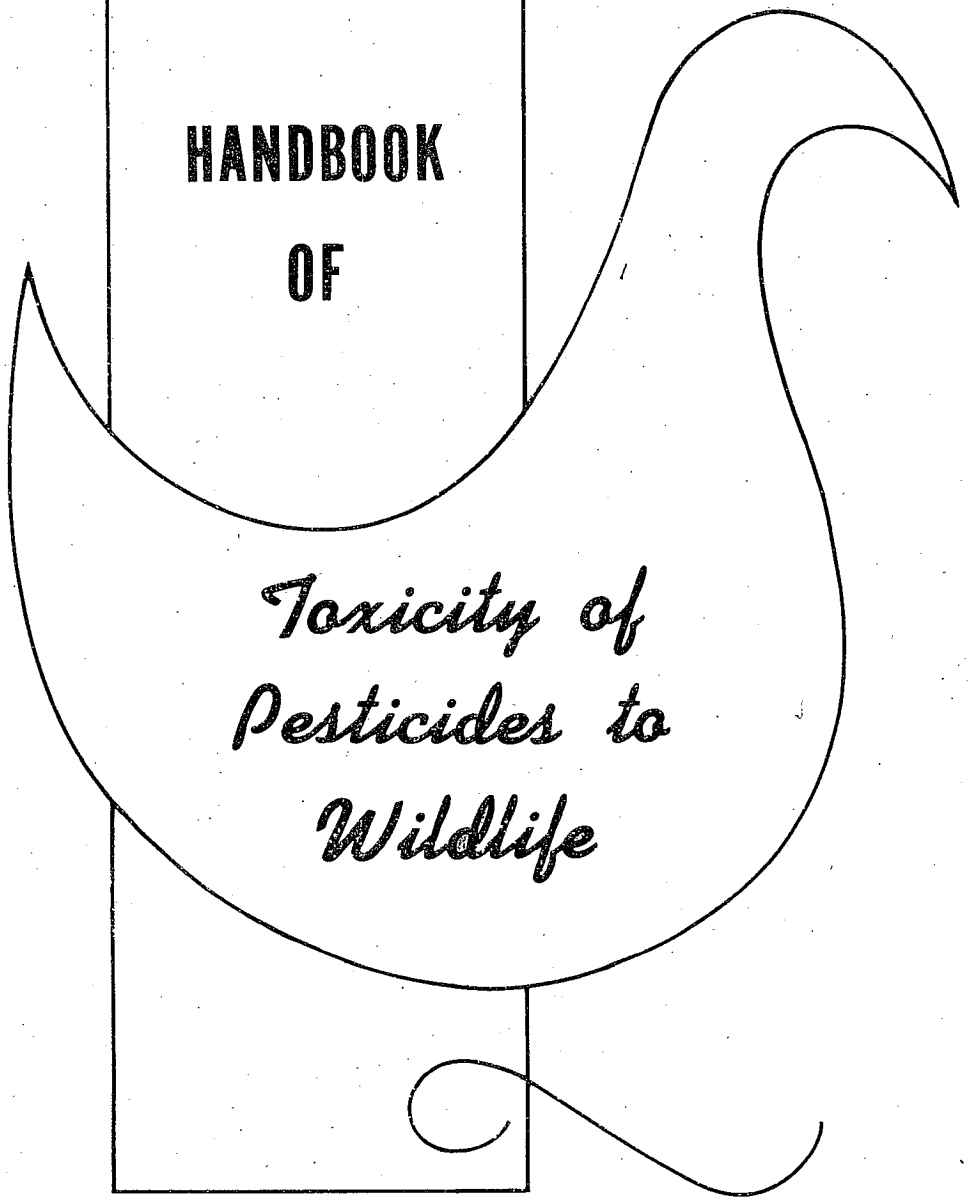
HANDBOOK OF



Toxicity of Pesticides to Wildlife

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife

HANDBOOK OF
Toxicity of Pesticides to Wildlife

by

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INTRODUCTION

Although the problems resulting from the use of pesticides in wildlife habitats have received considerable attention in recent years, the relationships 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 a compendium of pesticide toxicity data for wildlife species that will provide, if not final answers, at least a basis for comparison of one pesticide with another. We hope that this handbook will fill that need.

There are already many such compilations for laboratory animals, notably rats (Kerr and Brogden 1959, Gaines 1960, Hayes 1963, Dauterman and Guthrie 1965), but also dogs (Lehman 1965), fish (Henderson et al. 1960), snails (Dowdon and Bennett 1965), frogs (Kaplan and Overpeck 1964), and cladocerans (Anderson 1959, Sanders and Cope 1966). None of these compilations are, or have attempted to be, complete, but they do represent ready references to help answer certain simple questions about the acute or chronic toxicity and the hazards of given pesticides.

Unfortunately, sensitivity to toxicants varies greatly from species to species, even within the same genus. Toxicity figures for albino rats, while often used for wildlife purposes, are at best poor indicators of the susceptibility of, say, 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 always represented. To allow the broadest use of these data, we have conducted most tests with species that are common and widespread in the United States. The ring-necked pheasant, for example, is one of the most frequently bagged upland game birds in this country, and the mallard duck is probably the commonest waterfowl. Often, however, additional species with more restricted ranges, such as the fulvous tree duck or the sandhill crane, have been included. For ready comparison, one species, the mallard duck, has been tested on nearly all pesticides studied.

The chemicals chosen for testing include 108 pesticides, used in thousands of formulations. Generally, they are the pesticides to which wildlife are either most often exposed or

most susceptible. Most are widely used or represent common families of chemicals applied to forests, rangeland, aquatic habitat, or agricultural areas that wildlife live in or frequent. For many of the newer compounds, these are the first tests on wildlife species. Acute toxicity data and a list of the common symptoms observed are presented for each pesticide. For some, particularly those that are likely to be applied repeatedly or to persist for a long period of time after single application, the results of 30-day repeated oral toxicity or feeding tests are also included.

THE USE OF ACUTE TOXICITY FIGURES

The degree of hazard presented by a pesticide depends on many complex factors. Although no single way of expressing potential hazard is completely reliable, the most rapid and convenient indicator of hazard for most chemicals is probably the acute toxicity (the single dosage necessary to produce death).

The usual way of expressing acute toxicity is by means of an LD_{50} value. The LD_{50} (median lethal dosage) is a statistical estimate of the dosage that would be lethal to 50% of a very large population of the test species. It is also possible to calculate such values as the LD_5 or LD_{99}, but they are (for statistical reasons) less precise than the corresponding LD_{50} and more difficult to determine. Although LD_{50}'s give no information on the dosage that would be lethal to every individual of the species, or to treatment given in some other way than in the test, the LD_{50} value, with its confidence limits, is still probably the most convenient and reliable means available for comparing the inherent toxicity of chemicals.[1/]

How the LD_{50} figures in this handbook are used is largely a matter for the reader to decide, but a caution is given here to regard them only as guides or benchmarks. They are meaningful only in the context of other information on the pesticide's physico-chemical and biological properties and the rates and methods of application, most of which can readily be found in the scientific literature or in manufacturers' technical bulletins.

/ Much 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.

When the LD_{50} is used to evaluate the safety or hazard of a pesticide used in the field, even more factors must be considered. To span the gap between a species' susceptibility in the laboratory and its vulnerability in the field, such factors as the following must be taken into account:

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

Although each field application problem is unique, there is often enough similarity between cases to establish rules of thumb relating lethal levels for a species in laboratory toxicity tests (pharmacological susceptibility) to potential hazards from field exposure (ecological vulnerability). One method is to predict the field effects of a new chemical by comparing its LD_{50} for the species of interest with the LD_{50} of a chemical whose field effects are known. Thus, if pesticide X has an LD_{50} for pheasants of 100 mg/kg and is known to kill pheasants in the field when applied at 2 lb/acre, pesticide Y with an LD_{50} of 50 mg/kg might be expected to kill pheasants at 1 lb/acre. However, when comparable known chemicals are lacking, it is often still possible to predict field effects of a new compound in a general way. For example, DeWitt (1966) concluded that "losses of birds may be expected if the quantity of toxicant per square foot [resulting from a pesticide applica-

tion] equals or exceeds the quantity causing death of quail in short term feeding tests." Kenaga (1968) discusses this kind of laboratory-to-field extrapolation, and the reader is referred to his article for a detailed discussion of the factors to be taken into account.

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 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, while mortality is a conveniently measured effect, it should be recognized that levels of pesticide that do not kill may still produce subtle, yet damaging, effects on animals, such as inhibition of reproduction or impaired ability to escape from predators. These sublethal effects must be considered along with the LD_{50} in any comprehensive evaluation of a pesticide's safety.

SYMPTOMATOLOGY

The pattern of symptoms 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 LD_{50} for each pesticide, we have listed the symptoms and behavioral changes observed in the test animals after dosing. We hope that these will help wildlife biologists in the field to know what symptoms to look for when assessing short-term effects of pesticides on wild populations. They may also aid in arriving at a tentative identification of the pesticide involved when only a few known pesticides have been applied to an area. While it is unlikely that symptoms alone can ever surely identify a toxicant, they can sometimes eliminate certain known toxicants from further consideration. When the development of toxic symptoms produced a clearcut 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 recovery can have implications for the speed and thoroughness of absorption, the rate of metabolism or elimination, and the cumulativeness of residues in the tissues.

METHODOLOGY

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

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 were pen-reared from stock lines: mallard duck (Anas platyrhynchos), ring-necked pheasant (Phasianus colchicus), chukar partridge (Alectoris graeca), Japanese quail (Coturnix coturnix japonica), bobwhite quail (Colinis virginianus), California quail (Lophortix californicus), sharp-tailed grouse (Pedioecetes phasianellus), prairie chicken (Tympanuchus cupido), domestic goat (Capra aegagrus), and mule deer (Odocoileus hemionus hemionus).

The following species were live-trapped, donated, or purchased from various sources: pigeon (Columba livia); mourning dove (Zenaidura macroura); white-winged dove (Zenaida asiatica); house (English) sparrow (Passer domesticus); house finch (Carpodacus mexicanus); Oregon junco (Junco oreganus); red-winged blackbird (Agelaius phoeniceus); Canada goose (Branta canadensis); fulvous tree duck (Dendrocygna bicolor); gray partridge (Perdix perdix); lesser sandhill crane (Grus canadensis canadensis); pintail duck (Anas acuta); turkey (Meleagris gallopavo); golden eagle (Aquila chrysaetos); albino rat (Rattus norvegicus); New Zealand rabbit (Oryctolagus cuniculus); mule (Equus asinus x E. caballus); horse (Equus caballus); domestic ferret (Mustela putorious); and common bullfrog (Rana catesbeiana).

Source of Chemicals

The tested materials, technical or analytical grade samples of known (and generally high) purity, were received directly from their manufacturers, whom we thank for making them available. The purities are stated in the toxicity tables. Trivial and trade names[2/], as well as chemical names and common synonyms of the materials tested are given to make identification easier.

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. With goats and deer, the capsules were administered orally via balling gun. In a few cases (denoted in the tables by "S.T."), aqueous or corn oil suspensions or solutions were administered by stomach-tube with ball-tipped rat oral intubation needles.

The test materials were accurately weighed or micro-syringed into the capsules from precisely diluted acetone solutions. The acetone was evaporated at room temperature before the capsules were closed.

All test animals underwent a pre-treatment fasting period to avoid the effects of variable stomach contents on absorption and to bring each to near the basal metabolic state. Mule deer and goats were fasted for 24 hours; doves, sparrows, finches, and juncos were fasted for 2 to 4 hours; and all other species were fasted for 16 to 20 hours.

Acute Toxicity Determination

After initial range-finding dosages were administered, two to seven animals at each of four dosage levels were employed for each LD_{50} determination. The number of animals at the four dosage levels within each test was kept constant to allow computation of the acute oral LD_{50} by the method of Thompson (1947) and Weil (1952).

2/ Trade or brand names are provided for identification only. Their mention does not imply endorsement of commercial products by the Federal Government.

In virtually all cases, a 14-day post-treatment observation period was employed before final mortality counts were made. When animals were still showing outward evidence of intoxication at 14 days, the observation period was extended until death or recovery occurred. In no case did this exceed 30 days, although with chlorinated organics and mercurials it frequently took 2 to 4 weeks. During the observation period, inspections for symptoms were made as needed. Usually, this meant continual close observation the first day and single daily observations thereafter. Gross autopsies were performed at the end of the observation period or at death. Survivors were sacrificed by CO_2 asphyxiation.

Subacute Toxicity Determinations

An empirical value that represented the minimum repeated oral dosage (mg/kg/day) that was lethal in 30-day tests was determined for some pesticides. This was found by orally administering gelatin capsules containing 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: no deaths in 30 days, 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).

ARRANGEMENT OF THE HANDBOOK

In the following pages, toxicity information is given separately for each pesticide. The chemicals are arranged alphabetically by their common or trade name, whichever seems more frequently used. Other names—common, trade, and chemical—are also included in the alphabetical sequence for easy cross reference.

Under each heading are listed any alternative trivial, common, and trade names, the chemical name, the pesticide's primary use, and the purity of the samples tested. Chemical names follow the current system of nomenclature of Chemical Abstracts.

The next entry is a summary table of acute oral toxicity values. The species are arranged in the first column according to the frequency of their use as a test animal and always appear in the same order. When different samples of the pesticide were tested, the purity of the sample used on each species is denoted by a superscript number that refers back to the "Sample" entry above the table.

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

The third column gives the age of the test animals. Differences in susceptibility due to age can be expected, but our work indicates that these are generally small (usually less than 2-fold) and would not change the interpretation of the LD_{50} values. Immature and senescent animals were usually avoided in favor of young but mature, or nearly mature, test animals, thus lessening the chance of death unrelated to the treatment.

The fourth column gives the LD_{50} values in milligrams of pesticide per kilogram of body weight (mg/kg). The 95% confidence limits for each LD_{50} are given after it in parentheses. Where confidence limits were not calculable because of an all-or-none effect at the dosages used, a dash is placed in the parentheses. Where no LD_{50} 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 LD_{50} would lie are given (e.g., "200-400"). Where few, if any, animals died at the highest dosage given, the LD_{50} appears as "greater than" (>) the highest dosage. If no symptoms were produced even at the highest level, the LD_{50} appears as "much greater than (>>) the highest level administered.

A list of significant symptoms and behavioral changes seen in the test animals is given after the summary table. These are the characteristic symptoms that occurred when the animals were given lethal or near-lethal levels; they were observed in one or more, but not necessarily all, of the species tested. When pronounced symptoms occurred at levels much lower than the lethal level, the minimum symptom-

producing dosage is also given. Some attempt has been made to place the symptoms in the order of their onset, but this can vary from species to species and between individuals. A glossary of technical terms used in describing symptoms is given at the end of the handbook.

The "Notes" section lists any additional observations about acute toxicity that may be of value, and gives the results of 30-day repeated oral and chronic feeding tests with the pesticide if these have been conducted. These results are expressed as a 30-day EMLD value (this terminology is explained under the Methodology section). 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 cumulativeness is the ratio of the single oral LD_{50} (mg/kg) to the 30-day EMLD (mg/kg/day). This ratio, which we have called the "cumulative toxicity index," is also included in the Notes, along with a few words indicating how the pesticide compares with others in its chemical group. For example, Zectran, with an index of 3.00/1.25=2.40, shows practically no cumulative action, while dieldrin, with an index of 381/5.0=76.2, is highly cumulative, even for a chlorinated organic insecticide.

TABULAR SUMMARY OF TOXICOLOGICAL DATA FOR WILDLIFE

A 363 = See Matacil

AAT = See parathion

ABATE

Alternative names: AC 52160, ENT 27165, Experimental Insecticide 52160

Chemical name: O,O,O′,O′-tetramethyl O,O′-thiodi-p-phenylene phosphorothioate

Primary use: Insecticide

Sample purity: 92% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	--	80–100
Mallards	♀	--	80–100
Pheasants	♀	3–4 mo.	31.5 (18.1–54.9)
Chukars	♂ & ♀	2–3 mo.	270 (170–429)
Coturnix	♂	2 mo.	84.1 (60.6–116)
Pigeons	♂ & ♀	--	50.1 (16.7–150)
House sparrows	♀	--	35.4 (8.85–141)
Albino rats (S.T.)	♂	--	151 (--)
Bullfrogs	♀	--	>2000

Acute symptoms: Ataxia, low carriage, fluffed feathers, fasciculation, tremors, salivation, lacrimation, tracheal congestion, miosis, muscular weakness, tachycardia, tachypnea, tetany, immobility.

Notes: The 30-day EMLD for mallards is 2.5 mg/kg/day for both sexes. This gives a cumulative toxicity index of 80-100/2.5 = 32-40, indicating a high degree of cumulative action for an organophosphate. Dose-

ABATE (Continued)

response slopes in acute oral tests were low (increasing dosage levels did not produce a proportional increase in the response), which may indicate poor absorption in such large doses.

AC 3422 = See parathion

AC 3911 = See Thimet

AC 4049 = See malathion

AC 12880 = See dimethoate

AC 38023 = See Famophos

AC 52160 = See Abate

ACCOTHION

Alternative names: Sumithion, fenitrothion, Sumitomo, S 1102A, S 5660, BAY 41831, Folithion, CP 47114

Chemical name: O,O-dimethyl O-(4-nitro-m-tolyl) phosphorothioate

Primary use: Insecticide

Sample purity: 95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	1190 (392–3610)
Pheasants	♂	3 mo.	55.6 (28.9–107)
Bobwhite quail	♂	2–3 mo.	27.4 (19.0–37.1)
Mule deer	♂	13 mo.	>727

ACCOTHION (Continued)

Acute symptoms: Ataxia, high carriage, wing drop, wing shivers, falling, salivation, tremors. Mallards additionally displayed regurgitation, which may partially account for the higher LD_{50} figure.

Notes: The 30-day EMLD for mallards is less than 10 mg/kg/day. This gives a cumulative toxicity index of 1190/< 10 = >119, indicating an extremely high degree of cumulative action, particularly for an organophosphate. This is in part accounted for by regurgitation of larger acute doses and better absorption of small subacute doses.

ACETYLATED ZECTRAN = See Zectran (acylated)

ACTIDIONE

Alternative names: cycloheximide, naramycin A

Chemical name:
3-[2-(3,5-dimethyl-2-oxocyclohexyl)-2-hydroxyethyl] glutarimide

Primary use: Fungicide

Sample purity: 88.7%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	50–100

Acute symptoms: Goose-stepping ataxia, polydipsia, wing drop or wings crossed high over back, wing shivers or tremors, periodic falling, prostration. Regurgitation often took place immediately following oral administration. Symptoms of intoxication took 10 minutes to an hour to appear and up to a month to disappear among survivors. While 50 animals were tested, no exact

ACTIDIONE (Continued)

LD_{50} could be found because of the effects of regurgitation. All deaths occurred overnight following treatment.

Notes: Autopsies frequently revealed various congested organs.

AGRIDIP = See Co-Ral

AGRITOX = See BAY 37289

AGROX

Alternative names: None found

Chemical name: Formulation containing phenylmercuric urea and inert carrier materials

Primary use: Fungicide

Sample purity: 6.70% Phenylmercuric urea (4.0% mercury)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Only occasional mild ataxia between 1st and 4th day following treatment. Profuse regurgitation occurred within 5 to 10 minutes of single oral administration.

AKTON

Alternative names: SD 9098, ENT 27102

Chemical name:
O-[2-chloro-1-(2,5-dichlorophenyl)vinyl] O,O-diethyl phosphorothioate

Primary use: Insecticide

AKTON (Continued)

Sample purity: 98.5%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–5 mo.	>2000

Acute symptoms: Goose-stepping ataxia, walking on toes, tails pointed sharply upward, wing drop or wings crossed high over back, dyspnea, falling. Symptoms noticeable by 15–30 minutes but not by 24 hours. Levels as low as 10 mg/kg produced definite symptoms. Levels above 900 mg/kg produced moderate weight losses.

Notes: Gross autopsies showed cases of petechiation on heart surface, gastrointestinal hyperemia, and congestion of pancreas.

AL-50 = See Botran

ALDRIN

Alternative names: HHDN, Octalene, Compound 118, ENT 15949

Chemical name: 1,2,3,4,10,10-hexachloro-1,4,4a,5,8, 8a-hexahydro-1, 4-endo-exo-5,8 -dimethanonaphthalene

Primary use: Insecticide

Sample purity: 95% technical

ALDRIN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	520 (229–1210)
Pheasants	♀	3–4 mo.	16.8 (--)
Bobwhite quail	♀	3–4 mo.	6.59 (--)
Fulvous tree ducks	♂	3–6 mo.	29.2 (--)

Acute symptoms: Ataxia, circling, low carriage, nictitating membrane closed for long periods, fluffed feathers, tremors, phonation, violent wing-beat convulsions, seizures, opisthotonos. Deaths occurred ½ hour to 10 days post-treatment. Weight losses occurred among survivors of higher levels.

Notes: Gross autopsies revealed occasional liver adhesions to the parietal peritoneum. The 30-day EMLD for mallards is about 5.0 mg/kg/day for both sexes. This gives a cumulative toxicity index of 520/5.0 = 104, indicating a very high degree of cumulative action, even for a chlorinated hydrocarbon.

ALKRON = See parathion

ALLETHRIN

Alternative name: None found

Chemical name: dl-2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one ester of dl-cis/trans-chrysanthemummonocarboxylic acid

Primary use: Insecticide

Sample purity: 90%

ALLETHRIN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>>2000

Acute symptoms: None.

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

ALLISAN = See Botran

dl-2-ALLYL-4-HYDROXY-3-METHYL -2-CYCLOPENTEN-1-ONE ESTER OF dl/CIS TRANS-CHRYSANTHEMUMMONOCARBOXYLIC ACID = See allethrin

AMINOCARB = See Matacil

AMINOTRIAZOLE

Alternative names: amitrole, Amino Triazole, 3,A-T, Weedazol

Chemical name: 3-amino-1,2,4-triazole

Primary use: Herbicide

Sample purity: 90%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

AMINOTRIAZOLE (Continued)

Acute symptoms: Ataxia, weakness, slight wing drop, during the first 3 days after single oral administration only.

AMINO TRIAZOLE = See aminotriazole

3-AMINO-1,2,4-TRIAZOLE = See aminotriazole

4-AMINO-3,5,6-TRICHLOROPICOLINIC ACID = See Tordon

AMITROLE = See aminotriazole

APHAMITE = See parathion

APHOXIDE = See tepa

APO = See tepa

ARASAN = See Thiram

ARKOTINE = See DDT

AROCHLORS

Alternative names: chlorinated biphenyls, PCB's, polychlorinated biphenyls

Chemical name: Various polychlorinated biphenyl mixtures

Primary use: Industrial, such as plasticizers, heat-exchange agents

Sample purity: Four mixtures named Arochlor 1242[1/], 1254[2/], 1260[3/], and 1268[4/], where the last two digits of each number indicate percent chlorine in the sample.

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards [1/]	♂	10 mo.	>>2000
Mallards [2/]	♂	10 mo.	>>2000
Mallards [3/]	♂	10 mo.	>>2000
Mallards [4/]	♂	10 mo.	>>2000
Albino rats [2/] (S.T.)	♂	--	500-1000
Albino rats [4/] (S.T.)	♂	--	2000-4000

Acute symptoms: Mallards showed no symptoms. Rats treated with Arochlor 1254 showed ataxia, blanched retinas, ptosis of eyelid, serous nasal exudate that appeared porphyrin-like, withdrawal, lack of preening. Rats treated with Arochlor 1268 showed reddish exudate on eyelids, ataraxia, ptosis of eyelid, possible blindness, withdrawal. Rat mortalities occurred between 4 hours and 4 days post-treatment. Some survivors showed symptoms for as long as 8 days.

Notes: Two male albino rats were stomach-tubed for 6 days with 75 mg/kg/day of Arochlor 1268 in corn oil; one died on the 7th day. Two of two male rats survived a similar treatment with Arochlor 1254. In a feeding study, Arochlor 1254 at 1000 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. The 1000-ppm feeding level also reduced feeding by 21%. The 10-ppm level produced one death in six male rats at 29 days but no further mortalities by 45

days. These feeding studies suggest that a total intake of 500 to 2000 mg/kg of Arochlor 1254 is the lethal level for dietary exposures of 1 to 7 weeks in rats.

ARPROCARB = See Baygon

ASUNTOL = See Co-Ral

3,A-T = See aminotriazole

ATRAZINE

Alternative names: Gesaprim, G-30027

Chemical name: 2-chloro-4-ethylamino-6-isopropylamino-s-triazine

Primary use: Herbicide

Sample purity: 80% wettable powder

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	6 mo.	>2000

Acute symptoms: Weakness, tremors, ataxia, weight loss. Symptoms appeared 1 hour post-treatment and persisted up to 11 days.

AZINPHOS-METHYL = See Guthion

AZODRIN

Alternative name: SD 9129

Chemical name: 3-(dimethoxyphosphinyloxy)-N-methyl-cis-crotonamide

AZODRIN (Continued)

Primary use: Insecticide

Sample purity: >75%[1/], >80%[2/], and >90%[3/] technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[2/]	♂	4 mo.	4.76 (3.43-6.60)
Mallards[1/] (dermal)	♂	8-10 mo.	30
Pheasants[3/]	♀	7-8 mo.	2.83 (--)
Chukars[2/]	♀	4 mo.	6.49 (5.01-8.42)
Coturnix[1/]	♂	3 mo.	3.71 (2.73-5.03)
Bobwhite quail[1/]	♂	1-2 yr.	0.944 (0.749-1.19)
Pigeons[1/]	♂ & ♀	--	2.83 (1.39-5.75)
House sparrows[1/]	♂	Adult	1.61 (1.45-1.79)
House finches[3/]	♂	--	8-24
Canada geese[1/]	♂ & ♀	--	1.58 (1.10-2.28)
Merriam's turkeys[1/]	♂ & ♀	6-18 mo.	1-4
Golden eagles[1/]	♂	--	<0.75
Domestic goats[1/]	♀	12 mo.	20-50
Mule deer[1/]	♀	8-18 mo.	25-50

Acute symptoms: Birds: fluffed feathers, eyes closed, ataxia, lacrimation, salivation, polydipsia, dyspnea, tracheal congestion, defecation, mydriasis, hyperactive nictating membrane, tremors, wing-beat convulsions, tetany or opisthotonos. Mammals: ataxia, miosis, hyporeactivity, constant quivering, immobility, tracheal congestion, tachypnea, dyspnea, phonation. Mortalities generally occurred 1 to 60 hours post-treatment.

AZODRIN (Continued)

Notes: Gross autopsies revealed endocardial and gastrointestinal hemorrhaging. The 30-day EMLD for mallards is 0.25 mg/kg/day for both sexes. This gives a cumulative toxicity index of 4.76/0.25 = 19.4, indicating a high degree of cumulative action for an organophosphate.

B—622 = See Dyrene

BACILLUS THURINGIENSIS = See Thuricide

BAKTHANE = See Thuricide

BALAN

Alternative names: benefin (a close analog of Treflan), Binnell, EL-110

Chemical name: N-butyl-N-ethyl-α,α,α-trifluoro-2, 6-dinitro-p-toluidine

Primary use: Herbicide

Sample purity: 97.2%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>2000

Acute symptoms: Ataxia, weakness, falling. Regurgitation also occurred in the first 2 hours after treatment. The other symptoms occurred the 2nd to 14th day post-treatment. Although there were no mortalities, considerable weight losses occurred by the end of the 14-day observation period.

BASUDIN = See diazinon

BAY 8173 = See Systox

BAY 9027 = See Guthion

BAY 17147 = See Guthion

BAY 19639 = See Di-Syston

BAY 21116 = See Meta-Systox-R

BAY 21199 = See Co-Ral

BAY 25141 = See Dasanit

BAY 29493 = See Baytex

BAY 37289

Alternative names: S4400, Trichloronat, Agritox, Phytosol, ENT 25712

Chemical name: O-ethyl O-2,4,5-trichlorophenyl ethylphosphonothioate

Primary use: Insecticide

Sample purity: 98%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	12.0 (8.65-16.6)

BAY 37289 (Continued)

Acute symptoms: High carriage, neck tremors, goose-stepping ataxia, salivation, nutation, dyspnea, prostration with wings spread, tetany. Symptoms appeared as soon as 20 minutes and recovery among survivors took as long as 28 days. Mortalities generally occurred between 2 and 4 hours after treatment. Levels as low as 5.66 mg/kg produced some mortality. Weight losses occurred among survivors.

BAY 38819 = See Gophacide

BAY 39007 = See Baygon

BAY 41831 = See Accothion

BAY 44646 = See Matacil

BAYER E-601 = See methyl parathion

BAYGON

Alternative names: Propoxur, BAY 39007, arprocarb, UNDEN

Chemical name: o-isopropoxyphenyl methylcarbamate

Primary use: Insecticide

BAYGON (Continued)

Sample purity: 97%[1/] and 98%[2/] technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[2/]	♀	4-6 mo.	11.9 (--)
Pheasants[2/]	♂	3-5 mo.	20 (10-40)
Chukars[2/]	♂ & ♀	4-6 mo.	23.8 (--)
Coturnix[1/]	♀	20 mo.	28.3 (--)
California quail[1/]	♂	2 yr.	>30
Pigeons[1/]	♂ & ♀	--	60.4 (38.0-96.1)
Mourning doves[1/]	♂ & ♀	--	4.20 (--)
House sparrows[1/]	♀	--	12.8 (9.26-17.8)
House finches[1/]	♂ & ♀	Adult	3.55 (2.25-5.69)
Oregon juncos[1/]	♂	Adult	4.76 (--)
Lesser Canada geese[1/]	♂ & ♀	--	5.95 (4.89-7.24)
Lesser sandhill[1/] cranes	♂ & ♀	--	40-60
Domestic goats[1/]	♂	12 mo.	>800
Mule deer[1/]	♀	11 mo.	100-350
Bullfrogs[1/]	♂	--	595 (--)

Acute symptoms: Lacrimation, salivation, goose-stepping ataxia, tachypnea, dyspnea, diarrhea, immobility, tremors, wings spread in tetany, opisthotonos.

BAYGON (Continued)

Notes: The 30-day EMLD for pheasants is greater than 6.0 mg/kg/day for both sexes. That for mallards is 6.0 mg/kg/day. For mallards, this gives a cumulative toxicity index of $11.9/6.0 = 2.0$, indicating little or no cumulative action. Mallard and pheasant survivors of the 6.0-mg/kg/day level showed normal fertility, and their eggs hatched at the same rate as controls.

BAYTEX

Alternative names: BAY 29493, fenthion, DMTP, Entex, S 1752, Lebaycid, Tiguvon, Quelatox, ENT 25540, Mercaptophos

Chemical name: O,O-dimethyl O-[4-(methylthio)-m-tolyl] phosphorothioate

Primary use: Insecticide

Sample purity: 90%[1/] and 99%[2/] technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1/]	♀	4 mo.	5.94 (4.28-8.23)
Pheasants[2/]	♀	7-24 mo.	17.8 (9.33-34.0)
Chukars[1/]	♂ & ♀	3 mo.	25.9 (15.8-42.7)
Coturnix[2/]	♀	3 mo.	10.6 (8.41-13.3)
Pigeons[2/]	♂ & ♀	--	4.63 (3.24-6.61)
Mourning doves[2/]	♂ & ♀	--	2.68 (1.34-5.35)
House sparrows[2/]	♀	--	22.7 (14.6-35.1)
House finches[2/]	♂ & ♀	--	~10
Canada geese[2/]	♂ & ♀	--	12.0 (8.48-17.0)

BAYTEX (Continued)

Acute symptoms: Lacrimation, foamy salivation, tracheal congestion, goose-stepping ataxia, immobility, tonic tremors, tachypnea, dyspnea, clonic convulsions or opisthotonos.

Notes: The 30-day EMLD for mallards is 0.5 mg/kg/day for both sexes. This gives a cumulative toxicity index of 5.94/0.5 = 11.9, indicating moderate accumulative action. Survivors of the 0.5 mg/kg/day level laid eggs with markedly reduced fertility.

BENEFIN = See Balan

BENZO [b] THIEN-4-YL METHYLCARBAMATE = See Mobam

BIDRIN

Alternative names: SD 3562, dicrotophos

Chemical name: 3-(dimethoxyphosphinyloxy)-N,N-dimethyl-cis-crotonamide

Primary use: Insecticide

Sample purity: 98% α isomer

BIDRIN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3 mo.	4.24 (3.06-5.88)
Pheasants	♂	2 mo.	3.21 (2.45-4.21)
Chukars	♂ & ♀	1-2 yr.	9.63 (7.35-12.9)
Coturnix	♂	2½ mo.	4.32 (3.18-5.86)
Pigeons	♂ & ♀	--	2.00 (1.64-2.44)
Sharp-tailed grouse	♂	2-3 yr.	2.31 (1.78-3.00)
House sparrows	♂	--	3.00 (1.59-5.64)
House finches	♂ & ♀	--	2.83 (1.06-7.54)
Canada geese	♂ & ♀	--	2.28 (1.36-3.83)
Bullfrogs	♂	--	2000 (602-6640)

Acute symptoms: Goose-stepping ataxia, asthenia, miosis, salivation, lacrimation, tonic spasms, diarrhea, tachypnea, anorexia, prostration, tetany with wings outstretched, convulsions. As little as 1/10th of a lethal dose produced symptoms.

Notes: The 30-day EMLD for mallards is 0.250 mg/kg/day for both sexes. This gives a cumulative toxicity index of 4.24/.25 = 17, indicating moderately high cumulative toxicity. One mule deer buck received 0.75 mg/kg/day orally for 30 days. Only tremors and salivation were displayed. Another buck received 3.0/mg/kg/day orally for 7 days and died.

BINNELL = See Balan

BIO-5462 = See Thiodan

BIOTROL = See Thuricide

BIRLANE = See Supona

0,0-BIS(p-CHLOROPHENYL) ACETIMIDOYLPHOSPHORAMIDOTHIOATE = See Gophacide

BIS-N,N,N′,N′-TETRAMETHYLPHOSPHORODIAMIDIC ANHYDRIDE = See OMPA

BLACK LEAF 40 = See nicotine sulfate

BLADAN = See TEPP

BORDEAUX MIXTURE

Alternative name: 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

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000
Pheasants	♂	3 mo.	>2000

Acute symptoms: Only mild ataxia and wings crossed high over back from ½ hour to 1 day after treatment.

BOTRAN

Alternative names: dichloran, Allisan, U-2069, DCNA, AL-50, ditranil

Chemical name: 2,6-dichloro-4-nitroaniline

BOTRAN (Continued)

Primary use: Fungicide

Sample purity: 97%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	>2000

Acute symptoms: Regurgitation, ataxia, weakness, wing drop, falling when walking. Symptoms persisted for up to 5 weeks after treatment.

N-BUTYL-N-ETHYL-α,α,α-TRIFLUORO-2,6-DINITRO-p-TOLUIDINE = See Balan

C 570 = See phosphamidon

CALCIUM HYDROXIDE and COPPER SULFATE = See Bordeaux mixture

CARBARYL = See Sevin

CARBOPHENOTHION = See Trithion

CARBOPHOS = See Malathion

CASORON

Alternative names: dichlobenil, Casoron 133, NIA 5996

Chemical name: 2,6-dichlorobenzonitrile

Primary use: Herbicide

Sample purity: 98.7% technical

CASORON (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3 mo.	>2000
Pheasants	♂	8-9 mo.	1189 (857-1650)

Acute symptoms: In both species ataraxia and fluffed feathers with the neck pulled in was 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 10-16 days after single oral administration. Survivors suffered extreme weight losses in the first few weeks after treatment.

Notes: Hemorrhaging of the intestinal mucous membrane was noted at autopsy.

CASORON 133 = See Casoron

CD-68 = See chlordane

CERESAN L

Alternative names: Granosan ("Granosan" also refers to Ceresan M, Ceresan M-DB, and Ceresan Red)

Chemical name: Formulation containing methylmercury 2,3-dihydroxypropyl mercaptide and methylmercury acetate

Primary use: Seed disinfectant, Fungicide

Sample purity: 2.89% of former and 0.62% of latter ingredient (2.25% mercury)

CERESAN L (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3 mo.	>2000
Pheasants	♂	3-4 mo.	1190 (--)
Bobwhite quail	♂	2-3 mo.	1060 (841-1330)
Fulvous tree ducks	♂	3-6 mo.	1680 (--)

Acute symptoms: Ataxia, ataraxia, low carriage, hunching up with feathers fluffed, wing drop, neck pulled in, blinking, dyspnea, immobility. The mallards showed only ataxia for 3 days following treatment. Mortalities in the pheasants, bobwhites, and fulvous tree ducks took 1 to 9 days after single oral administration. This is a very slow-acting compound, and complete recovery from symptoms among surviving pheasants took up to 21 days.

Notes: The 30-day EMLD for mallards of both sexes is about 30 mg/kg/day, giving a cumulative toxicity index of >2000/30 = >66.

CERESAN M

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

Chemical name: N-(ethylmercuri)-p-toluene sulfonanilide

Primary use: Seed disinfectant, fungicide

Sample purity: 7.7% formulation

CERESAN M (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3 mo.	>2262
Mallard ducklings	♂ & ♀	7 days ± 1	>2262
Pheasants	♀	12 mo.	360 (--)
Coturnix	♀	2 mo.	668 (530-842)
Pigeons	♂ & ♀	--	755 (526-1080)
Prairie chickens	♂ & ♀	--	360 (233-566)

Acute symptoms: 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, ataraxia. Mortalities usually occurred a few days to a few weeks post-treatment.

Notes: Pheasant survivors of 30-day exposures to repeated oral treatment at 20 mg/kg/day produced eggs with slightly less hatchability than did controls treated with empty gelatin capsules.

CHEM BAM = See nabam

CHLORDAN = See Chlordane

CHLORDANE

Alternative names: Octachlor, Velsicol 1068, Octa-Klor, chlordan, CD-68, ENT 9932

Chemical name: 1,2,4,5,6,7,10,10-octachloro-4,7,8,9-tetrahydro-4,7-endomethyleneindane

Primary use: Insecticide

CHLORDANE (Continued)

Sample purity: 100% active (60% of named compound and 40% related compounds)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	4-5 mo.	1200 (954-1510)

Acute symptoms: Ataxia, tail up, use of wings for balance in walking, falling, phonation, neck muscle twitches, tremors. Symptoms appeared as soon as 5 minutes after single oral administration and persisted in some survivors for up to 1 or 4 weeks. Mortalities occurred between 1 and 8 days.

CHLORFENVINPHOS = See Supona

CHLORINATED BIPHENYLS = See arochlors

CHLORINATED CAMPHENE = See toxaphene

2-CHLORO-1-(2,4-DICHLOROPHENYL) VINYL DIETHYL PHOSPHATE = See Supona

O-[2-CHLORO-1-(2,5-DICHLOROPHENYL)VINYL] O,O-DIETHYL PHOSPHOROTHIOATE = See Akton

2-CHLORO-2-DIETHYLCARBAMOYL-1-METHYLVINYL DIMETHYL PHOSPHATE = See phosphamidon

2-CHLORO-4-ETHYLAMINO-6-ISOPROPYLAMINO-s-TRIAZINE = See atrazine

2-[4-CHLORO-6-ETHYLAMINO-s-TRIAZIN-2-YL)AMINO]-2-METHYLPROPIONITRILE = See SD 15418

CHLORO-IPC = See CIPC

CHLOROPHENOTHANE = See DDT

3-[p-(p-CHLOROPHENOXY)PHENYL]-1,1-DIMETHYLUREA = See Tenoran

5-(p-CHLOROPHENYL)SILATRANE = See DM 7537

2-CHLORO-1-(2,4,5-TRICHLOROPHENYL)VINYL DIMETHYL PHOSPHATE = See Gardona

CHLOROXURON = See Tenoran

CHLOROPROPHAM = See CIPC

CHRYSANTHEMUM CINERARIAFOLIUM = See pyrethrum

CICP = See CIPC

CINERINS = See pyrethrum

CIODRIN

Alternative name: SD 4294

Chemical name: α-methylbenzyl 3-(dimethoxyphosphinyloxy)-cis-crotonate and related compounds

Primary use: Insecticide

Sample purity: 85% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	790 (411–1520)

Acute symptoms: Ataxia, leg weakness, wings crossed high over back, opisthotonos. Most mortalities occurred about an hour after administration.

CIPC

Alternative names: Chloro-IPC, chloropropham, Y-3, CICP

Chemical name: isopropyl N-(3-chlorophenyl)carbamate

Primary use: Herbicide

Sample purity: 99%+

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	>2000

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

CL 38023 = See famophos

COMPOUND 118 = See aldrin

COMPOUND 497 = See dieldrin

COMPOUND 604 = See Phygon

COMPOUND 1080 = See Sodium monofluoroacetate

COMPOUND 3956 = See toxaphene

COMPOUND 4072 = See Supona

COPPER SULFATE and CALCIUM HYDROXIDE = See Bordeaux mixture

CO-RAL

Alternative names: coumaphos, BAY 21199, Resitox, Agridip, Asuntol, ENT 17957, Muscatox

CO-RAL (Continued)

Chemical name: O,O-diethyl O-3-chloro-4-methyl-2-oxo -2H-benzopyran-7-yl phosphorothioate

Primary use: Insecticide

Sample purity: 95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	29.8 (21.5–41.3)

Acute symptoms: Spraddle-legged walking, wing twitching, wing drop, nutation, prostration with wings spread, lacrimation, terminal wing-beat convulsions. Symptoms persisted in some survivors for up to 13 days accompanied by weight loss. Mortalities usually occurred 2 hours to overnight after treatment.

COTORAN

Alternative name: fluometuron

Chemical name: 3-(m-trifluoromethylphenyl) -1,1-dimethylurea

Primary use: Herbicide

Sample purity: 80% wettable powder

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	>2000

COTORAN (Continued)

Acute symptoms: Ataxia, wing drop or wings crossed high over back, tail pointed upward, fluffed feathers, hyperexcitability, phonation, falling. Symptoms appeared 15 minutes post-treatment and persisted for up to a week.

COUMAPHOS = See Co-Ral

CP 47114 = See Accothion

CP 14957 = See Telodrin

CYCLODAN = See Thiodan

CYCLOHEXIMIDE = See Actidione

CYGON = See dimethoate

2, 4-D

Alternative names: Ded-Weed 40, Weedar 64, Weed-B-Gon

Chemical name: 2,4-dichlorophenoxyacetic acid or its sodium salt or amine

Primary use: Herbicide

, 4-D (Continued)

Sample purity: Technical acid[1/], technical sodium salt[2/], and 4 lb. acid equivalent per gallon of the amine[3/]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1/]	♂ & ♀	3-5 mo.	≫1000
Mallards[2/]	♂ & ♀	3-5 mo.	≫2025
Mallards (S.T.)[3/]	♂	7 mo.	~2000
Pheasants[1/]	♂	3-4 mo.	472 (340-654)
Coturnix[1/]	♂	2 mo.	668 (530-842)
Pigeons[1/]	♂ & ♀	--	668 (530-842)
Mule deer[1/]	♀	8-11 mo.	400-800

Acute symptoms: Polydipsia, ataxia, tachypnea, tremors, prostration, ptosis of eyelid, salivation.

Notes: Gastrointestinal and endocardial hemorrhages were seen at autopsy in mortalities. Two mule deer does were orally administered the acid for 30 days; one survived 80 mg/kg/day and the other 240 mg/kg/day, showing only slight symptoms but no weight loss. Combinations of 2000 mg/kg 2,4-D amine and 2000 mg/kg Tordon 22K administered by stomach tube were not lethal to mallards.

ALF = See methyl parathion

ALMATION INSECT FLOWERS = See pyrethrum

)ASANIT

Alternative names: fensulfothion, BAY 25141, Terracur

Chemical name: O,O-diethyl O-p-(methylsulfinyl)phenyl phosphorothioate

DASANIT (Continued)

Primary use: Insecticide

Sample purity: 90%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	5-7 mo.	0.749 (0.595-0.944)

Acute symptoms: Regurgitation, ataxia, wings crossed high over back, wing and tail tremors, masseter tenseness, dyspnea, opisthotonos. Symptoms appeared as soon as 20 minutes after treatment, and mortalities took place in 34 minutes to 3 hours. Survivors appeared normal the day after treatment.

DBCP = See Nemagon

DBD = See Guthion

DCNA = See Botran

DDT

Alternative names: p,p'-DDT, dichlorodiphenyltrichoroethane, Arkotine, Dicophane, chlorophenothane, Zerdane, Gesarol, Guesarol, Guesapon, Neocid, pentachlorin, Gyron, DND, ENT 1506

Chemical name: 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane

Primary use: Insecticide

Sample purity: >99% (set point 105.4°F)

DDT (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3 mo.	>2240
Pheasants	♀	3–4 mo.	1296 (745–2257)
Coturnix	♂	2 mo.	841 (607–1170)
Pigeons	♂ & ♀	--	>4000
Lesser sandhill cranes	♂ & ♀	Adult	>1200
Bullfrogs	♀	--	>2000

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

Notes: The acute tests reported above were based on DDT administered orally in gelatin capsules. However, DDT in corn oil was given via stomach tube to another group of cranes and was not lethal at 1200 mg/kg, the highest level tested. The 30-day EMLD for mallards of either sex is 50 mg/kg/day. This gives a cumulative toxicity index for mallards of >2240/50 = >44.8, indicating a high degree of cumulative action. Adult cranes given 1000 mg/kg/day for 10 days survived, but a 12-day exposure at this level was lethal. Adult mallards were fed 100 ppm DDT in the diet. The first to die did so at 43 days and the last at 417 days. Median lethal time was about 1 year. Thirty ppm was not lethal to mallards or bobwhite quail of either sex in a 90-day feeding study. DDT is more readily absorbed from materials with a high lipid content.

p,p'-DDT = See DDT

DDVP

Alternative names: Vapona, dichlorvos, Herkol

Chemical name: 2,2-dichlorovinyl dimethyl phosphate

Primary use: Insecticide

Sample purity: 93%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	5–7 mo.	7.78 (6.0–10.1)
Pheasants	♂	3 mo.	11.3 (8.99–14.3)

Acute symptoms: Goose-stepping ataxia, use of wings to aid in balance, tremors, convulsions.

Notes: Various internal hemorrhages were found at autopsy in sacrificed survivors of both species.

DED-WEED 40 = See 2,4-D

DEMETON = See Systox

DEMETON METHYL = See Meta-Systox-R

DEMETON O = See Systox

DEMETON-S-METHYL-SULFOXIDE = See Meta-Systox-R

DERRIN = See rotenone

DERRIS EXTRACT = See rotenone

DIANISYLTRICHLOROETHANE = See methoxychlor

DIAZINON

Alternative names: Basudin, G-24480, ENT 19507

Chemical name:
O,O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate

Primary use: Insecticide

Sample purity: 89% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	3.54 (2.37–5.27)
Pheasants	♂	3–4 mo.	4.33 (3.02–6.22)
Bullfrogs	♀	--	>2000

Acute symptoms: Birds—goose-stepping ataxia, wing spasms, wing drop, hunched back, dyspnea, tenesmus, diarrhea, salivation, lacrimation, ptosis of eyelid, prostration, opisthotonos-like seizures or wing-beat convulsions.

DIBROM

Alternative names: naled, RE 4355, ENT 24988

Chemical name: 1,2-dibromo-2,2-dichloroethyl dimethyl phosphate

Primary use: Insecticide

Sample purity: 93%

DIBROM (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	--	52.2 (37.8–72.3)
Sharp-tailed grouse	♂	--	64.9 (37.3–111)
Canada geese	♂ & ♀	--	36.9 (27.2–50.0)
Mule deer	♂ & ♀	--	~200

Acute symptoms: Ataxia, salivation, tremors.

1,2-DIBROMO-3-CHLOROPROPANE = See Nemagon

1,2-DIBROMO-2,2-DICHLOROETHYL DIMETHYL PHOSPHATE = See Dibrom

DICHLOBENIL = See Casoron

DICHLONE = See Phygon

DICHLORAN = See Botran

2,6-DICHLOROBENZONITRILE = See Casoron

2,4-DICHLORO-6-(o-CHLOROANILINO)-s-TRIAZINE = See Dyrene

DICHLORODIPHENYLTRICHLOROETHANE = See DDT

2,3-DICHLORO-1,4-NAPHTHOQUINONE = See Phygon

2,6-DICHLORO-4-NITROANILINE = See Botran

2,4-DICHLOROPHENOXYACETIC ACID = See 2,4-D

3-(3,4-DICHLOROPHENYL)-1,1-DIMETHYLUREA = See diuron

2,4-DICHLOROPHENYL METHANESULFONATE
= See SD 7727

2,2-DICHLOROVINYL DIMETHYL PHOSPHATE = See DDVP

DICHLORVOS = See DDVP

DICOPHANE = See DDT

DICROTOPHOS = See Bidrin

DIELDRIN

Alternative names: Octalox, Compound 497, ENT 16225, HEOD

Chemical name: 1,2,3,4,10,10-hexachloro-6,7-epoxy-1, 4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5, 8-dimethanonaphthalene (=HEOD), and related compounds

Primary use: Insecticide

Sample purity: 100% (85% HEOD)

DIELDRIN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	6-7 mo.	381 (141-1030)
Pheasants	♂	10-23 mo.	79.0 (33.3-187)
Chukars	♂ & ♀	8-11 mo.	23.4 (15.2-36.0)
Coturnix	♂	2 mo.	69.7 (40.0-121)
Pigeons	♂ & ♀	--	26.6 (19.2-36.9)
House sparrows	♀	--	47.6 (34.3-66.0)
Canada geese	♂ & ♀	Adult	50-150
Fulvous tree ducks	♀	--	100-200
Gray partridges	♀	3-10 mo.	8.84 (3.32-23.6)
Domestic goats	♂	6-8 mo.	100-200
Mule deer	♂	8-18 mo.	75-150

Acute symptoms: Tail feathers spread and pointed either upward or downward, hyperexcitability, jerkiness in gait, ataxia, dyspnea, myasthenia, fluffed feathers, immobility, terminal wing-beat convulsions or opisthotonos. Mortalities usually occurred 1 to 9 days following treatment.

Notes: The 30-day EMLD for fulvous tree ducks is 2.5 and for gray partridges, 1.25 mg/kg/day. That for mallards is 5.0 mg/kg/day for both sexes. This results in a cumulative toxicity index of 381/5 = 76 for mallards, indicating a high degree of cumulative action. In 60-day feeding tests, 2.5 ppm was lethal to partridges, but not to fulvous tree ducks.

DIESEL OIL #1

Alternative names: None found

Chemical name: A petroleum fraction

Primary use: Adjuvant, pesticide carrier, fuel

Sample purity: Technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂ & ♀	>12 mo.	>20 ml/kg

Acute symptoms: Transient weakness, diarrhea and regurgitation.

Notes: Twenty milliliters per kilogram is far more than any mallard is likely to come into contact with in normal pesticide applications.

O,O-DIETHYL O-3-CHLORO-4-METHYL-2-OXO-2H-1-BENZOPYRAN-7-YL PHOSPHOROTHIOATE = See Co-Ral

O,O-DIETHYL S-[p-CHLOROPHENYLTHIO)METHYL] PHOSPHORODITHIOATE = See Trithion

DIETHYL ETHYLTHIOETHYL DITHIOPHOSPHATE = See Di-Syston

O,O-DIETHYL O(&S)-2-(ETHYLTHIO)ETHYL PHOSPHOROTHIOATE = See Systox

O,O-DIETHYL S-2-(ETHYLTHIO)ETHYL PHOSPHORODITHIOATE = See Di-Syston

O,O-DIETHYL S-(ETHYLTHIO)METHYL PHOSPHORODITHIOATE = See Thimet

O,O-DIETHYL O-(2-ISOPROPYL-4-METHYL-6-PYRIMIDINYL) PHOSPHOROTHIOATE = See diazinon

O,O-DIETHYL O-p-(METHYLSULFINYL)PHENYL PHOSPHOROTHIOATE = See Dasanit

O,O-DIETHYL O-p-NITROPHENYL PHOSPHOROTHIOATE = See parathion

O,O-DIETHYL O-3,5,6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE = See Dursban

2,3-DIHYDRO-2,2-DIMETHYL-7-BENZOFURANYL METHYLCARBAMATE = See Furadan

DIMETHOATE

Alternative names: Cygon, Fostion MM, Rogor, AC 12880, ENT 24650, L-395, Le-Kuo, Perfekthion, Roxion

Chemical name: **O,O-dimethyl S-(N-methylcarbamoylmethyl) phosphorodithioate**

Primary use: Insecticide

Sample purity: 97%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	41.7 (30.1–57.8)
Mule deer	♂ & ♀	--	≥200

Acute symptoms: Feathers drawn tightly to body, mild tachypnea, ataxia, myasthenia, tremors.

Notes: The 30-day EMLD for mallards is 6.0 mg/kg/day for both sexes. This gives a cumulative toxicity index

DIMETHOATE (Continued)

of 41.7/6 = 7, indicating a moderate degree of cumulative action.

DIMETHOXY-DT = See methoxychlor

3-(DIMETHOXYPHOSPHINYLOXY)-N-METHYL-cis CROTONAMIDE = See Azodrin

3-(DIMETHOXYPHOSPHINYLOXY)-N,N-DIMETHYL-cis CROTONAMIDE = See Bidrin

4-(DIMETHYLAMINO)-m-TOLYL METHYLCARBAMATE = See Matacil

4-DIMETHYLAMINO-3,5-XYLYL METHYLCARBAMATE = See Zectran

O,O-DIMETHYL S-(1,2-DICARBETHOXYETHYL) DITHIOPHOSPHATE = See malathion

O,O-DIMETHYL S-2-(ETHYLSULFINYL)ETHYL PHOSPHOROTHIOATE = See Meta-Systox-R

O,O-DIMETHYL S-(N-METHYLCARBAMOYLMETHYL) PHOSPHORODITHIOATE = See dimethoate

O,O-DIMETHYL O-(4-METHYLMERCAPTOPHENYL) PHOSPHATE = See GC 6506

O,O-DIMETHYL S-[2-METHOXY-1,3,4-THIADIAZOLE-5(4H)-ONYL -(4)-METHYL] PHOSPHORODITHIOATE = See GS 13005

O,O-DIMETHYL O-[4-(METHYLTHIO)-m-TOLYL] PHOSPHOROTHIOATE = See Baytex

O,O-DIMETHYL O-(4-NITRO-m-TOLYL) PHOSPHOROTHIOATE = See Accothion

O,O-DIMETHYL O-p-NITROPHENYL PHOSPHOROTHIOATE = See methyl parathion

O,O-DIMETHYL S-[4-OXO-1,2,3-BENZOTRIAZIN-3(4H) -YLMETHYL] PHOSPHORODITHIOATE = See Guthion

3-[2-(3,5-DIMETHYL-2-OXOCYCLOHEXYL)-2-HYDROXYETHYL] GLUTARIMIDE = See Actidione

DIMETHYL PARATHION = See methyl parathion

O,O-DIMETHYL S-PHTHALIMIDOMETHYL PHOSPHORODITHIOATE = See Imidan

O-p-(DIMETHYLSULFAMOYL)PHENYL O,O-DIMETHYL PHOSPHOROTHIOATE = See Famophos

DIMICRON = See phosphamidon

DINITROCRESOL = See Elgetol

DIQUAT

Alternative names: Reglone, FB/2

Chemical name: 1,1′-ethylene-2,2′-dipyridylium dibromide

Primary use: Herbicide

Sample purity: 30%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	564 (324–982)

Acute symptoms: 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 3 days post-treatment.

DISODIUM ETHYLENE BISDITHIOCARBAMATE
= See Nabam

DISULFOTON = See Di-Syston

DI-SYSTON

Alternative names: disulfoton, Dithiosystox, Frumin AL or G, Solvirex, dithiodemeton, thiodemeton, BAY 19639, M-74, ENT 23437, diethyl ethylthioethyl dithiophosphate

Chemical name: O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate

Primary use: Insecticide

Sample purity: 97%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	6.54 (3.76–11.4)
Domestic goats	♂	>5 yr.	<15.0

Acute symptoms: Ataxia, wing drop, immobility.

Notes: Mortalities all occurred between 2 and 3 hours after treatment. Doses as low as 4.24 but not 3.0 mg/kg produced mortality in mallards.

DITHANE = See Nabam

DITHANE Z-78 = See Zineb

DITHIODEMETON = See Di-Syston

DITHIOSYSTOX = See Di-Syston

DITRANIL = See Botran

DIURON

Alternative names: Karmex, Marmer

Chemical name: 3-(3,4-dichlorophenyl)-1,1-dimethylurea

Primary use: Herbicide

Sample purity: 95% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Ataxia and frequent falling persisted for up to 11 days.

D.M. 7537

Alternative name: M & T Chemicals RS150

Chemical name: 5-(p-chlorophenyl)silatrane

Primary use: Experimental rodenticide

Sample purity: 95%+

D.M. 7537 (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	21.7 (12.5-37.9)
Pheasants	♂	3-4 mo.	34.8 (25.5-47.4)
Chukars	♂ & ♀	3-4 mo.	3.54 (--)
House sparrows	♂ & ♀	--	0.371 (0.123-1.12)
Pintails	♂	--	<2.5
Albino rats (S.T.)	♂	--	~5.0
Bullfrogs	♂	--	300-600

Acute symptoms: Miosis, ataxia, tachypnea, dyspnea, phonation, circling, tenesmus, tremors, violent convulsions, terminal opisthotonos. This is a very fast-acting compound, producing symptoms in as little as 2 minutes and mortalities in a quarter hour. Recovery of survivors usually took place by 2 hours.

Notes: Secondary hazard appears to be minimal. Rats ingesting other albino rats that succumbed to 5 times the lethal doses did not show symptoms of intoxication.

DMTD = See methoxychlor

DMTP = See Baytex

DNC = See Elgetol

DND = See DDT

DNOC = See Elgetol

DNTP = See parathion

DODECACHLOROOCTAHYDRO-1,3,4-METHENO-2H-CYCLOBUTA[c,d]PENTALENE = See mirex

DOG BUTTON = See strychnine

DOWCO 139 = See Zectran

DOWCO 179 = See Dursban

DRC-714 = See Gophacide

DSE = See nabam

DURSBAN

Alternative names: Dowco 179, ENT 27311

Chemical name: O,O-diethyl O-3,5,6-trichloro-2-pyridyl phosphorothioate

Primary use: Insecticide

DURSBAN (Continued)

Sample purity: 94.5% [1] and 99% [2]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards [2]	♀	--	75.6 (35.4-161)
Mallards [2]	♂	--	70-80
Mallard ducklings [2]	♂ & ♀	17 days	167 (78.3-357)
Pheasants [2]	♀	3-5 mo.	17.7 (--)
Pheasants [2]	♂	3-5 mo.	8.41 (2.77-25.5)
Chukars [2]	♀	3-5 mo.	61.1 (47.5-78.6)
Chukars [2]	♂	3-5 mo.	60.7 (43.8-84.1)
Coturnix [1]	♂	2½ mo.	15.9 (10.5-24.0)
Coturnix [1]	♂	2 mo.	17.8 (--)
Pigeons [1]	♂ & ♀	--	26.9 (19.0-38.1)
House sparrows [1]	♂	--	21.0 (5.59-79.1)
Canada geese [2]	♂ & ♀	--	≥80
Lesser sandhill cranes [1&2]	♂	--	25-50
Albino rats [2] (S.T.)	♂	--	151 (--)
Domestic goats [1]	♀	--	500-1000
Bullfrogs [1]	♂	--	>400

Acute symptoms: Excessive blinking, hypoesthesia then hyperesthesia, 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 hour and 9 days.

DURSBAN (Continued)

Notes: Numerous instances of gross pathological changes were seen at autopsy in tissues of sacrificed survivors. The 30-day EMLD for mallards is less than 2.5 mg/kg/day for both sexes. This gives a cumulative toxicity index of 75/<2.5 = >30, indicating a high degree of cumulative action for an organophosphate. The 30-day EMLD for chukars is 10-20 mg/kg/day. For most species, the slope of the acute dose-response curve was low (decreasing dosage levels did not produce a proportional decrease in the response). This would indicate a reduced safety margin for the chemical because mortalities frequently occurred at levels much lower than the calculated LD_{50}'s.

DYRENE

Alternative names: B-622, Kemate

Chemical name: 2,4-dichloro-6-(o-chloroanilino)-s-triazine

Primary use: Fungicide

Sample purity: 95.5% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	>2000

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

E-601 = See methyl parathion

E-605 = See parathion

E-1059 = See Systox

E-3314 = See heptachlor

EL-110 = See Balan

ELGETOL

Alternative names: DNOC, DNC, Sinox, dinitrocresol

Chemical name: 2-methyl-4,6-dinitrophenol

Primary use: Herbicide

Sample purity: 95% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	5-7 mo.	22.7 (18.0-28.5)

Acute symptoms: Ataxia, wings crossed high over back, and tail tremors or shivering, falling when walking, tachypnea, dyspnea, ruffed or unkempt feathers, tetany with the legs extended posteriorly. Symptoms persisted in a few survivors for up to 2 weeks.

Notes: Gross autopsies of sacrificed survivors revealed two cases of petechiation in the coronary band.

ENDOSULFAN = See Thiodan

ENDRIN

Alternative names: Experimental Insecticide 269 (J. Hyman & Co.)

Chemical name: 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-endo-5,8-dimethanonaphthalene

Primary use: Insecticide

ENDRIN (Continued)

Sample purity: 96%[1] and 97%[2] technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1]	♀	10-13 mo.	5.64 (2.71-11.7)
Pheasants[2]	♀	3-4 mo.	1.78 (1.12-2.83)
Pigeons[1]	♂ & ♀	--	2.0-5.0
Sharp-tailed grouse[1]	♀	4 yr.	0.75-1.50
Domestic goats[1]	♀	12-24 mo.	25-50

Acute symptoms: Ataxia, slowness, drowsiness, tremors, tracheal congestion, prostration, convulsions. Deaths occurred up to 5 days post-treatment.

Notes: The 30-day EMLD for mallards is 0.125 mg/kg/day for both sexes. This gives a cumulative toxicity index of 5.64/0.125 = 45, indicating a moderately high degree of cumulative action.

ENT 1506 = See DDT

ENT 7796 = See lindane

ENT 9932 = See chlordane

ENT 15108 = See parathion

ENT 15152 = See heptachlor

ENT 15949 = See aldrin

ENT 16225 = See dieldrin

ENT 17034 = See malathion

ENT 17292 = See methyl parathion

ENT 17295 = See Systox

ENT 17957 = See Co-Ral

ENT 19507 = See diazinon

ENT 23233 = See Guthion

ENT 23437 = See Di-Syston

ENT 23708 = See Trithion

ENT 23979 = See Thiodan

ENT 24650 = See dimethoate

ENT 24915 = See tepa

ENT 24988 = See Dibrom

ENT 25515 = See phosphamidon

ENT 25540 = See Baytex

ENT 25545-X = See Telodrin

ENT 25644 = See famophos

ENT 25705 = See Imidan

ENT 25712 = See BAY 37289

ENT 25719 = See mirex

ENT 25734 = See GC 6506

ENT 25766 = See Zectran

ENT 25784 = See Matacil

ENT 27041 = See Mobam

ENT 27102 = See Akton

ENT 27165 = See Abate

ENT 27311 = See Dursban

ENTEX = See Baytex

EPN

Alternative names: ethyl p-nitrophenyl thionobenzenephosphonate

Chemical name: O-ethyl O-p-nitrophenyl phenylphosphonothioate

Primary use: Insecticide

Sample purity: 91% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3 mo.	3.08 (2.38-4.00)
Pheasants	♀	3-5 mo.	53.4 (38.5-74.1)
Chukars	♀	3 mo.	14.3 (10.3-19.8)
Coturnix	♀	2 mo.	5.25 (3.79-7.28)
Pigeons	♂ & ♀	--	5.90 (4.25-8.17)
House sparrows	♀	--	12.6 (7.16-22.2)

Acute symptoms: Ataxia, prostration, salivation, lacrimation, tenesmus, diarrhea, dyspnea, tremors, wings thrust at right angles to body axis, tetany, terminal wing-beat convulsions or opisthotonos.

1,1'-ETHYLENE-2,2'-DIPYRIDYLIUM DIBROMIDE = See diquat

N-(ETHYLMERCURI)-p-TOLUENE SULFONANILIDE = See Ceresan M

O-ETHYL O-p-NITROPHENYL PHENYLPHOSPHONOTHIOATE = See EPN

ETHYL p-NITROPHENYL THIONOBENZENEPHOSPHONATE = See EPN

ETHYL PARATHION = See parathion

O-ETHYL O-2,4,5-TRICHLOROPHENYL ETHYLPHOSPHONOTHIOATE = See BAY 37289

17α-ETHYNYL-3-METHOXY-1,3,5(10)-ESTRATRIEN-17β-ol = See Mestranol

ETILON = See parathion

EXPERIMENTAL INSECTICIDE 269 = See endrin

EXPERIMENTAL INSECTICIDE 3911 = See Thimet

EXPERIMENTAL INSECTICIDE 52160 = See Abate

FAMOPHOS

Alternative names: famphur, ENT 25644, AC 38023, Warbex, CL 38023

Chemical name: O-p-(dimethylsulfamoyl)phenyl O,O-dimethyl phosphorothioate

Primary use: Systemic insecticide

Sample purity: 35%

FAMOPHOS (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	9.87 (5.88–16.6)

Acute symptoms: Regurgitation, goose-stepping ataxia, wing drop, tremors, tonic seizures.

FAMPHUR = See famophos

FB/2 = See diquat

FENITROTHION = See Accothion

FENOPROP = See silvex

FENSULFOTHION = See Dasanit

FENTHION = See Baytex

FLUOMETURON = See Cotoran

FOLIDOL = See parathion

FOLITHION = See Accothion

FOLPET

Alternative names: Phaltan, thiophal, trichloromethyl-thiophthalimide

Chemical name: N-(trichloromethylthio)phthalimide

Primary use: Fungicide

Sample purity: 92.4%

FOLPET (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	>2000

Acute symptoms: The only symptoms seen were mild ataxia and wings crossed high over back for up to 18 days. Slight weight losses occurred.

FOSTION MM = See dimethoate

FRATOL = See sodium monofluoroacetate

FRUMIN AL = See Di-Syston

FRUMIN G = See Di-Syston

FUMAZONE = See Nemagon

FURADAN Carbofuran

Alternative name: NIA 10242

Chemical name: 2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate

Primary use: Insecticide, miticide, nematocide

Sample purity: 98.8%

FURADAN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	0.397 (0.315-0.500)
Pheasants	♀	3 mo.	4.15 (2.38-7.22)
Bobwhite quail	♀	3 mo.	5.04 (3.64-6.99)
Fulvous tree ducks	♀	3-6 mo.	0.238 (--)

Acute symptoms: Ataxia, wings crossed high over back, nutation, diarrhea, phonation, salivation, lacrimation, immobility with wings spread, dyspnea, miosis, terminal wing-beat convulsions or opisthotonos. Symptoms in survivors persisted up to 7 days. Mortalities occurred as soon as 5 minutes after treatment.

Notes: The 30-day EMLD is 0.2 mg/kg/day for mallard ducks, indicating little or no cumulative toxicity. As little as 2 ppm Furadan in the drinking water of fulvous tree ducks was lethal in 7-day exposures, and 1 ppm produced symptoms of intoxication.

G-24480 = See diazinon

G-30027 = See atrazine

GAMMA BHC = See lindane

GAMMEXANE = See lindane

GARDONA

Alternative name: SD 8447

Chemical name: 2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate

Primary use: Insecticide

GARDONA (Continued)

Sample purity: Technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂ & ♀	1 yr.	≫2000
Pheasants	♂ & ♀	2-4 mo.	~2000
Chukars	♂ & ♀	1 yr.	≫2000

Acute symptoms: No symptoms occurred with the mallards and chukars. The pheasants showed convulsions, tremors and prostration during the 2nd and 3rd day following treatment.

GARRATHION = See Trithion

GC 1283 = See mirex

GC 4072 = See Supona

GC 6506

Alternative names: ENT 25734

Chemical name: O,O-dimethyl O-(4-methylmercaptophenyl) phosphate

Primary use: Insecticide

Sample purity: 95%

GC 6506 (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	1.12 (0.811-1.56)

Acute symptoms: Goose-stepping ataxia, wing drop, wing shivers, whole-body tremors, running and falling, tetanic seizures. Symptoms appeared as soon as 4 minutes after administration and persisted in most survivors for 1 to 2 weeks.

GESAPRIN = See atrazine

GESAROL = See DDT

GOPHACIDE

Alternative names: DRC-714, BAY 38819

Chemical name: O,O-bis(p-chlorophenyl) acetimidoylphosphoramidothioate

Primary use: Rodenticide

Sample purity: 95% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	24.0 (19.0-30.9)
Pheasants	♀	3-5 mo.	161 (78.3-332)
Chukars	♂ & ♀	3 mo.	322 (168-620)
Golden eagles	♂ & ?	<3 yr.	2.5-5.0
Bullfrogs	♂	--	>2000

GOPHACIDE (Continued)

Acute symptoms: Myasthenia, arched back, anorexia, ataxia, wings crossed high over back, salivation, miosis, ptosis of eyelid, dyspnea, diarrhea, tremors, loss of righting reflex, tetanic seizures, opisthotonos. Delayed appearance of symptoms up to 4 days sometimes occurred. Survivors took up to a week to regain normal appearance and behavior.

GRANOSAN = See Ceresan L and Ceresan M

GS 13005

Alternative names: Supracide, Ultracide

Chemical name: O,O-dimethyl S-[2-methoxy-1,3,4-thiadiazole-5(4H)-onyl-(4)-methyl]phosphorodithioate

Primary use: Insecticide

Sample purity: 98.2%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	23.6 (16.5-33.8)
Pheasants	♀	4 mo.	33.2 (17.3-63.5)
Chukars	♂ & ♀	1-2 yr.	225 (178-283)
Canada geese	♂ & ♀	Adult	5-15

Acute symptoms: Goose-stepping ataxia, leg weakness, dyspnea, lacrimation, salivation, prostration, ataraxia, seizures with wings spread, terminal opisthotonos.

GUESAPON = See DDT

GUESAROL = See DDT

GUSATHION = See Guthion

GUSTATHION = See Guthion

GUTHION

Alternative names: Gusathion, Methyl Guthion, Azinphos-methyl, BAY 17147, BAY 9027, DBD, ENT 23233, Gustathion

Chemical name: O,O-dimethyl S-[4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl]phosphorodithioate

Primary use: Insecticide

Sample purity: 90% technical[1/] and 2 lb./gal. formulation[2/]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1/]	♂	3-4 mo.	136 (97.8-188)
Pheasants[1/]	♂	3-5 mo.	74.9 (59.5-94.3)
Pheasants[2/]	♂	3-4 mo.	283 (200-400)
Chukars[1/]	♂	3-4 mo.	84.2 (53.0-134)

Acute symptoms: Regurgitation, goose-stepping ataxia, wing drop, wing spasms, tenesmus, diarrhea, myasthenia, dyspnea, prostration, terminal wing-beat convulsions or opisthotonos.

Notes: The 30-day EMLD of the 90% sample for mallards is less than 8.75 mg/kg/day for both sexes. This gives a cumulative toxicity index of 136/< 8.75 = >16, indicating at least moderately high cumulative action for mallards. Based on the amount of active chemical present, the toxicities of the technical grade and the formulation for pheasants are nearly identical.

GYRON = See DDT

Hemerocampa pseudotsugata = See nucleopolyhedral virus

HEOD = See dieldrin

HEPTACHLOR

Alternative names: Velsicol 104, E-3314, ENT 15152

Chemical name: 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene

Primary use: Insecticide

Sample purity: 99.2%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3 mo.	≥2000

Acute symptoms: The only symptoms seen were ataxia, excessive swallowing, and nutation during the day of treatment. Mortalities occurred at night on the 6th to 8th day after administration.

1,4,5,6,7,8,8-HEPTACHLORO-3a,4,7,7a-TETRAHYDRO-4,7-METHANOINDENE = See heptachlor

HERCULES 3956 = See toxaphene

HERKOL = See DDVP

HETP = See TEPP

γ-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE = See lindane

1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4a,5,6,7,8,8a-OCTAHYDRO-1,4-endo-endo-5,8-DIMETHANONAPHTHALENE = See endrin

1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4a,5,6,7,8,8a-OCTAHYDRO-1,4-endo-exo-5,8-DIMETHANONAPHTHALENE = See dieldrin

1,2,3,4,10,10-HEXACHLORO-1,4,4a,5,8,8a-HEXAHYDRO-1,4-endo-exo-5,8-DIMETHANONAPHTHALENE = See aldrin

6,7,8,9,10,10-HEXACHLORO-1,5,5a,6,9,9a-HEXAHYDRO-6,9-METHANO-2,4,3-BENZODIOXATHIEPIN 3-OXIDE = See Thiodan

HHDN = See aldrin

HOE 2671 = See Thiodan

5-(α-HYDROXY-α-2-PYRIDYLBENZYL)-7-(α-2-PYRIDYLBENZYLIDENE)-5-NORBORNENE-2,3-DICARBOXIMIDE = See Norbormide

IFK = See IPC-400

IMIDAN

Alternative names: Prolate, R-1504, ENT 25705

Chemical name: O,O-dimethyl S-phthalimidomethyl phosphorodithioate

Primary use: Insecticide, acaricide

Sample purity: 97.2%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	1830 (1270–2630)

IMIDAN (Continued)

Acute symptoms: Regurgitation, polydipsia, excessive preening, ataxia, prostration with wings spread to the sides, salivation, tetanic seizures, terminal wing-beat convulsions. Levels as low as 96 mg/kg produced symptoms, while as little as 768 mg/kg produced some mortality.

INPC = See IC-400

INSECT FLOWERS = See pyrethrum

INSECT POWDER = See pyrethrum

IPC-400

Alternative names: Propham, INPC, Iso PPC, IFK, Y-2, isopropyl carbanilate

Chemical name: isopropyl N-phenylcarbamate

Primary use: Herbicide

Sample purity: 40% active formulation

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	>2000

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

ISOBENZAN = See Telodrin

Iso PPC = See IPC-400

O-ISOPROPOXYPHENYL METHYLCARBAMATE = See Baygon

ISOPROPYL CARBANILATE = See IPC-400

ISOPROPYL N-(3-CHLOROPHENYL)CARBAMATE = See CIPC

ISOPROPYL N-PHENYLCARBAMATE = See IPC-400

ISOSAFROLE, n-OCTYL SULFOXIDE OF = See Sulfoxide

KARBOFOS = See malathion

KARMEX = See diuron

KEMATE = See Dyrene

L-395 = See dimethoate

L-36352 = See Treflan

LANDRIN

Alternative names: SD 8530

Chemical name: 3,4,5-trimethylphenyl methylcarbamate

Primary use: Experimental insecticide

LANDRIN (Continued)

Sample purity: >95% [1] and 96% technical [2]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards [2]	♀	4 mo.	16.8 (7.94–35.6)
Mallards [1]	♀	7–11 mo.	22.4 (14.1–35.6)
Pheasants [1]	♂	3 mo.	51.9 (31.6–85.4)
Chukars [1]	♂ & ♀	7–11 mo.	60.0 (48.0–76.0)
Coturnix [2]	♂	2 mo.	70.8 (32.6–154)
Pigeons [2]	♂ & ♀	--	168 (121–233)
House sparrows [2]	♂	--	46.3 (37.4–57.3)
House sparrows [2]	♀	--	55.0 (38.5–78.6)
Domestic goat [2]	♂	36–48 mo.	210
Mule deer [2]	♂	5–11 mo.	50–100

Acute symptoms: Birds—hyperactivity, ataxia, slowness, wing drop, salivation, lacrimation, diarrhea, tachypnea, tonic spasms, immobility, tetany, violent convulsions. Mammals—ataxia, tremors, salivation, nutation, phonation, inability to stand, tachypnea, mucous-filled trachea, tachycardia, ataraxia. Symptoms and mortality occurred as soon as 1/4 hour after treatment. Mortalities generally occurred by 2 hours and complete recovery among survivors took 1 to 3 days.

LANNATE

Alternative name: methomyl

Chemical name: S-methyl N-[(methylcarbamoyl)oxy] thioacetimidate

Primary use: Insecticide

LANNATE (Continued)

Sample purity: 90%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	8 mo.	15.9 (12.6–20.0)
Pheasants	♂	3–4 mo.	15.4 (8.86–26.9)
Mule deer	♂	13 mo.	11.0–22.0

Acute symptoms: High carriage, ataxia, drowsiness, tachypnea, dyspnea, salivation, tenesmus, diarrhea, tremors, tetany or wing-beat convulsions.

Notes: The 30-day EMLD for mallards is 7.5 mg/kg/day for both sexes. This gives a cumulative toxicity index of 15.9/7.5 = 2.1, indicating little or no cumulative toxic action.

LEBAYCID = See Baytex

LE-KUO = See dimethoate

LINDANE

Alternative names: gamma BHC, Gammexane, ENT 7796

Chemical name: γ-1,2,3,4,5,6-hexachlorocyclohexane

Primary use: Insecticide

Sample purity: 25%

LINDANE (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Regurgitation, polydipsia, tremors, circling, weakness, slowness of reflexes, opisthotonos.

Notes: The 30-day EMLD for mallards is 30 mg/kg/day for both sexes. This gives a cumulative toxicity index of >2000/30 = >67, indicating a high degree of cumulative toxic action even for a chlorinated hydrocarbon.

LO-KUO = See dimethoate

LONCHOCARPUS EXTRACT = See rotenone

M-74 = See Di-Syston

MALATHION

Alternative names: carbophos, karbofos, Malathon, AC 4049, ENT 17034

Chemical name: 0,0-dimethyl S-(1,2-dicarbethoxyethyl) dithiophosphate

Primary use: Insecticide

Sample purity: 95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	1485 (1020–2150)

MALATHION (Continued)

Acute symptoms: Ataxia, walking high on toes, wing drop, falling stiffly with wings spread, tenesmus, foamy salivation, tremors. Mortalities occurred 100 minutes to overnight after treatment.

MALATHON = See malathion

MALIX = See Thiodan

MARLATE = See methoxychlor

MARMER = See diuron

MATACIL

Alternative names: Aminocarb, ENT 25784, BAY 44646, A 363

Chemical name: 4-(dimethylamino)-m-tolyl methylcarbamate

Primary use: Insecticide

Sample purity: 97%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	8 mo.	22.5 (17.8–28.3)
Pheasants	♂	3–4 mo.	42.4 (33.7–53.4)
Mule deer	♂	13–15 mo.	7.5–15.0

Acute symptoms: Ataxia, tenseness, lacrimation, salivation, tachypnea, feathers fluffed or drawn tightly against body, pilorection, diarrhea, dyspnea, tracheal congestion, wing-beat convulsions or opisthotonos. Mortality among birds usually occurred in the 1st hour after treatment.

MCA-600 = See Mobam

McNEIL 1025 = See Norbormide

MEMA RM

Alternative name: Mercuran

Chemical name: methoxy ethyl mercury acetate

Primary use: Fungicide

Sample purity: 11.4%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	1059 (764–1470)

Acute symptoms: Ataxia, wings crossed high over back, tail down, wing shivers, salivation, collapse. Regurgitation of part of the dosage occurred. Mortalities took place as early as 1 hour and as late as 6 days after treatment. Recovery among survivors took as long as 14 days.

MERCAPTOPHOS = See Baytex

MERCAPTOPHOS (USSR) = See Systox

MERCURAN = See Mema RM

MESTRANOL

Alternative name: None found

Chemical name: 17 α-ethynyl-3-methoxy-1,3,5(10)-estratrien-17β-ol

MESTRANOL (Continued)

Primary use: Antifertility agent

Sample purity: 95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Red-winged blackbirds	♂	--	>> 1000

Acute symptoms: None seen.

Notes: The 30-day EMLD for chukars is greater than 20 mg/kg/day for both sexes. The chukars treated at this level displayed some salivation and general weakness only. Eggs later produced by these chukars were slightly less fertile than those of a control group receiving empty gelatin capsules for a month.

META-SYSTOX-R

Alternative names: demeton methyl, methyl systox, BAY 21116, Metasystox R, demeton-S-methyl-sulfoxide

Chemical name: O,O-dimethyl S-2-(ethylsulfinyl)ethyl phosphorothioate

Primary use: Insecticide

Sample purity: 50% technical

META-SYSTOX-R (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	4 mo.	53.9 (38.9–74.8)
Pheasants	♂	3–4 mo.	42.4 (30.6–58.8)
Chukars	♂ & ♀	3–4 mo.	113 (81.7–157)
Coturnix	♀	2 mo.	84.1 (60.6–117)
Pigeons	♂ & ♀	--	14.9 (10.7–20.6)
House sparrows	♂	--	70.8 (43.4–116)

Acute symptoms: Ataxia, salivation, lacrimation, nutation, dyspnea, masseter tenseness, severe miosis, tenesmus, prostration or immobility in a prone position, tremors, tetany, terminal wing-beat convulsions or opisthotonos.

METHOMYL = See Lannate

2-METHOXYCARBONYL-1-METHYLVINYL DIMETHYL PHOSPHATE = See Phosdrin

METHOXYCHLOR

Alternative names: Dimethoxy-DT, DMDT, methoxy DDT, Dianisyltrichloroethane, Marlate

Chemical name: 1,1,1-trichloro-2,2-bis(p-methoxyphenyl) ethane

Primary use: Insecticide

Sample purity: Technical (88% of the named compound is considered 100% active)

METHOXYCHLOR (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Mallards receiving 2000 mg/kg displayed only minor leg weakness, which disappeared the following day.

METHOXY DDT = See methoxychlor

METHOXY ETHYL MERCURY ACETATE = See Mema RM

α-METHYLBENZYL 3-DIMETHOXYPHOSPHINYLOXY)-cis-CROTONATE = See Ciodrin

2-METHYL-4,6-DINITROPHENOL = See Elgetol

1,2-METHYLENEDIOXY-4-[2-(OCTYLSULFINYL)PROPYL] BENZENE = See Sulfoxide

METHYL GUTHION See Guthion

METHYLMERCURIC CYANOGUANIDINE = See Panogen

METHYLMERCURIC DICYANDIAMIDE = See Panogen

METHYLMERCURY ACETATE = See Ceresan L

METHYLMERCURY 2,3-DIHYDROXYPROPYL MERCAPTIDE = See Ceresan L

S-METHYL N-[(METHYLCARBOMYL)OXY]THIOACETIMIDATE = See Lannate

METHYL PARATHION

Alternative names: parathion methyl, Dalf, Nitrox, Metron, E-601, BAYER E-601, ENT 17292, dimethyl parathion

Chemical name: O,O-dimethyl O-p-nitrophenyl phosphorothioate

Primary use: Insecticide

Sample purity: 80%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3 mo.	10.0 (6.12–16.3)
Pheasants	♀	2 mo.	8.21 (5.69–11.9)

Acute symptoms: Regurgitation, salivation, lacrimation, asynergy, paralysis, convulsions.

1-1-METHYL-2-(3-PYRIDYL)PYRROLIDINE SULFATE = See nicotine sulfate

METHYL SYSTOX = See Meta-Systox-R

4-(METHYLSULFONYL)-2,6-DINITRO-N,N-DIPROPYLANILINE = See SD 11831

METRON = See methyl parathion

MEVINPHOS = See Phosdrin

MIREX

Alternative names: GC 1283, ENT 25719

Chemical name: dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta[c,d]pentalene

Primary use: Insecticide

MIREX (Continued)

Sample purity: 98%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2400

Acute symptoms: Temporary mild ataxia observed at 2400 mg/kg. Regurgitation occurred at 2400, but not at 1200 mg/kg or less.

ML-97 = See phosphamidon

MOBAM

Alternative names: MCA-600, ENT 27041, MOS-708

Chemical name: benzo[b]thien-4-yl methylcarbamate

Primary use: Insecticide

Sample purity: 98% technical

MOBAM (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	1 yr.	1130 (425-3020)
Pheasants	♂	2-3 mo.	228 (136-383)
Chukars	♂ & ♀	9 mo.	237 (137-410)
Coturnix	♂	2 mo.	668 (530-842)
Pigeons	♂ & ♀	--	273 (215-354)
Sharp-tailed grouse	♂	--	173 (99.9-300)
House sparrows	♂	--	57.8 (33.2-101)

Acute symptoms: Asynergy, myasthenia, goose-stepping ataxia, stumbling or collapse, lacrimation, foamy salivation, diarrhea, tachypnea, dyspnea, ataraxia, tetany, tonic convulsions.

Notes: The 30-day EMLD for mallards is 40 mg/kg/day. This gives a cumulative toxicity index of 1130/40 = 28, indicating a high degree of cumulative toxic action for a carbamate. Pheasants surviving 30 repeated daily oral doses at 40 mg/kg/day produced eggs of fertility, hatchability, and chick survivability very similar to those of a control group of pheasants treated 30 days with empty gelatin capsules.

MONOSODIUM FLUOROACETATE = See Sodium monofluoroacetate

MORSODREN = See Panogen

MOS-708 = See Mobam

M & TRS 150 = See DM 7537

MUSCATOX = See Co-Ral

NABAM

Alternative names: Dithane, Parzate, DSE, Chem Bam

Chemical name: disodium ethylenebisdithiocarbamate

Primary use: Fungicide

Sample purity: 93%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	>2560
Pheasants	♂	3-5 mo.	707 (--)
Coturnix	♂	2 mo.	2120 (1680-2670)
Pigeons	♂ & ♀	--	>2000
Domestic goats	♂	11 mo.	>800
Bullfrogs	♀	--	595 (--)

Acute symptoms: Ataxia, tremors, tachypnea, myasthenia, salivation, miosis, tenesmus, diarrhea, pilorection.

NALED = See Dibrom

1-NAPHTHYL N-METHYLCARBAMATE = See Sevin

NARAMYCIN A = See Actidione

NEMAFUME = See Nemagon

NEMAGON

Alternative names: Fumazone, OS 1897, Nemafume, DBCP

Chemical name: 1,2-dibromo-3-chloropropane

Primary use: Nematocide

NEMAGON (Continued)

Sample purity: 95% active ingredient and 5% other halogenated C_3 compounds

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–5 mo.	66.8 (48.2–92.6)

Acute symptoms: Ataxia, wings crossed high over back, tail high, tremors, falling. Mortalities took 2 to 5 days and complete recovery of survivors took 1 to 2 weeks. Survivors generally lost considerable body weight.

NEOCID = See DDT

NIA 5462 = See Thiodan

NIA 5996 = See Casoron

NIA 10242 = See Furadan

NICOTINE SULFATE

Alternative names: Black Leaf 40

Chemical name: 1-1-methyl-2-(3-pyridyl)pyrrolidine sulfate

Primary use: Insecticide

Sample purity: 40%

NICOTINE SULFATE (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	4 mo.	587 (397–869)
Pheasants	♀	3–4 mo.	1200–2000
Coturnix	♂	2 mo.	530 (383–735)
Pigeons	♂	--	>2000

Acute symptoms: 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 symptoms in mallards. Mortalities in most species occurred as soon as 6 minutes or as late as 2 days following treatment.

NICOULINE = See rotenone

NIRAN = See parathion

NITROSTIMINE = See parathion

NITROX = See methyl parathion

NOMERSAN = See Thiram

NORBORMIDE

Alternative names: Raticate, McNeil 1025, Shoxin

Chemical name: 5-(α-hydroxy-α-2-pyridylbenzyl)-7-(α-2-pyridylbenzylidene)-5-norbornene-2,3-dicarboximide

Primary use: Experimental rodenticide

Sample purity: 20%

NORBORMIDE (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	9–10 mo.	>3000

Acute symptoms: 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.

NUCLEOPOLYHEDRAL VIRUS

Alternative names: Hemerocampa pseudotsugata, viral pesticide, polyhedral virus

Chemical name: A preparation of the nucleopolyhedrosis virus Hemerocampa pseudotsugata

Primary use: Experimental insecticide

Sample purity: 30.01×10^6 polyhedra/mg

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂ & ♀	4 mo.	>361
Pheasants	♀	4 mo.	>384
House sparrows	♀	--	>1969
Albino rabbit (dermal)	♂	1–2 mo.	>241
Mule deer	♂	--	>52.9

NUCLEOPOLYHEDRAL VIRUS (Continued)

Acute symptoms: No symptoms, or minor temporary weakness only.

Notes: In terms of the proposed field application rates, these doses are quite large, equalling one and a half times the 50×10^9 polyhedra applied per acre. It should be kept in mind, however, that each infected target insect larva can produce 2 to 20% of this original acre 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 following oral administration. This could be interpreted as initial metabolic intoxication and allergic response to the foreign protein of the virus preparation.

Nux vomica = See strychnine

OCTACHLOR = See chlordane

OCTACHLOROCAMPHENE = See toxaphene

1,2,4,5,6,7,10,10-OCTACHLORO-4,7,8,9-TETRAHYDRO-4,7-endoMETHYLENEINDANE = See chlordane

1,3,4,5,6,7,8,8-OCTACHLORO-3a,4,7,7a-TETRAHYDRO-4,7-METHANOPHTHALAN = See Telodrin

OCTA-KLOR = See chlordane

OCTALENE = See aldrin

OCTALOX = See dieldrin

OCTAMETHYLPYROPHOSPHORAMIDE = See OMPA

OMPA

Alternative names: schradan, Pestox 3, Octamethylpyrophosphoramide, Sytam

OMPA (Continued)

Chemical name: bis-N,N,N′,N′-tetramethylphosphorodiamidic anhydride

Primary use: Systemic insecticide

Sample purity: 90%+ technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	36.3 (20.9–63.2)

Acute symptoms: Ataxia, falling, high carriage, tail high, wing drop, leg tetany, apnea, terminal wing-beat convulsions or opisthotonos. Mortalities all occurred 35–86 minutes after administration.

OR-1191 = See phosphamidon

OS 1897 = See Nemagon

OS 2046 = See Phosdrin

PANOGEN

Alternative names: Panogen 42, methylmercuric cyanoguanidine, Morsodren

Chemical name: methylmercuric dicyandiamide (=methylmercuric cyanoguanidine)

Primary use: Seed disinfectant, fungicide

PANOGEN (Continued)

Sample purity: 100% [1/] and 6.3% formulation [2/]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards [1/]	♂	--	56.1 (44.6–70.7)
Mallards [2/]	♂	3–4 mo.	595 (350–1010)
Pheasants [2/]	♂	4 mo.	566 (--)
House sparrows [2/]	♂ & ♀	--	300–900

Acute symptoms: Regurgitation, polydipsia, general weakness, slowness of reactions, fluffed feathers, tetany when disturbed, coma. Affected survivors took up to a week to regain normal appearance.

PANOGEN 42 = See panogen

PARAPHOS = See parathion

PARATHION

Alternative names: AAT, SNP, DNTP, Folidol, Niran, Etilon, paraphos, Rhodiatox, Thiophos, Nitrostigmine, AC 3422, E-605, Alkron, ENT 15108, ethyl parathion, Aphamite

Chemical name: O,O-diethyl O-p-nitrophenyl phosphorothioate

Primary use: Insecticide

Sample purity: 98.76% technical

PARATHION (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	2.13 (1.54–2.96)
Mallards	♀	2–3 mo.	1.90 (1.37–2.64)
Pheasants	♂	2–3 mo.	12.4 (--)
Chukars	♂ & ♀	3–12 mo.	24.0 (16.8–34.2)
Coturnix	♀	2 mo.	5.95 (3.38–10.5)
Pigeons	♂ & ♀	--	2.52 (1.82–3.50)
Sharp-tailed grouse	♀	12–36 mo.	4.0–10.0
House sparrows	♀	--	3.36 (2.43–4.66)
Fulvous tree ducks	♂ & ♀	--	0.125–0.250
Gray partridges	♂	3–10 mo.	16.0 (4.0–64.0)
Domestic goats	♂	10–72 mo.	28–56
Mule deer	♂	10 mo.	22.0–44.0

Acute symptoms: Lacrimation, tachypnea, dyspnea, asynergy, tenesmus, diarrhea, depression, paresis, tremors, prostration, convulsions, opisthotonos. Mortalities occurred as soon as 1/2 hour or as late as 13 days after single oral administration.

Notes: The 30-day EMLD for gray partridges is 3.0–6.0 mg/kg/day, and that for fulvous tree ducks is 0.01–0.02 mg/kg/day. In 60-day feeding studies, 1.5 ppm parathion in the diet was not lethal to fulvous tree ducks, but 8.0 ppm was lethal to some partridges.

PARATHION METHYL = See methyl parathion

PARZATE = See nabam

PARZATE ZINEB = See zineb

PCB's = See arochlors

PENTACHLORIN = See DDT

PERFEKTHION = See dimethoate

PEXTOX 3 = See OMPA

PHALTAN = See folpet

PHENACIDE = See toxaphene

PHENATOX = See toxaphene

PHENYLMERCURIC UREA = See Agrox

PHORATE = See Thimet

PHOSDRIN

Alternative names: mevinphos, OS-2046

Chemical name: 2-methoxycarbonyl-1-methylvinyl dimethyl phosphate

Primary use: Insecticide, acaricide

Sample purity: 100% analytical grade

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	6–7 mo.	4.63 (3.57–6.00)
Pheasants	♂	3–4 mo.	1.37 (0.951–1.98)
Sharp-tailed grouse	♂	Adult	0.75–1.50

PHOSDRIN (Continued)

Acute symptoms: Ataxia, either low or high carriage, toes curled, tachypnea, dyspnea, salivation, diarrhea, tremors, phonation, tetany or violent terminal wing-beat convulsions. Pheasant mortalities all occurred 8 to 18 minutes post-treatment. Mallard and grouse mortalities occurred 5 to 40 minutes post-treatment.

PHOSPHAMIDON

Alternative names: Dimicron, OR-1191, ENT 25515, C 570, ML-97

Chemical name: 2-chloro-2-diethylcarbamoyl-1 methylvinyl dimethyl phosphate

Primary use: Insecticide, acaricide

Sample purity: 80%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3 mo.	3.05 (2.33–4.00)
Chukars	♂ & ♀	3–5 mo.	9.7 (8.3–11.3)
Pigeons	♂ & ♀	--	2.0–3.0
Mourning doves (S.T.)	♂ & ♀	--	2.0–4.0
White-winged doves	♂ & ♀	Adult	2.34 (--)
Albino rats	♂	--	~9.37

Acute symptoms: Lacrimation, foamy salivation, miosis, tachypnea, dyspnea, ataxia, immobility, convulsions, tetany, opisthotonos. Mortalities occurred as soon as 8 minutes after treatment.

Notes: The early appearance of symptoms and the steepness of the acute dose-response curves (increasing dosage levels produced a disproportionately large increase

PHOSPHAMIDON (Continued)

in the response) indicate that phosphamidon is rapidly and thoroughly taken up from the gastrointestinal tracts of birds. In further tests, 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 much intoxication. Bullfrogs placed into aqueous solutions of up to 250 ppm survived a 17-day exposure period. (By way of comparison, a few parts per billion is lethal to certain crustaceans and 5 to 10 parts per million is lethal to several types of fish.) Repeated rat acute oral LD_{50} determinations on a stock 1:400 aqueous solution of phosphamidon showed that the potency of the solution after 41 days was about half that of the fresh solution.

PHYGON

Alternative names: dichlone, Compound 604

Chemical name: 2,3-dichloro-1,4-naphthoquinone

Primary use: Fungicide

Sample purity: 90%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Regurgitation, ataxia, falling under stress. Symptoms lasted up to 19 days, and some birds lost weight.

PHYTOSOL = See BAY 37289

PICLORAM = See Tordon

PLANAVIN = See SD 11831

POISON NUT = See strychnine

POLYCHLORINATED BIPHENYLS = See Arochlors

POLYHEDRAL VIRUS = See nucleopolyhedral virus

POMASIL = See Thiram

PROLATE = See Imidan

PROPHAM = See IPC-400

PROPOXUR = See Baygon

PYRETHRIN = See pyrethrum

PYRETHRUM

Alternative names: Insect Flowers, Insect Powder, Dalmation Insect Flowers, Trieste Flowers

Chemical name: A complex of components of the flowers of Chrysanthemum cinerafolium including compounds known as pyrethrins I & II and cinerins I & II

Primary use: Insecticide

Sample purity: 20%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>10,000

Acute symptoms: Possible slight weakness lasting a few hours. Also regurgitation.

QUAKER BUTTON = See strychnine

QUELATOX = See Baytex

R-1303 = See Trithion

R-1504 = See Imidan

RATICATE = See Norbormide

RE 4355 = See Dibrom

REGLONE = See diquat

RESITOX = See Co-Ral

RHODIATOX = See parathion

ROGOR = See dimethoate

ROTENONE

Alternative names: Derrin, Nicouline, tubatoxin

Chemical name: Extracts from Derris or Lonchocarpus plants

Primary use: Fish poison, insecticide

Sample purity: 32.38% cube resins

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>2000
Pheasants	♀	3-4 mo.	>1414

Acute symptoms: Ataxia, nutation, dyspnea, polyuria, feathers fluffed or held tightly to body, wing drop, neck pulled in, immobility. Regurgitation occurred at levels

ROTENONE (Continued)

above 1500 mg/kg. Symptoms were observed less than an hour after single oral administration, and complete recovery took up to a week.

ROXION = See dimethoate

RS 150 = See DM 7537

S 1752 = See Baytex

S 4400 = See BAY 37289

S 5660 = See Accothion

S 1102 A = See Accothion

SCHRADAN = See OMPA

SD 3562 = See Bidrin

SD 4294 = See Ciodrin

SD 4402 = See Telodrin

SD 7727

Alternative names: None found.

Chemical name: 2,4-dichlorophenyl methanesulfonate

Primary use: Experimental nematocide

Sample purity: >95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	>2000

SD 7727 (Continued)

Acute symptoms: Ataxia, high carriage, nutation, falling when walking, wings crossed high over back, tail pointed upward. Symptoms appeared in 9 minutes and regurgitation occurred at 10 minutes. Symptoms persisted for 8 to 13 days. Weight losses occurred.

SD 7859 = See Supona

SD 8447 = See Gardona

SD 8530 = See Landrin

SD 9098 = See Akton

SD 9129 = See Azodrin

SD 11831

Alternative names: Planavin

Chemical name: 4-(methylsulfonyl)-2,6-dinitro-N, N-dipropylaniline

Primary use: Herbicide

Sample purity: technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂ & ♀	--	>>2000
Chukars	♂ & ♀	--	>>2000

Acute symptoms: None.

Notes: The 30-day EMLD for both mallards and chukars is greater than 100 mg/kg/day. Mallards given 100 ppm in their diets for 30 days showed no gross effects other than slightly reduced feed intake.

SD 15418

Alternative names: None found

Chemical name:
2-[(4-chloro-6-ethylamino-s-triazin-2-yl)amino]
-2-methylpropionitrile

Primary use: Herbicide

Sample purity: >95%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–5 mo.	>2000
Bobwhite quail	♀	3–5 mo.	400–500

Acute symptoms: Loss of balance, goose-stepping ataxia, fluffed feathers, wing shivers, wings crossed high over back, falling when walking, tremors. Survivors showed symptoms up to 2 to 4 weeks after treatment. While no mallard mortalities occurred at levels below 2400 mg/kg, as little as 150 mg/kg produced symptoms.

Notes: The fact that regurgitation of part of the treatment took place, the low dosage that produced symptoms, and the prolonged recovery period may indicate that this material is of greater acute toxicity than the LD_{50} indicates and would be cumulative in its toxic action on mallards.

SEVIN

Alternative names: UC 7744, carbaryl

Chemical name: 1-naphthyl N-methylcarbamate

Primary use: Insecticide

SEVIN (Continued)

Sample purity: 50%[1], 85%[2], 95%[3], 100%[4] and 4 lb./gal. formulation[5]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[4]	♀	3 mo.	>2179
Pheasants[3]	♂	3–4 mo.	>2000
Pheasants[5]	♀	3–4 mo.	707 (--)
Coturnix[2]	♂	2 mo.	2290 (1740–3020)
Pigeons[2]	♂ & ♀	--	1000–3000
Sharp-tailed grouse[3]	♀	3–12 mo.	780–1700
Canada geese[1]	♂ & ♀	--	1790 (1480–2180)
Mule deer[3]	♀	11 mo.	200–400
Bullfrogs[1]	♂	--	>4000

Acute symptoms: Ataxia, weakness, salivation, tachypnea, tremors, tetany, paralysis, coma, convulsions. Regurgitation of some of the oral dose occurred in mallards.

Notes: The 30-day EMLD for mallards of both sexes is about 125 mg/kg/day. Survivors of the EMLD determinations reproduced normally. This is a relatively fast-acting chemical.

SHOXIN = See Norbormide

SILVEX

Alternative names: fenoprop; 2,4,5-TP

Chemical name: 2-(2,4,5-trichlorophenoxy)propionic acid

Primary use: Herbicide

Sample purity: Analytical grade

SILVEX (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	>2000

Acute symptoms: Ataxia, wings crossed high over back, tail pointed either abnormally up or down (loss of balance?), walking high on toes, minor tremors. Although no deaths occurred, levels as low as 500 mg/kg produced symptoms. Symptoms appeared as soon as 45 minutes after treatment and persisted up to 4 days.

SINOX = See Elgetol

SNP = See parathion

SODIUM ARSENITE

Alternative name: sodium meta-arsenite

Chemical name: sodium meta-arsenite

Primary use: Herbicide, insecticide

Sample purity: 97%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	323 (149–699)

Acute symptoms: Ataxia, high carriage, tetanic seizures. Symptoms persisted among survivors as long as 5 to 9 days. Mortalities usually occurred overnight after treatment.

SODIUM FLUOROACETATE = See sodium monofluoroacetate

SODIUM META-ARSENITE = See sodium arsenite

SODIUM MONOFLUOROACETATE

Alternative names: "1080", Compound 1080, monosodium fluoroacetate, sodium fluoroacetate, fratol, ten-eighty

Chemical name: sodium monofluoroacetate

Primary use: Mammal control agent

Sample purity: ≥90%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards (S.T.)	♂	3 mo.	9.11 (5.60–14.6)
Mallard ducklings	--	7 days ± 1	5.97 (4.25–8.39)
Pheasants (S.T.)	♂	3–5 mo.	6.46 (3.85–10.8)
Chukars	♂ & ♀	3 mo.	3.51 (2.58–4.78)
Coturnix	♂	3 mo.	17.7 (11.0–28.7)
Pigeons	♂ & ♀	--	4.24 (3.36–5.34)
Mourning doves (S.T.)	♂ & ♀	--	8.55–14.6
House sparrows	♂	--	3.00 (2.38–3.78)
Merriam's turkeys	♀	<6 mo.	4.00 (1.20–13.3)
Golden eagles	--	--	1.25–5.00
Mule deer	♂	8–11 mo.	0.30–1.00
Mules	♂ & ♀	--	0.22–0.44
Horses	♂ & ♀	--	0.35–0.55
Domestic ferrets (S.T.)	♂	Yearling	1.41 (--)
Bullfrogs	♂	--	54.4 (25.6–115)

SODIUM MONOFLUOROACETATE (Continued)

Acute symptoms: Respiratory, central nervous system, and muscle effects such as dyspnea, ataxia, weakness, tremors, convulsions. Ferrets additionally displayed muscarinic and cardiac effects. The time between treatment and death was relatively constant in all species, from 1 hour to 1 day, with few exceptions.

Notes: The 30-day EMLD for mallards is 0.5 mg/kg/day. This gives a cumulative toxicity index of 9.11/0.5 = 18:2, indicating a moderate to high degree of cumulative action for this species.

SOLVIREX = See Di-Syston

STRYCHNINE

Alternative names: strychnine alkaloid, strychnine sulfate, Strychnos nux vomica, Nux vomica, Strychnos, dog button, Quaker button, poison nut

Chemical name: An extract of the seeds of Strychnos nux vomica

Primary use: Bird and mammal control agent

Sample purity: 98% N.F. strychnine alkaloid[1/] and U.S.P. strychnine sulfate[2/]

STRYCHNINE (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1/]	♂ & ♀	6 mo.	2.9 (--)
Pheasants[1/]	♂	10–23 mo.	24.7 (14.4–42.2)
Pheasants[2/]	♂	2 mo.	8.48 (4.41–16.3)
Chukars[1/]	♂ & ♀	5–7 mo.	16.0 (8.0–32.0)
Coturnix[1/]	♀	2 mo.	22.6 (11.9–42.9)
Pigeons[1/]	♂ & ♀	--	21.3 (16.9–26.9)
Mourning doves (S.T.)[2/]	♂ & ♀	Juvenile	>5.12
House sparrows[1/]	♂	--	4.18 (3.18–5.50)
House sparrows (S.T.)[2/]	♀	--	4.0–8.0
Golden eagles[1/]	--	--	~5.0
Golden eagles[2/]	--	--	>5.0
Mule deer[1/]	♀	8–11 mo.	17.0–24.0
Bullfrogs[1/]	♂	--	2.21 (--)

Acute symptoms: Feathers fluffed or held tightly against body, low or high carriage, ataxia or asynergy, 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. Symptoms appeared as soon as 10 minutes following treatment, and recovery of survivors was generally complete within a few hours, except for the eagles, which took up to 48 hours to recover.

STRYCHNINE (Continued)

Notes: To convert strychnine alkaloid figures to strychnine sulfate figures (molecular weight of the sulfate ÷2÷molecular weight of the alkaloid = 1.2813), multiply the alkaloid figures by 1.28. 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 apparently does not always hold true, as can be seen by comparing the pheasant LD_{50}'s.

STRYCHNINE ALKALOID = See strychnine

STRYCHNINE SULFATE = See strychnine

Strychnos nux vomica = See strychnine

SULFOX-CIDE = See sulfoxide

SULFOXIDE

Alternative names: n-octyl sulfoxide of isosafrole, sulfoxyl, Sulfox-Cide

Chemical name: 1,2-methylenedioxy-4 -[2-(octylsulfinyl)propyl]benzene

Primary use: Pesticide synergist

Sample purity: 82% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	4 mo.	>2000

Acute symptoms: Weakness, goose-stepping ataxia, ataxia, occasional stumbling or falling, wings held very high on body. Symptoms were seen as soon as 25 minutes after treatment and persisted for up to 13 to 14 days.

SULFOXYL = See sulfoxide

SUMITHION = See Accothion

SUMITOMO = See Accothion

SUPONA

Alternative names: Compound 4072, GC 4072, chlorofenvinphos, Birlane, SD 7859

Chemical name: 2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate

Primary use: Insecticide

Sample purity: 91% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	85.5 (44.5-164)

Acute symptoms: Goose-stepping ataxia, wing drop or wings crossed high over back, wing shivers, fluffed feathers, high stance, nutation, tenseness, falling when walking, lacrimation, dyspnea, tremors, terminal wing-beat convulsions. Symptoms appeared as soon as 3 to 6 minutes. Complete recovery took as long as 2 to 3 weeks. Survivors generally lost small amounts of body weight by the end of the 14- to 28-day observation period.

Notes: Gross autopsies of sacrificed survivors revealed one case each of distended gall bladder, blister on Glisson's capsule on the liver, hemorrhagic ovaries, and enlarged flaccid heart.

SUPRACIDE = See GS 13005

SYNTHETIC 3956 = See toxaphene

SYSTOX

Alternative names: demeton, E-1059, BAY 8173, demeton O, Mercaptophos (USSR), ENT 17295

Chemical name: O,O-diethyl O(&S)-2-(ethylthio)ethyl phosphorothioate mixture

Primary use: Insecticide

Sample purity: 92%[1/] and 99%[2/] technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[2/]	♂	3 mo.	7.19 (5.19–9.97)
Pheasants[2/]	♀	2 mo.	8.21 (5.69–11.9)
Chukars[1/]	♂ & ♀	3 mo.	15.1 (12.0–19.0)
Coturnix[1/]	♀	2 mo.	8.48 (6.73–10.7)
Pigeons[1/]	♂ & ♀	--	8.48 (6.73–10.7)
Sharp-tailed grouse[1/]	♂ & ♀	Adult	4.76 (--)
House sparrows[1/]	♀	--	9.52 (6.87–13.2)
House finches[1/]	♂ & ♀	--	2.38 (--)
Domestic goats[1/]	♂	--	8.0–18.0
Bullfrogs[1/]	♂	--	562 (178–1780)

SYSTOX (Continued)

Acute symptoms: Polydipsia, weakness, goose-stepping ataxia, lacrimation, salivation, tremors, tachypnea, dyspnea, prostration, convulsions with miosis and apnea, tetany or opisthotonos. Symptoms appeared as soon as 6 minutes after treatment, and mortalities usually occurred in 1 to 3 hours. There was remarkable uniformity in symptoms and timing between species.

Notes: The 30-day EMLD for mallards is 2.5–5.0 mg/kg/day for both sexes. This gives a cumulative toxicity index of 7.19/2.5–5.0 = 1.4–2.9, indicating little cumulative action for mallards.

SYTAM = See OMPA

TELODRIN

Alternative names: SD 4402, isobenzan, CP-14957, ENT 25545-X

Chemical name: 1,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanophthalan

Primary use: Experimental insecticide

Sample purity: 99%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	5–7 mo.	4.15 (2.47–6.97)

Acute symptoms: Ataxia, fasciculation, tenseness, backwards swimming, tail high and fanned, loss of righting reflex, circling, opisthotonos. Symptoms appeared as soon as 30 minutes after treatment. Mortalities occurred about 2 hours after treatment. Survivors appeared normal by the next day, but lost moderate

TELODRIN (Continued)

amounts of body weight by the end of the 14-day observation period.

TEN-EIGHTY = See sodium monofluoroacetate

TENORAN

Alternative names: chloroxuron

Chemical name: 3-[p-(p-chlorophenoxy)phenyl] -1,1-dimethylurea

Primary use: Herbicide

Sample purity: 50% Wettable powder

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>2000

Acute symptoms: Ataxia, weakness, sideways walking, falling. Symptoms were not apparent until 3rd day after single oral administration, then persisted for 3 to 14 days.

TEP = See TEPP

TEPA

Alternative names: aphoxide, APO, ENT 24915

Chemical name: tris(1-aziridinyl)phosphine oxide

Primary use: Chemosterilant, insecticide

Sample purity: 72.5%

TEPA (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	8.54 (6.16-11.8)
Pheasants	♀	3-4 mo.	25.2 (17.2-37.0)
Chukars	♂ & ♀	2-4 mo.	63.9 (48.8-83.8)
Coturnix	♀	2 mo.	>20 (>80?)
Pigeons	♂ & ♀	--	10-80
House finches	♂	--	~100
Red-winged blackbirds	♂	--	13.5 (10.0-18.2)
Canada geese	♂ & ♀	--	13.0 (9.36-18.0)
Bullfrogs	♂	--	500 (250-1000)

Acute symptoms: Ataxia, wing drop, tachypnea, dyspnea, nutation, tremors (the house finches raised their wings slowly above their head when disturbed), ataraxia or prostration, repeated wing-beat convulsions. Mortalities occurred 4 hours to 10 days after treatment.

Notes: The 30-day EMLD for chukars is >1.0 mg/kg/day, but survivors of this level later produced markedly less fertile eggs than a control group receiving empty gelatin capsules for the 30-day dosage period.

TEPP

Alternative names: Tetron-100, HETP, TEP, Bladan

Chemical name: tetraethyl pyrophosphate (=TEPP) and other ethyl phosphates

Primary use: Insecticide

Sample purity: 40% TEPP, 60% other ethyl phosphates

TEPP (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	3.56 (--)
Pheasants	♂	3–4 mo.	4.22 (2.93–6.09)
Chukars	♂ & ♀	3–4 mo.	10.1 (7.28–14.0)
Bullfrogs	♀	--	89.1 (46.3–171)

Acute symptoms: Birds—goose-stepping ataxia, miosis, salivation, lacrimation, tenesmus, diarrhea, wings crossed over back, tetanic seizures, wing-beat convulsions or opisthotonos. Mortalities usually occurred in the first 25 minutes after treatment.

TERRACUR = See Dasanit

TERSAN = See Thiram

TETRAETHYL PYROPHOSPHATE = See TEPP

O,O,O′,O′-TETRAMETHYL O,O′-THIODI-p-PHENYLENE PHOSPHOROTHIOATE = See Abate

TETRAMETHYLTHIURAM DISULFIDE = See Thiram

TETRON-100 = See TEPP

THIMET

Alternative names: phorate, Experimental Insecticide 3911, AC 3911

Chemical name: O,O-diethyl S-(ethylthio)methyl phosphorodithioate

Primary use: Insecticide

Sample purity: 98.8%

THIMET (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	0.616 (0.367–1.03)
Pheasants	♀	3–4 mo.	7.12 (4.94–10.3)
Chukars	♀	3 mo.	12.8 (3.20–51.2)
Bullfrogs	♀	--	85.2 (59.3–122)

Acute symptoms: Ataxia, diarrhea, beak-sharpening reflex, polydipsea, 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 symptoms in mallards. This was an extremely fast-acting compound on all species tested. Symptoms occurred in pheasants as soon as 3 minutes after treatment.

THIMUL = See Thiodan

THIODEMETON = See Di-Syston

THIODAN

Alternative names: Malic, endosulfan, Thimul, Cyclodan, BIO-5462, HOE 2671, NIA 5462, ENT 23979

Chemical name: 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin 3-oxide

Primary use: Insecticide

Sample purity: 96% technical

THIODAN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3-4 mo.	33.0 (23.8-45.8)

Acute symptoms: Goose-stepping ataxia, high carriage, wings crossed high over back, tail pointed down, occasional wing tremors (possibly shivering), occasional falling when walking. Symptoms occurred as soon as 10 minutes after treatment and persisted up to a month in a few animals.

THIOPHAL = See folpet

THIOPHOS = See parathion

THIOSAN = See Thiram

THIRAM

Alternative names: TMTD, TMTDS, Arasan, Nomersan, Pomasol, Tuads, Tersan, Thiosan

Chemical name: tetramethylthiuram disulfide

Primary use: Fungicide

Sample purity: 99%+

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>2800
Pheasants	♂	3-4 mo.	673 (485-932)

THIRAM (Continued)

Acute symptoms: Mallards showed transient ataxia only. Pheasants showed tachypnea, wing drop, reluctance to move, fluffed feathers, ptosis of eyelid, diarrhea, tremors like those produced by chlorinated organic compounds, immobility.

THURICIDE

Alternative names: Bacillus thuringiensis, Biotrol, Bakthane

Chemical name: A bacterial toxin in parasporal bodies of Bacillus thuringiensis

Primary use: Insecticide

Sample purity: 50×10^9 spores/gm

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>>2000

Acute symptoms: No noticeable effects on appearance, behavior, or body weight at 2000 mg/kg.

TIGUVON = See Baytex

TMTD = See Thiram

TMTDS = See Thiram

TORDON

Alternative names: picloram

Chemica name: 4-amino-3,5,6-trichloropicolinic acid

Primary use: Herbicide

TORDON (Continued)

Sample purity: 90.5%[1/] and Tordon 22K formulation[2/]

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards[1/]	♂	3-4 mo.	>2000
Mallards (S.T.)[2/]	♂	7 mo.	>2000
Pheasants[1/]	♂	3-4 mo.	>2000

Acute symptoms: Regurgitation occurred soon after treatment in the mallards. The pheasants showed only mild ataxia and fasciculation following treatment.

TOXAPHENE

Alternative names: chlorinated camphene, octachlorocamphene, Hercules 3956, Compound 3956, Synthetic 3956, Phenacide, Phenatox

Chemical name: A mixture of various chlorinated camphenes

Primary use: Insecticide

TOXAPHENE (Continued)

Sample purity: 90%[1/] and 100%[2/] (100% = 67–69% total chlorine content)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallard ducklings[1/]	--	7 days ± 1	30.8 (23.3-40.6)
Mallards[2/]	♀	3-5 mo.	70.7 (37.6-133)
Pheasants[1/]	♀	3 mo.	40.0 (20.0-80.0)
Bobwhite quail[1/]	♂	3 mo.	85.4 (59.2-123)
Sharp-tailed grouse[1/]	♂	1-4 yr.	10-20
Fulvous tree ducks[1/]	♂	3-6 mo.	99.0 (37.2-264)
Lesser sandhill cranes[2/]	♀	--	100-316
Domestic goats[1/]	♂	>5 yr.	>160
Mule deer[1/]	♂	16-17 mo.	139-240

Acute symptoms: Ataxia, goose-stepping ataxia, circling, low or high carriage, neck pulled in, ptosis of eyelid, constant tremors that appeared like shivering, phonation, reluctance to move, tenesmus, hyperthermia, wing-beat convulsions or opisthotonos. This is a fairly slow-acting chemical. While symptoms were seen as soon as 20 minutes in some species, mortalities usually took 2 to 14 days.

2,4,5-TP = See silvex

TREFLAN

Alternative names: trifluralin, L-36352

Chemical name: α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine

TREFLAN (Continued)

Primary use: Herbicide

Sample purity: 96.7%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3–4 mo.	>2000
Pheasants	♂	3–4 mo.	>2000

Acute symptoms: Very mild ataxia only.

N-(TRICHLOROMETHYLTHIO) PHTHALIMIDE = See folpet

1,1,1-TRICHLORO-2,2-BIS(p-CHLOROPHENYL)ETHANE = See DDT

1,1,1-TRICHLORO-2,2-BIS(p-METHOXYPHENYL)ETHANE = See methoxychlor

TRICHLOROMETHYLTHIOPHTHALIMIDE = See folpet

TRICHLORONAT = See BAY 37289

2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID = See silvex

TRIESTE FLOWERS = See pyrethrum

α,α,α-TRIFLUORO-2,6-DINITRO-N,N-DIPROPYL -p-TOLUIDINE = See Treflan

3-(m-TRIFLUOROMETHYLPHENYL)-1,1-DIMETHYLUREA = See Cotoran

TRIFLURALIN = See Treflan

3,4,5-TRIMETHYLPHENYL METHYLCARBAMATE = See Landrin

TRIS(1-AZIRIDINYL)PHOSPHINE OXIDE = See tepa

TRITHION

Alternative names: carbophenothion, R-1303, ENT 23708, Garrathion

Chemical name: O,O-diethyl S-[(p-chlorophenylthio)methyl] phosphorodithioate

Primary use Insecticide, acaricide

Sample purity: 94.65%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	3–4 mo.	121 (95.9–152)

Acute symptoms: Rubber-legged goose-stepping ataxia, wing drop, high carriage, use of wings for support in walking, falling, nutation, lacrimation, tremors. Symptoms were seen as soon as 1 hour after treatment and persisted among some survivors for up to 2 weeks. Mortalities typically occurred overnight following treatment.

TUADS = See thiram

TUBATOXIN = See rotenone

U-2069 = See Botran

UC 7744 = See Sevin

ULTRACIDE = See GS 13005

UNDEN = See Baygon

VAPONA = See DDVP

VELSICOL 104 = See heptachlor

VELSICOL 1068 = See chlordane

VIRAL PESTICIDE = See nucleopolyhedral virus

WARBEX = See famophos

WEEDAR 64 = See 2,4-D

WEEDAZOL = See aminotriazole

WEED-B-GON = See 2,4-D

Y-2 = See IPC-400

Y-3 = See CIPC

ZECTRAN

Alternative name: Dowco 139, ENT 25766

Chemical name: 4-dimethylamino-3,5-xylyl methylcarbamate

Primary use: Insecticide

Sample purity: 99% + (recrystallized three times)

ZECTRAN (Continued)

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂ & ♀	5–7 mo.	3.0 (--)
Mallard ducklings	♂ & ♀	17 days	4.2 (--)
Pheasants	♀	--	4.5 (3.4–6.0)
Chukars	♂ & ♀	4–5 mo.	5.24 (4.17–6.61)
Coturnix	♀	2–3 mo.	3.21 (2.45–4.21)
Sharp-tailed grouse	♂	--	10.0 (6.5–15.4)
Pigeons	♂ & ♀	--	6.47 (3.72–11.3)
Mourning doves (S.T.)	♂ & ♀	3 mo.	2.83 (--)
House sparrows	♀	--	50.4 (21.9–116)
House finches	♂	--	4.76 (3.43–6.60)
Canada geese	♀	--	2.64 (--)
Lesser sandhill cranes	?	--	1.0–4.5
Albino rats (S.T.)	♂	--	14.14 (--)
Albino rabbits (dermal)	?	--	>2000
Domestic goats	♂	--	15–30
Mule deer	♂ & ♀	5–30 mo.	20–30
Bullfrogs	♂	--	283–800

Acute symptoms: Ataxia, neck tremors, nystagmus, miosis, tachypnea, dyspnea, lacrimation, salivation, diarrhea, tachycardia, tracheal congestion, elevated body temperature, terminal convulsions. The most typical symptom is increased respiratory rate, up to

ZECTRAN (Continued)

3 or 4 times normal for a species. Death appears to occur by respiratory paralysis. Zectran poisoning and recovery are rapid. Usually peak symptoms or death occurred within 1 hour and recovery was often complete by 3 hours.

Notes: LD_{50}'s of Zectran to mallards of six ages between 48 hours and 7 months were nearly identical, indicating little change in susceptibility with age. The 30-day EMLD is 2.3, 5-10, and 1.25 mg/kg/day, respectively, for chukars, deer, and mallards. This gives a cumulative toxicity index for mallards of $3.0/1.25 = 2.4$, indicating little cumulative action. No effects were seen on the fertility or hatchability of eggs produced by mallards surviving 2.66 mg/kg/day for 30 days. A formulation of Zectran and Dowanol TPM was tested on 3- to 4-month-old mallards and resulted in an acute oral LD_{50} of 35.0 mg/kg. This formulation contains 6% Zectran, which gives an LD_{50} of 2.1 mg/kg for the Zectran present. This is close to the 3.0 mg/kg LD_{50} for recrystallized Zectran itself.

(ZECTRAN (ACYLATED)

Alternative name: acetylated Zectran

Chemical name: Same as Zectran

Primary use: Proposed insecticide

Sample purity ≥80%

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♀	3-4 mo.	>2000
Bullfrogs	♂	--	≫2000

ZECTRAN (ACYLATED)

Acute symptoms: None for bullfrogs. For mallards, moderate ataxia, masseter tenseness, excessive chewing motions during first 4 or 5 hours only.

ZERDANE = See DDT

ZINC ETHYLENE-1,2-BISDITHIOCARBAMATE = See zineb

ZINEB

Alternative names: Dithane Z-78, Parzate zineb

Chemical name: zinc ethylene-1,2-bisdithiocarbamate

Primary use: Fungicide

Sample purity: 95% technical

Acute Oral Toxicity Summary

Species	Sex	Age	LD_{50} (95% conf. lim.) mg/kg
Mallards	♂	11-12 mo.	>2000
Pheasants	♀	3-4 mo.	>2000

Acute symptoms: Goose-stepping ataxia, wings crossed over back, general myasthenia from the 1st hour up to 1 or 2 days.

"1080" = See sodium monofluoroacetate

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GLOSSARY OF TERMS

Symptoms	Meaning
anorexia	loss of appetite
apnea	cessation of breathing
asthenia	weakness, debility
ataraxia	imperturbability
ataxia	loss of muscular coordination
bradycardia	slow heart beat
bradypnea	slow breathing
circling	locomotion in circles
clonic convulsions	alternate relaxation and involuntary contractions of muscles
convulsions	massive involuntary muscle contractions
diarrhea	discharge of more or less fluid feces
dyspnea	shortness of breath (labored breathing)
edema	swelling
eosinophilia	excessive eosinophiles in differential white blood cell counts
epistaxis	nose bleed

Symptoms	Meaning
erythema	redness of skin due to dilation of blood vessels
excessive phonation	making of abnormally loud or frequent vocal sounds
exophthalmia	protruding eyeball
exudate	a secretion of fluid
fasciculation	skin or superficial tremors
flaccid	defective or flabby muscle tone
fluffed feathers	analogous to pilorection
goose-stepping ataxia	a type of incoordination where the feet are raised unnessarily high in each step
high carriage	body assumes taller-than-usual position during walking or standing
hyperacusis	increased reaction to sound
hyperemia	congestion, an unusual amount of blood in a part
hyperexcitability	increased reaction to stimuli
hyperthermia	elevated body temperature
hypoesthesia	dulled sensitivity to touch
hyporeactivity	lethargy, diminished reaction to stimuli
hypothermia	lowered body temperature
immobility	prostration or inability to move on feet

Symptoms	Meaning
ischemia	local paling of skin (often due to constriction of the blood vessels)
lacrimation	tears
lethargy	stupor, torpor, sluggishness
loss of righting reflex	no attempt to regain normal body position
low carriage	body assumes lower-than-usual position during walking or standing
masseter tenseness	tightness of 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	NOTE: this is normal in ducks and certain other species, unless to excess
nutation	nodding of the head
nystagmus	involuntary eyeball movement
opacity	loss of lense or corneal transparency

Symptoms	Meaning
opisthotonos	arching of the back and arching of the neck over back
paresis	partial or incomplete paralysis
petechia	small pin-point hemorrhage spots
phonation	utterance of vocal sounds
polydipsia	excessive drinking
polyuria	excessive urination
ptosis	drooping of the eyelid
righting reflex	ability to assume upright position
salivation	excessive secretion of saliva
slow reactions	to stimuli
tachycardia	rapid heart beat
tachypnea	rapid breathing
tenesmus	spasmodic contractions of anal sphincter
terminal wing-beat convulsions	when such convulsions are the last symptom preceding death
tetanic seizures	temporary whole-body rigidity
tetany	firmly and continuously contracted muscle
tonic convulsions	continuous, unremitting convulsions

Symptoms	Meaning
tracheal congestion	results from constriction of tracheal cartilages and/or mucous accumulation in trachea
tremors	twitching of muscles
unkempt	having disorderly fur or feathers from lack of preening
wing-beat convulsions	convulsions associated with nonfunctional wing flapping
wing drop	wings carried in abnormally low position
wings crossed over back	produced by very high wing position
wing shivers	constant wing twitching
withdrawal	diminished interaction with other animals in cage or observer

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