Thanite
ENT 133: see rotenone
ENT 154: see DNOC
ENT 987: see thiram
ENT 1122: see dinoseb
ENT 1506: see DDT
ENT 1716: see methoxychlor
ENT 2435: see nicotine sulfate
ENT 3776: see dichlorone
ENT 4225: see TDE
ENT 7796: see lindane
ENT 8601: see benzene hexachloride
ENT 9106: see nabam
ENT 9735: see toxaphene
ENT 9932: see chlordane
ENT 14874: see zineb
ENT 15108: see parathion
ENT 15152: see heptachlor
ENT 15541: see cycloheximide
ENT 15949: see aldrin
ENT 16223: see dieldrin
ENT 16391: see chlordcone
ENT 16634: see sulfoxide
ENT 17034: see malathion
ENT 17251: see endrin
ENT 17291: see chlordane
ENT 17292: see methyl parathion
ENT 17295: see demeton
ENT 17510: see allethrin
ENT 17798: see EPN
ENT 17957: see coumaphos
ENT 18445: see Nemagon
ENT 18771: see TEPP
ENT 19507: see Diazinon
ENT 19763: see trichlorfon
ENT 20738: see DDVP
ENT 22374: see mevinphos
ENT 22897: see dioxathion
ENT 23233: see azinphos-methyl
ENT 23284: see ronnel
ENT 23437: see disulfoton
ENT 23648: see dicofox
ENT 23708: see carbofenothion
ENT 23737: see tetradifon
ENT 23969: see carbaryl
ENT 23979: see endosulfan
ENT 24042: see phorate
ENT 24105: see ethion
ENT 24482: see dicrotophos
ENT 24650: see dimethoate
ENT 24717: see crotoxyphos
ENT 24915: see tepa
ENT 24945: see fensulfothion
ENT 24964: see oxydemetonmethyl
ENT 24969: see chlorfenvinphos
ENT 24988: see naled
ENT 25445: see amitrole
ENT 25515: see phosphamidon
ENT 25540: see fenthion
ENT 25545-X: see isobenzan
ENT 25580: see thionazin
ENT 25602: see crufomate
ENT 25644: see fampfur
ENT 25671: see Baygon
ENT 25705: see Imidan
ENT 25712: see trichloronat
ENT 25715: see fenitrothion
ENT 25719: see mirex
ENT 25726: see methiocarb
ENT 25734: see GC 6506
ENT 25766: see mexitacarbe
ENT 25784: see aminocarb
ENT 25796: see fonopos
ENT 25809: see Cyolan
ENT 25843: see Landrin
ENT 26538: see captan
ENT 26539: see folpet
ENT 26665: see dichlobenil
ENT 27041: see Mobam
ENT 27093: see Aldicarb
ENT 27102: see Akton
ENT 27127: see bufencarb
ENT 27129: see monocrotrophos
ENT 27164: see carbofuran
ENT 27165: see temephos
ENT 27311: see chlorpyrifos
ENT 27318: see ethoprop
ENT 27396: see methamidophos
ENT 27448: see phoxim
ENT 27520: see Dowco 214
ENT 27552: see bromopropylate
ENT 27572: see Nemacur
ENT 27625: see C-2307
ENT 27738: see Vendex
ENT 27822: see acephate
ENT 27985B: see RU 11-679
ENT 28203: see trifluralin
ENT 28244: see atrazine
ENT 29054: see difluron
ENT 70460: see methoprene
Entex: see fenthion
Entocon growth regulant: see methoprene

EPN

Alternative Names: ethyl p-nitrophenyl thionobenzene-phosphonate, EPN-300, ENT 17798

Chemical Name: Phenyl phosphonothioic acid, O-ethyl O-(4-nitrophenyl) ester (CAS 2104-64-5)

Primary Use: Insecticide, acaricide

Sample Purity: 91%, 65.2%, 87.7%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>3.08 (2.38-4.00)</td>
</tr>
<tr>
<td>Mallard (MM)</td>
<td>20</td>
<td>M</td>
<td>4-5</td>
<td>7.09 (5.18-9.69)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>5-6</td>
<td>36.3 (28.0-47.1)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>F</td>
<td>2</td>
<td>5.25 (3.79-7.28)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-5</td>
<td>53.4 (38.5-74.1)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>14.3 (10.3-19.8)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>5.90 (4.25-8.17)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>16</td>
<td>F</td>
<td>-</td>
<td>12.6 (7.16-22.2)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, imbalance, hyperreactability, regurgitation, falling, sitting, goose-stepping ataxia, prostration, asthenia, myasthenia, salivation, lacrimation, tenesmus, diarrhea, loss of righting reflex, dyspnea, lethargy, tremors, wings spread, wing-drop, using wings for or to aid pedestrian locomotion, using wings to aid standing or balance, penile extrusion, tetany, and terminal wing-beat convulsions and opisthotonos. Signs appeared as soon as 30 min and mortalities occurred as soon as 1 h or as late as 2 days after treatment. Remission took up to 4 days.

Other Toxicity Data: The calculated percutaneous LD50 for the 65.2% sample in 1-year-old mallard hens (n = 8) after a 24-h dermal foot exposure is 480 (CL 240-960) mg/kg. The calculated percutaneous LD50 for the 87.7% sample in 4- to 5-month-old mallard (MM) drakes (n = 8) after a 24-h dermal foot exposure is 400 (CL 180-890) mg/kg. Signs were similar in these two tests and included, in addition to several of the above, phonation, slowness, exudate from nares, running and falling, and ataxia. Signs appeared as soon as 5 h and mortalities usually occurred between 7 and 24 h after the initiation of treatment; one mortality, however, occurred between 1 and 4 days after the initiation of treatment. Remission took up to 4 days. When the percutaneous LD50 is compared with the acute oral LD50, EPN appears to have a relatively low order of dermal hazard in mallards.

Notes: Acetycholinesterase activity measurements were made on the brains of the mortalities and survivors of the acute oral and percutaneous tests of the 87.7% formulation in mallards (MM). Survivors were sacrificed between 14 and 16 days after the initiation of treatment. At that time, when compared with their controls (n = 3, \( \Delta pHT/45 \) min = 0.813, s = 0.100, range = 0.732-0.925), survivors of the acute oral treatment had a mean of 14.6% inhibition (n = 10, \( \Delta pHT/45 \) min = 0.694, s = 0.092, range = 0.535-0.846). When compared with their controls (n = 2, \( \Delta pHT/45 \) min = 0.766, s = 0.053, range = 0.748-0.823), survivors of the percutaneous treatment had a mean of 23.0% inhibition (n = 7, \( \Delta pHT/45 \) min = 0.605, s = 0.086, range = 0.426-0.701). Mortalities that occurred overnight after acute oral treatment showed only 8.8% inhibition (n = 3, \( \Delta pHT/45 \) min = 0.741, s = 0.092, range = 0.684-0.847), whereas mortalities that occurred more rapidly (on the day of treatment) showed 60.8% inhibition (n = 17, \( \Delta pHT/45 \) min = 0.319, s = 0.097, range = 0.169-0.513). Mortalities from the percutaneous treatment showed 49.1% inhibition (n = 2, \( \Delta pHT/45 \) min = 0.400, s = 0.037, range = 0.374-0.427).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

For a discussion of the comparative toxicity of EPN, see Tucker and Haegele (1971).

EPN-300: see EPN
Equino-Aid: see trichlorfon
Esteron: see 2,4-D
Esteron 245: see 2,4,5-T
Estone: see 2,4-D
ET-14: see ronnel
ET-57: see ronnel

ETHAMPHENPHION

Alternative Names: BAY 5505, BAY 69469, Muritan

Chemical Name: Phosphorothioic acid, \( O,O \)-diethyl \( O-(2 \)-diethylaminoethyl-4-methylsulphonylphenyl) ester

Primary Use: Rodenticide

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>8-11</td>
<td>10.4 (7.26-14.8)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>16</td>
<td>M</td>
<td>-</td>
<td>5.46 (4.19-7.11)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Polydipsia and regurgitation (in mallards), hyperreactivity, tenseness, slowness, ataxia, imbalance, running and falling, tremors, salivation, using wings for pedestrian locomotion, penile extrusion,
tonic convulsions of the legs, immobility, tetanic seizures, loss of righting reflex, and wing-beat convulsions. Signs appeared as soon as 6 min and mortalities usually occurred between 2 and 3 h after treatment. Remission took up to 10 days; however, the penis of one drake never retracted.

Other Toxicity Data: The calculated percutaneous LD50 for 1-year-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 56.6 [40.0–80.0] mg/kg. Signs observed after percutaneous treatment included, in addition to several of those reported above, wings spread, lacrimation, and nasal exudate. Mortalities occurred overnight after the initiation of treatment. When the percutaneous LD50 is compared with the acute oral LD50, it appears that ethamphenphos has a slight to moderate degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

ETHION

Alternative Names: diethion, ENT 24105, NIA 1240, Niagara 1240, Nialate, phosphorothioic acid, 8167 RP

Chemical Name: Phosphorothioic acid, S,S'-methylene O,O,O',O'-tetaethyl ester (CAS 563-12-2)

Primary Use: Insecticide, acaricide

Sample Purity: 95%

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>10</td>
<td>F</td>
<td>3</td>
<td>≥2,560</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>1,297</td>
</tr>
</tbody>
</table>

(745–2,257)

Signs of Intoxication: Ataxia, wing-drop, dyspnea, and falling. Signs appeared as soon as 1 h and mortalities occurred between 1.5 and 18 h after treatment. Remission took up to 2 days.

ETHROP

Alternative Names: ENT 27318, ethophosph, Jolt, Mocap, phosethoph, prophos, V-937-101

Chemical Name: Phosphorothioic acid, O-ethyl S,S-di-propyl ester (CAS 13194-48-4)

Primary Use: Nematocide, soil insecticide

Sample Purity: 95.8%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>12.6 [10.6–15.0]</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3–4</td>
<td>4.21 (3.03–5.83)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, ataxia, ataxia, violent wing-beat convulsions, salivation, lacrimation, ptosis, exudate from nares, dyspnea, and opisthotonos. Signs appeared as soon as 7 min and mortalities usually occurred between 15 and 60 min after treatment. Remission took up to 2 weeks.

Other Toxicity Data: The calculated percutaneous LD50 for 1-year-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 10.6 [7.50–15.0] mg/kg. Signs observed after dermal exposure included hyporeactivity, ataxia, slowness, stumbling, falling, using wings to aid pedestrian locomotion, wings spread, immobility, dyspnea, spasms, lacrimation, ashenia, myasthenia, and penile protrusion in the mortalities. Signs appeared as soon as 2.5 h and mortalities usually occurred between 4 and 18 h after the initiation of treatment. One drake, however, experienced prolonged intoxication from which debilitation developed and death occurred 29 days after treatment had ended. Remission typically took up to 1 week. When the percutaneous LD50 is compared with the acute oral LD50, ethoprop appears to have an extremely high degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Ethophos: see ethophos
Ethyl p-nitrophenyl thionobenzephosphonate: see EPN
Ethyl parathion: see parathion
Ethyl phosphates: see TEPP
Etinol: see parathion
Etrole: see ronnel
Experimental Nematicide 269: see endrin
Experimental Nematicide 391: see phorate
Experimental Nematicide 52160: see temephos
Experimental Nematicide 18133: see thionazin
E-Z-Off D: see DEF
Famfos: see famphur
Famophos: see famphur

FAMPHUR

Alternative Names: AC-38023, American Cyanimid 38023,
Bo-Ana, CL 38023, Dovip, ENT 25644, Famfos, Famphos, Warbex

Chemical Name: Phosphorothric acid, O-[4-[(dimethylamino)sulfonyle]phenyl] O,O-dimethyl ester (CAS 52-85-7)

Primary Use: Systemic insecticide

Sample Purity: 35%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>9.87 (5.88-16.6)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, goose-stepping ataxia, wing-drop, tremors, tonic seizures.

FB/2: see diquat dibromide
FBHC: see benzene hexachloride
Fen-All: see TBA
Fenamiphos: see Nemacur
Fence Rider: see 2,4,5-T
Fenchlorphos: see ro nell
Fenchlorphos: see ro nell

FENITROTHION


Chemical Name: Phosphorothric acid, O,O-dimethyl O-(3-methyl-4-nitrophenyl) ester (CAS 122-14-5)

Primary Use: Insecticide, acaricide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1,190 (392-3,610)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>F</td>
<td>3</td>
<td>1,662 (185-14,958)</td>
</tr>
<tr>
<td>Sharp-tailed</td>
<td>12</td>
<td>M</td>
<td>6-7</td>
<td>53.4 (42.4-67.3)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation (in mallards), ataxia, high carriage, wing-drop, wing shivers, falling, salivation, tremors, loss of righting reflex, tetanic seizures, dyspnea, miosis, lacrimation, and wing-beat convulsions. Signs appeared as soon as 30 min and mortalities usually occurred between 1 h and 4.5 days after treatment; one mortality, however, occurred 17.5 days after treatment. Remission took up to 16 days.

Other Toxicity Data: The calculated percutaneous LD50 for 1-year-old mallard drakes (n = 8) after a 24-h foot exposure is 504 (CL 370-686) mg/kg. Signs observed after dermal treatment were similar to those noted above. Mortalities occurred between 19 and 24.25 h after the initiation of treatment. Remission took up to 5 days. When the percutaneous LD50 is compared with the acute oral LD50, fenitrothion appears to have an extremely high degree of dermal hazard in mallards.

The 30-day EMLD for 4- to 5-month-old mallards of both sexes (n = 18) appears to lie between 3.33 and 10.0 mg/kg per day. The resulting cumulative toxicity index is 1,190/3.33=199-357, indicating an extremely high degree of cumulative action in mallards, particularly for an organophosphate. This finding may be accounted for in part by regurgitation of larger acute doses and better absorption of small subacute doses.

The 30-day EMLD for 5- to 6-month-old pheasants of both sexes (n = 12) appears to lie between 6.00 and 15.0 mg/kg per day. The resulting cumulative toxicity index is 55.6/6.00=15.0 = 35.6-9.27, indicating a moderate degree of cumulative action for fenitrothion in pheasants.

Notes: Gross necropsies of mortalities from the 30-day pheasant and mallard studies revealed many small spleens.

Acetylcholinesterase activity measurements were made on the brains of pheasant mortalities and survivors sacrificed on the day after the final dosage in the 30-day EMLD studies. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.029, range = 1.299-1.360), survivors showed 68.3% inhibition (n = 6, ΔpH/45 min = 0.422, s = 0.093, range = 0.254-
FENSFLOTION

Alternative Names: BAY 25141, Dasanit, ENT 24945, S 767, Terracur P

Chemical Name: Phosphorothioic acid, O,O-diethyl O-[4-(methylsulfinyl)phenyl] ester (CAS 115-90-2)

Primary Use: Insecticide

Sample Purity: 90%

Acute Oral Toxiciy Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>5-7</td>
<td>0.749 (0.595-0.944)</td>
</tr>
<tr>
<td>Sharp-tailed grousse</td>
<td>3</td>
<td>M</td>
<td>9-10a</td>
<td>0.500-1.00</td>
</tr>
<tr>
<td>California quail</td>
<td>20</td>
<td>M</td>
<td>6-7</td>
<td>1.68 (1.38-2.04)</td>
</tr>
<tr>
<td>California quail</td>
<td>20</td>
<td>F</td>
<td>2-3</td>
<td>1.19 (0.935-1.51)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>1.34 (1.06-1.68)</td>
</tr>
</tbody>
</table>

*Most of these cocks had well-developed testes, indicating their active breeding condition.

Notes: For data and discussion on the effects of age on the sensitivity of mallards to fensulfothion, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

FENTHION

Alternative Names: BAY 29493, Baytex, DMTP, ENT 25540, Entex, Lebacid, Mercaptophos, Queleton, S 1752, Tiguon

Chemical Name: Phosphorothioic acid, O,O-dimethyl O-[3-methyl-4-(methylthio)phenyl] ester (CAS 55-38-9)

Primary Use: Insecticide

Sample Purity: 90% and 99%

Acute Oral Toxiciy Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada goose</td>
<td>8</td>
<td>M,F</td>
<td>3</td>
<td>12.0 (9.33-14.0)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>4</td>
<td>5.94 (4.28-8.22)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>4</td>
<td>M</td>
<td>2-3</td>
<td>4.86 (3.24-6.61)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>6-7</td>
<td>15.0 (11.9-18.9)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>7-22a</td>
<td>17.8 (9.33-34.0)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>3</td>
<td>25.9 (15.8-42.7)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>3</td>
<td>4.63 (3.24-6.61)</td>
</tr>
<tr>
<td>Mourning dove (st)</td>
<td>8</td>
<td>M,F</td>
<td>-</td>
<td>2.50 (1.25-5.00)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>20</td>
<td>F</td>
<td>-</td>
<td>22.7 (14.6-35.1)</td>
</tr>
<tr>
<td>House finch (st)</td>
<td>10</td>
<td>M,F</td>
<td>-</td>
<td>10</td>
</tr>
</tbody>
</table>

*These hens may have been in breeding condition.

Signs of Intoxication: Lacration, foamy salivation, tracheal congestion, goose-stepping ataxia, immobility, tonic...
tremors, tachypnea, dyspnea, clonic convulsions or opisthotonos. Signs appeared as soon as 8 min and mortalities usually occurred between 30 min and 2 h after treatment. Remission took up to 2 days.

Other Toxicity Data: The calculated percutaneous LD$_{50}$ for 10-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 44.0 (CL 22.0–88.0) mg/kg. Signs observed after dermal treatment included, in addition to several of the above, wing-beat convulsions and penile extrusion. Mortalities usually occurred between 18 and 25 h after the initiation of treatment. When the percutaneous LD$_{50}$ is compared with the acute oral LD$_{50}$, fenthion appears to have a relatively low degree of dermal hazard in mallards.

The 30-day EMLD$^1$ for mallards (n = 12) is 0.5 mg/kg per day for both sexes. The resulting cumulative toxicity index is $5.94/0.5 = 11.9$, indicating moderate cumulative action. The fertility of eggs laid by survivors of the treatment level at 0.5 mg/kg per day was markedly reduced.

Notes: For a discussion of the comparative toxicity of fenthion, see Tucker and Haegele (1971).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Fermide 850: see thiram
Fernasan: see thiram
Fernesta: see 2,4-D
Fernimine: see 2,4-D
Fernoxone: see 2,4-D
Ferxon: see 2,4-D
Film extender: see Yuma Chemical “Spreader A”

**FLUOMETURON**

**Alternative Names:** C-2059, Cotoran, Lanex

**Chemical Name:** $N,N'$-dimethyl-$N''$-(3-trifluoromethyl) phenyljurea (CAS 2164-17-2)

**Primary Use:** Herbicide

**Sample Purity:** 80% Wettable powder

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3–4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, wing-drop or wings crossed high over back; tail pointed upward, fluffed feathers, hyperexcitability, phonation, falling. Signs appeared 15 min after treatment and persisted for up to a week.

**FOLPET**

**Alternative Names:** ENT 26539, Folpan, Phaltan, thiophal, trichloromethylthiophthalimide

**Chemical Name:** 2-[(Trichloromethyl)thio]-1H-isindole-1, 3(2H)-dione (CAS 133-07-3)

**Primary Use:** Fungicide

**Sample Purity:** 92.4%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD$_{50}$ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** The only signs seen were mild ataxia and wings crossed high over back for up to 18 days. Slight weight losses occurred.

**FONOFOS**

**Alternative Names:** Dyfonate, ENT 25796, N-2788, N-2790

**Chemical Name:** Ethylphosphonodithioic acid, O-ethyl S-phenyl ester (CAS 994-22-9)
Primary Use: Soil insecticide

Sample Purity: 94.3%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>16.9 (13.4-21.3)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Hyperexcitability, wide stance, reluctance to leave the swimming pond, ataxia, goose-stepping ataxia, falling, sitting, tremors, spasms, using wings to aid pedestrian locomotion, wing-drop, immobility, and terminal wing-beat convulsions. Signs appeared as soon as 25 min and mortalities usually occurred between 1 and 3 h after treatment. Remission took up to 4 days.

Forlin: see lindane
For-Mal: see malathion
Forron: see 2,4,5-T
Fos-Fall “A”: see DEF
Fosferno M50: see methyl parathion
Fosfeno 50: see parathion
Fostion MM: see dimethoate
Fratol: see sodium monofluoroacetate
French pyrethroid: see RU 11-679
Frutone A: see 2,4,5-T
Frutone T: see silvex
Frumin AL: see disulfoton
Frumin G: see disulfoton
Fumzone: see Nemagon
Guradan: see carbofuran
Furloc: see CIPC
FW-293: see dicofol
Fyfanon: see malathion
G-24480: see Diazinon
G-30027: see atrazine
Gallotox: see PMA
Gamaphex: see lindane
Gamma BHC: see lindane
Gamma isomer of benzene hexachloride: see lindane
Gammalin: see lindane
Gammex: see lindane
Gammexane: see lindane
Gammaopaz: see lindane
Gardentox: see Diazinon
Gardona: see tetrachlorvinphos
Garlon: see silvex
Garrathion: see carbophenothion
GC-1189: see chlordecone
GC-1283: see mirex

GC-6506

Alternative Names: ENT 25734

Chemical Name: Phosphoric acid, dimethyl 4-(methylthio) phenyl ester (CAS 3254-63-5)

Primary Use: Insecticide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>1.12 (0.811-1.56)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>0.668 (0.531-0.842)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>5</td>
<td>F</td>
<td>4</td>
<td>0.500-1.00</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, goose-stepping ataxia, wing-drop, wing shivers, tremors, miosis, convulsions, running and falling, ataxia, tachypnea, tetanic seizures, and terminal wing-beat convulsions. Signs appeared as soon as 4 min and mortalities usually occurred between 15 min and 2.5 h after treatment; however, one mallard died 9 days after treatment. Remission took up to 2 weeks.

Gearphos: see methyl parathion
Gebutox: see dinoseb
Genitox: see DDT
Gesapen: see DDT
Gesaprim: see atrazine
Gesarex: see DDT
Gesarol: see DDT

GOPHACIDE

Alternative Names: BAY 38819, DRC-714, phosacetim, phosacetim

Chemical Name: Phosphorimidothioic acid, (1-iminoethyl)-O,O-bis(4-chlorophenyl) ester (CAS 4104-14-7)

Primary Use: Rodenticide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>2</td>
<td>M</td>
<td>—</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Test animal</td>
<td>No.</td>
<td>Sex</td>
<td>Age (months)</td>
<td>LD₅₀ 95% CL (mg/kg)</td>
</tr>
<tr>
<td>-------------</td>
<td>-----</td>
<td>-----</td>
<td>--------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>24.0 (19.0-30.9)</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>3</td>
<td>M,F</td>
<td>&lt; 36</td>
<td>2.5-5.0</td>
</tr>
<tr>
<td>Pheasant</td>
<td>16</td>
<td>F</td>
<td>3-5</td>
<td>161 (78.3-332)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>3</td>
<td>322 (168-620)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Myasthenia, arched back, anorexia, ataxia, wings crossed high over back, salivation, miosis, ptosis, dyspnea, diarrhea, tremors, loss of righting reflex, tetanic seizures, opisthotonos. Appearance of signs was sometimes delayed up to 4 days. Remission took up to 1 week.

Gramoxone: see paraquat dichloride
Grandamone: see grandlure

**GRANDLURE**

**Alternative Names:** Grandamone

**Chemical Name:** (3,3-Dimethylcyclohexylidene)-acetaldehyde, mixture with (2Z)-2-(3,3-dimethylcyclohexylidene) ethanol and (1R-cis)-1-methyl-2-(1-methylethenyl)cyclobutaneethanol (CAS 1104-05-5)

**Primary Use:** Female boll weevil sex attractant (pheromone produced by the male boll weevil)

**Sample Purity:** Technical grade

**Acute Oral Toxicity Summary:** None

**Signs of Intoxication:** No signs were observed in dietary tests on mallards or bobwhites.

**Other Toxicity Data:** The 8-day dietary LC₅₀ for 15-day-old mallard ducklings (n = 50) is >5,000 ppm. The 8-day dietary LC₅₀ for 11- to 13-day-old bobwhite chicks (n = 40) is >5,000 ppm. Food consumption and body weight gains in the ducklings and the chicks in these studies appeared to be normal.

Granosan: see Ceresan L, Ceresan M
Granutox: see phorate
GS-13005: see methidathion
GS-14260: see terbutryn
GS-19851: see bromopropylate
Guesapron: see DDT
Guesarol: see DDT
Gusathion: see azinphos-methyl
Gusathion M: see azinphos-methyl
Guthion: see azinphos-methyl

Gyron: see DDT
HC-1281: see TBA
HCCH: see benzene hexachloride
HCH: see benzene hexachloride
Hedonal: see 2,4-D
HEOD: see dieldrin

**HEPTACHLOR**

**Alternative Names:** Drinex H-34, E-3314, ENT 15152, Heptamul, Velsicoll 104

**Chemical Name:** 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene (CAS 76-44-8)

**Primary Use:** Insecticide

**Sample Purity:** 99.2%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>M</td>
<td>3</td>
<td>≥ 2,080</td>
</tr>
</tbody>
</table>

Signs of Intoxication: The only signs seen were ataxia, excessive swallowing, and nutation during the day of treatment. Mortalities occurred at night on the 6th and 8th days after administration.

**Other Toxicity Data:** For effects on mallard eggshell thickness, see Haegle and Tucker (1974).

Heptamul: see heptachlor
Herbicide 273: see endothall
Herbicide 282: see endothall
Herbicide 283: see endothall
Herbicide: see amitrole
Hercules 528: see dioxathion
Hercules 3956: see toxaphene
Hercules AC 528: see dioxathion
Herkol: see DDVP
HETP: see TEPP
Hexachlor: see benzene hexachloride
Hexachloran: see benzene hexachloride
Hexadrin: see endrin
Hexafor: see benzene hexachloride

**HEXAFLURATE**

**Alternative Names:** Nopalmate, Nopalmitate, TD-480

**Chemical Name:** Potassium hexafluoroarsenate (CAS 17029-22-0)

**Primary Use:** Herbicide (primary target—prickly pear cactus)
### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>193 (117-317)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>M,F</td>
<td>12a</td>
<td>229 (132-399)</td>
</tr>
<tr>
<td>Gray partridge</td>
<td>12</td>
<td>M</td>
<td>-</td>
<td>142 (112-178)</td>
</tr>
</tbody>
</table>

*aThese were in the early stages of gonadal regression at the end of the breeding season.

**Signs of Intoxication:** Regurgitation, circling, tremors, tenseness, spasms, dyspnea, tachypnea, polydipsia, opisthotonos, convulsions, and tetany. Signs appeared as soon as 10 min and mortalities occurred usually between 1 and 3 h after treatment. Remission took up to 1 week.

**Other Toxicity Data:** The 30-day EMLD for 4-month-old mallards of both sexes (n = 6) is 40.0 mg/kg per day. The resulting cumulative toxicity index is 193/40.0 = 4.8, indicating little cumulative toxicity of hexaflurate for mallards.

Hexathane: see zineb  
Hexathir: see thiram  
Hexavin: see carbaryl  
Hexyclan: see benzene hexachloride  
HHDN: see aldrin  
Hinosan: see edifenphos  
HL 331: see PMA  
HOE 2671: see endosulfan  
Hong Nien: see PMA  
Hydout: see endothall  
Hydrothol 47: see endothall  
Hydrothol 191: see endothall  
IFK: see IPC-400  
Igran: see terbutryn  
Igran 50: see terbutryn

---

### IPC-400

**Alternative Names:** Chem-Hoe, IFK, INPC, IPC, Iso PPC, isoprropyl carbonilate, proham, Triherbide-IPC, Tuberite

**Chemical Name:** Carbamic acid, phenyl-1-methylthyl ester

**Primary Use:** Herbicide

**Sample Purity:** 40% active formulation

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>20</td>
<td>M</td>
<td>3-4</td>
<td>1,830 (1,270-2,630)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>14</td>
<td>M</td>
<td>3</td>
<td>&gt;250</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>237</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, high carriage, goose-stepping ataxia, falling when walking, walking with the aid of the wings. Signs persisted 2 to 4 weeks after single oral administration.

---

**IMIDAN**

**Alternative Names:** ENT 25705, Phosmet, Phthalophos, Prolate, R-1504, Stauffer R-1504

**Chemical Name:** Phosphorodithioic acid, S-[1,3-dihydro-1,3-dioxy-2H-isothiole-2-yl,methyl]O,O-dimethyl ester (CAS 732-11-6)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 97.2%
**ISOBENZAN**

Alternative Names: CP-14957, ENT 25545-X, SD 4402, Telodrin

Chemical Name: 1,3,4,5,6,7,8,8-Octachloro-1,3,3a,4,7,7a-hexahydro-4,7-methanoisobenzofuran (CAS 297-78-9)

Primary Use: Insecticide

Sample Purity: 99%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>5-7</td>
<td>4.15 (2.47-6.97)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, fasciculation, tenseness, swimming backwards, tail high and fanned, loss of righting reflex, circling, opisthotonos. Signs appeared as soon as 30 min and mortalities occurred about 2 h after treatment. Survivors appeared normal by the next day, but lost moderate amounts of body weight by the end of the 14-day observation period.

Iso PPC: see IPC-400
Isopropyl carbamitate: see IPC-400
ISO-Systox: see demeton
Isox: see benzene hexachloride
Ixodex: see DDT
Jolt: see ethoprop
Juvenile hormone mimics: see methoprene
Karbaspray: see carbaryl
Karbofos: see malathion
Karmex: see diuron
Kazide: see potassium azide
Kazoex: see potassium azide
Kelthane: see diocofel
Kemate: see anilazine
Kepone: see chlordecone
Kil-Ail: see sodium arsenite
Kilmite 40: see TEPP
Kilsoeb: see dinoseb
Kilrat: see zinc phosphide
Kithiol: see malathion
Kobutol: see PCNB
Kopsoi: see DDT
Kop-Thiodan: see endosulfan
Kop-Thion: see malathion
Korlan: see rotenone
Kuron: see silvex
Kurosai: see silvex
Kuton: see silvex
Kypchlor: see chlordane
Kypfos: see malathion
Kypzin: see zineb
L-11/6: see phorate
L-36352: see trifluralin
Lamprecid 2770: see TFM
Lamprecide: see TFM

**LANDRIN**

Alternative Names: ENT 25843, OMS 597, SD 8530

Chemical Name: 2,3,5-Trimethylphenyl methylcarbamate; and 3,4,5-trimethylphenyl methylcarbamate(1:4) (CAS 12407-86-2)

Primary Use: Soil insecticide

Sample Purity: >95%¹ and 96%²

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard²</td>
<td>9</td>
<td>F</td>
<td>4</td>
<td>14.1 (10.0-20.0)</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>12</td>
<td>F</td>
<td>7-11a</td>
<td>28.3 (14.7-54.4)</td>
</tr>
<tr>
<td>California quail²</td>
<td>12</td>
<td>F</td>
<td>5-6</td>
<td>195 (141-271)</td>
</tr>
<tr>
<td>Japanese quail²</td>
<td>24</td>
<td>M</td>
<td>2</td>
<td>70.8 (32.6-154)</td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>9</td>
<td>M</td>
<td>2-3</td>
<td>67.2 (25.2-179)</td>
</tr>
<tr>
<td>Chukar¹</td>
<td>12</td>
<td>M,F</td>
<td>7-11a</td>
<td>61.7 (43.2-88.1)</td>
</tr>
<tr>
<td>Rock dove¹</td>
<td>12</td>
<td>M,F</td>
<td>—</td>
<td>168 (121-233)</td>
</tr>
<tr>
<td>House sparrow²</td>
<td>20</td>
<td>M</td>
<td>—</td>
<td>46.3 (37.4-57.3)</td>
</tr>
<tr>
<td>House sparrow²</td>
<td>12</td>
<td>F</td>
<td>—</td>
<td>55.0 (38.5-78.6)</td>
</tr>
<tr>
<td>Mule deer²</td>
<td>4</td>
<td>M</td>
<td>5-11</td>
<td>70.7 [50.0-100]</td>
</tr>
</tbody>
</table>

¹These birds may have been in breeding condition.

Signs of Intoxication: Birds—hyperactivity, ataxia, slowness, wing-drop, salivation, lacrimation, diarrhea, tachypnea, tonic spasms, immobility, tetany, violent convulsions. Mammals—ataxia, tremors, salivation, nystagmus, phonation, inability to stand, tachypnea, mucous-filled trachea, tachycardia, ataxia. Signs and mortality occurred as soon as 15 min after treatment. Mortalities generally occurred by 2 h and complete recovery among survivors took 1 to 3 days.
Note: For a discussion of the comparative toxicity of Lannate, see Tucker and Haegele (1971).

Lanes: see fluometuron
Lannate: see methomyl
Largon: see diflufen
Larvactrol: see Bacillus thuringiensis (Berliner)
Lasso: see alachlor
Lazo: see alachlor
Lead tetraethid: see tetraethyllead
Lead, tetraethyl: see tetraethyllead
Lebacid: see fenthion
Le-Kuo: see dimethoate
Lepton: see leptophos

**LEPTOPHOS**

**Alternative Names:** Abar, Lepton, Phosvel, VCS 506

**Chemical Name:** Phenyl phosphonothioic acid, O-(4-bromo-2,5-dichlorophenyl) O-methyl ester (CAS 21609-90-5)

**Primary Use:** Insecticide, experimental fungicide

**Sample Purity:** 90%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>9</td>
<td>F</td>
<td>4</td>
<td>1,333 (982-1,809)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>10</td>
<td>M</td>
<td>11</td>
<td>228 (184-283)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>M</td>
<td>9-11</td>
<td>29.2 (20.4-41.6)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>62.8 (15.9-248)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, high carriage, jerkiness, running and falling, asthenia, unkemptness, sitting, hyporeactivity, hypoaactivity, withdrawal, immobility, spasms, tremors, and ataraxia. Signs appeared as soon as 30 min after treatment. Mortalities appeared to fall into two classes: most occurred rapidly (between 1 and 5 h after treatment), but some were delayed (between 6 and 24 h after treatment).

**Notes:** Acetylcholinesterase activity measurements were made of the brains of bobwhite mortalities and sacrificed survivors (14-28 days after treatment). When compared with their controls (n = 5, ΔpH/45 min = 1.101, s = 0.100, range = 0.976–1.226), mortalities that occurred within 5 h after treatment showed 74.8% inhibition (n = 3, ΔpH/45 min = 0.278, s = 0.207, range = 0.046-0.444). A single mortality that occurred overnight after treatment showed 7.7% inhibition (n = 1, ΔpH/45 min = 1.016); two mortalities that occurred overnight and one day after treatment showed no measurable inhibition (n = 2, ΔpH/45 min = 1.246, s = 0.056, range = 1.206–1.285). Sacrificed survivors showed only 0.6% inhibition (n = 8, ΔpH/45 min = 1.094, s = 0.152, range = 0.887–1.283).

One could speculate that two toxicological modes of action operate during intoxication with leptophos. One type of response could be attributed to depression of acetylcholinesterase activity by this pesticide. Mortalities associated with this response would be rapid and significant depression of cholinesterase activity would be found. The other type of response could be attributed to the chlorine content of this pesticide, which could cause it to act in the manner of a central nervous system stimulant. Mortalities associated with this type of response would occur over a longer period of time and would not be accompanied by depression of cholinesterase activity. Other similarly chlorinated and brominated organophosphate compounds (such as chlorpyrifos) may possess similar toxicological properties.

Lilly 36532: see trisulfuron
Lindafor: see lindane
Lindagam: see lindane

**LINDANE**

**Alternative Names:** ENT 7796, Forlin, Gamaphex, gamma BHC, gamma isomer of benzene hexachloride, Gammalin, Gammex, Gammxane, Gammopaz, Lindafor, Lindagam, Lintox, Novigam, Silvanol

**Chemical Name:** (1α,2α,3β,4α,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane (CAS 58-89-9)

**Primary Use:** Insecticide

**Sample Purity:** 25%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, polydipsia, tremors, circling, weakness, slowness of reflexes, opisthotonus.

**Other Toxicity Data:** The 30-day EMLD for mallards (n = 12) is 30 mg/kg per day for both sexes. The resulting cumulative toxicity index is >2,000/36 = >67, indicating a high degree of cumulative toxic action even for an organochlorine compound.
MALATHION

Alternative Names: AC 4049, carbofos, Chemathion, Compound 4049, Cythion, Emmatos, Emmatos Extra, ENT 17034, For-Mal, Fyfanon, Karbofos, Kithiol, Kop-Thion, Kyfos, Malamar, Malaspray, Malathon, mercaptogroup, MLT, phosphothion

Chemical Name: ([Dimethoxyphosphinothiol]thi)butanedioic acid, diethyl ester (CAS 121-75-5)

Primary Use: Insecticide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>24</td>
<td>F</td>
<td>3</td>
<td>1,485 (1,020-2,150)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>167 (120-231)</td>
</tr>
<tr>
<td>Horned lark</td>
<td>9</td>
<td>M,F</td>
<td>A</td>
<td>403 (247-658)</td>
</tr>
</tbody>
</table>

Except as noted.

Signs of Intoxication: Ataxia, walking high on toes, imbalance, hyperactivity, wing-drop, weakness, slowness, sitting, ptosis, falling with wings spread, tenesmus, salivation, swallowing, tremors, dyspnea, and convulsions. Signs appeared as soon as 25 min and mortalities usually occurred between 1 and 18 h after treatment. Remission took up to 7 days.

Notes: Acetylcholinesterase activity measurements were made of the brains of the horned larks. When compared with the controls (n = 7, ΔpH/45 min = 0.868, s = 0.059, range = 0.742-0.930), mortalities showed a mean inhibition of 86.9% (n = 3, ΔpH/45 min = 0.114, s = 0.090, range = 0.026-0.207), whereas sacrificed survivors (14 days after treatment) showed a mean inhibition of 21.4% (n = 8, ΔpH/45 min = 0.682, s = 0.130, range = 0.493-0.922).

MEMA RM

Alternative Names: Mercuran

Chemical Name: (Acetato-O)(2-methoxyethyl)mercury (CAS 151-38-2)

Primary Use: Fungicide

Sample Purity: 11.4% (7.15% mercury)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1,059 (764-1,470)</td>
</tr>
<tr>
<td>Mule deer (st)</td>
<td>1</td>
<td>M</td>
<td>16</td>
<td>&gt;250</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Mallards—ataxia, wings crossed high over back, tail down, wing shivers, salivation, collapse. Part of the dosage was regurgitated. Mortalities occurred as early as 1 h and as late as 6 days after treatment. Remission took as long as 2 weeks. Deer—piloerection, belching, bloody diarrhea, and anorexia. Remission took up to 2 weeks.

Mendrin: see endrin
Menlite: see mevinphos
MEP: see fenitrothion
Mercaptodimethur: see methiocarb
Mercaptofos: see demeton
Mercaptophos: see fenthion, demeton
Mercaptothion: see malathion
Mercuram: see thiram
Mercuran: see Mena RM
Merpan: see captan
Mersolite: see PMA

MESTRANOL

Alternative Names: None found

Chemical Name: 3-Methoxy-19-nor-pregna-1,3,5(10)-trien-20yn-17-ol (CAS 72-33-3)
Primary Use: Antifertility agent, repellent

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Red-winged blackbird (st)</td>
<td>1</td>
<td>M</td>
<td>—</td>
<td>&gt;913</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia and imbalance. Signs appeared as soon as 2.5 h after treatment. Remission took up to 2 days.

Other Toxicity Data: The 15-day EMLD for chukars (n = 1M, 3F) is greater than 20 mg/kg per day for both sexes. The chukars treated at this level displayed some salivation and general weakness only. A subsequent reproduction study with these chukars revealed reduced egg fertility compared with that of a control group receiving empty gelatin capsules for a month.

Mesurol: see methiocarb
Metacid 50: see methyl parathion
Metafos: see methyl parathion
Metalkamate: see bufencarb
Metaphos: see methyl parathion
Metasystemox: see oxydemetonmethyl
Meta-Systox-R: see oxydemetonmethyl
Metathion E-50: see fenitrothion

METHAMIDOPHOS

Alternative Names: BAY 71628, ENT 27396, Monitor, Ortho 9006, RE-9006, SRA 5172, Tamaron

Chemical Name: Phosphoramidothioic acid, O,S-dimethyl ester (CAS 10265-92-6)

Primary Use: Insecticide, acaricide

Sample Purity: 74.8%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada goose</td>
<td>15</td>
<td>M,F</td>
<td>33</td>
<td>8.48 (4.20-16.8)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>23.6</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>4</td>
<td>33.2</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>12-24b</td>
<td>225 (178-283)</td>
</tr>
</tbody>
</table>

aExcept as noted.
bThese adult birds may have been in reproductive condition—they were tested in the early part of the breeding season.

Signs of Intoxication: Goose-stepping ataxia, leg weakness, dyspnea, lacrimation, salivation, prostration, ataxia, seizures with wings spread, terminal opisthotonos. Signs appeared as soon as 10 min and mortalities usually occurred between 90 min and 5 h after treatment. Remission took up to 2 days.

Note: Treatment levels as low as 77.9 mg/kg have produced mortalities in chukars.

METHIOCARB

Alternative Names: BAY 37344, BAY H-321, Draza, DRC-736, ENT 25726, Mesurol, mercaptodimethur (proposed), Metmercapturon

Chemical Name: 3,5-Dimethyl-4-(methylthio)phenyl methylycarbamate (CAS 3566-00-5)

Primary Use: Insecticide, stupefacient, avian repellent

Sample Purity: 98%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>12.8 (7.37-22.4)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>11</td>
<td>F</td>
<td>3-6</td>
<td>-270</td>
</tr>
<tr>
<td>Horned lark</td>
<td>15</td>
<td>M,F</td>
<td>A</td>
<td>31.4 (20.4-48.4)</td>
</tr>
</tbody>
</table>

*Except as noted.

Signs of Intoxication: High carriage, tenseness, shakiness, ataxia, imbalance, backing, running and falling, disorientation, abnormal reactivity, sitting, withdrawal, ptosis, ataxia, clonic convulsions, immobility, dyspnea, and opisthotonos. Signs appeared as soon as 5 min and mortalities usually occurred between 1 and 2 h after treatment; however, two pheasants died 6-20 h after treatment. Remission took up to 1 wk.

Notes: Acetylcholinesterase activity measurements were made on the brains of the horned larks. When compared with controls (n = 7, +pH/45 min = 0.868, s = 0.059, range = 0.742-0.930), mortalities showed 59.9% inhibition (n = 7, +pH/45 min = 0.348, s = 0.059, range = 0.251-0.440), whereas survivors sacrificed 14-17 days after treatment showed only 6.6% inhibition (n = 9, +pH/45 min = 0.811, s = 0.070, range = 0.719-0.904).

Other Toxicity Data: The 30-day EMLD for 17- to 23-week-old mallards (n = 12) is 7.5 mg/kg per day for both sexes. The resulting cumulative toxicity index is 15.9/7.5 = 2.1, indicating little or no cumulative toxic action.

**METHOPREN**

Alternative Names: Altosid, EN7 70460, Entococon growth regulator, ZR-515

Chemical Name: (E,E)-11-Methoxy-3,7,11-trimethyl-2,4-dodecadienoic acid, 1-methylethyl ester (CAS 40596-69-8)

Primary Use: Insect growth regulator acting as an insecticide, mimics the action of juvenile hormone

Sample Purity: 17% cis-, 68.9% trans-, technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>9</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, goose-stepping ataxia, slowness, reluctance to move, sitting, and withdrawal. Signs appeared as soon as 2 h and persisted for up to 2 days after treatment.

Note: Treatment levels as low as 500 mg/kg produced signs of intoxication in the mallards.

**METHOXYCHLOR**

Alternative Names: dianisyltrichloroethane, Dimethoxy-DT, DMDT, EN7 7116, Marlute, methoxy DDT, Moxie

Chemical Name: 1,1'-(2,2,2-Trichloroethyldiene)-bis [4-methoxybenzene] 88% and related compounds 12% (CAS 72-43-5)

Primary Use: Insecticide

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>3</td>
<td>M</td>
<td>A&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>California quail</td>
<td>7</td>
<td>F</td>
<td>9-10&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

<sup>a</sup>Except as noted.

<sup>b</sup>Most of these birds were in reproductive condition.
**Signs of Intoxication:** Slight asthenia in the legs of mallards, jitteriness, low stance, and wings spread. Signs appeared as soon as 1 h after treatment. Remission took up to 2 days.

**Notes:** One of six California quail treated at 2,000 mg/kg died 6 days after treatment. Signs of intoxication, however, were not observed.

**Methoxy DDT:** see methoxychlor  
**Methyl demeton-S-oxidoxide:** see oxydemetonmethyl  
**Methyl Guthion:** see azinphos-methyl  
**Methylmercuric cyanoguanidine:** see Panogen  
**Methyl nitrophen:** see fenitrothion

**METHYL PARATHION**

**Alternative Names:** Bayer E-601, Dalf, dimethyl parathion, E-601, ENT 17292, Folidol M, Fosferno M50, Gearphos, Metacide 50, metafos, methylphos, Metron, Nitrox, Nitroz 80, parathion-methyl, Partron M, Tekwaisa, Wofadox

**Chemical Name:** Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester (CAS 298-00-0)

**Primary Use:** Insecticide

**Sample Purity:** 80%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months(a))</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>16</td>
<td>M</td>
<td>3</td>
<td>10.0 (6.12-16.3)</td>
</tr>
<tr>
<td>Mallard</td>
<td>20</td>
<td>F</td>
<td>18</td>
<td>6.60 (4.42-9.88)</td>
</tr>
<tr>
<td>Mallard (MM)</td>
<td>15</td>
<td>F</td>
<td>4-5</td>
<td>60.5 (18.2-201)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>16</td>
<td>M</td>
<td>A</td>
<td>5.76 (5.70-10.0)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>2</td>
<td>8.21 (5.69-11.9)</td>
</tr>
<tr>
<td>Red-winged</td>
<td>12</td>
<td>F</td>
<td>Ab</td>
<td>23.7 (17.1-32.9)</td>
</tr>
</tbody>
</table>

\(a\) Except as noted.  
\(b\) These birds may have been in reproductive condition.

**Signs of Intoxication:** Polydipsia, regurgitation, ataxia, falling, dyspnea, salivation, withdrawal, using wings for pedestrian locomotion, mutation, lacrimation, atasynergy, immobility, convulsions, wing-beat convulsions, and opisthotonos. Signs appeared as soon as 10 min and mortalities usually occurred between 15 min and 2 h after treatment. However, three bobwhites died between 4 and 20 h and one died 36 h after treatment. Remission usually took up to 2 days; however, one bobwhite showed prolonged signs, including ataxia, bradypnea, ptosis, convulsions, tremors, erection of the feathers on the head, ataxia, sitting, hyperexcitability, and disorientation for up to 14 days after treatment.

**Other Toxicity Data:** The calculated percutaneous LD50 for 5-month-old mallard (MM) hens (n = 8) after a 24-h dermal foot exposure is 53.6 (CL 39.3-72.9) mg/kg. Signs appeared as soon as 4 h and mortalities usually occurred between 7 and 21 h after the initiation of treatment. Remission took up to 2 days. Mild dermal irritation was caused by exposure to methyl parathion. When the percutaneous LD50 is compared with the acute oral LD50, it appears that methyl parathion has an extremely high degree of dermal hazard in mallards.

**Notes:** Acetylcholinesterase activity measurements were made on the brains of the mallards (MM), bobwhites, and red-winged blackbirds from the above tests. Mallard mortalities from the acute oral treatment, when compared with controls (n = 2, 2\(\mu\)H/45 min = 0.768, s = 0.026, range = 0.750-0.787), showed 76.2% inhibition (n = 8, 2\(\mu\)H/45 min = 0.185, s = 0.161, range = 0.063-0.565); whereas mortalities from the percutaneous treatment, when compared with their controls (n = 2, 2\(\mu\)H/45 min = 0.823, s = 0.037, range = 0.797-0.849), showed 91.2% inhibition (n = 6, 2\(\mu\)H/45 min = 0.072, s = 0.020, range = 0.048-0.099). Mallard survivors of the acute oral treatment showed 12.8% inhibition (n = 17, 2\(\mu\)H/45 min = 0.670, s = 0.132, range = 0.455-0.929), whereas survivors of the percutaneous treatment showed 37.7% inhibition (n = 3, 2\(\mu\)H/45 min = 0.513, s = 0.132, range = 0.372-0.633) when they were sacrificed 14-15 days after treatment. Bobwhite mortalities, when compared with their controls (n = 12, 2\(\mu\)H/45 min = 1.450, s = 0.083, range = 1.346-1.604), showed 93.6% inhibition (n = 12, 2\(\mu\)H/45 min = 0.092, s = 0.069, range = 0.004-0.184), whereas survivors sacrificed 14-21 days after treatment showed 68.6% inhibition (n = 9, 2\(\mu\)H/45 min = 0.455, s = 0.407, range = 0.012-0.994). Red-winged blackbird mortalities, when compared with their controls (n = 3, 2\(\mu\)H/45 min = 1.747, s = 0.083, range = 1.667-1.833), showed 64% inhibition (n = 7, 2\(\mu\)H/45 min = 0.628, s = 0.215, range = 0.347-0.896), whereas survivors sacrificed 14 days after treatment showed 26.5% inhibition (n = 9, 2\(\mu\)H/45 min = 1.284, s = 0.118, range = 1.120-1.447).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Methyl systox: see oxydemetonmethyl  
Methylmercaptosoxid: see oxydemetonmethyl  
Methyltriazotion: see azinphos-methyl  
Methylcaptopuron: see methiocarb
MEVINPHOS

Alternative Names: ENT 22374, Menite, OS-2046, Phosdrin, Phosfene

Chemical Name: 3-[(Dimethoxyphosphinyl)oxy]-2-butenenoic acid, methyl ester (CAS 7786-34-7)

Primary Use: Insecticide, acaricide

Sample Purity: 100% analytical grade (60% α, 40% other)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>5-7</td>
<td>4.63 (3.57-6.00)</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>12</td>
<td>M</td>
<td>Aᵇ</td>
<td>1.34 (0.695-2.57)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>1.37 (0.951-1.98)</td>
</tr>
<tr>
<td>California quail</td>
<td>9</td>
<td>F</td>
<td>18</td>
<td>7.14 (6.50-15.6)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>F</td>
<td>2-3</td>
<td>3.21 (2.45-4.21)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>Aᵇ</td>
<td>4.57 (3.42-6.09)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>4-5</td>
<td>5.24 (4.17-6.61)</td>
</tr>
<tr>
<td>Sandhill crane</td>
<td>4</td>
<td>M,F</td>
<td>1</td>
<td>1.00-4.50</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>6.47 (3.72-11.3)</td>
</tr>
<tr>
<td>Mourning dove (st)</td>
<td>6</td>
<td>M,F</td>
<td>3</td>
<td>2.83 (2.00-4.00)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>16</td>
<td>F</td>
<td>Aᵇ</td>
<td>50.4 (21.9-116)</td>
</tr>
<tr>
<td>House finch (st)</td>
<td>12</td>
<td>M</td>
<td>A</td>
<td>4.76 (3.43-6.60)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>5</td>
<td>M,F</td>
<td>5-30</td>
<td>12.5-25.0</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>2</td>
<td>M</td>
<td>-</td>
<td>15.0-30.0</td>
</tr>
</tbody>
</table>

*Except as noted.  ᵇSome of these grouse may have been in reproductive condition.

Signs of Intoxication: Ataxia, either low or high carriage, toes curled, tachypnea, dyspnea, salivation, diarrhea, tremors, phonation, tetany or violent terminal wing-beat convulsions. Signs appeared as soon as 2 min in mallards and 5 min in the other species; mortalities usually occurred between 4 and 34 min in mallards and between 5 and 20 min after treatment in the other species. Remission took up to 12 days.

Other Toxicity Data: The calculated percutaneous LD₅₀ for 1-year-old mallard hens (n = 8) after a 24-h foot exposure is 11.1 (CL 4.98-24.7) mg/kg. Signs observed after dermal treatment included, in addition to several of the above, lacrimation, spasms, and wings spread. When the percutaneous LD₅₀ is compared with the acute oral LD₅₀, mevinphos appears to have a relatively high degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

MEXACARBBATE

Alternative Names: Dowco 139, ENT 25766, Zectran

Chemical Name: 4-(Dimethylamino)-3,5-dimethylphenol methylcarbamate (ester) (CAS 315-18-4)

Primary Use: Insecticide

Sample Purity: ≈99% (recrystallized 3 times)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>8</td>
<td>M</td>
<td>—</td>
<td>566 (283-1.131)</td>
</tr>
<tr>
<td>Canada goose</td>
<td>6</td>
<td>M,F</td>
<td>—</td>
<td>2.64 (2.00-3.48)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>5-7</td>
<td>2.98 (2.50-3.50)</td>
</tr>
<tr>
<td>Mallard duckling (st)</td>
<td>9</td>
<td>M,F</td>
<td>15-19 d</td>
<td>4.20 (3.50-5.00)</td>
</tr>
<tr>
<td>Sharp-tailed grous  e</td>
<td>12</td>
<td>M</td>
<td>Aᵇ</td>
<td>10.0 (6.50-15.6)</td>
</tr>
<tr>
<td>California quail</td>
<td>9</td>
<td>F</td>
<td>18</td>
<td>7.14 (6.88-19.0)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>F</td>
<td>2-3</td>
<td>3.21 (2.45-4.21)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>Aᵇ</td>
<td>4.57 (3.42-6.09)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>4-5</td>
<td>5.24 (4.17-6.61)</td>
</tr>
<tr>
<td>Sandhill crane</td>
<td>4</td>
<td>M,F</td>
<td>1</td>
<td>1.00-4.50</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>6.47 (3.72-11.3)</td>
</tr>
<tr>
<td>Mourning dove (st)</td>
<td>6</td>
<td>M,F</td>
<td>3</td>
<td>2.83 (2.00-4.00)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>16</td>
<td>F</td>
<td>Aᵇ</td>
<td>50.4 (21.9-116)</td>
</tr>
<tr>
<td>House finch (st)</td>
<td>12</td>
<td>M</td>
<td>A</td>
<td>4.76 (3.43-6.60)</td>
</tr>
<tr>
<td>Mule deer</td>
<td>5</td>
<td>M,F</td>
<td>5-30</td>
<td>12.5-25.0</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>2</td>
<td>M</td>
<td>-</td>
<td>15.0-30.0</td>
</tr>
</tbody>
</table>

*Except as noted.  ᵇSome of these birds may have been in breeding condition.

Signs of Intoxication: Ataxia, imbalance, neck tremors, nystagmus, miosis, hyporeactivity, sitting, reluctance to move, ataraxia, falling, convulsions, tachypnea, dyspnea, lacrimation, salivation, diarrhea, tachycardia, tracheal congestion, hyperthermia, terminal convulsions. The most typical sign is increased respiratory rate (up to 3 or 4 times the normal rate for a species). Death appears to occur by respiratory paralysis. Zectran poisoning and recovery are rapid. Usually peak signs or death occurred within 1 h and recovery was often complete by 3 h.

Other Toxicity Data: LD₅₀'s of Zectran to mallards of six ages between 48 h and 7 months were nearly identical, indicating little change in susceptibility with age; see Hudson et al (1972).
The 30-day EMLD is 2.33, 5-10, and 1.25 mg/kg per day, respectively, for chukars (n = 1M, 5F), deer (n = 4), and mallards (n = 12). For mallards, the resulting cumulative toxicity index is 3.0/1.25 = 2.4, indicating little cumulative action.

No effects were seen on the fertility or hatchability of eggs produced by mallards surviving 2.66 mg/kg per day for 30 days.

A formulation of Zectran and Dowanol TPM was tested on 3- to 4-month-old female mallards (n = 9) and resulted in an acute oral LD50 of 35.0 mg/kg. This formulation contains 6% Zectran, which gives an LD50 of 2.1 mg/kg for the Zectran present. This level is close to the 2.98 mg/kg LD50 for recrystallized Zectran itself.

Notes: For a more detailed discussion of some of the above data, see Tucker and Crabtree (1969).
For a discussion of the comparative toxicity of mexacarb, see Tucker and Haegele (1971).

MEXACARBATE (ACYLATED)

Alternative Names: acetylated mexacarbate, acetylated Zectran, Zectran (acylated)

Chemical Name: N-acetyl-4-dimethylamino-3,5-dimethylphenyl methylcarbamate ester

Primary Use: Experimental insecticide

Sample Purity: > 80%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>2</td>
<td>M</td>
<td></td>
<td>&gt; 2,000</td>
</tr>
<tr>
<td>Mallard</td>
<td>18</td>
<td>F</td>
<td>3-4</td>
<td>&gt; 2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: None for bullfrogs. For mallards, moderate ataxia, masseter tenseness, excessive chewing motions during first 4 or 5 h only.

Note: For a more detailed discussion of the above data, see Tucker and Crabtree (1969).

Microbial control agent: see Nosema locustae

MIREX

Alternative Names: Dechlorane, Dodecachloropentacyclocdecane, ENT 25719, GC-1283

Chemical Name: 1,1a,2,2,3,3a,4,5,5a,5b,6-Dodecachlorooctahydro-1,3,4-metheno-1H-cyclobuta[cd]pentale (CAS 2385-85-5)

Primary Use: Insecticide

Sample Purity: 98%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>9</td>
<td>M</td>
<td>12b</td>
<td>952 (357-2,535)</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>8</td>
<td>M</td>
<td></td>
<td>173 (99-300)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>M</td>
<td>5-6</td>
<td>463 (266-805)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>2b</td>
<td>668 (530-842)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>2-3</td>
<td>228 (136-383)</td>
</tr>
<tr>
<td>Chukar</td>
<td>16</td>
<td>M,F</td>
<td>9b</td>
<td>237 (137-410)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td></td>
<td>273 (215-354)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>12</td>
<td>M</td>
<td>8b</td>
<td>57.8 (33.2-101)</td>
</tr>
</tbody>
</table>

*Except as noted.
*Many of these birds may have been in breeding condition.

Signs of Intoxication: Asymmetry, myasthenia, ataxia, imbalance, goose-stepping ataxia, stumbling or collapse,
tremors, lacrimation, foamy salivation, diarrhea, tachypnea, dyspnea, loss of righting reflex, ataxia, tetany, tonic convulsions, clonic convulsions, wing-beat convulsions, and phonation.

Other Toxicity Data: The 30-day EMLD for mallards (n = 3M, 3F) is 40 mg/kg per day. The resulting cumulative toxicity index is 952/40 = 24, indicating a high degree of cumulative toxic action for a carbamate.

The fertility, hatchability, and chick survivability of eggs produced by pheasants (n = 3M, 3F) surviving 30 daily oral doses at a treatment level of 40 mg/kg per day were similar to those of a control group of pheasants treated 30 days with empty gelatin capsules.

Notes: For a discussion of the comparative toxicity of Mobam, see Tucker and Haegele (1971).

Mocap: see ethoprop
Molluscicide Bayer 73: see clonitralid
Monitor: see methamidophos
Monocron: see monocrotophos

**MONOCROTOPHOS**

**Alternative Names:** Azodrin, CIBA 1414, ENT 27129, Monocron, Nuvacron, SD 9129

**Chemical Name:** (E)-Phosphoric acid, dimethyl [1-methyl-3-(methylamino)-3-oxo-1-propenyl] ester (CAS 919-44-8)

**Primary Use:** Insecticide

**Sample Purity:** >75%, 1 >80%, 2

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex (months)</th>
<th>LD50 (mg/kg)</th>
<th>95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada goose</td>
<td>12</td>
<td>M,F</td>
<td>1.58</td>
<td>(1.10-2.28)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>4.76</td>
<td>(4.36-8.60)</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>6</td>
<td>N</td>
<td>0.188</td>
<td>(0.094-0.376)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>12</td>
<td>M</td>
<td>0.944</td>
<td>(0.749-1.19)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>0.763</td>
<td>(0.483-1.33)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>3.71</td>
<td>(2.75-5.03)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>2.83</td>
<td>(2.00-4.00)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>F</td>
<td>6.49</td>
<td>(5.01-8.42)</td>
</tr>
<tr>
<td>Gray partridge</td>
<td>7</td>
<td>F</td>
<td>6.40-12.8</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>13</td>
<td>M,F</td>
<td>2.00-3.16</td>
<td></td>
</tr>
</tbody>
</table>

aExcept as noted.
bSome of these birds may have been in breeding condition.

**Signs of Intoxication:** Birds—fluffed feathers, eyes closed, ataxia, lacrimation, salivation, polydipsia, dyspnea, tracheal congestion, defecation, mydriasis, hyperactive nictitating membrane, tremors, wing-beat convulsions, tetany or opisthotonos. Mammals—ataxia, miosis, hyporeactivity, constant quivering, immobility, tracheal congestion, tachypnea, dyspnea, phonation. Mortalities usually occurred 1 to 60 h after treatment. Remission usually took up to 4 days; however, some mortalities occurred after this time.

Other Toxicity Data: The 30-day EMLD for mallards (n = 6M, 6F) is about 0.25 mg/kg per day. The resulting cumulative toxicity index is 4.76/0.25 = 19.4, indicating a high degree of cumulative action for an organophosphate.

The calculated percutaneous LD50 for the 75% sample for 1-year-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 30.0 (CL 13.5-66.8) mg/kg. In general, signs were similar to those reported above. Mortalities usually occurred between 3 and 19 h after the initiation of treatment. Remission took up to 3 days after treatment had ended. When the percutaneous LD50 is compared with the acute oral LD50, it appears that monocrotophos has a moderate degree of percutaneous hazard in mallards.

**Notes:** Gross necropsies often revealed endocardial and gastrointestinal hemorrhaging.

For a discussion of the comparative toxicity of monocrotophos, see Tucker and Haegele (1971).

For data and discussion on the effects of age on the sensitivity of mallards to monocrotophos, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Monosodium fluoroacetate: see sodium monofluoroacetate
Monsanto CP-47114: see fenitrothion
Morsdren: see Panogen
Motox: see toxaphene
Mous-con: see zinc phosphate
Moxie: see methoxychlor 
M & T Chemicals RSI50: see D.M. 7537
Muritan: see ethamphenphon
Muscatox: see coumaphos
N-2788: see fonofos
N-2790: see fonofos

**NABAM**

**Alternative Names:** Chem Bam, Dithane D-14, DSE, ENT 9106, Parzate, Spring-Bak

**Chemical Name:** 1,2-Ethanediylbiscarbamodithioic acid, disodium salt (CAS 142-59-6)

**Primary Use:** Fungicide

**Sample Purity:** 93%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>6</td>
<td>F</td>
<td>—</td>
<td>420</td>
</tr>
<tr>
<td>Mallard</td>
<td>4</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2,560</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>1,680-2,670</td>
</tr>
<tr>
<td>Pheasant</td>
<td>9</td>
<td>M</td>
<td>3-5</td>
<td>707</td>
</tr>
<tr>
<td>Rock dove</td>
<td>5</td>
<td>M,F</td>
<td>—</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Domestic goat</td>
<td>2</td>
<td>M</td>
<td>11</td>
<td>&gt;800</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, tremors, tachypnea, myasthenia, salivation, miosis, tenesmus, diarrhea, piloerection.

**NALED**

**Alternative Names:** bromchlorphos, Bromex, Dibrom, ENT 24988, RE-4355

**Chemical Name:** Phosphoric acid, 1,2-dibromo-2,2-dichloroethyl dimethyl ester (CAS 300-76-5)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 93%, 1 92%<sup>2</sup>

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada goose&lt;sup&gt;1&lt;/sup&gt;</td>
<td>9</td>
<td>M,F</td>
<td>—</td>
<td>49.9 (31.7-78.6)</td>
</tr>
</tbody>
</table>

**NEMACUR**

**Alternative Names:** BAY 68138, ENT 27572, fenamiphos (proposed), phenamiphos (proposed)

**Chemical Name:** Phosphoroid acid, ethyl 3-methyl-4-(methylthio) phenyl(1-methylethyl) ester (CAS 2224-92-6)

**Primary Use:** Nematocide

**Sample Purity:** 81%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>1.68</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>11&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.83 (1.12-3.01)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>7</td>
<td>M</td>
<td>3-4</td>
<td>0.500-1.00</td>
</tr>
</tbody>
</table>

<sup>a</sup>Most of these hens were in breeding condition.

**Signs of Intoxication:** Ataxia, goose-stepping ataxia, slow-
ness, withdrawal, hyporeactivity, wing-drop, regurgitation, tachypnea, rapid swallowing, using wings for pedestrian locomotion, immobility, ataxia, lacrimation, salivation, dyspnea, tetanic seizures, wing tremors, opisthotonos, and terminal wing-beat convulsions. Signs appeared as soon as 10 min and mortalities usually occurred between 0.5 and 2 h after treatment. Remission took up to 14 days.

Other Toxicity Data: The calculated percutaneous LD₅₀ for 1-year-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 23.8 (CL 17.5-32.4) mg/kg. Signs observed were similar to those reported above, and appeared as soon as 4 h after the initiation of treatment. Mortalities usually occurred between 19 and 24 h after the initiation of treatment. When the percutaneous LD₅₀ is compared with the acute oral LD₅₀, Nemacur appears to have a relatively low degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Nemafos: see thionazin
Nemaflume: see Nemagon

**NEMAGON**

**Alternative Names:** BBC 12, DBCP, dibromochloropropane, ENT 18445, Fumazine, Nemaflume, OS 1897

**Chemical Name:** 1,2-Dibromo-3-chloropropane (CAS 96-12-8)

**Primary Use:** Nematicide

**Sample Purity:** 95% active ingredient and 5% other halogenated C₃ compounds

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>LD₅₀ (mg/kg)</th>
<th>95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>587</td>
<td>(397-869)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>530</td>
<td>(383-735)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>1,200-2,000</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Rock dove</td>
<td>100-200</td>
<td></td>
</tr>
<tr>
<td>Mule deer</td>
<td>3-12</td>
<td></td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Wing shivers or fasciculation, ataxia, excessive swallowing and chewing motions, masseter tenseness, mild narcosis, strong whole-body tremors, miosis, terminal wing-beat convulsions or opisthotonos. Levels as low as 6.0 mg/kg produced some signs in mallards. In most species mortalities occurred as soon as 6 min or as late as 2 days following treatment.

Nicotline: see rotenone
Nifos T: see TEPP
Nimitox: see temephos
Niran: see chlordane, parathion
Nitrador: see DNOC
Nitralin: see Planavin
Nitropropone C: see dinoseb
Nitrostigmine: see parathion
Nitrox: see methyl parathion
Nitrox 80: see methyl parathion

**NICOTINE SULFATE**

**Alternative Names:** Black Leaf 40, ENT 2435

**Chemical Name:** (S)-3-(l-methyl-2-pyrrolidinyl) pyridine sulfate,(2:1) (CAS 65-30-5)

**Primary Use:** Insecticide

**Sample Purity:** 40%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ (mg/kg)</th>
<th>95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-5</td>
<td>66.8</td>
<td>(48.2-92.6)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>156</td>
<td>(89.3-271)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>8</td>
<td>F</td>
<td>3-4</td>
<td>1,200-2,000</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Rock dove</td>
<td>5</td>
<td>M</td>
<td>--</td>
<td>100-200</td>
<td></td>
</tr>
<tr>
<td>Mule deer</td>
<td>3</td>
<td>F</td>
<td>12</td>
<td>587</td>
<td>(397-869)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Wing shivers or fasciculation, ataxia, excessive swallowing and chewing motions, masseter tenseness, mild narcosis, strong whole-body tremors, miosis, terminal wing-beat convulsions or opisthotonos. Levels as low as 6.0 mg/kg produced some signs in mallards. In most species mortalities occurred as soon as 6 min or as late as 2 days following treatment.
NORBORMIDE

Alternative Names: McNeil 1025, Ricatec, ShoXin

Chemical Name: 3a,4,7,7a-Tetrahydro-5-(hydroxyphenyl-2-pyridinylmethyl)-7-phenyl-2-pyridinylmethylene)-4,7-methano-1H-isodindole-1,3(2H)-dione (CAS 991-42-4)

Primary Use: Experimental rodenticide

Sample Purity: 20%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>9-10</td>
<td>&gt;3,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, dyspnea, polydipsia, slight loss of balance, excessive preening. No significant changes in body weight had occurred by the end of the 14-day observation period.

NOSEMA LOCUSTAE

Alternative Names: None found

Chemical Name: Nosema locustae Canning (Microsporida; Nosematidae), a microsporidian protozoan

Primary Use: An experimental microbial control agent for grasshoppers and Mormon crickets, commonly applied at the rate of 2.47 × 10^6 spores per hectare.

Sample Purity: 1.72 × 10^6 spores/mL water, 1 × 10^6 spores/mL water

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (spores/bird)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>10</td>
<td>M,F</td>
<td>1</td>
<td>&gt;5 × 10^9</td>
</tr>
<tr>
<td>Pheasant</td>
<td>10</td>
<td>M</td>
<td>A</td>
<td>&gt;5 × 10^9</td>
</tr>
</tbody>
</table>

Notes: One mallard died 2 months after treatment, but 9 other mallards and 10 controls survived and appeared normal throughout the 7-month observation period before sacrifice. We have no explanation for the single mallard mortality; however, it was probably not related to treatment with Nosema locustae.

Novathion: see fenitrothion
Novigam: see lindane
NRDC 104: see resmethrin
Nucidol: see Diazinon

NUCLEOPOLYHEDRAL VIRUS

Alternative Names: Hemerocampa pseudotsugata, polyhedral virus, viral pesticide

Chemical Name: A preparation of the nucleopolyhedrosis virus Hemerocampa pseudotsugata

Primary Use: Experimental insecticide

Sample Purity: 30.01 × 10^6 polyhedra per milligram

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>2</td>
<td>M,F</td>
<td>4</td>
<td>&gt;404</td>
</tr>
<tr>
<td>Pheasant</td>
<td>1</td>
<td>F</td>
<td>4</td>
<td>&gt;384</td>
</tr>
<tr>
<td>House sparrow</td>
<td>1</td>
<td>F</td>
<td>--</td>
<td>&gt;1,969</td>
</tr>
<tr>
<td>Mule deer</td>
<td>1</td>
<td>M</td>
<td>--</td>
<td>&gt;52.9</td>
</tr>
</tbody>
</table>

Signs of Intoxication: No signs, or minor temporary weakness only.

Other Toxicity Data: The percutaneous LD50 for a male albino rabbit (n = 1) after a 28-h exposure appears to be greater than 241 mg/kg.

Three hen mallards survived repeated daily dosages of 5 mg/kg per day for 5 days, at which time treatment was terminated.

Notes: In terms of the proposed field application rates, these doses are quite large, equaling 1.5 times the 50 × 10^6 polyhedra applied per hectare. It should be kept in mind, however, that each infected target insect larva can produce 2 to 20% of this original treatment rate.

Minor primary dermal irritation was noted on the rabbit tested (equal to +1 on the FDA scale for erythema and edema).

The mule deer displayed moderate transient neutrophilia and eosinophilia after oral administration. This response could be interpreted as initial metabolic intoxication and allergic response to the foreign protein of the virus preparation.
Nudrin: see methomyl
Nuvacon: see monocrotophos
Nuvan: see DDVP
Nuvanol: see fenithrothion
Nux vomica: see strychnine
Nylmerate: see PMA
Octachlor: see chlor dane
Octachlorocamphene: see toxaphene
Octa-Klor: see chlor dane
Octalen: see aldrin
Octalox: see dieldrin
Octamethylpyrophosphoramide: see schradan:
n-Octyl sulfoxide of isosafrole: see sulfoxide

OIL HERDER

Alternative Names: Shell Oil Herder

Chemical Name: 60% of an active material which is described as a linear primary alcohol of C₁₂ to C₁₅ range, 40% ethylene glycol monobutyl ether

Primary Use: Oil-spill clean-up agent

Sample Purity: 100%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>6</td>
<td>F</td>
<td>4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation, ataxia, stumbling, ptosis, loss of righting reflex, using wings to aid pedestrian locomotion, tremors, intermittent opisthotonos or emprosthotonos, immobility, dyspnea, wing-beat convulsions, and occasional hyperexcitability or hyperactivity upon remission. Signs appeared as soon as 15 min, and except for prolonged asthenia and slowness in some birds, remission had occurred by the day following treatment.

Oil-soaked bird clean-up agent: see Shell Sol 70
Oko: see DDVP
OM 2424: see Terrazole
OMPA: see schradan
OMS-33: see Baygon
OMS-43: see fenitrothion
OMS-597: see Landrin
OMS-708: see Mobam
OMS-771: see alicarb
OMS-1155: see Dowco 214
OMS-1804: see diflurane
Ontrack WE-1: see pcp
OR-1911: see phosphanid
Orthene: see acephate
Ortho 5353: see bufencarb
Ortho 9006: see methamidophos
Ortho 12420: see acephate
Orthocide: see captan
Orthocide 406: see captan
Ortho-Klor: see chlor dane
Ortho Parquat: see paraquat dichloride
Orthophos: see parathion
Ortho Phosphate Defoliant: see DEF
Ortran: see acephate
OS-1897: see Nemagon
OS-2046: see mevinphos

OXYDEMETONMETHYL


Chemical Name: Phosphorothioic acid, S-[2-(ethylsulfinyl) ethyl] O,O-dimethyl ester (CAS 301-12-2)

Primary Use: Insecticide

Sample Purity: 50%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (MM; st)</td>
<td>19</td>
<td>M</td>
<td>4-5</td>
<td>53.9 (38.9-74.8)</td>
</tr>
</tbody>
</table>
### PANOSOL AN-2

**Alternative Names:** None found

**Chemical Name:** An aromatic solvent composed of 23.7% C₆ to C₁₆ alkylbenzenes, 17.7% naphthalene, 46.3% C₁₁ to C₁₃ substituted naphthalenes, 11.2% C₈ to C₁₄ napthene + dinaphthene benzenes, and 1.1% C₁₂ to C₁₆ acenaphthenes (percent by volume)

**Primary Use:** Insecticide and herbicide solvent

**Sample Purity:** Technical grade

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal (MM; st)</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (MM; st)</td>
<td>9</td>
<td>M</td>
<td>4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Polydipsia, regurgitation, ataxia, sitting, and slowness. Signs appeared as soon as 2 min after treatment; however, no mortalities occurred. Remission had occurred by the day following treatment.

---

### PANOCREN

**Alternative Names:** Methylmercuric cyanoguanidine, Morrisden, Panogen 42

**Chemical Name:** Mercury, (cyanoguanidinato-N')(methyl) (CAS 502-39-6)

**Primary Use:** Seed disinfectant, fungicide

**Sample Purity:** 100%¹ and 6.3% formulation²

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard¹</td>
<td>6</td>
<td>M</td>
<td>4</td>
<td>53.0</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>561</td>
</tr>
<tr>
<td>Pheasant²</td>
<td>9</td>
<td>M</td>
<td>3</td>
<td>566</td>
</tr>
<tr>
<td>House sparrow (st)²</td>
<td>2</td>
<td>M,F</td>
<td></td>
<td>300-900</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, polydipsia, general weakness, slowness of reactions, fluffed feathers, tetany when disturbed, coma. Remission took up to 1 week.

**Note:** See "Notes" for PMA

Panogen 42: see Panogen
Panoram D-31: see dieldrin
Panthion: see parathion
Pamron: see parathion
Paphros: see parathion
Parrquat CL: see paraquat dichloride

---

### PARAQUAT DICHLORIDE

**Alternative Names:** Dextrone X, Gramoxone, Ortho Paraquat, parrquat CL, PP-148, FP-910, Weedol

**Chemical Name:** 1,1'-Dimethyl-4,4'-bipyridinium dichloride (CAS 1910-42-5)

**Primary Use:** Herbicide

**Sample Purity:** 21%

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD₅₀ 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>199</td>
</tr>
</tbody>
</table>

**Note:**

Pallethrine: see allethrin
PAM: see PMA
Pamol 2 Forte: see zineb
Signs of Intoxication: Polydipsia, regurgitation, swallowing, ataxia, imbalance, wing-drop, hyporeactivity, slowness, asthenia, sitting, running and falling, and possible miosis. Polydipsia and regurgitation appeared as soon as 9 min and other signs of intoxication appeared 3 hr after treatment. Mortalities usually occurred between 3 and 20 hr after treatment; however, one bird died between 1 and 2 days after treatment. Remission took up to 12 days.

Other Toxicity Data: The calculated percutaneous LD50 for 10- to 11-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 600 (CL 424–848) mg/kg. Signs observed after dermal treatment included, in addition to several of those reported above, lacrimation, wings spread, using wings to aid pedestrian locomotion, and wing shivers. Mortalities occurred between 5.5 and 21.5 hr after the initiation of treatment. Remission took up to 5 days. When the percutaneous LD50 is compared with the acute oral LD50, paraquat dichloride appears to have a moderate degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Parasporal bodies: see Bacillus thuringiensis (Berliner)
Parathene: see Parathion

### PARATHION

**Alternative Names:** AAT, AC-3422, Alkron, Alleron, American Cyanamid 3422, Apilamite, BAY E-603, Bladan, Corothion, DNTF, E-605, ENT 15108, ethyl parathion, Etillon, Folidol, Fosfono 50, Niran, Nitrothionine, Orthophos, Panthion, Pararam, Paraphos, Parathene, Parawet, Phoskil, Rhoditox, SNP, Sopraphion, Stathion, Thiofos

**Chemical Name:** Phosphorothioic acid, O,O-dilethyl O-(4-nitrophenyl) ester (CAS 56-38-2)

**Primary Use:** Insecticide

**Sample Purity:** 98.76%, 98.6%, and 99.5%

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulvous whistling-duck</td>
<td>4</td>
<td>M,F</td>
<td>12b</td>
<td>0.125–0.250</td>
</tr>
<tr>
<td>Mallard</td>
<td>24</td>
<td>M</td>
<td>3–4</td>
<td>2–40</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>2–3</td>
<td>1.90</td>
</tr>
</tbody>
</table>

*Except as noted.

*BThese birds were in active breeding condition.

#### Signs of Intoxication: Lacrimation, tachypnea, dyspnea, asynery, tenesmus, diarrhea, paresis, tremors, prostration, convulsions, opisthotonos. Mortalities occurred as soon as 30 min or as late as 13 days after single oral administration.

#### Other Toxicity Data: An estimation of the 30-day EMLD for gray partridges (n = 2) appears to be about 3.0–6.0 mg/kg per day, and that for fulvous whistling-ducks (n = 2) is about 0.01–0.02 mg/kg per day.

In 60-day feeding studies, 1.5 ppm parathion in the diet was not lethal to fulvous whistling-ducks (n = 2), but 8.0 ppm was lethal to one of the two gray partridges tested.

The calculated percutaneous LD50 for 10-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 28.3 [20.0–40.0] mg/kg. Signs observed after dermal treatment included, in addition to several of the above, penile extrusion in two of the dead birds. Mortalities occurred 3–21.5 h or 43–50 h after the initiation of treatment. When the percutaneous LD50 is compared with the acute oral LD50 for mallard drakes of similar age,
parathion appears to have a relatively low degree of percutaneous hazard in mallards.

**Notes:** For a discussion of the comparative toxicity of parathion, see Tucker and Haegele (1971).

For additional data and a discussion of the effects of age on the sensitivity of mallards to parathion, see Hudson et al. (1972).

For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

For data and discussion on the effects of parathion on eggshell thickness in mallards and coturnix, see Haegele and Tucker (1974).

Parathion-methyl: see methyl parathion
Parawet: see parathion
Partron M: see methyl parathion
Parzate: see nabam, zineb
Parzate C: see zineb
Parzate zineb: see zineb
Payze: see cyanazine
PCB's: see polychlorinated biphenyls

**PCNB**

**Alternative Names:** Avicol, Botrel, Brassicol, Folosan, Kobutol, PKhNB, quintozene, terrachlor, terraclor, Terra-Coat LT-2, Terra-Coat L-205, Tilcarex, Tri-PCNB, Tritisan

**Chemical Name:** Pentachloronitrobenzene (CAS 82-68-8)

**Primary Use:** Soil fungicide, seed dressing fungicide

**Sample Purity:** 99%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>16</td>
<td>F</td>
<td>3</td>
<td>380 (205-704)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>9</td>
<td>F</td>
<td>3-6</td>
<td>504</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Polydipsia and regurgitation (in mallards), tachypnea, wing shivers or twitching, jerkiness, shakiness, ataxia, imbalance, tremors, and spasms. Signs appeared as soon as 10 min and mortalities in mallards usually occurred between 2 and 24 h after treatment and in pheasants between 3 and 5 days after treatment. However, one pheasant died after about 3 h and one died between 10 and 12 days after treatment. Remission took up to 2 weeks.

Penchlorol: see PCP
Penlite: see sodium arsenite
Pennamine D: see 2,4-D
Penta: see PCP
Pentachlorin: see DDT
Pentacon: see PCP
Penta General Weed Killer: see PCP
Penwar: see PCP
Perfechlorin: see dimethoate
Pestox 3: see schradan
Pestox III: see schradan
PH 60-40: see difluron
Phaltan: see folpet
Phencide: see toxaphene
Phenamiphos: see Nemacur
Phenatox: see toxaphene
Phenmad: see PMA
Pherocon GM: see disparlure
Pheromone: see disparlure, granulure
Phix: see PMA

**PCP**

**Alternative Names:** Chlorophen, Dowicide G, Dowicide 7, Ontrack WE-1, penchlorol, penta, Pentacon, Penta

General Weed Killer, Penwar, Santobrite, Santophen, Sinituho, sodium pentachlorophenate, Weedone

**Chemical Name:** Pentachlorophenol (CAS 87-86-5)

**Primary Use:** Insecticide, fungicide, molluscicide, defoliant, herbicide, wood preservative

**Sample Purity:** 99.6%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>16</td>
<td>F</td>
<td>3</td>
<td>380 (205-704)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>9</td>
<td>F</td>
<td>3-6</td>
<td>504</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, tenseness, jerkiness, jitters, hyperexcitability, slow and disoriented reactions, goose-stepping ataxia, and sitting. After treatment, signs appeared as soon as 1 h in mallards and as soon as 3 days in pheasants. Remission took up to 15 days in mallards and 7 days in pheasants.

**PHORATE**

**Alternative Names:** 3911, AC-3911, American Cyanamid 3911, ENT 24042, Experimental Insecticide 3911, Granutox, L-11/6, Rampart, Thimet, timet
Chemical Name: Phosphorothioic acid, O,O-diethyl S-[ (ethylthio) methyl] ester (CAS 298-02-2)

Primary Use: Insecticide

Sample Purity: 98.8%¹ and 88%²

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog¹</td>
<td>16</td>
<td>F</td>
<td>-</td>
<td>85.2 (59.3-122)</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>0.616 (0.367-1.03)</td>
</tr>
<tr>
<td>Mallard²</td>
<td>12</td>
<td>F</td>
<td>12</td>
<td>2.55 (2.02-3.21)</td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>7.12 (4.94-10.3)</td>
</tr>
<tr>
<td>Chukar¹</td>
<td>8</td>
<td>F</td>
<td>3</td>
<td>12.8 (3.20-51.2)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, diarrhea, beesharping reflex, polydipsia, lacrimation, loss of righting reflex, immobility, irregular heart and respiratory rates, tremors, wing-beat convulsions or opisthotonos. Levels as low as 0.09 mg/kg produced signs in mallards. This was an extremely fast-acting compound on all species tested. Signs occurred in pheasants as soon as 3 min after treatment. Mortalities usually occurred between 10 min and 4 hr after treatment. Remission took up to 2 days.

Other Toxicity Data: The 30-day EMLD for the 98.8% sample for 5- to 6-month-old pheasants of both sexes (n = 12) appears to lie between 3.50 and 7.00 mg/kg per day. The resulting cumulative toxicity index is 7.12/3.50-7.00 = 1.0-2.3, indicating little or no cumulative action for phorate in pheasants.

The calculated percutaneous LD50 for the 88% sample for 1-year-old mallard hens (n = 8) after a 24-h dermal foot exposure is 203 (CL 149-276) mg/kg. Mortalities occurred between 19.5 and 24 h after the initiation of treatment. When the percutaneous LD50 is compared with the acute oral LD50 for mallards of the same age, phorate appears to have a very low degree of dermal hazard in mallards.

Notes: Acetylcholinesterase activity measurements were made on the brains of pheasant mortalities and survivors sacrificed on the day following the final dosage in the 30-day EMLD studies. When compared with their controls (n = 6, ΔpH/45 min = 1.331, s = 0.229, range = 1.299-1.366), survivors showed 58.7% inhibition (n = 6, ΔpH/45 min = 0.550, s = 0.119, range = 0.422-0.741). When compared with their controls (n = 6, ΔpH/45 min = 1.097, s = 0.068, range = 0.996-1.159), mortalities showed 96.3% inhibition (n = 6, ΔpH/45 min = 0.041, s = 0.020, range = 0.023-0.080).

PHOSPHAMIDON

Alternative Names: C-570, Dimecron, ENT 25515, ML-97, OR-1911

Chemical Name: Phosphoric acid, 2-chloro-3-(dimethylamino)-1-methyl-3-oxo-1-propenyl dimethyl ester (CAS 297-99-4)

Primary Use: Insecticide, acaricide

Sample Purity: 80%,¹ 85%²

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)¹</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>3.81 (2.91-5.00)</td>
</tr>
<tr>
<td>Sharp-tailed grouse²</td>
<td>4</td>
<td>M</td>
<td>12-24b</td>
<td>1.50-3.00</td>
</tr>
<tr>
<td>Japanese quail (st)²</td>
<td>8</td>
<td>F</td>
<td>A³</td>
<td>3.60 (1.80-7.20)</td>
</tr>
<tr>
<td>Pheasant (st)²</td>
<td>12</td>
<td>F</td>
<td>4</td>
<td>4.24</td>
</tr>
<tr>
<td>Chukar¹</td>
<td>9</td>
<td>M,F</td>
<td>3-5</td>
<td>11.8 (3.37-5.34)</td>
</tr>
<tr>
<td>Rock dove¹</td>
<td>3</td>
<td>M</td>
<td>F</td>
<td>2.11-3.66</td>
</tr>
<tr>
<td>White-winged dove (st)¹</td>
<td>8</td>
<td>M,F</td>
<td>A³</td>
<td>2.93 (2.44-3.66)</td>
</tr>
<tr>
<td>Albino rat (st)¹</td>
<td>8</td>
<td>M</td>
<td>-</td>
<td>11.0 (9.39-12.8)</td>
</tr>
<tr>
<td>Mule deer (st)¹</td>
<td>3</td>
<td>M,F</td>
<td>24-36</td>
<td>44.0-88.0</td>
</tr>
</tbody>
</table>

*Except as noted.

¹These birds may have been in breeding condition.

Signs of Intoxication: Lacrimation, foamy salivation, miosis, wing-drop, tachypnea, dyspnea, ataxia, immobility, convulsions, tetany, and opisthotonos. Signs appeared as soon as 6 min and mortalities usually occurred.
between 8 and 30 min after treatment. Remission took up to 1 day.

Other Toxicity Data: Phosphamidon applied to the scales of the legs or to the eyes of birds was rapidly toxic, but phosphamidon sprayed on dry feathers did not produce substantial intoxication.

The calculated cutaneous LD50 for the 85% sample for 1-year-old mallard hens (n = 8) after a 24-h dermal foot exposure is 26.0 (CL 5.25–129) mg/kg. Signs observed after dermal treatment included, in addition to several of those reported above, high carriage, hyporeactivity, using wings to aid pedestrian locomotion, nasal exudate, wings spread, spasms, tremors, and ataxia. Mortalities usually occurred between 5 and 24 h after the initiation of treatment; however, one hen died overnight after the end of the 24-h exposure. Remission took up to 4 days after treatment ended. When the percutaneous LD50 is compared with the acute oral LD50, phosphamidon appears to have a slight to moderate degree of dermal hazard in mallards.

A female bullfrog placed in aqueous solutions up to 250 ppm survived a 17-day exposure at the highest treatment level (250 ppm). (By way of comparison, a few nanoliters are lethal to certain crustaceans and 5 to 10 ppm are lethal to several types of fish.)

Repeated acute oral LD50 determinations with rats, using a stock 1:400 aqueous solution of phosphamidon containing 1,000 mg/L Yuma Chemical “Spreader A,” showed that the potency of the solution after 41 days was about half that of the fresh solution.

Notes: The early appearance of signs and the steepness of the acute dose-response curves (increasing dosage levels produced disproportionately large increases in the response) indicate that phosphamidon is rapidly and thoroughly taken up from the gastrointestinal tracts of birds.

For further discussion of the cutaneous toxicity data, see Hudson et al. (1979).

Phosphorodithioic acid: see ethion
Phosfenthion: see malathion
Phosvel: see leptofoh
Phosvit: see DDVP

Sample Purity: 73%

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>546</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(314-950)</td>
</tr>
<tr>
<td>Sharp-tailed</td>
<td>12</td>
<td>F</td>
<td>6</td>
<td>35.7</td>
</tr>
<tr>
<td>grouse</td>
<td></td>
<td></td>
<td></td>
<td>(25.7-49.4)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>46.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(33.8-65.0)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Polydipsia and regurgitation (in mallards), ataxia, hyperexcitability, goose-stepping ataxia, running and falling, phonation, high carriage, slowness, asthenia, wing-drop, tremors, tachypnea, dyspnea, falling, wing-best convulsions, immobility, wings spread, tetany, and opisthotonos. Treatment levels as low as 15.6 mg/kg produced toxic signs in mallards. Signs appeared as soon as 5 min and mortalities usually occurred between 30 min and 4 h after treatment; however, one mallard died 13 days after treatment. Remission took up to 20 days.

Other Toxicity Data: The 30-day EMLD for 5- to 6-month-old mallards of both sexes (n = 12) appears to be less than 2.50 mg/kg per day. The resulting cumulative toxicity index is 546/<2.50 = >218, indicating an extremely high degree of cumulative action for phoxim in mallards, even when regurgitation of acute dosages is taken into account.

Note: Gross necropsies of mortalities and sacrificed survivors of the 30-day pheasant study revealed small spleens.

Phoxime: see phoxim
Phthalophos: see Imidan
Phygon: see dichlone
Phygon XL: see dichlone
Phygon Seed Protectant: see dichlone
Phytar 560: see Silvisar-510
Phytosol: see trichloronat

PHOXIM

Alternative Names: BAY 77488, Baythion, ENT 27448, phoxime, Valoxon, Volaton

Chemical Name: 4-Ethoxy-7-phenyl-3,5-dioxo-6-aza-4-phospaoct-6-ene-8-nitrile, 4-sulfide (CAS 14816-18-3)

Primary Use: Insecticide

PICLORAM

Alternative Names: Borolin, Tordon

Chemical Name: 4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid (CAS 1918-02-1)

Primary Use: Herbicide

Sample Purity: 90.5% and Tordon 22K formulation
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mallard (st)</td>
<td>1</td>
<td>M</td>
<td>7</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation occurred soon after treatment in the mallards. Pheasants showed only mild ataxia and fasciculation following treatment.

Other Toxicity Data: Combinations of 1,000 mg/kg pirimiphos-methyl and 1,000 mg/kg D, L-dopa were not lethal to two mallard drakes.

PKhNB: see PCNB

**PLANAVIN**

Alternative Names: nitralin (proposed), SD 11831

Chemical Name: 4-(Methylsulfonyl)-2,6-dinitro-N,N-dipropyl benzenamine (CAS 4726-14-1)

Primary Use: Herbicide

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>878</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>169</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, fluffed feathers, goose-stepping ataxia, imbalance, tenseness, slowness, ataraxia, falling, withdrawal, hyporeactivity, hypoactivity, and ptosis. Signs appeared as soon as 30 min in mallards and 2.5 h in pheasants and mortalities usually occurred between 4-20 h and 2 days in mallards and between 2 and 6 days after treatment in pheasants. Remission took up to 7 days.

Other Toxicity Data: The 30-day EMLD for 5- to 6-month-old pheasants of both sexes (n = 12) appears to be greater than 18.0 mg/kg per day. The resulting cumulative toxicity index is 169/18.0 = 9.4, indicating a relatively slight degree of cumulative action for PMA in pheasants, in comparison with other mercurial pesticides.

Notes: Several interesting comparisons of mercurial toxicity are made possible by conversions of the toxicity values of mercurial compounds to toxicity figures for actual metallic mercury (Hg) in those compounds. The ethyl and methyl mercurial pesticides, when converted in this manner, show surprising similarity of toxicity. For instance, the acute oral LD50 for Ceresan L in ring-necked pheasant cocks is 1,190 mg/kg, which is equivalent to 26.8 mg/kg Hg. The acute oral LD50 for Ceresan M in pheasant hens is 160 mg/kg, which is equivalent to 11.5 mg/kg Hg. The acute oral LD50 for Panogen in pheasant cocks is 566 mg/kg, which is equivalent to 23.8 mg/kg Hg. The acute oral toxicity of Ceresan L in mallards is high because of regurgitation; however, when dosed subacutely, the total accumulation of metallic mercury that killed half of the test group was equivalent to 22.5 mg/kg Hg, which is very close to the median lethal acute dosage for pheasants. This finding indicates a high degree of cumulative action for Ceresan L (an ethyl mercury pesticide) in mallards.

A phenyl mercury compound, PMA, appears to be much less toxic, on the basis of metallic mercury, than the ethyl or methyl mercury compounds. As shown in the summary, the acute oral LD50 for PMA in pheasant hens is 169 mg/kg, which is equivalent to 101 mg/kg Hg. The group of pheasants treated with 18.0 mg/kg per day survived a total administration of 540 mg/kg PMA, which is...
equivalent to 321 mg/kg Hg. This finding indicates that PMA not only is less toxic, on the basis of metallic mercury, than ethyl or methyl mercury pesticides, but also appears to have less cumulative action.

PMAC: see PMA
PMAS: see PMA
Poison nut: see strychnine

**POLYCHLORINATED BIPHENYLS**

**Alternative Names:** Aroclor (several products), chlorinated biphenyls, PCB's

**Chemical Name:** Various polychlorinated biphenyl mixtures

**Primary Use:** Industrial, such as plasticizers, heat-exchange agents; have become widespread environmental contaminants

**Sample Purity:** Four mixtures designated Aroclor 1242, 1254, 1260, and 1268 (the last two digits of each number indicate percent chlorine in the sample)

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard1</td>
<td>3</td>
<td>M</td>
<td>8-9a</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Mallard2</td>
<td>3</td>
<td>M</td>
<td>8-9a</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Mallard3</td>
<td>3</td>
<td>M</td>
<td>8-9a</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Mallard4</td>
<td>3</td>
<td>M</td>
<td>8-9a</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Bobwhite4</td>
<td>3</td>
<td>M</td>
<td>12</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Albino rat (st)2</td>
<td>6</td>
<td>M</td>
<td></td>
<td>841</td>
</tr>
<tr>
<td>(500-1,410)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albino rat (st)4</td>
<td>10</td>
<td>M</td>
<td></td>
<td>2,000-4,000</td>
</tr>
</tbody>
</table>

*aThese drakes may have been in breeding condition.

**Signs of Intoxication:** Mallards showed no signs. Bobwhites showed jitteriness and ataxia. Rats treated with Aroclor 1254 showed ataxia, blanched retinas, ptosis, serous nasal exudate that appeared porphyrin-like, withdrawal, lack of preening. Rats treated with Aroclor 1268 showed reddish exudate on eyelids, ataxia, ptosis, possible blindness, withdrawal. Rat mortalities occurred between 4 and 7 days after treatment. Some survivors showed signs for as long as 8 days. Treatment levels as low as 100 mg/kg Aroclor 1254 produced one rat mortality.

**Other Toxicity Data:** Two male albino rats received 75 mg/kg per day of Aroclor 1268 in corn oil administered by stomach tube for 6 days; one died on the 7th day. Two male rats were similarly treated with Aroclor 1254 and both survived. In a feeding study, Aroclor 1254 at 1,000 ppm was lethal to none of six male rats by 14 days, one of five by 28 days, three of four by 43 days, and four of four by 53 days. Food consumption was reduced by 21%. A treatment level of 10 ppm produced one death in six male rats at 29 days (possibly not caused by Aroclor intake) but no further mortalities by 45 days. These feeding studies suggest that a total intake of about 500 to 2,000 mg/kg of Aroclor 1254 is the lethal level for dietary exposures of 1 to 7 weeks in rats.

**Notes:** Gross necropsies in bobwhites revealed gastrointestinal purpura in one bird and gastrointestinal hemorrhage in another.

For effects on eggshell thickness, see Haegele and Tucker (1974).

Polychlorocamphene: see toxaphene
Polyhedral virus: see nucleopolyhedral virus
Polyram-Ultra: see thiram
Polyram Z: see zineb
Pomarsol: see thiram
Pomason: see thiram

**POTASSIUM AZIDE**

**Alternative Names:** Azide, Kazide, Kazoe, PPG-101, Smite

**Chemical Name:** Potassium azide (CAS 12136-44-6)

**Primary Use:** Herbicide, fungicide, nematocide, insecticide, bactericide, growth regulator

**Sample Purity:** ≥98%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test Animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>22.8</td>
</tr>
<tr>
<td>California quail</td>
<td>15</td>
<td>M</td>
<td>9-10</td>
<td>20.8</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>15.1</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, stumbling, fluffed feathers, falling, sitting, polydipsia, and attempted regurgitation (in mallards), ptosis, ataxia, myasthenia, using wings to aid in and for pedestrian locomotion, nuation, spasms, tremors, immobility, wings spread, phonation, opisthotonos, bradypnea, dyspnea, and terminal wingbeat convulsions. Signs appeared as soon as 5 min and mortalities usually occurred between 15 min and 17 h after treatment. Remission took up to 9 days.

PP-148: see paraquat dichloride
PP-910: see paraquat dichloride
PROCESS OIL 492

Alternative Names: None found

Chemical Name: Unknown

Primary Use: Carrier; ingredient in 492 Mosquito Larvicide Oil

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>18</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, stumbling. Signs appeared on the day following treatment. Remission took up to 2 days.

Prolate: see Imidan
Propham: see IPC-400
Propoph: see ethoprop
Propoxur: see Baygon
Protex: see rotenone
Proxol: see trichlorfon
Pyramin: see allethrin

PYRETHRUM

Alternative Names: Dalmation Insect Flowers, Insect Flowers, Insect Powder, Trieste Flowers

Chemical Name: A complex of components of the flowers of Chrysanthemum cinerariaefolium, including compounds known as pyrethrins I (CAS 121-21-7) and II (CAS 121-21-9) and cinerins I (CAS 25402-06-6) and II (CAS 121-21-0)

Primary Use: Insecticide

Sample Purity: 20%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>6</td>
<td>F</td>
<td>3-4</td>
<td>&gt;10,000</td>
</tr>
</tbody>
</table>

RE-11775

Alternative Names: None found

Chemical Name: Carbamic acid, methyl(phenylthio-3-(1-methylpropyl)phenyl ester (CAS 25474-41-3)

Primary Use: Experimental mosquito larvicide and adulticide

Sample Purity: 60% Active isomer, 40% other isomers

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>7-9</td>
<td>12.8 (7.37-22.4)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>6-7</td>
<td>103 (79.2-133)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, falling, using wings to aid pedestrian locomotion, penile extrusion (in mallards), immobility, tremors, dyspnea, salivation, wing-beat con-
vulsions, and tetany. Signs appeared as soon as 5 min; mortalities usually occurred between 0.5 and 2 h after treatment. Remission took up to 2 days.

Rebelate: see dimethoate
Reddon: see 2,4,5-T
Reglene: see diquat dibromide
Resitox: see coumaphos
Restox: see coumaphos

**RESMETHRIN**

**Alternative Names:** benzoeluoline, Chryson, cismethrin, d trans isomer = bioresmethrin, FMC-17370, NIA 17370, NRDC 104, SBP-1382, Synthrin

**Chemical Name:** 2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid, [5-(phenylmethyl)-3-furanyl methyl ester (CAS 10453-86-8)

**Primary Use:** Insecticide (synthetic pyrethroid)

**Sample Purity:** ~100% (≤ 30% cis, ≥ 70% trans)

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California quail</td>
<td>3</td>
<td>M</td>
<td>5–6</td>
<td>≥2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** None.

R and H FW-293: see dicofol
Rhodiatox: see parathion
Rhothane D-3: see TDE
Riglen: see PMA
Rocup: see Airkem A-33 Dry
Rogor: see dimethoate

**RONNEL**

**Alternative Names:** Dow ET-14, Dow ET-57, Ectoral, ENT 23284, ET-14, ET-57, Etrolene, fenchlorfos, fenchlorphos, Koralon, Nankor, Trolene, Viozene

**Chemical Name:** Phosphorothioic acid, O-Dimethyl O-(2,4,5-trichlorophenyl) ester (CAS 299-84-3)

**Primary Use:** Insecticide, acaricide

**Sample Purity:** 92.5%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>≥2,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, nystagmus, dysmetria, polyuria, feathers fluffed or held tightly to body, wing-drop, neck pulled in, immobility. Regurgitation occurred at levels above 1,500 mg/kg. Signs were observed less than 1 h after single oral administration and mortalities occurred up to 5 days after treatment. Remission took up to 1 week.

Roxion: see dimethoate

**RU 11-679**

**Alternative Names:** bioethanolomethrin, ENT 27985B, French pyrethroid, NIA 24110

**Chemical Name:** 3-(Cyclopentylidenemethyl)-2,2-dimethyl-(1R-trans)-cyclopropanecarboxylic acid, [5-(phenylmethyl)-3-furanyl]methyl ester (CAS 22431-62-5)

**Primary Use:** Insecticide (synthetic pyrethroid)

**Sample Purity:** 96%, 36% in DOPC (2,6-dioctadecyl-p-cresol)
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>33</td>
<td>F</td>
<td>18</td>
<td>&gt;1,600</td>
</tr>
<tr>
<td>Mallard</td>
<td>11</td>
<td>F</td>
<td>18</td>
<td>&gt;1,600</td>
</tr>
<tr>
<td>California quail</td>
<td>16</td>
<td>F</td>
<td>9-11</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(117-165)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, polydipsia, regurgitation, tremors, wide stance, phonation, circling, spasms, tense-ness, falling, sitting, using wings for pedestrian loco-motion, loss of righting reflex, and immobility. Signs appeared as soon as 20 min and mortalities often occurred between 1.5 and 5 h after treatment.

Other Toxicity Data: Although the LD50 for the pure ma-terial in mallards is reported as >1,600 mg/kg, mortalities occurred at dosage levels as low as 200 mg/kg.

Notes: Addition of DOPC, an antioxidant, does not appear to enhance the toxicity of RU 11-679 in mallards and California quail.

Gross visual examination of the internal organs of sacrificed mallards revealed small spleens in several birds.

Ruelene: see crufomate
Rukseam: see DDT
Rumetan: see zinc phosphide
Ruphos: see dioxathion
S 276: see disulfoton
S 767: see fensulfothion
S-1102A: see fenitrothion
S 1752: see fenthion
S 4400: see trichloronat
S 5660: see fenitrothion
Salo: see 2,4-D
Santobrite: see PCP
Santophen: see PCP
Sapecn: see chlorfenvinphos
Sarolex: see Diazinon
SBP-1382: see resmethrin
SC-110: see PMA

SCHRADAN

Alternative Names: ENT 17291, octamethylpyrophosphor-amide, OMPA, Pestox III, Pestox 3, Systam

Chemical Name: Octamethylidiphosphoramid (CAS 152-16-9)

Primary Use: Systemic insecticide

Sample Purity: ≥90%

SD 7727

Alternative Names: None found

Chemical Name: 2,4-Dichlorophenol methanesulfonate (CAS 3687-13-6)

Primary Use: Experimental nematocide

Sample Purity: >95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>36.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(20.9-63.2)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(13.7-26.4)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, falling, high carriage, wing-drop, loss of righting reflex, slowness, fluffed feathers, tetany, ptosis, apnea, immobility, wing-beat convulsions, and opisthotonos. Signs appeared as soon as 17 min and mortalities occurred between 35 and 86 min in mallards and between 27 min and 4.5 days after treatment in pheasants. Remission took up to 1 week.

Scutl: see PMA
SD 3562: see dicrotophos
SD 4294: see crotodoxphos
SD 4402: see isobenzan

SD 7859: see chlorfenvinphos
SD 8447: see tetrachlorvinphos
SD 8530: see Landrin
SD 9098: see Akton
SD 9129: see monocrotophos
SD 11831: see Planavin
SD 14114: see Vendex
SD 15418: see cyanazine
SD 16898

Alternative Names: None found

Chemical Name: Acetic acid, thio-, S-cyanomethyl ester, methylcarbamoyloxime

Primary Use: Experimental insecticide, miticide

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)*</th>
<th>LD50 (95% CL) (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>9-11</td>
<td>7.55 (5.99-9.51)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>3</td>
<td>F</td>
<td>12-24</td>
<td>6.00-12.0</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>M</td>
<td>8-10</td>
<td>3.00-6.00</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>12</td>
<td>5.99 (4.32-8.31)</td>
</tr>
</tbody>
</table>

*Some birds of each species were in breeding condition.

Signs of Intoxication: Ataxia, imbalance, hyporeactivity, sitting, penile extrusion (in mallards), tremors, falling, wing-drop, wings spread, excessive swallowing, ptosis, immobility, tetany, emprosthotonos, and violent wing-beat convulsions. Signs appeared as soon as 2 min and mortalities usually occurred between 20 and 60 min after treatment. Remission had occurred by 1 day after treatment.

SD 17250

Alternative Name: thiocarboxime (proposed)

Chemical Name: (Z)-N-[((methylamino)carbonyl)oxy]ethanimidothiolic acid, 2-cyanoethyl ester (CAS 29118-87-4)

Primary Use: Experimental insecticide, miticide

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)*</th>
<th>LD50 (95% CL) (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada goose</td>
<td>12</td>
<td>M,F</td>
<td>A</td>
<td>8.99 (6.49-12.5)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>9-11</td>
<td>12.0 (9.51-15.1)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>3</td>
<td>F</td>
<td>24</td>
<td>15.0-37.9</td>
</tr>
<tr>
<td>California quail</td>
<td>31</td>
<td>M,F</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>M</td>
<td>8-10</td>
<td>4.00-8.00</td>
</tr>
</tbody>
</table>

*Except as noted. Some birds of each species were in the early stages of gonadal reproductive development.

Signs of Intoxication: Ataxia, regurgitation, imbalance, and slowness. Signs appeared as soon as 20 min and remission took up to 1 day for most birds, but one bird showed signs for up to 10 days.

Seadrin: see aldrin
Selinon: see DNOC
Sendran: see Baygon
Septene: see carbaryl
Sevin: see carbaryl
Sevin-4-Oil: see carbaryl
Shell Oil Herder: see Oil Herder
Shell Oil Herder #2: see Oil Herder #2

SD 30053

Alternative Names: None found

Chemical Name: Ethyl 2-(N-benzoyl-3,4-dichloroanilino)propiolate

Primary Use: Experimental herbicide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, imbalance, tremors, falling, immobility, penile extrusion, dyspnea, possible lacrimation, and terminal wing-beat convulsions. Signs appeared as soon as 15 min and mortalities usually occurred between 0.5 and 1 h after treatment. Remission took up to 2 days.

Other Toxicity Data: The 30-day EMLD for 5- to 6-month-old mallards of both sexes (n = 12) is 8.00 mg/kg per day. The resulting cumulative toxicity index is 12.0/8.00 = 1.5, indicating little cumulative action for SD 17250 in mallards.

Notes: The dose-response slope for California quail was extremely low; treatment levels as low as 12.0 mg/kg produced some mortalities, whereas levels as high as 67.8 mg/kg did not produce 100% mortality.

SHELL SOL 70

Alternative Names: None found

Chemical Name: A solvent composed of 98.2% paraffins and 0.9% naphthenes

Primary Use: Industrial solvent, cleansing agent for oil-soaked birds
Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (MM; st)</td>
<td>10</td>
<td>M</td>
<td>4-5</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Slowness. Signs appeared as soon as 1.5 h after treatment, and remission took up to 2 days.

Other Toxicity Data: No mortality occurred in a group of six 5-month-old mallard (MM) drakes exposed to the compound by immersion of the whole body, so the feathers were completely wetted. This manner of exposure was designed to simulate the use of the chemical for removing oil from an oil-soaked bird. Approximately 4 L of the solvent were placed in a pail; each bird was immersed, except for the head, in the solvent and the feathers were rubbed vigorously. After the bird was removed from the pail, hand pressure was applied to the feathers in an attempt to remove as much solvent from the soaked feathers as possible. Three of the six birds were then placed in an indoor pen and the other three were placed in an outdoor pen. Weather conditions in the outdoor pen during the initial period of the test were relatively severe: on the 1st and 2nd days of the test, low ambient temperature was 3.5° C; ambient temperature dropped to -1° C on the 3rd day and for the next 3 days the temperature did not rise above the freezing point—about 7-10 cm of snow was on the ground and the low ambient temperature dropped to -10° C.

Although no mortalities occurred, clinical signs of intoxication were severe. Signs included ataxia, goose-stepping ataxia, falling, sitting, backing, falling on tails, regurgitation, paresis, alternating lethargy and alertness, hyporeactivity, ataxia, possible exophthalmia, and unkemptness. Signs appeared as soon as 20 min after treatment and ataxia persisted for up to 1 day after treatment in several birds. Although the feathers were completely soaked with the solvent, there appeared to be no tendency for the feathers to become water-soaked, and before clinical signs appeared, the birds were able to swim normally and at the proper level in the water. On the day following treatment, the feathers of all birds appeared to be normal (except for a slight degree of unkemptness) and there still appeared to be no tendency for them to become water-soaked. However, 8 days after treatment it was noticed that the birds had been losing feathers, and on examination it was noted that the feathers of all birds could be plucked much more easily than normal. Breast feathers and those on the sides of the body, covering the pectoralis muscles, seemed to be the most susceptible to plucking. The epidermal surface showed moderate irritation with mild erythema and eschar formation. Three days later (11 days after treatment) there was scab formation over the irritated areas, and the feathers seemed to pluck less easily. In areas where the skin irritation was less severe, there was still eschar formation but no scab formation. Refeathering of the bare areas had progressed well by 22 days after treatment.

The three indoor birds were placed outdoors with the other three birds on the 22nd day after treatment and observation of these birds was continued for 1 year to check for signs of abnormalities that might occur during the molting period. Except for one bird, which died from causes probably not related to chemical exposure about 6 months later, the birds appeared normal throughout the observation period, and all went through the spring and fall molts successfully. All were in good plumage and all had gained about 200 g body weight when the study ended.

Shimmerex: see PMA
Short-stop E: see terbutryn
Shoxin: see norbormide
Silvanol: see lindane

SILVEX

Alternative Names: Aqua-Vex; Ded-Weed; fenoprop; Fruitone T; Garlon; Kuroen; Kuroar; Kuton; 2,4,5-TP

Chemical Name: 2-(2,4,5-Trichlorophenoxy)-propanoic acid (CAS 93-72-1)

Primary Use: Herbicide

Sample Purity: Analytical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mule deer</td>
<td>1</td>
<td>F</td>
<td>42</td>
<td>&lt;400</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Mallards—ataxia, imbalance and tremors; deer—tension, jitteriness, and anorexia. Signs appeared in mallards as soon as 45 min and remission took up to 4 days. The doe died during the night after treatment.

Notes: Gross necropsy of the dead deer revealed severely hemorrhagic small intestine, hemorrhagic abomasum, hydropneumonia, coronary band petechiation, endocardial petechiation, lungs with interstitial emphysema, and trachea and bronchi filled with fluid from the rumen.

SILVISAR-510

Alternative Names: Arsan, Phytar 560, Rad-E-Cate 35
Chemical Name: Mixture of cacodylic acid (dimethylarsinic acid) and triethanolamine cacodylate (CAS 75-60-5)

Primary Use: Herbicide, silvicide (tree killer)

Sample Purity: 54.3%, total As = 27.14% (cacodylic acid 46.0%, triethanolamine cacodylate 8.3%)

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard (st)</td>
<td>9</td>
<td>F</td>
<td>3-4</td>
<td>&gt;2,400</td>
</tr>
<tr>
<td>Chukar (st)</td>
<td>6</td>
<td>M,F</td>
<td>4</td>
<td>≥2,000</td>
</tr>
<tr>
<td>Mule deer (st)</td>
<td>1</td>
<td>F</td>
<td>15</td>
<td>&gt;320</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation and polydipsia (in mallards), ataxia, falling, using the wings to aid pedestrian locomotion, ashen face, and anorexia (in deer). Signs appeared as soon as 10 min and mortalities occurred between 1 and 2 days after treatment. Remission took up to 1 month.

Sodium fluoroacetate: see sodium monofluoroacetate

**SODIUM ARSENITE**


Chemical Name: Arseninous acid, sodium salt (CAS 7784-46-5)

Primary Use: Herbicide, insecticide

Sample Purity: 97%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog*</td>
<td>12</td>
<td>M</td>
<td>--</td>
<td>54.4 (25.6-115)</td>
</tr>
<tr>
<td>Mallard (st)*</td>
<td>20</td>
<td>M</td>
<td>3</td>
<td>9.11 (5.60-14.6)</td>
</tr>
<tr>
<td>Mallard duckling (st)</td>
<td>20</td>
<td>--</td>
<td>1 wk</td>
<td>5.97 (4.25-8.39)</td>
</tr>
<tr>
<td>Golden eagle*</td>
<td>6</td>
<td>M,F</td>
<td>--</td>
<td>3.54 (0.498-25.1)</td>
</tr>
<tr>
<td>California quail (st)</td>
<td>12</td>
<td>F</td>
<td>18</td>
<td>4.63 (2.66-8.05)</td>
</tr>
<tr>
<td>Japanese quail (st)</td>
<td>20</td>
<td>M,F</td>
<td>3b</td>
<td>12.8 (7.23-22.8)</td>
</tr>
<tr>
<td>Pheasant (st)</td>
<td>12</td>
<td>M</td>
<td>2-3</td>
<td>6.46 (3.85-10.8)</td>
</tr>
<tr>
<td>Chukar (st)</td>
<td>20</td>
<td>M,F</td>
<td>3</td>
<td>3.51 (2.58-4.78)</td>
</tr>
<tr>
<td>Turkey*</td>
<td>10</td>
<td>F</td>
<td>&lt;6</td>
<td>4.76 (1.19-19.0)</td>
</tr>
<tr>
<td>Rock dove (st)</td>
<td>12</td>
<td>M,F</td>
<td>--</td>
<td>4.24 (3.36-5.34)</td>
</tr>
<tr>
<td>Mourning dove (st)</td>
<td>13</td>
<td>M,F</td>
<td>--</td>
<td>8.55-14.6</td>
</tr>
<tr>
<td>House sparrow (st)</td>
<td>12</td>
<td>M</td>
<td>Ab</td>
<td>3.00 (2.38-3.78)</td>
</tr>
</tbody>
</table>

*These cocks were in good breeding condition.

Signs of Intoxication: Ataxia, goose-stepping ataxia, asthe-
### Test animal

<table>
<thead>
<tr>
<th>Domestic ferret</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(60)</td>
<td>8</td>
<td>M</td>
<td>~12</td>
<td>1.41 [1.00–2.00]</td>
</tr>
<tr>
<td>Mule deer</td>
<td>6</td>
<td>M</td>
<td>8–11</td>
<td>0.33–1.00</td>
</tr>
</tbody>
</table>

*Except as noted.

*These birds may have been in breeding condition.

#### Signs of Intoxication:
Respiratory, central nervous system, and muscle effects such as dyspnea, ataxia, weakness, tremors, convulsions. Ferrets additionally displayed muscular and cardiac effects, i.e., signs indicative of stimulation of the parasympathetic nervous system, including increased salivation, urination, and defecation, with eventual cardiac failure. The time between treatment and death was relatively constant in all species, from 1 h to 1 day, with few exceptions.

#### Other Toxicity Data:
The 30-day EMLD for mallards (n = 3 M, 3 F) is 0.5 mg/kg per day. The resulting cumulative toxicity index is 9.11/0.5 = 18.2, indicating a moderate to high degree of cumulative action for this species.

To determine the secondary hazard of 1080, ferrets (n = 5) were fed one white-footed mouse per ferret. The mice had been treated with sodium monooctfluoracetate at dosage levels based on the body weight of the ferret to which it was to be fed (i.e., the mice received toxicant at 1, 2, 4, or 8 mg/kg of ferret body weight). In this way, all of the offered mouse were eaten by the ferret, the ferret would receive a dosage of 1, 2, 4, or 8 mg/kg. The ferrets had been fasted 1–3 days, and were given the mice either dead or alive between 1 and 2 h after the mice had been dosed. The mice were completely consumed within 10–15 min. The only ferret that survived this treatment had received one of the two mice dosed at 2 mg/kg. Thus, it appears that sodium monooctfluoracetate has a high degree of secondary toxicity in mammals.

#### Notes:
For a discussion of the comparative toxicity of sodium monooctfluoracetate, see Tucker and Haegele (1971).

For data and discussion on the effects of age on the sensitivity of mallards to sodium monooctfluoracetate, see Hudson et al. (1972).

#### Sodium pentachlorophenate:
- see PCP

#### Solvirex:
- see disulfoton

#### Sonar:
- see fenithrothion

#### Sprathion:
- see parathion

#### Soprocid: see benzene hexachloride

#### Soxyn: see fluorodifen

#### Spectracide: see Diazinon

#### Spotracter: see thiram

#### Spreader: see Yuma Chemical “Spreader A”

---

### Spring-Bak
- see nabam

### Sprout Nip
- see CIPC

### Spud-Nic: see CIPC

### SR 73: see clonitralid

### SR 406: see captan

### SRA 5172: see methamidophos

#### STARLICIDE

#### Alternative Names: CL 47676, DRC-1339

#### Chemical Name:
3-Chloro-4-methylbenzenamine hydrochloride (CAS 7745-89-3)

#### Primary Use:
Avidice, avi-repellent

#### Sample Purity:
97%

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3–4</td>
<td>128 (102–161)</td>
</tr>
<tr>
<td>Mallard (at H₂O)</td>
<td>6</td>
<td>M</td>
<td>3–4</td>
<td>96–192</td>
</tr>
<tr>
<td>Mallard (st corn oil)</td>
<td>5</td>
<td>M</td>
<td>3–4</td>
<td>48–96</td>
</tr>
<tr>
<td>Mallard (st propylene glycol)</td>
<td>4</td>
<td>M</td>
<td>3</td>
<td>48–96</td>
</tr>
</tbody>
</table>

#### Signs of Intoxication:
Polydipsia, regurgitation, ataxia, imbalance, tremors, tail fanning, ataraxia, slowness, falling, ptosis, loss of righting reflex, tachypnea, sitting, dyspnea, using wings to aid pedestrian locomotion, and immobility. Signs appeared as soon as 10 min and mortalities usually occurred between 2 and 3 days after treatment. Remission took up to 1 month. Strong and persistent signs were produced by treatment levels as low as 6.0 mg/kg.

#### Station: see parathion

#### Staufer R-1303: see carbophenothon

#### Staufer R-1504: see Imidan

#### Stilflos: see tetrachlorvinphos

#### Strobeane-T: see toxaphene

---

### STRYCHNINE

#### Alternative Names:
- dog button, Nux vomica, poison nut,
- Quaker button, strychnine alkaloid, strychnine sulfate,
- Strychnos nux-vomica, strychnos

#### Chemical Name:
An alkaloid extract of the seeds of Strychnos nux-vomica; strychnidin-10-one (CAS 57-24-0); strychnidin-10-one, sulfate (2:1) (CAS 64-41-3)²
Primary Use: Bird and mammal control agent, rodenticide

Sample Purity: 98% N.F./strychnine alkaloid, and U.S.P. strychnine sulfate

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months*)</th>
<th>LD50 (95%CL) mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog¹</td>
<td>4</td>
<td>M</td>
<td>-</td>
<td>2.21 [1.56-3.12]</td>
</tr>
<tr>
<td>Mallard duckling²</td>
<td>20</td>
<td></td>
<td>36 h</td>
<td>2.62 (1.94-3.55)</td>
</tr>
<tr>
<td>Mallard duckling²</td>
<td>20</td>
<td></td>
<td>1 wk</td>
<td>2.00 (1.51-2.65)</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>15</td>
<td></td>
<td>1</td>
<td>5.88 (3.23-10.7)</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>16</td>
<td>M,F</td>
<td>6</td>
<td>2.83 [2.00-4.00]</td>
</tr>
<tr>
<td>Mallard¹</td>
<td>20</td>
<td>M,F</td>
<td>6</td>
<td>2.27 (1.26-4.11)</td>
</tr>
<tr>
<td>Golden eagle¹</td>
<td>3</td>
<td>M</td>
<td>-</td>
<td>4.80-8.10</td>
</tr>
<tr>
<td>Golden eagle¹</td>
<td>2</td>
<td></td>
<td>-</td>
<td>5.00-10.0</td>
</tr>
<tr>
<td>California quail¹</td>
<td>9</td>
<td>M</td>
<td>5-6</td>
<td>112 (51.6-243)</td>
</tr>
<tr>
<td>Japanese quail¹</td>
<td>24</td>
<td>F</td>
<td>28</td>
<td>22.6 (11.9-42.9)</td>
</tr>
<tr>
<td>Pheasant¹</td>
<td>12</td>
<td>M</td>
<td>12-24³</td>
<td>24.7 (14.4-42.2)</td>
</tr>
<tr>
<td>Pheasant (st)²</td>
<td>12</td>
<td>M</td>
<td>2</td>
<td>8.48 (4.11-16.3)</td>
</tr>
<tr>
<td>Chukar¹</td>
<td>8</td>
<td>M,F</td>
<td>5-7</td>
<td>16.0 (8.0-32.0)</td>
</tr>
<tr>
<td>Rock dove¹</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>21.3 (16.9-26.9)</td>
</tr>
<tr>
<td>Mourning dove (st)²</td>
<td>9</td>
<td>M,F</td>
<td>J</td>
<td>&gt;5.12</td>
</tr>
<tr>
<td>House sparrow¹</td>
<td>20</td>
<td>M</td>
<td>- d</td>
<td>4.18 (3.18-5.50)</td>
</tr>
<tr>
<td>House sparrow (st)²</td>
<td>6</td>
<td>F</td>
<td>-</td>
<td>4.00-8.00</td>
</tr>
<tr>
<td>Mule deer¹</td>
<td>5</td>
<td>F</td>
<td>8-11</td>
<td>17.0-24.0</td>
</tr>
</tbody>
</table>

*Except as noted.
Some of these hens were laying eggs.
*These cocks were in breeding condition.
*These sparrow may have been in breeding condition.

Signs of Intoxication: Feathers fluffed or held tightly against body; low or high carriage; ataxia or asynergia; fasciculation, wing-drop, tails pointed down, salivation, tremors, hyperacusis, muscle tenseness, recurring convulsions or tetanic seizures, anorexia, tachycardia, immobility, violent convulsions or opisthotonos. During the early and middle stages of intoxication, slight touch, light, or sound stimuli produced exaggerated responses and often seizures. Signs appeared as soon as 10 min and mortalities usually occurred between 1 and 5 h after treatment; however, deer mortalities occurred as late as 4 days and California quail mortalities as late as 7 days after treatment. Except in cases of delayed mortality, remission had usually occurred by several hours after treatment.

Notes: To convert strychnine alkaloid figures to strychnine sulfate figures, multiply the alkaloid figures by 1.28 (molecular weight of the sulfate + 2 + molecular weight of the alkaloid = 1.2813). If the toxicity of strychnine were proportional to the amount of alkaloid present, this factor would predict the toxicity of the sulfate from that of the alkaloid. This relation apparently does not always hold true, as can be seen by comparing the LD50’s for pheasants with the two formulations.

For a discussion of the comparative toxicity of strychnine, see Tucker and Haegele (1971).

Strychnine alkaloid: see strychnine
Strychnine sulfate: see strychnine
Strychnos: see strychnine
Streptos nux-vomica: see strychnine
Subitex: see dinoeseb
Substituted naphthalenes: see Panasol AN-2
Sulfox-Cide: see sulfoxide

SULFOXIDE

Alternative Names: ENT 16634, n-octyl sulfoxide of isosafrole, Sulfox-Cide, sulfoxyl

Chemical Name: 5-[2-(octysulfiny1)propyl]-1,3-benzodioxole
(CAS 120-62-7)

Primary Use: Pesticide synergist

Sample Purity: 88%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>3-4</td>
<td>&gt;2.000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Weakness, goose-stepping ataxia, ataxia, occasional stumbling or falling, wings held very high on body. Signs were seen as soon as 25 min after treatment and persisted for up to 14 days.

Sulfoxyl: see sulfoxide
Sumithion: see fenitrothion
Sumitomo: see fenitrothion
Sunclide: see Baygon
Supona: see chlorfenvinphos
Supracide: see methidathion
Su Seguro Carpider: see trifluralin
Sultan: see butylate
Synklor: see chlordane
Synthetic 3956: see toxaphene
Synthrin: see resmethrin
Systam: see schradan
Systemox: see demeton
Systox: see demeton

### 2,4,5-T


**Chemical Name:** 2,4,5-Trichlorophenoxyacetic acid (CAS 93-76-5)

**Primary Use:** Herbicide

**Sample Purity:** Assumed technical grade

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1,467-2,725)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>4</td>
<td>F</td>
<td>3</td>
<td>500-1,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>6</td>
<td>F</td>
<td>7</td>
<td>&gt; 1,000</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, polydipsia and regurgitation (in mallards), goose-stepping ataxia, geotaxia, hypovolality, withdrawal, and slowness. Signs appeared as soon as 20 min in mallards and 1 day in pheasants and mortalities occurred between 3 and 24 h after treatment. Remission took up to 3 days.

T-2: see TBA
Tag Fungicide: see PMA
Tag HL 331: see PMA
Tamaron: see methamidophos
Taterpex: see CIPC

### TBA

**Alternative Names:** Benzabor, Benzac, Benzac 1281, Fen-Ail, HC-1281, T-2, TCB, Tribac, trichlorobenzoic acid, Tryben 200, Zobar

**Chemical Name:** 2,3,6-Trichlorobenzoic acid (CAS 50-31-7)

**Primary Use:** Herbicide

**Sample Purity:** 98.9% 2,3,6-TBA (60.7%); 2,3,4-TBA (9.3%); 2,4,5-TBA (26.3%); 2,4,6-TBA (2.6%); tetra-chlorobenzoic acids (0.8%); and dichlorobenzoic acids (0.3%)

#### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>20</td>
<td>M,F</td>
<td>1 wk</td>
<td>&gt; 0.108</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>16</td>
<td>M</td>
<td>7</td>
<td>0.0150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0099–0.0245)</td>
</tr>
<tr>
<td>Ringed turtle-dove</td>
<td>30</td>
<td>M</td>
<td>A</td>
<td>&gt; 0.810</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Regurgitation, polydipsia, anorexia, hypovolality, slowness, emaciation, asthenia, ataxia, imbalance, sitting, fluffed feathers, hyperexcitability, jitteriness, huddled position, unkempt, falling, hyporeactivity, tremors, spasms, convulsions, and immobility. Regurgitation appeared as soon as a few minutes after treatment, but other signs of intoxication did not appear until 7 days after treatment. Mortalities occurred...
between 13 and 37 days after treatment. Remission in survivors had apparently occurred by 30 days after treatment.

Notes: Gross necropsies of the sacrificed ringed turtle-dove survivors revealed enlarged livers; livers from the dosage level of 0.108 mg/kg were twice the size of those from control birds. Necropsies of the dead bobwhite revealed severe emaciation, visceral uration, and accumulation of fluids in the pericardium and abdominal cavity.

TCDS: see tetradifon
TD-480: see hexaflurate

**TDE**

**Alternate Names:** DDD, dichloro diphenyl dichloroethane, ENT 4225, ME-1700, Rhothane D-3, tetrachlorodiphenylethane

**Chemical Name:** 1,1′- (2,2-Dichloroethylidene) bis[4-chlorobenzene] (CAS 72-54-8)

**Primary Use:** Insecticide, mosquito larvicide and adulticide

**Sample Purity:** ≥95%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>California quail</td>
<td>4</td>
<td>F</td>
<td>6</td>
<td>&gt;760</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>386 (270-551)</td>
</tr>
</tbody>
</table>

**Signs of Intoxication:** Ataxia, imbalance, hyperexcitability, tenseness, jerkiness, shakiness, slowness, hypoactivity, huddled position, ptosis, tremors, and ataraxia. Signs appeared as soon as 2 h and mortalities usually occurred between 1 and 5 days after treatment. Remission took up to 11 days.

**Testion:** see tetradifon
**Testion V-18:** see tetradifon
**Tekwaisa:** see methyl parathion
**TEL:** see tetrahydroxin
**Telodrin:** see isobenzan

**TEMEPHOS**

**Alternate Names:** abaphos, Abate, Abathon, AC-52160, Biothion, Difenfos, ENT 72165, Experimental Insecticide 52160, Nimitox, tetrafenphos

**Chemical Name:** Phosphorothioic acid O,O′-(thiodi-4,1-phenylene) O,O′,O′-tetramethyl ester (CAS 3383-96-8)

**Primary Use:** Insecticide

**Sample Purity:** 92%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>3</td>
<td>F</td>
<td>—</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Mallard</td>
<td>16</td>
<td>M</td>
<td>4-7</td>
<td>79.4 (38.5-163)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>6</td>
<td>18.9 (15.0-23.8)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>12</td>
<td>M</td>
<td>2b</td>
<td>84.1 (60.6-116)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>10</td>
<td>F</td>
<td>3-4</td>
<td>35.4 (25.5-49.0)</td>
</tr>
<tr>
<td>Chukar</td>
<td>9</td>
<td>M,F</td>
<td>2-3</td>
<td>240 (110-321)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>16</td>
<td>M,F</td>
<td>—b</td>
<td>50.1 (16.7-150)</td>
</tr>
<tr>
<td>House sparrow</td>
<td>16</td>
<td>F</td>
<td>A&lt;sup&gt;b&lt;/sup&gt;</td>
<td>35.4 (8.85-141)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Except as noted.
<sup>b</sup>Some of these birds may have been in breeding condition.

**Signs of Intoxication:** Asthenia, ataxia, low carriage, fluffed feathers, fasciculation, tremors, salivation, lacrimation, tracheal congestion, miosis, muscular weakness, tachycardia, tachypnea, tetany, immobility. Penile extrusion occurred in one mallard. Signs appeared as soon as 5 min and mortalities usually occurred between 1 and 24 h after treatment; however, one mallard died 15 days after treatment. Remission in survivors took up to 2 weeks. Treatment levels as low as 10 mg/kg produced signs and 12.5 mg/kg produced deaths.

**Other Toxicity Data:** The 30-day EMLD for mallards (n = 22) is 2.5 mg/kg per day for both sexes. The resulting cumulative toxicity index is 79.4/2.5 = 32, indicating a high degree of cumulative action for an organophosphate.

**Notes:** Dose-response slopes in acute oral tests were low (increasing dosage levels did not produce proportional increases in the response), which may indicate poor absorption of single doses.

For a discussion of the comparative toxicity of temephos, see Tucker and Haegerle (1971).

**Temik:** see aldicarb
**Tendex:** see Baygon
**Ten-eighty:** see sodium monofluoroacetate
Tenoran: see chloroxuron
TEP: see TEPP

**TEPA**

**Alternative Names:** aphoxide, APO, ENT 24915

**Chemical Name:** 1,1',1''-Phosphinyldyne-trisaziridine (CAS 545-55-1)

**Primary Use:** Chemosterilant, insecticide

**Sample Purity:** 72.5%

### Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfrog</td>
<td>8</td>
<td>M</td>
<td>-</td>
<td>500 (250-1,000)</td>
</tr>
<tr>
<td>Canada goose</td>
<td>12</td>
<td>M,F</td>
<td>-</td>
<td>13.0 (9.08-18.6)</td>
</tr>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>8.54 (6.16-11.8)</td>
</tr>
<tr>
<td>Japanese quail</td>
<td>16</td>
<td>F</td>
<td>2a</td>
<td>&gt;20.0 (22.0-40.5)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>6</td>
<td>F</td>
<td>3-4</td>
<td>29.9 (22.0-40.5)</td>
</tr>
<tr>
<td>Chukar</td>
<td>12</td>
<td>M,F</td>
<td>2-4</td>
<td>63.9 (48.8-83.8)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>12</td>
<td>M,F</td>
<td>- b</td>
<td>=30.0 (10.0-18.2)</td>
</tr>
<tr>
<td>Red-winged blackbird</td>
<td>8</td>
<td>M</td>
<td>-</td>
<td>13.5 (10.0-18.2)</td>
</tr>
<tr>
<td>House finch</td>
<td>16</td>
<td>M</td>
<td>- b</td>
<td>=100</td>
</tr>
</tbody>
</table>

*a These hens were all laying eggs.
*b These birds may have been in breeding condition.

**Signs of Intoxication:** Ataxia, wing-drop, tachypnea, dyspnea, nutrition, tremors (the house finches raised their wings slowly above their head when disturbed), ataxia or prostration, repeated wing-beat convulsions. Signs appeared as soon as 25 min and mortalities occurred 4 h to 10 days after treatment. Remission took up to 12 days.

**Other Toxicity Data:** The calculated percutaneous LD50 for 1-year-old mallard drakes (n = 8) after a 24-h foot exposure is 64.0 (CL 28.7-142) mg/kg. In addition to many of the above, signs observed after percutaneous exposure to TEPP included ataxia, imbalance, slowness, fluid exuding from nares, spasms, wings spread, and immobility. Mortalities occurred between 2.5 and 25.5 h after initiation of treatment. When the percutaneous LD50 is compared with the acute oral LD50, TEPP appears to have a low degree of dermal hazard in mallards.

**Note:** For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

**TERBUTRYN**

**Alternative Names:** GS-14260, Igran, Igran 50, prebane, Short-stop E

**Chemical Name:** N-(1,1-dimethyl-ethyl)-N'-ethyl-6-(methyl-thio)-1,3,5-triazine-2,4-diamine (CAS 886-50-0)

**Primary Use:** Herbicide

**Sample Purity:** 97.8%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>4</td>
<td>F</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Polydipsia, regurgitation, ataxia, imbalance, sitting, and tremors. Signs were observed only in mallards and appeared as soon as 19 min after treatment. Remission took up to 10 days. No mortalities occurred.

**TERGITOL 12-P-6**

Alternative Names: None found

Chemical Name: Unknown

Primary Use: Emulsifier, ingredient in 492 Mosquito Larvicide Oil

Sample Purity: Technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>F</td>
<td>18</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia and imbalance. Signs appeared as soon as 2 h after treatment. Remission had occurred by 1 day after treatment.

Terpenes: see Thanite
Terpinyl thiocyanatoacetate: see Thanite
Terrachlor: see PCNB
Terrachlor-Super X: see Terrazole
Terraclor: see PCNB
Terra-Coat L-205: see PCNB, Terrazole
Terra-Coat LT-2: see PCNB
Terracur P: see fensulfothion

**TERRAZOLE**

Alternative Names: OM 2424, Terrachlor-Super X, Terra-Coat L-205, Truban

Chemical Name: 5-Ethoxy-3-(trichloromethyl)-1,2,4-thiadiazole (CAS 2593-15-9)

Primary Use: Fungicide

Sample Purity: 95%

**TETRARADIFON**

Alternative Names: ENT 23737, Duphar, NIA 5488, TCDS, tedion, Tedion V-18, V-18

Chemical Name: 1,2,4-Trichloro-5-[(4-chlorophenyl)sulfonfonyl]benzene (CAS 116-29-0)

Primary Use: Insecticide, acaricide

Sample Purity: 99.4%
Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>3</td>
<td>M</td>
<td>4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Ataxia, wing twitching, imbalance, and slowness. Signs appeared as soon as 1 h after treatment. Remission had occurred by the day following treatment.

TETRAETHYLLEAD

Alternative Names: lead, tetraethyl; lead tetraethide; TEL

Chemical Name: Tetraethyl-plumbane (CAS 78-00-2)

Primary Use: Gasoline additive

Sample Purity: Commercially pure

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>24</td>
<td>M</td>
<td>12</td>
<td>458 (324–649)</td>
</tr>
<tr>
<td>Mallard (st)</td>
<td>24</td>
<td>M</td>
<td>12b</td>
<td>308 (237–400)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>12b</td>
<td>546 (313–950)</td>
</tr>
<tr>
<td>Ring-billed gull</td>
<td>9</td>
<td>M,F</td>
<td>1</td>
<td>250 (170–368)</td>
</tr>
</tbody>
</table>

*These cocks may have been in breeding condition.

Signs of Intoxication: Polydipsia, regurgitation, reluctance to leave the swimming pond (in mallards), shakiness, hypoactivity, wing-drop, wings spread, ataxia, imbalance, geotaxis, slowness, running and falling, sitting, reluctance to move, fluffed feathers, ptosis, ataxia, asthenia, mydriasis, tremors, and anorexia. Regurgitation in mallards occurred as soon as 7 min, other signs appeared as soon as 20 min, and mortalities usually occurred between 1 and 4 days after treatment. Remission took up to 8 days.

Note: For data and discussion on the effects of tetraethyllead on eggshell thickness in mallards and Japanese quail, see Haegele and Tucker (1974).

Tetraethylpyrophosphate: see TEPP
Tetrafenphos: see temephos
Tetrasodium ethylene diamine tetraacetate: see Airkem A-33 Dry
Teton-100: see TEPP

TFM (TFM recrystallized by Aldrich Chemical Co.), TFM-FG (field grade TFM)

Chemical Name: 4-Nitro-3-(trifluoromethyl)phenol (CAS 88-30-2)

Primary Use: Lampricide

Sample Purity: >96% (TFM-A), 35% in dimethyl formamide (TFM-FG)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>24</td>
<td>M</td>
<td>12</td>
<td>458 (324–649)</td>
</tr>
<tr>
<td>Mallard (st)</td>
<td>24</td>
<td>M</td>
<td>12b</td>
<td>308 (237–400)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>12b</td>
<td>546 (313–950)</td>
</tr>
<tr>
<td>Ring-billed gull</td>
<td>9</td>
<td>M,F</td>
<td>1</td>
<td>250 (170–368)</td>
</tr>
</tbody>
</table>

*Except as noted.

These birds may have been in breeding condition.

Signs of Intoxication: Polydipsia, regurgitation, stumbling, tachypnea, sitting, ataxia, ataxia, imbalance, myasthenia, running and falling, withdrawal, dyspnea, wing-drop, wings spread, tonic convulsions, tetanic seizures, and terminal wing-beat convulsions and opisthotonos. The timing of the appearance of signs and mortalities was different for the two formulations. With TFM-A signs appeared as soon as 13 min and mortalities usually occurred between 20 and 50 min after treatment. Remission took up to 7 or 8 days. With TFM-FG signs appeared as soon as 1 min and mortalities usually occurred between 4 and 20 min after treatment. Remission took up to 4 h.

Other Toxicity Data: Mallards 8 weeks old (5 M and 5 F per treatment group) were exposed to TFM-A in their drinking and swimming water at concentrations of 5.0, 15.8, 50.0, and 500 mg/L for 48 h. No mortalities occurred but clinical signs were apparently induced at the 50.0 mg/L level and the 500 mg/L level caused rejection of the treated water.

Mallards 1 year old (n = 5 M and 5 F per treatment group) were exposed to TFM-FG in their drinking and swimming water at concentrations of 57.1 and 285.7 mg/L (20.0 and 100 mg/L active TFM) for 48 h. No mortalities occurred and clinical signs of intoxication were slight.
A combination of TFM-FG and clonitralid was administered to mallard drakes (n = 24), bobwhite cocks (n = 24), and male and female ring-billed gulls (n = 24). Results were similar to those after administration of TFM-FG alone. Mallards 4 months old (n = 15 M and 15 F) were exposed to the mixture in their drinking and swimming water with results similar to the studies of TFM-FG alone. In these combination studies, the ratio of TFM to clonitralid was 98:2; the mixture thus contained 34.3% active TFM and 0.7% active clonitralid.

Notes: On the basis of active ingredients, it appears that TFM-FG is more toxic to mallards than TFM-A. This finding can be explained as a synergistic effect contributed by the dimethylformamide carrier, which probably speeds the absorption of TFM in the gastrointestinal tract either by affecting the membranes lining the tract or by acting as a solvent for the TFM.

For further discussion of these data, see Hudson (1979).

TFM-A: see TFM
TFM-FG: see TFM
TH-6040: see difluron

**THALLIUM SULFATE**

**Alternative Names:** Zelio

**Chemical Name:** Thallous sulfate (CAS 7446-18-6)

**Primary Uses:** Rodenticide, insecticide bait ingredient, mammal control agent

**Sample Purity:** 99% (80.2% Thallium)

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12 M</td>
<td>3</td>
<td>36.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(28.3-47.5)</td>
<td></td>
</tr>
<tr>
<td>Golden eagle</td>
<td>4</td>
<td>-</td>
<td>1</td>
<td>60.0-120</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12 M</td>
<td>3-4</td>
<td>23.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(17.1-32.9)</td>
<td></td>
</tr>
</tbody>
</table>

*Except as noted.

**Signs of Intoxication:** Polydipsia, regurgitation, ataxia, imbalance, high carriage, slowness, goose-stepping ataxia, myasthenia, asthenia, hypoaactivity, hopping and falling, wing-drop, immobility, and loss of righting reflex. Signs appeared as soon as 15 min and mortalities usually occurred between 1 and 7 days after treatment. Remission took up to 20 days.

**Notes:** For a more complete presentation of the toxicological data for the eagle studies, and results of residue analyses performed on the eagle mortalities, see Bean and Hudson (1976).

Gross necropsies of mallard and pheasant mortalities revealed consistent incidences of severe visceral uration (especially of the Glisson’s capsule and the pericardium), pericardium adhering to the heart, hyperemia and purpura of the gastrointestinal tract, sloughing of the lining of the gastrointestinal tract, coronary band petechiation, and small spleens.

**THANITE**

**Alternative Names:** ENT 92, terpinyl thiocyaanoacetate

**Chemical Name:** 82% Exo-acetic acid, thiocyanato-, 1,7,7-trimethylbicyclo[2.2.1] hept-2-yl ester and 18% related terpenes (CAS 115-31-1)

**Primary Use:** Insecticide, experimental piscicide

**Sample Purity:** 100%

**Acute Oral Toxicity Summary**

<table>
<thead>
<tr>
<th>Test animal</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>M</td>
<td>12a</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

*These drakes may have been in breeding condition.

**Signs of Intoxication:** Polydipsia, regurgitation, ataxia, goose-stepping ataxia, jerking, reluctance to rise and move, falling, unkemptness, using wings to aid pedestrian locomotion, emaciation, and asthenia. Signs appeared 1 day after treatment in mallards and 7 days after treatment in pheasants. No mortalities occurred. Remission took up to 20 days.

Thiflor: see endosulfan
Thimer: see thiram
Thimet: see phorate
Thimul: see endosulfan
Thiobarboxime: see SD 17250
Thiodan: see endosulfan
Thiodemeton: see disulfoton

**THIONAZIN**

**Alternative Names:** AC-18133, American Cyanamid 18133, Cynem, EN-18133, ENT 25580, Experimental Nematocide 18133, Nemafo, Nemaphos, Nenopos, Zeno

**Chemical Name:** Phosphorothiolic acid, O,O-diethyl O-pyrazinyl ester (CAS 297-97-2)
Primary Use: Nematocide, soil insecticide, fungicide
Sample Purity: 95.6%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>1.68 (1.21–2.33)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3–4</td>
<td>2.11 (1.68–2.66)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Regurgitation and polydipsia (in mallards), ataxia, imbalance, running and falling, sitting, miosis, masseter tenseness, lacrimation, using wings for pedestrian locomotion, dyspnea, wings spread, tremors, ashenia, tonic convulsions, tetanic seizures, wing-beat convulsions and opisthotonus. Signs appeared as soon as 5 min and mortalities usually occurred between 10 and 80 min after treatment. Remission had usually occurred by 2 days after treatment.

Other Toxicity Data: The calculated percutaneous LD50 for 10-month-old mallard drakes (n = 8) after a 24-h dermal foot exposure is 7.07 [CL5.00–10.0] mg/kg. Penile extrusion was noted in mortalities; otherwise, signs after dermal treatment were similar to those reported above. Mortalities usually occurred between 1 and 19 h after the initiation of treatment; however, one drake died 4 days after the initiation of treatment. Remission took up to 5 days. When the percutaneous LD50 is compared with the acute oral LD50, thionazin appears to have a moderate degree of dermal hazard in mallards.

Note: For further discussion of the percutaneous toxicity data, see Hudson et al. (1979).

Thionex: see endosulfan
Thiophal: see folpet
Thiophos: see parathion
Thiosan: see thiram
Thiotex: see thiram

THIRAM


Chemical Name: Thio peroxydicarbonic diamide ((H2N)C(S)2S), tetramethyl (CAS 137-26-8)

Primary Use: Fungicide
Sample Purity: ≥99%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>F</td>
<td>3</td>
<td>&gt;2.800</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3–4</td>
<td>673 (485–932)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Mallards showed transient ataxia only. Pheasants showed tachypnea, wing-drop, reluctance to move, fluffed feathers, ptosis, diarrhea, tremors like those produced by chlorinated organic compounds, immobility.

Thiramad: see thiram
Thirasan: see thiram
Thuricide: see Bacillus thuringiensis (Berliner)
Thylate: see thiram
Tiezene: see zineb
Tiguvon: see fenithion
Tilcarex: see PCNB
Timet: see phorate
Tirampa: see thiram
TMTD: see thiram
TMTDS: see thiram
Tordon: see picloram
Tormona: see 2,4,5-T
Torque: see Vendex
Toxakil: see toxaphene

TOXAPHENE

Alternative Names: Alitrex, campechloor, chlorinated camphene, Clor Chem T-590, Compound 3956, ENT 9735, Hercules 3956, Motox, octachlorocamphene, Phenacide, Phenatox, polychlorocamphene, Strobane-T, Synthetic 3956, Toxakil

Chemical Name: Chlorinated camphenes (CAS 8001-35-2)

Primary Use: Insecticide

Sample Purity: 90%¹ and 100%² (100% = 67–69% total chlorine content)

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulvous whistling-duck¹</td>
<td>8</td>
<td>M</td>
<td>3–6</td>
<td>99.0 (37.2–264)</td>
</tr>
</tbody>
</table>
Bovinox, Cekufon, chlorofos, chlorophos, Chlorophos, Danex, dipterex, Dipterex, Diptetes, Dylox, ENT 19763, Equino-Aid, metrifonate, Neguvon, Proxol, trichloro- fon, trichlorphon, trichlorphon, Trinex, Tugon

Chemical Name: Phosphonic acid, (2,2,2-Trichloro-1-hydroxyethyl)-dimethyl ester (CAS 52-68-6)

Primary Use: Insecticide

Sample Purity: 98%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95% CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>M</td>
<td>3-4</td>
<td>36.8 (26.6-51.1)</td>
</tr>
<tr>
<td>Bobwhite</td>
<td>6</td>
<td>M</td>
<td>10b</td>
<td>22.4 (13.3-37.6)</td>
</tr>
<tr>
<td>California quail</td>
<td>12</td>
<td>F</td>
<td>9-11b</td>
<td>59.3 (47.1-74.7)</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>4</td>
<td>95.9 (76.1-121)</td>
</tr>
<tr>
<td>Rock dove</td>
<td>9</td>
<td>M,F</td>
<td>A</td>
<td>123 (78.1-195)</td>
</tr>
<tr>
<td>Ringed turtle-dove</td>
<td>8</td>
<td>F</td>
<td>A</td>
<td>32.0 (26.9-38.0)</td>
</tr>
</tbody>
</table>

TRICHLORONAT

Alternative Names: Agrisil, Agrotux, BAY 37289, ENT 25712, fenophosphon, Phytosol, S 4400, trichloronate

Chemical Name: Ethyl phosphonothioic acid, O-ethyl O-(2,4,5-trichlorophenyl) ester (CAS 327-98-0)
Primary Use: Insecticide

Sample Purity: 98%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 95%CL (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3–4</td>
<td>12.0 (8.65–16.6)</td>
</tr>
</tbody>
</table>

Signs of Intoxication: High carriage, neck tremors, goose-stepping ataxia, salivation, nivation, dyspnea, prostration with wings spread, tetany. Signs appeared as soon as 20 min and recovery among survivors took as long as 28 days. Mortalities usually occurred between 2 and 4 h after treatment. Levels as low as 5.66 mg/kg produced some mortality. Weight losses occurred among survivors.

Trichloronate: see trichloronat
Trichlorophen: see trichlorophen
Trichlorpyrophos: see chlorpyrifos
Tri-Endothal: see endothall
Trieste Flowers: see pyrethrum

TRIFLURALIN

Alternative Names: Elancolan, ENT 28203, L-36352, Lilly 36352, Su Seguro Carpidor, Trefanocide, Treficon, Treflan, Triflurex, Trifl

Chemical Name: 2,6-Dinitro-N,N-dipropyl-4-(trifluoro-methyl) benzenamine (CAS 1582-09-8)

Primary Use: Herbicide

Sample Purity: 96.7%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>3–4</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Very mild ataxia only.

Triflurex: see trifluralin
Trifocide: see DNOC
Triherbicide-CIPC: see CIPC
Triherbicide-IPC: see IPC-400
Trijm: see trifluralin
Trimeton: see dimethoate
Trinex: see trichlorfon

Trinoxol: see 2,4,5-T
Trioxone: see 2,4,5-T
Tri-PCNB: see PCNB
Tripomol: see thiram
Trihetion: see carbophenothion
Trihsoan: see PCNB
Triothoril: see zineb
Trolene: see ronnel
Truban: see Terrazole
Tryphen 200: see TBA
Tuads: see thiram
Tuba: see rotenone
Tubaxin: see rotenone
Tuberite: see IPC-400
Tugon: see trichlorfon
U-2069: see dicrolan
UC 7744: see carbaryl
UC 21149: see aldicarb
Ultradic: see methidathion
Ultradic Geigy: see methidathion
Unden: see Baygon
V-18: see tetradifon
Valexon: see phoxim
Vancide 95RE: see captan
Vancide PA: see CHE 1843
Vancide TM-95: see thiram
Vancide TM-Flowable: see thiram
Vapona: see DDVP
Vapotone: see TEPP
V-C9-104: see ethrop
VCS 506: see leptophans
Vegaben: see chloramben
Vegiben: see chloramben
Velsicol 104: see heptachlor
Velsicol 1068: see chlordane

VENDEX

Alternative Names: ENT 27738, neostanox (proposed), SD 14114, Torque

Chemical Name: Hexakis(2-methyl-2-phenylpropyl)dianthenoxane (CAS 13356-08-6)

Primary Use: Miticide

Sample Purity: >95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>7</td>
<td>F</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>M</td>
<td>3</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: Mallards—ataxia, stumbling, phona-
tion, imbalance, geotaxis, slowness, asthenia, and myasthenia. Signs appeared as soon as 25 min after treatment, and remission took up to 21 days. No mortalities occurred. No signs were observed in pheasants.

Verbigen: see chloramben
Vergemaster: see 2,4-D
Vertron 2D: see 2,4-D
Viozene: see rotenone
Viral pesticide: see nucleopolyhedral virus
Visko-Rhap Low Volatile 4L: see 2,4-D
Volaton: see phoxim
Voncaptan: see captan
Vonduron: see diuron
Warbex: see famphur
Weed-Ag-Bar: see 2,4-D
Weedar: see 2,4,5-T
Weedar 64: see 2,4-D
Weedazol: see amitroli
Weed-B-Gon: see 2,4-D
Weedex Wonder Bar: see 2,4-D
Weedol: see paraquat dichloride
Weedone: see 2,4-D; PCP; 2,4,5-T
WHO OMS-711: see aldicarb
WL 19805: see cyanazine
Wofatoo: see methyl parathion
Y-2: see IPC-400
Y-3: see CIPC
Yomesan: see clonitralid

YUMA CHEMICAL "SPREADER A"

Alternative Names: film extender, spreader

Chemical Name: Unknown

Primary Use: As substance which increases the area that a given volume of liquid will cover on a solid or on another liquid, used in pesticide applications

Sample Purity: Assumed technical grade

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chukar (st)</td>
<td>2</td>
<td>-</td>
<td>3-4</td>
<td>1,000-10,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: None observed. The only mortality occurred between 23 and 43 h after treatment.

Z-78: see zineb
Zeboxx: see zineb
Zectran: see mexacarbate
Zectran (acylated): see mexacarbate (acylated)
Zello: see thallium sulfate

Zinophos: see thionazin
Zephran chloride: see Airkem A-33 Dry
Zerdane: see DDT
Zidan: see zineb

ZINC PHOSPHIDE

Alternative Names: Kilrat, Mous-con, Rumetan

Chemical Name: Zinc phosphide (CAS 1314-84-7)

Primary Use: Rodenticide

Sample Purity: 94%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>12</td>
<td>F</td>
<td>3-4</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(11.8-108)</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>2</td>
<td>-</td>
<td>12</td>
<td>&gt;20.0</td>
</tr>
<tr>
<td>Pheasant</td>
<td>12</td>
<td>M</td>
<td>3</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(11.4-23.7)</td>
</tr>
<tr>
<td>Horned lark (st)</td>
<td>9</td>
<td>M,F</td>
<td>A&lt;sup&gt;b&lt;/sup&gt;</td>
<td>47.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(13.0-172)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Except as noted.
<sup>b</sup>These birds may have been in breeding condition.

Signs of Intoxication: Polydipsia and regurgitation (in mallards), ataxia, imbalance, anorexia, tenseness, hyporeactivity, hyporeactivity, tachypnea, dyspnea, ptosis, and immobility. Signs appeared as soon as 15 min and mortalities usually occurred between 2 and 21 h after treatment. Remission took up to 1 month.

ZINEB


Chemical Name: [1,2-Ethanediylbis(carbamothioate)] (2-)zinc (CAS 12122-67-7)

Primary Use: Fungicide

Sample Purity: 95%

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>M</td>
<td>11-12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>&gt;2,000</td>
</tr>
<tr>
<td>Pheasant</td>
<td>3</td>
<td>F</td>
<td>3-4</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

<sup>a</sup>These drakes may have been in breeding condition.
Signs of Intoxication: Goose-stepping ataxia, wings crossed over back, general myasthenia from 1 h up to 1 or 2 days.

Zinophos: see thionazin
Zinosan: see zineb
Zobar: see TBA
ZR-515: see methoprene
17/147: see azinphos-methyl

492 MOSQUITO LARVICIDE OIL

Alternative Names: None found

Chemical Name: Mixture of Armeen OD, Tergitol 12-P-6, and Process Oil 492

References

American Ornithologists' Union. 1982. Thirty-fourth supplement to the American Ornithologists' Union check-list of North American birds. Supplement to The Auk:99(3)1ce–16ce.


Primary Use: Mosquito control (pre-imago stage)

Sample Purity: 100%—1% Tergitol 12-P-6 and 0.5% Armeen OD in Process Oil 492

Acute Oral Toxicity Summary

<table>
<thead>
<tr>
<th>Test animal</th>
<th>No.</th>
<th>Sex</th>
<th>Age (months)</th>
<th>LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>6</td>
<td>F</td>
<td>18</td>
<td>&gt;2,000</td>
</tr>
</tbody>
</table>

Signs of Intoxication: None.

666: see benzene hexachloride
1080: see sodium monofluoroacetate
3911: see phorate
8167 RP: see ethion


Hudson, R. H. 1979. Toxicities of the lampricides 3-trifluoroethyl-4-nitrophenol (TFM) and the 2-aminoethanol salt of 2',5-dichloro-4'-'nitrosallycyanilide (Bayer 73) to four bird species. U.S. Fish Wildl. Serv., Invest. Fish Control 89. 5 pp.


Weil, C. S. 1952. Tables for convenient calculation of median-effective dose (LD50 or ED50) and instructions in their use. Biometrics 8:249–263.

Glossary

Aggressiveness—Loss of fear of the investigator, abnormal belligerence toward the investigator or other individuals in the test group

Anorexia—Loss of appetite, not eating food

Apnea—Cessation of breathing

Asthenia—Weakness, debility

Asynergy—Lack of coordination between muscle groups; movements are in serial order instead of being made together

Ataraxia—Imperturbability, calmness

Ataxia—Muscular incoordination, especially when voluntary muscular movements are attempted

Bradycardia—Slow heart beat

Bradynea—Slow breathing

Catatonia—Stupor, tendency for an animal to assume and remain in a fixed posture, characterized by extreme unresponsiveness and inactivity

Clonic convulsions—Alternate relaxation and involuntary contractions of muscles

Coma—Abnormal deep stupor; the animal cannot be roused by stimulation

Convulsions—Massive involuntary muscle contractions

Debility—Weakness of tonicity in functions or organs of the body

Diarrhea—Discharge of more or less fluid feces

Dyspnea—Shortness of breath, labored breathing

Edema—Swelling

Emaciation—Wasting of the flesh, state of being extremely lean

Emprosthotonos—Lying with the body incurved, arching of the neck toward the belly

Eosinophilia—Excessive eosinophiles in differential white blood cell counts

Epistaxis—Nose bleed

Erythema—Redness of the skin due to dilation of blood vessels

Eschar—A slough, especially following a burn

Excessive phonation—Making abnormally loud or frequent vocal sounds

Exophthalmia—Protruding eyeballs

Exudate—Secretion of fluid

Fasciculation—Skin or superficial tremors

Flaccid—Defective or flabby muscle tone

Geotaxis—Heavy-footed walking due to muscular incoordination in the legs and feet

Goose-stepping ataxia—A type of incoordination where the feet are raised unnecessarily high in each step

Hemorrhage—Abnormal discharge of blood from vessels into tissues or from the body

Hyperacusis—Increased reaction to sound

Hyperemia—Congestion, an unusual amount of blood in a part of the body

Hyperexcitability—Increased reaction to stimuli

Hyperthermia—Elevated body temperature

Hypoesthesia—Dulled sensitivity to touch

Hyporeactivity—Lethargy, diminished reaction to stimuli
Ischemia—Local pallor of the skin (often due to constriction of the blood vessels)
Lacrimation—Production of tears
Lethargy—Stupor, torpor, sluggishness
Loss of righting reflex—No attempt to regain normal body position
Masseter tenseness—Tightness of the jaw muscle
Miosis—Constriction of the pupil
Muscarinic syndrome—Stimulation of smooth muscle, often resulting in secretions
Myasthenia—Muscular weakness
Mydriasis—Dilation of the pupil
Neutrophilia—Excessive neutrophiles in differential white blood cell counts
Nictitating membrane flicker—Abnormally frequent activation of the nictitating membrane of the eye
Nutation—Nodding of the head
Nystagmus—Involuntary eyeball movement
Opacity—Loss of lens or corneal transparency
Opisphotonos—Arching of the back and arching of the neck over the back
Paralysis—Temporary suspension or permanent loss of function
Paraplegia—Paralysis of the lower body and both legs
Paresis—Partial or incomplete paralysis
Penile extrusion—Forcing or pushing out of the penis
Petechia—Small pin-point hemorrhage spots
Phonation—Utterance of vocal sounds
Pica—A perversion of appetite with a craving for substances not fit for feed
Pilorrection—Hairs more erect than usual
Polydipsia—Excessive drinking
Polyuria—Excessive urination
Prostration—Absolute exhaustion
Ptosis—Drooping of the eyelid
Purpura—Hemorrhages into the skin, mucous membranes, internal organs, and other tissues; does not disappear under pressure
Righting reflex—Ability to assume upright normal body position
Remission—Lessening of severity, or abatement of signs of intoxication
Running or hopping and falling—Animal runs or hops for a short distance and then falls, sometimes going into a tonic spasm or tetanic seizure
Salivation—Excessive secretion of saliva
Spasm—An involuntary, sudden movement or convulsive muscular contraction
Sternal recumbency—Resting or reclining on the chest or breast
Tachycardia—Rapid heart beat
Tachypnea—Rapid breathing
Tenesmus—Spasmodic contractions of anal sphincter
Tetanic seizures—Temporary whole-body rigidity
Tetany—Intermittent tonic convulsions
Tonic convulsions—Continuous, unremitting muscular contractions
Torpor—State of being dormant or inactive; temporary loss of all or part of the power of sensation or motion
Tracheal congestion—Congestion resulting from constriction of trachael cartilages, mucous accumulation in the trachea, or both
Tremors—Twisting of muscles
Unkemptness—Disorderly fur or feathers, from lack of grooming or preening
Urition—Excessive deposition of uric acid salts in connective tissue
Using wings for or to aid pedestrian locomotion—A condition in birds where ataxia is so severe that walking or flying is not possible, but the wings can still be used for movement on the floor or ground
Wing-beat convulsions—Convulsions associated with non-functional wing flapping
Wing-drop—Wings carried in abnormally low position
Wings crossed over back—Condition resulting from very high wing position
Wing shivers—Constant rapid wing twiching
Withdrawal—Diminished interaction with other animals in cage or with observer

Index to Species Tested

Agelaius phoeniceus: see Red-winged blackbird
Albino rat—Rattus norvegicus: chlorpyrifos, D.M. 7537, D.M. 7597, nucleopolyhedral virus, phosphamidon, polychlorinated biphenyls
Alectoris chukar: see Chukar
Anas acuta: see Northern pintail
Anas platyrhynchos: see Mallard
Aquila chrysaetos: see Golden eagle
Bobwhite: see Northern bobwhite
Branta canadensis: see Canada goose
Bullfrog—Rana catesbeiana: Baygon, carbaryl, chlorpyrifos, DDT, demeton, Diazinon, dicrotophos, D.M. 7537, Gophicide, mexacarb, mexacarb (acylated), napham, phorate, phosphamidon, sodium monofluoroacetate, strychnine, temephos, TEPA, TEPP
California quail—Callipepla californica: aldicarb, Baygon, C-12 trichlorfon, carbaryl, CHE 1843, chlordane, chlorpyrifos, DDT, demeton, dicrotophos, dieldrin, Dowco 214, endrin, EPN, fen-methyl, fenthion, hexaflurate, Landrin, leptofoths, methoxychlor, mexacarbate, Moxam, monocrotophos, Nemacur, oxydemeton-methyl, parathion, potassium azide, RE-11775, resmethrin, RU 11-679, SD 17250, sodium arsenite, sodium monofluoroacetate, strychnine, TDE, temephos, TFM, toxaphene, trichlorfon
Callipepla californica: see California quail
Canada goose—*Branta canadensis*: Baygon, carbaryl, chlortyphos, dicrotophos, dieldrin, fenthion, methidathion, mexacarbate, monocrotophos, naled, SD 17250, TEPA

*Capra hircus*: see Domestic goat

*Carpodacus mexicanus*: see House finch

Chukar—*Alectoris chukar*: azinphos-methyl, Baygon, carbaryl, Ceresan M, chlortyphos, 2,4-D, demeton, dicrotophos, dieldrin, D.M. 7537, EPN, fenthion, Gophacide, Landrin, mestranol, methidathion, mexacarbate, Mobam, monocrotophos, oxydemetonmethyl, parathion, phorate, phosphamidon, Planavin, SD 16898, Silvisar-510, sodium monofluoroacetate, strychnine, temephos, TEPA, TEPP, tetraclorvinphos, Yuma Chemical

"Spreader A"

*Colinus virginianus*: see Northern bobwhite

*Colombia livia*: see Rock dove

*Coturnix japonica*: see Japanese quail

Dark-eyed junco—*Junco hyemalis*: Baygon

*Dendrocrocyna bicolor*: see Fulvous whistling-duck

Domestic ferret (European polecat)—*Mustela putorius*: sodium monofluoroacetate

Domestic goat—*Capra hircus*: Baygon, chlortyphos, demeton, dieldrin, disulfoton, endrin, Landrin, mexacarbate, monocrotophos, nabam, parathion, toxaphene

Domestic pigeon: see Rock dove

*Eremophila alpestris*: see Horned lark

European polecat: see Domestic ferret

Ferret: see Domestic ferret

Fulvous whistling-duck—*Dendrocrocyna bicolor*: aldrin, carbophuran, Ceresan L, dieldrin, parathion, toxaphene

Goat: see Domestic goat

Golden eagle—*Aquila chrysaetos*: Gophacide, monocrotophos, sodium monofluoroacetate, strychnine, thallium sulfate, zinc phosphide

Gray partridge—*Perdix perdix*: aldrin, Ceresan M, dieldrin, hexafluorurate, monocrotophos, parathion, toxaphene

Greater prairie chicken—*Tympanuchus cupido*: Ceresan M *Grus canadensis*: see Sandhill crane

Horned lark—*Eremophila alpestris*: malathion, methiocarb, toxaphene, zinc phosphide

House finch—*Carpodacus mexicanus*: Baygon, demeton, dicrotophos, fenthion, mexacarbate, monocrotophos, TEPA

House sparrow—*Passer domesticus*: Baygon, chlortyphos, demeton, dicrotophos, dieldrin, D.M. 7537, EPN, fenthion, Landrin, mexacarbate, Mobam, monocrotophos, nucleopolyphedral virus, oxydemetonmethyl, Panogen, parathion, sodium monofluoroacetate, strychnine, temephos

Japanese quail—*Coturnix japonica*: Baygon, carbaryl, Ceresan L, Ceresan M, chlortyphos, 2,4-D, DDT, demeton, dicrotophos, dieldrin, EPN, fenthion, Landrin, mexacarbate, Mobam, monocrotophos, nabam, nicotine sulfate, oxydemetonmethyl, parathion, phosphamidon, pyrethrum, sodium monofluoroacetate, strychnine, temephos, TEPA, tetraethyllead, toxaphene

*Juno hyemalis*: see Dark-eyed junco

*Larus delawarensis*: see Ring-billed gull

Mallard—*Anas platyrhynchos*: acephate, acrolein, Agrox, Airkem A-33 Dry, Akton, alachlor, aldicarb, aldrin, allethrin, aminoacid, 6-aminonicotinamide, amitrole, anilazine, Armeen OD, atrazine, Avitrol 200, azinphosmethyl, *Bacillus thuringiensis* (Berliner), Balan, BAY 93820, BAY 98663, Baygon, benzoxy hexachloride, bordeaux mixture, bromopropylate, butenafos, butylate, C-12 trichlorfon, C-2307, capsule wall material, captan, carbaryl, carbofuran, carbofenothion, Ceresan L, Ceresan M, CHE 1843, chlordane, chlordecone, chlorfenvinphos, chlormequat chloride, chloroxuron, chlorpyrifos, CIPC, clonitralid, coumaphos, crotoxophos, crufomate, cyanazine, cycloheximide, Cyolate, 2,4-D, DDT, DDVP, DEF, demeton, Diazon, dichlobenil, dichlorane, dicloran, dicrotophos, dieldrin, diesel oil #1, di-fluran, dimethoate, dimethylformamide, disobe, dioxathion, diquat dibromide, disparlure, disulfoton, diuron, D.M. 7537, DNOC, Dowco 214, Duomeen T-9, edifenphos, endosulfan, endothall, endrin, EPN, ethaphenphos, ethion, ethoprop, fashur, fenitrothion, fensulfothion, fenthion, fluometuron, folpet, fonofos, GC-6506, Gophacide, grandule, heptachlor, hexafluurate, Imidan, IPC-400, isobenzan, Landrin, leptothen, lindane, malathion, Mem-RM, mestranol, methamidophos, methidathion, methiocarb, methomyl, metheophene, methoxychlor, methyl parathion, mevinphos, mexacarbate, mexacarbate (acylated), mirex, Mobam, monocrotophos, nabam, naled, Nemacur, Nemagon, nicotine sulfate, norbormide, *Nosema locustae*, nucleopolyhedral virus, Oil Herder, Oil Herder #2, oxydemetonmethyl, Panasol AN-2, Panogen, paraquat dichloride, parathion, PCNB, PCP, phorate, phosphamidon, phoxim, picoheran, Planavin, PMA, polychlorinated biphenyls, potassium azide, Process Oil 492, pyrethrum, RE-1775, rotenol, rotenone, RU 11-679, schradan, SD 7727, SD 16898, SD 17250, SD 30053, Shell Sol 70, silvex, Silvisar-510, sodium arsenite, sodium monofluoroacetate, Staricile, strychnine, sulfoxide, 2,4,5-T, TBA, TCDD, TDE, temephos, TEPA, TEPP, terbutryn, Tertigol 12-P-6, Terrazole, tetrachlorvinphos, tetradifen, tetraethyllead, TFM, thallium sulfate, Thanite, thionazin, thiram, toxaphene, trichlorfon, trichloronat, trifluralin, Vendex, zinc phosphide, zineb, 492 Mosquito Larvicide Oil

*Meleagris gallopavo*: see Wild turkey

Mourning dove—*Zenaida macroura*: Baygon, fenthion, mexacarbate, sodium monofluoroacetate, strychnine

Mule deer—*Odocoileus hemionus hemionus*: aldrin, aminoacid, azinphos-methyl, Baygon, carbaryl, 2,4-D, demeton, dicrotophos, dieldrin, disulfoton, endrin, fenitrothion, Landrin, Mem-RM, methomyl, mexacarbate, monocrotophos, naled, nicotine sulfate, nucleopolyhedral virus, parathion, phosphamidon, silvex, Silvisar-510, sodium monofluoroacetate, strychnine, toxaphene
Mustela putorius: see Domestic ferret
Northern bobwhite—Colinus virginianus: aldrin, azinphos-methyl, C-12 trichlorfon, carbofuran, Ceresan L, chlor-fenvinphos, clonitralid, cyanazine, DDT, dimethyldichloro-diamine, disparure, ethamphenphion, fenitrothion, fenthion, grandule, leptophos, methyl parathion, monocrotophos, polychlorinated biphenyls, SD 16898, SD 17250, TCDD, TFM, toxaphene, trichlorfon
Northern pintail—Anas acuta: D.M. 7537
Odocoileus hemionus hemionus: see Mule deer
Oregon junco: see Dark-eyed junco
Passer domesticus: see House sparrow
Perdix perdix: see Gray partridge
Phasianus colchicus: see Ring-necked pheasant
Pheasant: see Ring-necked pheasant
Pigeon: see Rock dove
Rana catesbeiana: see Bullfrog
Rat: see Albino rat
Rattus norvegicus: see Albino rat
Red-winged blackbird—Agelaius phoeniceus: mestranol, methyl parathion, TEPA
Ring-billed gull—Larus delawarensis: clonitralid, dimethylformamide, TFM
Ringed turtle-dove—Streptopelia risoria: TCDD, trichlorfon
Ring-necked pheasant—Phasianus colchicus: aldicarb, aldrin, aminocarb, atrazine, azinphos-methyl, BAY 93820, Bayon, benzene hexachloride, bordeaux mixture, butfenarb, C-12 trichlorfon, C-2307, carbaryl, carbofuran, carbofenthrin, Ceresan L, Ceresan M, chloramben, chlordane, chlorfenvinphos, chlorpyrifos, coumaphos, cycloheximide, 2,4-D, DDT, DDVP, DEF, demeton, Diazinon, dichlobenil, dicloran, dicofol, dicotophos, dieledrin, dimethoate, dinoseb, dioxathion, disulfoton, D.M. 7537, DNO, Dowco 214, Duomeen T-E-9, edifenphos, endosulfan, endoethall, endrin, EPN, ethion, ethopropr, fenitrothion, fensulfoton, fenthion, fluorodifen, GC-6506, Gophacid, Imidan, Landrin, leptophos, malathion, methidathion, methiocarb, methomyl, methyl parathion, mevinphos, mexacarb, mirex, Mobam, monocrotophos, nabam, naled, Nemagon, nicotine sulfate, Nosema locustae, nucleopolyhedral virus, oxydemetonmethyl, Panogen, parathion, PCNB, PCC, phorate, phosphamidon, phoxim, picloram, PMA, potassium azide, ronnel, rotenone, schradan, SD 16898, SD 17250, sodium arsenite, sodium monofluoroacetate, strychnine, 2,4,5-T, TBA, TDE, temephos, TEPA, TEPP, terbutryn, tetrachlorvinphos, thallium sulfate, Thalite, thionazin, thiram, toxaphene, trichlorfon, trifluralin, Vendex, zinc phosphide, zineb
Rock dove (domestic pigeon)—Columbia livia: Baygon, carbaryl, Ceresan M, chlorpyrifos, 2,4-D, DDT, demeton, dicrotophos, dieledrin, endrin, EPN, fenthion, Landrin, mexacarb, Mobam, monocrotophos, nabam, nicotine sulfate, oxydemetonmethyl, parathion, phosphamidon, sodium monofluoroacetate, strychnine, temephos, TEPA, trichlorfon
Sandhill crane—Grus canadensis: Baygon, chlorpyrifos, DDT, mexacarb, toxaphene
Sharp-tailed grouse—Tymanuchus phasianellus: Baygon, carbaryl, carbofenothion, demeton, dicrotophos, endrin, fenitrothion, fensulfothion, methoxychlor, mevinphos, mexacarb, Mobam, naled, parathion, phosphamidon, phoxim, toxaphene
Streptopelia risoria: see Ringed turtle-dove
Turkey: see Wild turkey
Tymanuchus cupido: see Greater prairie chicken
Tymanuchus phasianellus: see Sharp-tailed grouse
White-crowned sparrow—Zonotrichia leucophrys: D.M. 7537
White-winged dove—Zenaida asiatica: phosphamidon
Wild turkey—Meleagris gallopavo: monocrotophos, sodium monofluoroacetate
Zenaida asiatica: see White-winged dove
Zenaida macroura: see Mourning dove
Zonotrichia leucophrys: see White-crowned sparrow
A list of current Resource Publications follows.


As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.