

PHYSICIAN'S GUIDE TO PESTICIDE HEALTH HAZARDS

Researched and Written by
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FOREWORD

Pesticide exposure and poisoning can result in serious illness, especially when it is incorrectly diagnosed. A guidance manual is beneficial for health care professionals who have little experience in recognizing the signs and symptoms or in the treatment of pesticide poisonings, which often mimic other illnesses. The Environmental Protection Agency manual on Recognition and Management of Pesticide Poisonings (fourth edition) by Donald P. Morgan, M.D., Ph.D. is a primary source. A ready, quick reference, with current information on the symptomatology of pesticide exposure and the immediate management and treatment of the patient as well as a listing of the primary pesticides used on crops grown in Texas, for physicians and other health care personnel is important. This quick guide for physicians is intended to not replace the Morgan manual as a source, but provides specific information on pesticides used in Texas as well as providing summary poisoning symptoms, management and treatment.

Although, many of the pesticides sold are used in the agricultural sector, accidents can, and have occurred in the home. Recent state legislation (the agricultural Right-to-Know Law) has prompted Texas to make a commitment to protect the health of its farmworkers, farmers and farming communities by promoting safe use of pesticides on crops. The Agricultural Extension Service of Texas A&M University in conjunction with the U.S. Department of Agriculture, has directed educational efforts on pesticide safety through county agents and specialists to provide important information on preventing, recognizing and treating pesticide exposures and poisonings. The problem of pesticide exposure is of particular concern to areas where specialty crops requiring intensive hand labor are located and where there exist large farmworker populations as in the Texas-Mexico border community.

The Health Education Training Centers Alliance of Texas (HETCAT) has among its goals disease prevention and health promotion, especially in the underserved border area. By arranging for the development of this guidance manual on medical

evaluation and the management of the more common poisonings, HETCAT and Texas Agricultural Extension Service are establishing initiatives to complement the pesticide information available to physicians and health care providers.

HETCAT would be interested in hearing from you on this manual as to its usefulness. If you would like to send us your comments, please use the address below.

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or your local County Extension Agent

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PREFACE

It is the intent of this manual to serve as a guide for medical evaluation of pesticide poisonings. Too often poisonings resulting from pesticide exposures are masked by anticholinergic effects, chronic dermatitis and anxiety. This manual should serve as a guide for the recognition and management of the more common pesticide poisonings. Of greater importance is that it should increase the awareness of the possible medical and social consequences of long term chronic exposure.

It is not, however, the intent of this manual to, in any way whatsoever, replace sound medical judgement. This manual is designed to serve as an easy, accessible guide to the: recognition, diagnosis, evaluation and acute management of pesticide poisonings.

It is imperative that physicians fully understand the severity of pesticide health hazards and be prepared to recognize and manage this possible health problem in farmworkers or home pesticide users.

Children are also susceptible to exposure at home and work sites. Again, it is imperative that physicians be able to quickly ascertain poisoning symptoms and treat the patient correctly.

The manual has three sections: general pesticide information, epidemiology and toxicity, and patient management and treatment.

References, narratives and tables give short descriptions, resource information and telephone numbers to guide physicians in the recognition of pesticide poisonings.

The last section has a general introduction to patient management, patient treatment, and crop information. The crop information is divided into 4 geographic areas of Texas. To assist the physician, the pesticides are divided into commercial labels, chemical names, and the common crops on which they are used. In this way the physician can relate symptoms and possible poisoning at a glance.

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SECTION I

INTRODUCTION

A. PESTICIDES: What are they?

The term "pesticides" represents a substance or mixture of substances intended to prevent, destroy, repel or mitigate any pest. A pesticide can also be a plant regulator, defoliant or desiccant.

B. Pesticide classifications.

For the purposes of this manual, pesticides have been classified into the following categories:

- formulation
- target action
- chemical action
- target and chemical action

Examples of each group have been cited in Table I; but this is by no means a complete list of pesticide classifications. These are, however, the most commonly used types of agricultural pesticides.

Each pesticide comes with specific handling and usage instructions on the product label and labeling. Federal and state regulations require registration of each chemical and that certain statements be displayed. Additional information can be obtained from Material Safety Data Sheets (MSDSs). The MSDSs explain chemical characteristics and can be obtained from the manufacturer or dealer.

C. Pesticide Poisonings

Poisonings are classified by toxicity and hazard. The toxicity of a pesticide refers to the potency of the chemical when tested under experimental conditions. The hazard of a pesticide refers to the risk when a chemical is used or applied. There are wide ranges of pesticide uses. The incorrect use, application, storage, and disposal of pesticides are often key factors that relate to unnecessary exposures.

TABLE I
CLASSIFICATIONS

BY FORMULATION:

- Sprays (liquids, wettable and water-soluble powders, oil solutions, fogging concentrates and emulsible concentrates)
- Dusts (active and inert)
- Aerosols (push button, total release)
- Fumigants (vaporizers)
- Granulars (inert carriers, soluble granulars)
- Pellets (inert carriers, soluble pellets)
- Impregnates (shelf papers, wood preservatives)
- Fertilizer combinations
- Baits
- Slow-release (paint-on, adhesives, resin strips)
- Repellents
- Attractants
- Animal Systemics (oral, dermal, feed additive)

BY TARGET ACTION:

Acaricide, Algicide, Avicide, Bactericide, Fungicide, Herbicide, Insecticide, Larvicide, Miticide, Molluscicide, Nematicide, Ovicide, Pediculicide, Piscicide, Predicide, Rodenticide, Silvicide, Slimicide, Termiticide.

Attractants, Chemosterilants, Defoliants, Desiccants, Disinfectants, Growth Regulators, Pheromones, Repellents.

BY CHEMICAL ACTION:

- Anticholinesterases (organophosphate and carbamates)
- Organochlorines
- Nitro and Chlorophenols
- Pyrethrins/Pyrethroids

BY CHEMICAL ACTION AND TARGET:

- Insecticides (organochlorines, organophosphates, carbamates, miscellaneous insecticides, pyrethrins)
- Fungicides and Bactericides (inorganic, antibiotics, mercury, metals, dithiocarbamates, chlorinated fungicides)

continued next page

TABLE I
CLASSIFICATIONS *Continued*

- Herbicides, Defoliants, Desiccants (inorganic carboxylics, aromatics, phenols, nitrogen)
- Nematicide (halogenated, hydrocarbon cyanates)
- Rodenticides (fluorides, anticoagulants)
- Molluscicides
- Avicides
- Regulators of plant growth and reproduction

TOXICOLOGICAL EFFECTS

ACUTE POISONING

Acute poisoning is of immediate concern. Provide first aid to recognize the signs and symptoms, and treatment.

CHRONIC POISONING

Long term chronic exposure has long been a concern to man and the environment. Neurological, visual, and reproductive effects are a few of the medical complications. Long term toxicological effects to land, water, and air is also a very serious complication.

Although many pesticides are commonly used, scientists will agree that very little is known about the effects of long-term chronic exposure. Carcinogenicity and teratogenicity is an increasing concern. Pesticide poisoning symptoms may mimic other conditions which can make potential chronic conditions difficult to diagnose.

Furthermore, there are few diagnostic tests which are prompt and give a definitive diagnosis. Only cholera has baseline monitoring and diagnostic tests readily available. Strict standards for application, exposure, entry, and monitoring of health effects need to be initiated immediately.

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CLASSIFICATIONS

ACTION:
liquids, wettable and water-soluble powders, oil
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CLASSIFICATIONS *Continued*

- Herbicides, Defoliants, Desiccants (inorganic, metals, carboxylics, aromatics, phenols, nitrogens)
 - Nematicide (halogenated, hydrocarbons, thiophenes, cyanates)
 - Rodenticides (fluorides, anticoagulants)
 - Molluscicides
 - Avicides
 - Regulators of plant growth and reproduction
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TOXICOLOGICAL EFFECTS

ACUTE POISONING

Acute poisoning is of immediate concern. Providers must learn to recognize the signs and symptoms, and treat patients.

CHRONIC POISONING

Long term chronic exposure has long been a concern to both man and the environment. Neurological, visual, dermal and reproductive effects are a few of the medical concerns to man. Long term toxicological effects to land, water and ecosystem is also a very serious complication.

Although many pesticides are commonly used today, most scientists will agree that very little is known about the health effects of long-term chronic exposure. Carcinogenicity, mutagenicity and teratogenicity is an increasing concern. Acute pesticide poisoning symptoms may mimic many medical conditions which can make potential chronic cases difficult to diagnose.

Furthermore, there are few diagnostic tests which are accurate, prompt and give a definitive diagnosis. Only cholinesterase testing has baseline monitoring and diagnostic tests readily available. Strict standards for application, exposure, entry time and medical monitoring of health effects need to be initiated for all pesticides.

Another point to remember is that pesticides, especially nitrogenous compounds, have a strong hydrosoluble binding effect in plant and animal tissues and remain in the environment for an indefinite period of time. Depending on the binding or degradation of the compounds, the resulting exposure may or may not affect plant and animal tissues.

In research and studies using animals, some pesticides have caused cancer, birth defects, neurosis, dermatitis, optic degeneration and death.

By Federal regulation, the Environmental Protection Agency (EPA) has classified potentially carcinogenic pesticides into 5 categories.

Group A - Human carcinogen

Sufficient evidence from epidemiologic studies to support a casual association between exposure to agents and cancer.

Group B - Probable human carcinogen

B1 - Sufficient evidence of carcinogenicity from animal studies with limited evidence of carcinogenicity from epidemiologic studies.

B2 - Sufficient evidence of carcinogenicity from animal studies, with inadequate or no epidemiologic data.

Group C - Possible human carcinogen

Limited evidence of carcinogenicity in the absence of human data.

Group D - Inadequate or no human and animal data.

Group E - No evidence of carcinogenicity in at least two adequate animal tests in different species in adequate epidemiologic and animal studies. This classification is based on available evidence and does not mean that the agent will not be a carcinogen under any circumstances.

D. LAWS AND REGULATIONS ON PESTICIDES

In 1906, the Federal Food, Drug, and Cosmetic Act was enacted, and in 1947, the Federal Insecticide, Fungicide and

Rodenticide Act (FIFRA) was passed. Since then, there have been a variety of new, updated and expanded state and federal regulations. In 1988, FIFRA was amended along with it came requirements on safety. The National Institute of Occupational Safety and Health (NIOSH). Regulatory agencies and research organizations like the Environmental Protection Agency, the National Institute of Health (NIH) and the Centers for Disease Control (CDC) have written rules and regulations for the use of pesticides. These include registration, classification of pesticides, monitoring, information on canceled products, manufacturer responsibility, interstate testing. None of these laws, rules and regulations, however, have specifically addressed worker pesticide exposures. California, Oregon, and Washington have initiated legislation toward this end. Other states like the laboratory monitoring and worker protection by the state of California. Texas, however, has not yet state to enact strict worker protection law. The most notable are the 1987 Texas Agricultural Hazard Communication Law (Right-to-Know) and the Agricultural Hazard Communication Regulation (Register Volume 14, #9-1/31/89).

The purposes of the Right-to-Know Law are:

- to provide farmers and agricultural workers with information about pesticides used on Texas crops, the effects of these pesticides and ways to avoid exposure to themselves and their families
- to improve the diagnosis and treatment of pesticide-related illnesses in this state by ensuring that health care providers have access to accurate information on pesticides used and the symptoms of pesticide-related illnesses

Covered agricultural employers (when quantitative criteria are met) are required to:

- provide their workers with relevant crop labels that they are read.

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The purposes of the Right-to-Know Law are:

- to provide farmers and agricultural workers with important information about pesticides used on Texas crops, the health effects of these pesticides and ways to minimize pesticide exposure to themselves and their families.
- to improve the diagnosis and treatment of pesticide-related illnesses in this state by ensuring that health care providers have access to accurate information on specific pesticides used and the symptoms of pesticide-related health problems.

Covered agricultural employers (when quantity use and payroll criteria are met) are required to:

- provide their workers with relevant crop sheets and ensure that they are read.

- inform workers about spray schedules and the relevant pesticide reentry intervals.
- supply to their workers with the required protective clothing and safety equipment or device.
- maintain a Workplace Chemical List (WCL) and a Material Safety Data Sheet (MSDS) and make these available to workers or their designated representatives, upon request.
- inform workers orally or in writing of the existence of the WCL and its location.
- provide other basic health and safety information.
- provide emergency information immediately to their workers, local fire chiefs, medical personnel, designated farmworker representatives and certain members of the community, upon request.

Other state agencies that have joined in setting worker safety regulations and environmental protection standards are the Air Control Board, Texas Water Commission and the Texas Department of Health. In 1985, the Texas Occupational Disease Reporting Act (HB2091) required reporting of certain occupational diseases. ACUTE PESTICIDE POISONING is one of them. All known and/or confirmed cases of acute occupational pesticide poisonings are to be reported to the Texas Department of Health (TDH). Case reports can be submitted to local health authorities, regional staff or directly to the Bureau of Disease Control and Epidemiology at 1(800)-252-8239.

In 1988 the world's supply of pesticides was estimated at three billion tons. The United States, the largest producer of pesticides in the world uses half of the world's supply. Ninety (90%) percent is used in agricultural business. While mixers, applicators, suppliers, loaders and manufacturers are most at risk, they constitute only a small population in comparison to 4.4 million agricultural workers in the United States. Agricultural workers today face many occupational hazards, pesticide exposure being one of them.

The following laws have been instituted to guarar a "reasonable and safe" work environment:

TABLE II
(Federal and State Regulations)

- FIFRA (Federal Insecticide, Fungicide, and and subsequent amendments)
 - SARA (Superfund Amendments and Reauth)
 - Title III (Emergency Planning and Comm Know)
 - Texas Hazard Communication Act
 - Occupational Safety Law 1972/OSHA (U.S)
 - Texas Agricultural Right-To-Know
-

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- Texas Hazard Communication Act
- Occupational Safety Law 1972/OSHA (U.S. Dept. of Labor)
- Texas Agricultural Right-To-Know

SECTION II

PATIENT EXPOSURE

A. OVERVIEW

Pesticide poisoning and exposure are serious problems. The Texas Agricultural Extension Service, the Texas Department of Agriculture, the Texas Department of Health, the Poison Control Center and the National Migrant Referral Project and its consultants, are waging an important educational program aimed both at health care providers and workers.

Physicians and other health care providers can be unaware of potential pesticide poisoning, pesticide exposure and pesticide treatments. This guide is designed to assist health providers in a rapid assessment of these problems, focusing on:

- 1) the primary signs and symptoms of acute poisoning
- 2) what precautions to take
- 3) emergency care for the most common pesticides used in the state of Texas

Pesticide poisoning:

The National Pesticide Telecommunications Network (NPTN) from the Texas Tech University Health Science Center and the Texas Poison Control Center at the University of Texas Medical Branch in Galveston have both compiled annual reports on the age, frequency, and type of pesticide poisonings over the last 5 years.

Nationally, reports have risen from 8,494 in 1984 to 25,780 in 1987 (a 203% increase). These figures only account for those poisonings that were reported. Much of the reporting is through the National Migrant Referral Project and through the epidemiology offices of both the state of California and the state of Texas.

The following is information from the Texas Center and the National Pesticide Telecommunications Center. In 1987 Texas ranked 4th among the states in pest reports:

TABLE III
(Reporting)

Total Reports	25,780
Medical care given	19,053
Common Provider	ER, physician
Hospitalized	1,801
Ages	1-97 years of age
50% of reporting	Private clinic
Highest reporting rate	July-September
Common exposure route	Dermal, inhaled
Most common pesticide	Dursban/(or Chlordane/(or Diazinon/(or

B. TOXICOLOGY

EXPOSURE OF PESTICIDES

Both acute and chronic poisoning occur in the field; however, the symptoms and health effects vary. It is very common for farmworkers or users to be exposed during application, and when entering treated areas before the allowed re-entry and catching (wind) drift in the field hours following are the most common routes and factors:

- 1) contact with residue
- 2) contact with drift
- 3) inappropriate applications or storage
- 4) contact with sprays while spraying or being sprayed
- 5) accidental ingestion

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Common exposure route	Dermal, inhalation, ingestion
Most common pesticide	Dursban/(organophosphate) Chlordane/(organochlorine) Diazinon/(organophosphate)

B. TOXICOLOGY

EXPOSURE OF PESTICIDES

Both acute and chronic poisoning occur in the same manner, however, the symptoms and health effects vary with pesticides. It is very common for farmworkers or users around the home to be exposed during application, and when eating, smoking or entering treated areas before the allowed waiting period, and catching (wind) drift in the field housing units. The following are the most common routes and forms of exposure.

- 1) contact with residue
- 2) contact with drift
- 3) inappropriate applications or storage
- 4) contact with sprays while spraying or being directly sprayed
- 5) accidental ingestion

EXPOSURE ROUTE

Direct Contact - Absorption (through dermal, ocular, and mucous membranes by touch, rubbing, eating)

Dermal - Adsorption, Absorption

Inhalation - Respiratory, Mucous membranes

Ingestion - Oral, Absorption

"Jose Garcia, an unlicensed pesticide applicator, was mixing two cotton pesticides, a hose broke, spraying him with the pesticides. He became ill and went temporarily blind. After being treated in a hospital, he recovered."

—Dallas Morning News, 8/9/81

C. POPULATION AT RISK

Agricultural workers represent the largest occupational group at risk to pesticide poisoning. An estimated 4.4 million agricultural workers are employed by agribusiness. Of these, an estimated 2.3 million are exposed directly or indirectly to pesticides or their residues as a result of occupational activities. Pesticide usage continues to be evaluated due to potential occupational exposure. Certain pesticides, for example, DDT, Aldrin, Amitraz, Chlordane and Dibromochloropropane (DBCP) have been restricted, cancelled or banned, because of their toxicity and, "less toxic" organophosphates have been substituted. Dursban and Diazinon are organophosphate insecticides commonly used for corn, watermelon, onions and sorghum. Chlordane, a chlorinated hydrocarbon insecticide was commonly used on broccoli, cabbage, citrus and tomatoes and, extensively by the public health sector in vector control. Chlordane, Aldrin, Dieldrin and Heptachlor belong to the DDT family and are now being replaced by the "less" toxic organophosphates. The DDT family pesticides have a long residual action and persist in the environment for years. In 1973, the grandfather of chlorinated hydrocarbons, DDT, was banned in the United

States because of its build-up in the food chain and other wildlife; chlordane has also been on the market.

It is to be noted that some of the pesticides now used in the home and, homeowners are at risk for potential pesticide poisonings.

What does this mean for the agricultural worker?

Inevitably the responsibility for the safe use of pesticides rests on the workers, for they are the ones most at risk. Occupations at risk for pesticide poisoning and greatest susceptibility are:

- 1) agricultural workers
- 2) mixers, loaders
- 3) manufacturers
- 4) emergency care personnel
- 5) health care workers
- 6) household users

D. PHYSICIAN RESPONSIBILITIES

The previous case has several implications: 1) prompt emergency medical attention at the time of exposure and 2) research and medical data show that the use of pesticides poses a serious health hazard. On a basic toxicology course, physicians are usually taught about pesticide poisoning in medical school. Pesticide poisoning is relatively new and physicians in many cases are not prepared to manage, diagnose and treat this problem. More pesticide related problems are becoming more occurrence, not only in the rural areas, but in urban areas as well. Major metropolitan emergency rooms and hospitals are receiving patients who have been poisoned from rural and agricultural areas. Physicians must take the responsibility of learning to recognize and treat the adverse health effects of pesticide poisonings.

ROUTE

- Absorption (through dermal, ocular, and mucous membranes by touch, rubbing, eating)
- Adsorption, Absorption
- Respiratory, Mucous membranes
- Oral, Absorption

an unlicensed pesticide applicator, was mixing pesticides, a hose broke, spraying him with the pesticide and he became ill and went temporarily blind. After being hospitalized, he recovered."

—Dallas Morning News, 8/9/81

ON AT RISK

workers represent the largest occupational group for pesticide poisoning. An estimated 4.4 million workers are employed by agribusiness. Of these, 1.2.3 million are exposed directly or indirectly to pesticides or their residues as a result of occupational pesticide usage continues to be evaluated due to occupational exposure. Certain pesticides, for example DDT, Aldrin, Amitraz, Chlordane and Dieldrin (DIBCP) have been restricted, banned, because of their toxicity and, "less toxic" organophosphates have been substituted. Dursban and other organophosphate insecticides commonly used on watermelon, onions and sorghum. Chlordane, a hydrocarbon insecticide was commonly used on orange, citrus and tomatoes and, extensively by the health sector in vector control. Chlordane, Aldrin, and Heptachlor belong to the DDT family and are being replaced by the "less" toxic organophosphates. Many pesticides have a long residual action and persist in the environment for years. In 1973, the grandfathered hydrocarbons, DDT, was banned in the United

States because of its build-up in the food chain of fish, birds and other wildlife; chlordane has also been removed from the market.

It is to be noted that some of the pesticides mentioned above were used in the home and, homeowners are also at risk for potential pesticide poisonings.

What does this mean for the agricultural worker?

Inevitably the responsibility for the safe use of pesticides rests on the workers, for they are the ones who are at risk. Occupations at risk for pesticide poisoning, in order of greatest susceptibility are:

- 1) agricultural workers
- 2) mixers, loaders
- 3) manufacturers
- 4) emergency care personnel
- 5) health care workers
- 6) household users

D. PHYSICIAN RESPONSIBILITIES

The previous case has several implications: 1) acute poisoning, 2) prompt emergency medical attention and 3) long-term effects. Physicians have a unique responsibility to prevent and treat pesticide exposure and pesticide poisoning. Recent research and medical data show that the improper use of pesticides poses a serious health hazard. Other than taking a basic toxicology course, physicians are usually not taught about pesticide poisoning in medical school. The information is relatively new and physicians in many cases are not prepared to manage, diagnose and treat this problem. Yet, more and more pesticide related problems are becoming a common occurrence, not only in the rural areas, but in the urban areas as well. Major metropolitan emergency care facilities and hospitals are receiving patients who have been transferred from rural and agricultural areas. Physicians are now facing the responsibility of learning to recognize and manage the adverse health effects of pesticide poisonings.

Molley Joel Coye, M.D., M.P.H., expresses the following concerns about the diagnosis and treatment of pesticide poisoning:

- 1) The symptoms are almost always nonspecific.
- 2) In cases it will not be easy for the physician to definitely prove the diagnosis.
- 3) In some cases the exposure occurred a long time before the onset of the symptoms, or the symptoms have existed for a while before the patient realized that a past exposure might have caused them.
- 4) Very little research has been done on the clinical toxicology of pesticides and even less is published in medical journals and texts.
- 5) In many parts of the country, the library resources in occupational and environmental medicine are extremely limited (only 800 board-certified specialists in occupational medicine exist in the United States).

For many reasons, including those listed previously, clinicians have diagnosed pesticide poisoning as the following:

- | | |
|----------------------|---------------------------|
| ● "Flu" | ● Anxiety |
| ● Narcotic Abuse | ● Asthma |
| ● Alcoholic Stupor | ● Gastroenteritis |
| ● Contact Dermatitis | ● Allergic Conjunctivitis |
| ● Neurosis | |

For these reasons physicians and other health providers should familiarize themselves with pesticide poisoning in order to consider it in the differential diagnosis. The use of crop sheets can be a major assistance to the physicians in developing an awareness of the local pesticides used in their communities. These can be obtained from the Texas Department of Agriculture or from the Texas Agricultural Extension Service "Right To Know" training programs. If health care providers do this, they can relate the symptoms and the causative agent more rapidly and begin to consider possible pesticide exposure in cases.

The signs and symptoms of acute and chronic pesticide poisoning are provided in Table 5.

Physicians, laboratory directors and/or any per a clinic or hospital laboratory in which a laborat reveals evidence of a reportable poisoning is reporting the case to the TDH.

Finally, providers must also realize that as mo used without properly following handling instruc can expect a greater number of pesticide-related l

For assistance with resource and reference info have a better understanding of pesticide expos following:

TABLE IV
RESOURCE NUMBERS

National Pesticide Telecommunications	
Network	
Texas State Poison Control Center	
Local Poison Control Offices:	
Amarillo	
Conroe	
Corpus Christi	
Dallas	
El Paso	
Lubbock	
Odessa	
Planview	
San Angelo	
Tyler	
Tyler	
Wichita Falls	
Poison Control Center	
Toxicology	
Texas Department of Agriculture	
Right-to-Know	
Pesticide Enforcement	
Texas Department of Health	
Texas Agricultural Extension Service	

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 tional and environmental medicine are extremely
 d (only 800 board-certified specialists in
 tional medicine exist in the United States).

asons, including those listed previously, clinicians
 sed pesticide poisoning as the following:

Abuse	● Anxiety
Stupor	● Asthma
Dermatitis	● Gastroenteritis
	● Allergic Conjunctivitis

ns physicians and other health providers should
 nselves with pesticide poisoning in order to
 he differential diagnosis. The use of crop sheets
 : assistance to the physicians in developing an
 e local pesticides used in their communities. These
 l from the Texas Department of Agriculture or
 Agricultural Extension Service "Right To Know"
 ns. If health care providers do this, they can relate
 and the causative agent more rapidly and begin
 sible pesticide exposure in cases.

ymptoms of acute and chronic pesticide poisoning
 Table 5.

Physicians, laboratory directors and/or any person in charge of
 a clinic or hospital laboratory in which a laboratory examination
 reveals evidence of a reportable poisoning is responsible for
 reporting the case to the TDH.

Finally, providers must also realize that as more pesticides are
 used without properly following handling instructions, physicians
 can expect a greater number of pesticide-related health problems.

For assistance with resource and reference information and to
 have a better understanding of pesticide exposure, consult the
 following:

TABLE IV	
RESOURCE NUMBERS	
National Pesticide Telecommunications	
Network	1-800-858-7378
Texas State Poison Control Center	1-800-392-8548
Local Poison Control Offices:	
Amarillo	(806) 354-1100
Conroe	(409) 539-7700
Corpus Christi	(512) 881-4559
Dallas	1-800-441-0040
El Paso	(915) 533-1244
Lubbock	(806) 793-4366
Odessa	(915) 333-1231
Planview	(806) 296-5900
San Angelo	(915) 653-6741
Tyler	(903) 531-8082
Tyler	(903) 597-8884
Wichita Falls	(817) 322-6771
Poison Control Center	
Toxicology	(713) 792-4300
Texas Department of Agriculture	
Right-to-Know	(512) 463-7547
Pesticide Enforcement	1-800-832-7347
Texas Department of Health	1-800-252-8239
Texas Agricultural Extension Service	(409) 845-3849

TABLE V

ACUTE POISONING

<u>Systems Affected</u>	<u>Acute Symptoms</u>	<u>Signs</u>
Neurological	Headache Dizziness Paraesthesia	Convulsions Incoordination Fasciculation Tremors
Psychological	Mental Confusion Anxiety Sensory Abnormalities	Coma/Stupor
Cardiac	Bradycardia Tachycardia Hypertension	Rhinorrhea Chest Pains Shortness of Breath
Respiratory	Tachypnea Apnea Dyspnea	Cough Wheezing
Gastrointestinal	Nausea Cramping	Vomiting Salivation Diarrhea Stomach Pain
Urinary	Renal Insufficiency Renal Failure Oliguria	Urinary Retention Pain
Dermal	Warm Skin Increased	Rash Sweating

TABLE VI

CHRONIC POISONING

<u>Pesticide</u>	<u>Chronic Effect</u>	<u>Cons</u>
Aldrin, Captan Chlordane	Carinogenesis	Affec lip, s bloo
Aldrin, Captan, Diazinon, Parathion	Teratogenesis	Stillb defec
Chlordecone	Reproductive	Steril of pr impo prem mens irreg
Organophosphates	Mutagenesis	Abor defec
	Neurological	Verti conv
Organochlorines	Miscellaneous	Com impa bloo

CHRONIC POISONING

This remains a much more controversial area than the proven consequences of acute poisoning. Low-dose chronic exposure remains a serious concern because of the potential for long term damage. The following is a table of long-term exposure consequences.

TABLE V

ACUTE POISONING

<u>Acute Symptoms</u>	<u>Signs</u>
Headache	Convulsions
Dizziness	Incoordination
Paraesthesia	Fasciculation
	Tremors
Mental Confusion	Coma/Stupor
Anxiety	
Sensory Abnormalities	
Bradycardia	Rhinorrhea
Tachycardia	Chest Pains
Hypertension	Shortness of Breath
Tachypnea	Cough
Apnea	Wheezing
Dyspnea	
Nausea	Vomiting
Cramping	Salivation
	Diarrhea
	Stomach Pain
Renal Insufficiency	Urinary Retention
Renal Failure	Pain
Oliguria	
Warm Skin	Rash
Increased	Sweating

TABLE VI

CHRONIC POISONING

<u>Pesticide</u>	<u>Chronic Effect</u>	<u>Consequences</u>
Aldrin, Captan Chlordane	Carinogenesis	Affects stomach, lip, skin, prostate, blood, leukemia
Aldrin, Captan, Diazinon, Parathion	Teratogenesis	Stillbirth, birth defects
Chlordecone	Reproductive	Sterility, toxemia of pregnancy, impotence, prematurity, menstrual irregularities
Organophosphates	Mutagenesis	Abortion, birth defects, sterility
	Neurological	Vertigo, tremor, convulsions
Organochlorines	Miscellaneous	Coma, anxiety, impaired language, blood disorders

POISONING

... much more controversial area than the proven
of acute poisoning. Low-dose chronic exposure
us concern because of the potential for long term
following is a table of long-term exposure

SECTION III

PATIENT MANAGEMENT

The following section will provide a general overview of pesticide poisoning, toxicology, recognition and management by pesticide categories.

Regardless of the poisoning, there are certain precautions that all providers must take with each individual considered to have a potential pesticide exposure.

RECOMMENDATIONS FOR PATIENT:

- Wash with soap and water immediately.
- Go to the nearest doctor, hospital or clinic.
- Have a family member or friend go with you, do not drive yourself.
- Tell your physician you think you have been exposed to pesticides.
- If possible, request the pesticide label poisoning information from the farmer.
- As a health care provider you have the right to ask the farmer for any pertinent information, logs, precautions, name of pesticides used, and above all call the poison control center for emergency instructions on separate recommendations.

To avoid exposure or poisoning, workers must strictly adhere to the application instructions and take the following precautions:

- **Clearly understand special instructions for mixing and applying pesticides.**
- **Use protective clothing or any other required equipment.**
- **Clearly understand precautions for re-entry, drift and residue exposure.**
- **Wash hands before any oral or eye contact.**
- **Wash clothes separately from regular wash.**
- **Bathe with soap and water immediately after any pesticide contact.**

NOTE:

Special attention should be given to child pesticides directly or through secondary household members coming in from the field house. Acute and chronic toxicity thresholds are lower for children than for adults. Antidote recommendations must be administered accordingly.

Recognition and Management of Pesticide Poisoning
Donald P. Morgan, EPA, 1989 was used to compile summaries within this guide.

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ORGANOPHOSPHATES

Toxicology Acetylcholine accumulation and phosphorylation of the acetylcholinesterase enzyme.

Chemical Effects Cholinergic junctions produce an effect on smooth muscles causing muscle contraction.

Nicotinic junctions produce an effect on skeletal muscles, and can cause paralysis but can weaken or paralyze.

Brain - sensory and behavioral effects including incoordination, and dizziness.

Exposure (respiratory depression and are usual causes of death; cases involving children are common). Organophosphate poisoning can occur by ingestion, absorption, or inhalation. Organophosphates can be fatal if exposure is for prolonged periods. Neurotoxicity can cause weakness, paresthesias of the extremities predominantly in the hands, persisting for weeks to years.

SECTION III

PATIENT MANAGEMENT

This section will provide a general overview of pesticide toxicology, recognition and management by pesticide

After poisoning, there are certain precautions that must be taken with each individual considered to have had pesticide exposure.

PRECAUTIONS FOR PATIENT:

1. Wash with soap and water immediately.

2. Contact nearest doctor, hospital or clinic.

3. If family member or friend go with you, do not drive

4. If physician you think you have been exposed to

5. Request the pesticide label poisoning information from the farmer.

6. If you are the provider you have the right to ask the farmer for pertinent information, logs, precautions, name of pesticide used, and above all call the poison control center for any special instructions on separate recommendations.

7. In case of exposure or poisoning, workers must strictly adhere to the instructions and take the following precautions:
Understand special instructions for mixing and handling pesticides.

Wear protective clothing or any other required

Understand precautions for re-entry, drift and residue exposure.

Wash before any oral or eye contact.

Wash clothes separately from regular wash.

1. Wash with soap and water immediately after any contact.

NOTE:

Special attention should be given to children poisoned by pesticides directly or through secondary exposure from household members coming in from the field or outside the house. Acute and chronic toxicity thresholds can be lower for children than for adults. Antidote recommendations and dose levels must be administered accordingly.

Recognition and Management of Pesticide Poisoning, 4th Edition, Donald P. Morgan, EPA, 1989 was used to develop treatment summaries within this guide.

★ ★ ★

ORGANOPHOSPHATES

Toxicology Acetylcholine accumulation is caused by phosphorylation of the acetylcholinesterase enzyme.

Chemical Effects Cholinergic junctions produce muscarinic effect on smooth muscles and gland cells, causing muscle contractions and secretions;

Nicotinic junctions produce excitatory effects on skeletal muscles, and autonomic ganglia, but can weaken or paralyze the end plate cells;

Brain - sensory and behavioral disturbance, incoordination, and depressed motor function;

Exposure (respiratory depression and pulmonary edema are usual causes of death; reported pesticide cases involving children are more likely to be organophosphate poisonings) inhalation, ingestion, absorption. In some cases organophosphates can be stored in fat cells for prolonged periods. Neurotoxicity in this case can cause weakness, paralysis, paresthesia of the extremities predominantly of the legs—persisting for weeks to years;

Symptoms/Signs Develop immediately after exposure or within 12 hours (average onset is within 4 hours).
Most prominent are:

HEADACHE NAUSEA
DIZZINESS MUSCLE TWITCHING
WEAKNESS HYPERSECRETION
MIOSIS PULMONARY EDEMA

Other symptoms are: anxiety, restlessness, tremor, incoordination, vomiting, abdominal cramps, diarrhea, sweating, salivation, tearing, rhinorrhea, bronchorrhea, blurred or dark vision, chest tightness, wheezing, productive cough, tachycardia, hypertension, sinus arrest, toxic psychosis, confusion, bizarre behavior, unconsciousness, incontinence and convulsions.

A constant exposure at low doses can cause persistent anorexia, weakness, and malaise. Acute ingestion may cause prolonged paralysis of the head, neck, limbs, and thorax muscles.

Laboratory **Do not wait for laboratory confirmations if there are strong clinical indications of organophosphate poisoning.**

Test for low cholinesterase levels in plasma or red blood cells. There are various tests available (Michael, Nabb-Whitfield, Ellman-Boehringer). A twenty-five percent or more depression is generally regarded as an exposure/poisoning.

It is important to document baseline or pre-exposure levels. Many persons have an established level of cholinesterase that will test normal but is actually lower and should be considered a case of poisoning. When in doubt draw two samples 4 weeks apart. A significant change between the two levels is suggestive of a poisoning.

Treatment

- 1) If necessary, clear airway oxygen (lavage may be as cardiac and respiratory support and monitoring)
- 2) Atropine sulfate IV (pr >12 yrs. 0.4-2.0 mg q/ (until atropinization: fully dilated pupils, and tach <12 yrs. 0.05 mg/kg q
- 3) Draw heparinized blood
- 4) Pralidoxime (protopam necessary if severe neuromuscular compromise >12 yrs. 1-2 gm/minute (No more than 0.2 gm/ <12 yrs. 20-50 mg/kg Repeat in 1-2 hours, then intervals. (Do NOT use carbamate poisoning)
- 5) 72-hour observation

If ingested, gastric lavage prevent central nervous system depression.

- 1) Intubate, aspirate, lavage
- 2) Remember to protect airway
- 3) Use large orogastric tube
- 4) Lavage with activated charcoal saline
- 5) After lavage, instill activated a cathartic:
>12 yrs. 50-100 gm/300-600 ml
<12 yrs. 15-30 gm/100-300 ml

Develop immediately after exposure or within 12 hours (average onset is within 4 hours).

Most prominent are:

HEADACHE	NAUSEA
DIZZINESS	MUSCLE TWITCHING
WEAKNESS	HYPERSECRETION
MIOSIS	PULMONARY EDEMA

Other symptoms are: anxiety, restlessness, tremor, incoordination, vomiting, abdominal cramps, diarrhea, sweating, salivation, tearing, rhinorrhea, bronchorrhea, blurred or dark vision, chest tightness, wheezing, productive cough, tachycardia, hypertension, sinus arrest, toxic psychosis, confusion, bizarre behavior, unconsciousness, incontinence and convulsions.

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It is important to document baseline or pre-exposure levels. Many persons have an established level of cholinesterase that will test normal but is actually lower and should be considered a case of poisoning. When in doubt draw two samples 4 weeks apart. A significant change between the two levels is suggestive of a poisoning.

Treatment

- 1) If necessary, clear airway and administer oxygen (lavage may be necessary, as well as cardiac and respiratory mechanical support and monitoring).
- 2) Atropine sulfate IV (preferred)
>12 yrs. 0.4-2.0 mg q/15'
(until atropinization: flushing, dry mouth, dilated pupils, and tachycardiac/140')
<12 yrs. 0.05 mg/kg q/15'
- 3) Draw heparinized blood sample
- 4) Pralidoxime (protopam, 2-PAM may be necessary if severe respiratory or neuromuscular compromise exists.
>12 yrs. 1-2 gm/minute IV
(No more than 0.2 gm/minute)
<12 yrs. 20-50 mg/kg
Repeat in 1-2 hours, then in 10-12 hour intervals. (Do NOT use for probable carbamate poisoning)
- 5) 72-hour observation

If ingested, gastric lavage is necessary to prevent central nervous system (CNS) depression.

- 1) Intubate, aspirate, lavage
- 2) Remember to protect airway
- 3) Use large orogastric tube
- 4) Lavage with activated charcoal in isotonic saline
- 5) After lavage, instill activated charcoal with a cathartic:
>12 yrs. 50-100 gm/300-800 ml water
<12 yrs. 15-30 gm/100-300 ml water

ORGANOPHOSPHATES

<u>BRAND</u>	<u>CHEMICAL</u>	<u>COMMON CROPS</u>
NORTHEAST		
Diazinon	Diazinon	Blueberries, Melons, Coastal Bermuda
Lorsban	Chlorpyrifos	Corn, Sorghum
Counter	Terbufos	Corn
Cygon	Dimethoate	Corn, Watermelons, Melons, Wheat, Sorghum
Dysyston-8	Disulfoton	Corn
Guthion	Azinphosmethyl	Cotton, Peaches, Pecans
Pencap-M	Methyl Parathion	Cotton, Wheat, Southern Peas
Parathion	Ethyl Parathion	Cotton, Wheat, Melons, Watermelons, Coastal Bermuda, Pecans, Sorghum
Azodrin	Monocrotophos	Cotton
Bidrin	Dicrotophos	Cotton
Phosdrin	Mevinphos	Melons
Malathion	Malathion	Melons, Coastal Bermuda
Dylox	Trichlorfon	Coastal Bermuda
Zolone	Phosalone	Peaches, Pecans
SOUTHEAST		
Pencap	Methyl-Parathion	Wheat, Soybeans, Rice, Cotton
Orthene	Acephate	Cotton
Guthion	Azinphosmethyl	Cotton, Pecans, Peaches
Parathion	Ethyl Parathion	Cotton, Wheat, Sorghum, Peanuts
Azodrin	Monocrotophos	Cotton, Peanuts
Cygon	Dimethoate	Wheat, Watermelons
Counter	Terbufos	Corn, Sorghum
Zolone	Phosalone	Pecans, Peaches
Malathion	Malathion	Pecans, Squash
Lorsban	Chlorpyrifos	Pecans, Sorghum, Peanuts
Diazinon	Diazinon	Watermelons, Peanuts, Blueberries, Coastal Bermuda
Trithion	Carbophenothion	Watermelons
Dylox	Trichlorfon	Coastal Bermuda
Zolone	Phosalone	Coastal Bermuda, Peaches, Pecans
SOUTH/VALLEY		
Phosdrin	Mevinphos	Turnips, Spinach, Celery, Lettuce
Diazinon	Diazinon	Turnips, Onions, Collards, Kale, Kohlrabi, Mustard Greens, Swiss Chard
Metasystox-R	Oxydemeton-Methyl	Squash, Cucumbers, Melons, Watermelons
Lorsban	Chlorpyrifos	Sorghum, Corn, Citrus
Counter	Terbufos	Sorghum, Corn
Cygon	Dimethoate	Sorghum, Melons, Tomatoes, Watermelons, Kale, Kohlrabi, Collards, Mustard Greens, Swiss Chard
Orthene	Acephate	Peanuts, Lettuce
Di-Syston	Disulfoton	Peanuts, Cauliflower
Parathion	Ethyl Parathion	Onions, Collards, Kale, Kohlrabi, Mustard Greens, Swiss Chard
Monitor	Metamidophos	Cauliflower, Melons, Cabbage, Peppers, Watermelons, Broccoli
Guthion	Azinphos-Methyl	Broccoli, Peppers, Cotton, Peaches, Sugarcane
Pencap-M	Methyl Parathion	Cotton
Zolone	Phosalone	Peaches
EPN 3 + 3	EPN	Cotton

continued next page

ORGANOPHOSPHATES Co

<u>BRAND</u>	<u>CHEMICAL</u>	<u>COMMON CROPS</u>
WEST/HIGH PLAINS		
Parathion	Ethyl Parathion	Alfalfa, Melons, Watermelons, Peaches, Cabbage, Cotton
Pencap-M	Methyl Parathion	Alfalfa, Onions
Cygon	Dimethoate	Alfalfa, Seed Sorghum
Lorsban	Chlorpyrifos	Alfalfa, Seed Sorghum
Monitor	Methamidophos	Melons, Cabbage
Phosdrin	Mevinphos	Melons, Watermelons
Azodrin	Monocrotophos	Peanuts
Thimet	Phorate	Sugar Beets
Orthene	Acephate	Peppers
Bidrin	Dicrotophos	Cotton

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CARBAMATES (INSECTICIDES)

Toxicology Acetylcholine accumulation and subsequent carboxylation of the enzyme.

Chemical Effects Cholinergic junctions produce effects on smooth muscle causing muscle contraction.

Nicotinic effects produce effects on skeletal muscles and autonomic ganglia can cause twitching and paralyze end plate cells.

Brain - sensory and motor incoordination and depression.

NOTE: Unlike organophosphate acetylcholinesterase inhibitors, carbamates dissociate more readily from the enzyme - limits duration of poisoning - produces greater span of action - production and lethality - invalidates blood cholinesterase activity.

Exposure Inhalation, ingestion, dermal contact, kidneys and liver.

ORGANOPHOSPHATES

<u>EMICAL</u>	<u>COMMON CROPS</u>
zinon	Blueberries, Melons, Coastal Bermuda
orpyrifos	Corn, Sorghum
bufos	Corn
methoate	Corn, Watermelons, Melons, Wheat, Sorghum
ulfoton	Corn
nphosmethyl	Cotton, Peaches, Pecans
thyl Parathion	Cotton, Wheat, Southern Peas
yl Parathion	Cotton, Wheat, Melons, Watermelons, Coastal Bermuda, Pecans, Sorghum
nocrotophos	Cotton
rotophos	Cotton
vinphos	Melons
lathion	Melons, Coastal Bermuda
chlorfon	Coastal Bermuda
salone	Peaches, Pecans
thyl-Parathion	Wheat, Soybeans, Rice, Cotton
phate	Cotton
nphosmethyl	Cotton, Pecans, Peaches
yl Parathion	Cotton, Wheat, Sorghum, Peanuts
nocrotophos	Cotton, Peanuts
methoate	Wheat, Watermelons
bufos	Corn, Sorghum
salone	Pecans, Peaches
lathion	Pecans, Squash
lorpyrifos	Pecans, Sorghum, Peanuts
zinon	Watermelons, Peanuts, Blueberries, Coastal Bermuda
rbophenothion	Watermelons
chlorfon	Coastal Bermuda
salone	Coastal Bermuda, Peaches, Pecans
vinphos	Turnips, Spinach, Celery, Lettuce
zinon	Turnips, Onions, Collards, Kale, Kohlrabi, Mustard Greens, Swiss Chard
ydemeton-Methyl	Squash, Cucumbers, Melons, Watermelons
orpyrifos	Sorghum, Corn, Citrus
bufos	Sorghum, Corn
methoate	Sorghum, Melons, Tomatoes, Watermelons, Kale, Kohlrabi, Collards, Mustard Greens, Swiss Chard
ephate	Peanuts, Lettuce
ulton	Peanuts, Cauliflower
yl Parathion	Onions, Collards, Kale, Kohlrabi, Mustard Greens, Swiss Chard
amidophos	Cauliflower, Melons, Cabbage, Peppers, Watermelons, Broccoli
inphos-Methyl	Broccoli, Peppers, Cotton, Peaches, Sugarcane
thyl Parathion	Cotton
osalone	Peaches
N	Cotton

ORGANOPHOSPHATES *Continued*

<u>BRAND</u>	<u>CHEMICAL</u>	<u>COMMON CROPS</u>
WEST/HIGH PLAINS		
Parathion	Ethyl Parathion	Alfalfa, Melons, Onions, Peanuts, Watermelons, Peppers, Potatoes, Cabbage, Cotton
Pencap-M	Methyl Parathion	Alfalfa, Onions
Cygon	Dimethoate	Alfalfa, Seed Sorghum
Lorsban	Chlorpyrifos	Alfalfa, Seed Sorghum
Monitor	Methamidophos	Melons, Cabbage
Phosdrin	Mevinphos	Melons, Watermelons, Peppers
Azodrin	Monocrotophos	Peanuts
Thimet	Phorate	Sugar Beets
Orthene	Acephate	Peppers
Bidrin	Dicrotophos	Cotton

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CARBAMATES (INSECTICIDES)

Toxicology Acetylcholine accumulation is caused by carboxylation of the acetylcholinesterase enzyme.

Chemical Effects Cholinergic junctions produce muscarinic effects on smooth muscles and gland cells causing muscle contractions and secretions.

Nicotinic effects produce excitatory effects on skeletal muscles and autonomic ganglia that can cause twitching and also, weaken or paralyze end plate cells.

Brain - sensory and behavioral changes, incoordination and depressed motor function.

NOTE: Unlike organophosphate acetylcholine accumulation, carbamates dissociate more readily, which:

- limits duration of poisoning
- produces greater span between symptom production and lethal dose
- invalidates blood CHE fluids

Exposure Inhalation, ingestion, dermal. Excreted by the kidneys and liver.

Symptoms/Signs Early = malaise, muscle weakness, dizziness and sweating.

Other symptoms: headache, salivation, nausea, vomiting, abdominal pain, diarrhea, miosis, incoordination, slurred speech, dyspnea, bronchospasm, chest tightness, pulmonary edema, blurred vision, muscle twitching, spasms, convulsions and cardiac complications.

Laboratory If blood sample is not drawn within 1-2 hours after exposure, cholinesterase levels will not be depressed.

Urine analysis should be done for N-Methyl Carbamate metabolites.

If clinically strong for acute poisoning, DO NOT WAIT for laboratory confirmation.

- Treatment
- 1) Clear airway, oxygen and gastric lavage may be necessary as well as cardiac and respiratory mechanical support and monitoring.
 - 2) Atropine sulfate IV (preferred)
 - >12 yrs. 0.4-2.0 mg q/15'
 - (until atropinization)
 - <12 yrs. 0.05 mg/kg q/15'
 - (DO NOT USE PRALIDOXIME)
 - 3) a. Draw heparinized blood sample
 - b. Take urine sample for metabolites
 - 4) 72-hour observation

If ingested, gastric lavage is necessary to prevent CNS depression.

- 1) Intubate, aspirate, lavage
- 2) Remember to protect airway
- 3) Use large orogastric tube
- 4) Lavage with activated charcoal in isotonic saline

continued next page

continued

- 5) After lavage, instill active a cathartic:
 - >12 yrs. 50-100 gm/30
 - <12 yrs. 15-30 gm/100.

CARBAMATES (INSECTICIDES)

<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
NORTHEAST		
Carbaryl	Sevin	Blueberries, Peaches Southern Peas, Sweet Watermelons, Wheat Corn, Sorghum Peanuts Melons
Carbofuran Aldicarb Maneb	Furadan Temik Dithane	
SOUTHEAST		
Carbamyl	Sevin	Squash, Pecans, Water Peaches, Rice, Coast Blueberries
Carbofuran Molinat	Furadan Ordram	Corn, Rice, Sorghum Rice
SOUTH VALLEY		
Methomyl	Lannate, Nudrin	Peppers, Onions, Tomatoes Cucumbers, Corn, Cabbage Broccoli, Spinach, Cauliflower Greens, Squash, Kale Swiss Chard, Kohlrabi Peanuts, Lettuce, Melons Collards, Peppers, Potatoes Turnips, Swiss Chard Sorghum, Corn Peanuts, Citrus
Carbaryl	Sevin	
Carbofuran Aldicarb	Furadan Temik	
WEST		
Carbaryl Methomyl	Sevin Lannate, Nudrin	Alfalfa, Grapes Alfalfa, Grapes, Watermelons Peppers, Potatoes, Squash Alfalfa, Sugar Beets
Carbofuran	Furadan	

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ORGANOCHLORINES (INSECTICIDES)

Toxicology Gastrointestinal absorption through aerosols and vapor interference with fluxes of calcium ion nerve cell membranes.

Chemical Effects Myoclonic Jerking (Nerve interference causes neuronal

Early = malaise, muscle weakness, dizziness and sweating.

Other symptoms: headache, salivation, nausea, vomiting, abdominal pain, diarrhea, miosis, incoordination, slurred speech, dyspnea, bronchospasm, chest tightness, pulmonary edema, blurred vision, muscle twitching, spasms, convulsions and cardiac complications.

If blood sample is not drawn within 1-2 hours after exposure, cholinesterase levels will not be depressed.

Urine analysis should be done for N-Methyl Carbamate metabolites.

If clinically strong for acute poisoning, DO NOT WAIT for laboratory confirmation.

- 1) Clear airway, oxygen and gastric lavage may be necessary as well as cardiac and respiratory mechanical support and monitoring.
- 2) Atropine sulfate IV (preferred)
 - >12 yrs. 0.4-2.0 mg q/15'
 - (until atropinization)
 - <12 yrs. 0.05 mg/kg q/15'
 - (DO NOT USE PRALIDOXIME)
- 3) a. Draw heparinized blood sample
 - b. Take urine sample for metabolites
- 4) 72-hour observation

If ingested, gastric lavage is necessary to prevent CNS depression.

- 1) Intubate, aspirate, lavage
- 2) Remember to protect airway
- 3) Use large orogastric tube
- 4) Lavage with activated charcoal in isotonic saline

continued

- 5) After lavage, instill activated charcoal with a cathartic:
 - >12 yrs. 50-100 gm/300-800 ml water
 - <12 yrs. 15-30 gm/100-300 ml water

CARBAMATES (INSECTICIDES)

<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
NORTHEAST		
Carbaryl	Sevin	Blueberries, Peaches, Pecans, Sorghum, Southern Peas, Sweet Potatoes, Watermelons, Wheat, Coastal Bermuda
Carbofuran	Furadan	Corn, Sorghum
Aldicarb	Temik	Peanuts
Maneb	Dithane	Melons
SOUTHEAST		
Carbamyl	Sevin	Squash, Pecans, Watermelons, Corn, Peaches, Rice, Coastal Bermuda, Blueberries
Carbofuran	Furadan	Corn, Rice, Sorghum
Molinate	Ordram	Rice
SOUTH VALLEY		
Methomyl	Lannate, Nudrin	Peppers, Onions, Tomatoes, Lettuce, Cucumbers, Corn, Cauliflower, Cabbage, Broccoli, Spinach, Celery, Mustard Greens, Squash, Kale, Collards, Turnips, Swiss Chard, Kohlrabi, Watermelon
Carbaryl	Sevin	Peanuts, Lettuce, Mustard Greens, Kale, Collards, Peppers, Peaches, Sorghum, Turnips, Swiss Chard, Kohlrabi
Carbofuran	Furadan	Sorghum, Corn
Aldicarb	Temik	Peanuts, Citrus
WEST		
Carbaryl	Sevin	Alfalfa, Grapes
Methomyl	Lannate, Nudrin	Alfalfa, Grapes, Watermelons, Cabbage, Peppers, Potatoes, Seed Sorghum
Carbofuran	Furadan	Alfalfa, Sugar Beets

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ORGANOCHLORINES (INSECTICIDES)

Toxicology Gastrointestinal absorption or respiratory through aerosols and volatile. Causes interference with fluxes of cations across the nerve cell membranes.

Chemical Effects Myoclonic Jerking (Nerve cell membrane interference causes neuronal irritability).

Convulsions	Pulmonary gas exchange interference (metabolic acidosis).
Myocardial	Cardiac arrhythmias.
	High concentrations induce hepatic enzyme activity, biotransformation of steroid hormones, lipophilic compounds are likely to be excreted in maternal milk, causes porphyria cutanea and aplastic anemia.
Exposure	Absorption by ingestion, dermal, gastrointestinal absorption.
Symptoms/Signs	<p>Early onset symptoms of these chemicals are similar to some organophosphates (check symptom section on organophosphates or the Morgan manual for further description).</p> <p>Sensory disturbance hyperesthesia, paresthesia of face and extremity.</p> <p>Headache, dizziness, nausea, vomiting, incoordination, tremor, mental confusion, myoclonic jerking tonic-clonic convulsions.</p> <p>Non-DDT like symptoms cause: immediate convulsions 48 hours after exposure and continue over days; prolonged chronic exposure = weight loss, tremor, muscle weakness, involuntary eye movement, chest and joint pain, skin rash, slurred speech, mental changes.</p> <p>Respiratory metabolic acidosis and death.</p>
Laboratory	Blood gas chromatographic exams and urinary metabolites. These are performed through university/poison control centers and private labs.

Treatment	<p>Observe for toxicosis; sensory incoordination, slurred speech, motor activity (convulsions)</p> <ol style="list-style-type: none"> 1) Take seizure precautions 2) Oxygen + anticonvulsives 3) Gastric lavage may be needed 4) Monitor and assist pulmonary and cardiac status.
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BIOLOGICAL INSECTICIDES

(repellents and pyrethrum, pyrethrins, nicotine)

Toxicology	Naturally occurring extract from flowers; Lipophilic, and repels insects and paralyzes the nervous system. Numerous commercial insecticides (the homeowner) exist as "pyrethroids" are combined with organophosphates, remain as residues.
Chemical Effects	Dermal and respiratory (anaphylactic in some cases)
Exposure	Skin, pulmonary mucous membranes
Signs/Symptoms	Asthma reactions; allergic dermatitis; cholinesterase symptoms if the product is combined.
Laboratory	Will vary between specific insecticides.
Treatment	<ol style="list-style-type: none"> 1) Avoid contact with the insecticide or inhalation of the chemical 2) Antihistamines 3) Treat asthmatic symptoms 4) Treat chronic dermatitis 5) Eye flushing with clean solution

Pulmonary gas exchange interference (metabolic acidosis).

Cardiac arrhythmias.

High concentrations induce hepatic enzyme activity, biotransformation of steroid hormones, lipophilic compounds are likely to be excreted in maternal milk, causes porphyria cutanea and aplastic anemia.

Absorption by ingestion, dermal, gastrointestinal absorption.

Early onset symptoms of these chemicals are similar to some organophosphates (check symptom section on organophosphates or the Morgan manual for further description).

Sensory disturbance hyperesthesia, paresthesia of face and extremity.

Headache, dizziness, nausea, vomiting, incoordination, tremor, mental confusion, myoclonic jerking tonic-clonic convulsions.

Non-DDT like symptoms cause: immediate convulsions 48 hours after exposure and continue over days; prolonged chronic exposure = weight loss, tremor, muscle weakness, involuntary eye movement, chest and joint pain, skin rash, slurred speech, mental changes.

Respiratory metabolic acidosis and death.

Blood gas chromatographic exams and urinary metabolites. These are performed through university/poison control centers and private labs.

Treatment Observe for toxicosis; sensory disturbances, incoordination, slurred speech, involuntary motor activity (convulsions).
1) Take seizure precautions
2) Oxygen + anticonvulsives
3) Gastric lavage may be necessary
4) Monitor and assist pulmonary ventilation and cardiac status.

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BIOLOGICAL INSECTICIDES

(repellents and pyrethrum, pyrethrins, nicotine as acaricides)

Toxicology Naturally occurring extract of chrysanthemum flowers; Lipophilic, and rapidly penetrates insects and paralyzes the nervous system. Numerous commercial indoor products (for the homeowner) exist as "bug bombs" and are combined with organophosphates or carbamates, remain as residues on crops.

Chemical Effects Dermal and respiratory (allergens) (anaphylactic in some cases)

Exposure Skin, pulmonary mucous membranes

Signs/Symptoms Asthma reactions; allergic rhinitis; contact dermatitis; cholinesterase symptomatology if the product is combined.

Laboratory Will vary between specific biological insecticides.

Treatment 1) Avoid contact with the pesticide residues or inhalation of the chemical vapors
2) Antihistamines
3) Treat asthmatic symptomatology
4) Treat chronic dermatitis with steroids
5) Eye flushing with clean water and saline solution

- 6) Treat other toxic effects of organophosphates, carbamates and other (organochlorines)
- 7) Treat nicotinic poisoning with decontamination washing with soap and water, may need to administer pulmonary ventilation

OTHER INSECTICIDES (ORGANOCHLORINES)

<u>NORTHEAST</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
<u>Subcategories</u>			
(Pyrethroids)	Ammo Pydrin	Cypermethrin Fenvalerate	Cotton Pecans, Watermelons
(Biological)	Dipel	Bacillus thuringensis (B.t.)	Sweet Potatoes
(Elemental Sulfur)	Dusting Sulfur	Sulfur	Peaches
<u>SOUTHEAST</u> (Organochlorine)	Thiodan Marlate	Endosulfan Methoxychlor	Squash Corn
(Pyrethroids)	Ammo Pydrin Scout	Cypermethrin Fenvalerate Tralomethrin	Cotton Cotton
(Elemental Sulfur)	Ambush, Pounce Dusting Sulfur	Permethrin Sulfur	Cotton, Soybeans Soybeans Peaches
<u>SOUTH/VALLEY</u> (Pyrethroids)	Ambush, Pounce	Permethrin	Spinach, Turnips, Tomatoes, Collards, Mustard Greens, Kale, Peppers, Lettuce, Broccoli, Cabbage, Corn, Celery, Cauliflower, Swiss Chard, Kohlrabi
	Pydrin	Fenvalerate	Squash, Cabbage, Broccoli
	Asana	Esfenvalerate	Tomatoes, Cabbage, Cucumbers, Squash
(Organochlorine)	Ammo, Cymbush	Cypermethrin	Cotton, Onions
	Kelthane Acaraben Thiodan	Dicofol Chlorobenzilate Endosulfan	Citrus Citrus Cucumbers, Tomatoes
(Biological)	Dipel	Bacillus thuringensis	Collards, Lettuce, Kale, Celery, Mustard Greens, Cabbage, Broccoli, Turnips, Spinach, Swiss Chard, Kohlrabi, Cauliflower

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OTHER INSECTICIDES *Contin*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>
(Inorganic Salt)	Kocide Tri-Basic	Copper Hydroxide Cooper Sulfate
<u>WEST</u> (Pyrethroids)	Ambush, Pounce	Permethrin
	Asana Pydrin	Esfenvalerate Fenvalerate
(Elemental Sulfur) (Organochlorine)	Ammo, Cymbush Dusting Sulfur	Cypermethrin Sulfur
	Endocide, Thiodan	Endosulfan
(Inorganic Salt)	Kocide	Copper Hydroxide

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FUNGICIDES

<u>Toxicology</u>	Effects vary from fungicide or system it affects. These a form of dusts, powders, and grain, as well for storage of these and for mature crop
<u>Chemical Effects</u>	Skin irritants, dermal sen manifestations.
<u>Exposure</u>	Skin, mucous membranes
<u>Symptoms/Signs</u>	Skin lesions, scarring, conjun pyrexia, corneal opacities, porphyria, cellulitis, weak methemoglobinemia.
<u>Laboratory</u>	Will vary between different :

- 6) Treat other toxic effects of organo-phosphates, carbamates and other (organochlorines)
- 7) Treat nicotinic poisoning with decontamination washing with soap and water, may need to administer pulmonary ventilation

ECTICIDES (ORGANOCHLORINES)

<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
Ammo ydrin Dipel	Cypermethrin Fenvalerate Bacillus thuringensis (B.t.) Sulfur	Cotton Pecans, Watermelons Sweet Potatoes Peaches
Dusting Sulfur	Sulfur	Peaches
Thiodan Mlarlate Ammo ydrin scout Ambush, Pounce Dusting Sulfur	Endosulfan Methoxychlor Cypermethrin Fenvalerate Tralomethrin Permethrin Sulfur	Squash Corn Cotton Cotton Cotton, Soybeans Soybeans Peaches
Ambush, Pounce	Permethrin	Spinach, Turnips, Tomatoes, Collards, Mustard Greens, Kale, Peppers, Lettuce, Broccoli, Cabbage, Corn, Celery, Cauliflower, Swiss Chard, Kohlrabi Squash, Cabbage, Broccoli
Asana	Esfenvalerate	Tomatoes, Cabbage, Cucumbers, Squash
Ammo, Cymbush	Cypermethrin	Cotton, Onions
Kelthane Acaraben Thiodan Dipel	Dicofol Chlorobenzilate Endosulfan Bacillus thuringensis	Citrus Citrus Cucumbers, Tomatoes Collards, Lettuce, Kale, Celery, Mustard Greens, Cabbage, Broccoli, Turnips, Spinach, Swiss Chard, Kohlrabi, Cauliflower

OTHER INSECTICIDES *Continued*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
(Inorganic Salt)	Kocide Tri-Basic	Copper Hydroxide Copper Sulfate	Peppers Peppers, Tomatoes
WEST (Pyrethroids)	Ambush, Pounce Asana Pydrin	Permethrin Esfenvalerate Fenvalerate	Cotton, Melons, Cabbage, Peppers Cotton, Peanuts Cotton, Melons, Potatoes, Peppers, Peanuts, Cabbage
(Elemental Sulfur) (Organochlorine)	Ammo, Cymbush Dusting Sulfur	Cypermethrin Sulfur	Onions Grapes
(Inorganic Salt)	Endocide, Thiodan Kocide	Endosulfan Copper Hydroxide	Watermelons, Peppers, Cabbage Peppers

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FUNGICIDES

Toxicology	Effects vary from fungicide type and organ or system it affects. These are usually in the form of dusts, powders, and granules for seed and grain, as well for storage and shipment of these and for mature crop protection.
Chemical Effects	Skin irritants, dermal sensitizers, system manifestations.
Exposure	Skin, mucous membranes
Symptoms/Signs	Skin lesions, scarring, conjunctivitis, keratitis, pyrexia, corneal opacities, hepatomegaly, porphyria, cellulitis, weakness, anorexia, methemoglobinemia.
Laboratory	Will vary between different fungicides

Treatment Vary between hexachlorobenzenes, pentachlorobenzenes, diclolean, chloroneb, and thrian.

- 1) Wash
- 2) Lavage and induce vomiting necessary + syrup of ipecac
- 3) 3-8 gm q.i.d. of cholestyramine will accelerate elimination
- 4) Treat porphyria symptoms
- 5) Monitor liquids and cardiac functions

FUNGICIDES

<u>NORTHEAST</u> <u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
(Ethlenebisdi-thiocarbamate)	Manzate	Maneb Mancozeb	Peanuts, Watermelons
(Benzonitrile)	Bravo	Chlorothalonil	Melons, Peanuts, Watermelons
(Benzimidazole)	Benlate	Benomyl	Melons
(Pthalimide)	Captan	Captan	Peaches
(Chlorinated Hydrocarbons)	Terrachlor	PCNB	Peanuts
(Organotin)	Du-Ter	Triphenyltin	Pecans
(Benzimidazole)	Apl-Luster, Arbotect	Thiabendazole	Sweet Potatoes
(Chlorophenoxy)	Bayleton	Triadimefon	Wheat
<u>SOUTHEAST</u> (Ethlenebisdi-thiocarbamate)	Dithane, Manzate	Mancozeb	Wheat, Squash, Watermelons
(Benzonitrile)	Bravo	Chlorothalonil	Squash, Watermelons, Peanuts
(Dicarboximide)	Captan	Captan	Peaches
(Organotin)	Du-Ter	Triphenyltin Hydroxide	Pecans
(Elemental Sulfur)	Dusting Sulfur	Sulfur	Peaches
(Trizole)	Tilt	Propiconazole	Rice, Wheat
(Chlorophenoxy)	Bayleton	Triadimefon	Wheat
<u>SOUTH/VALLEY</u> (Organotin)	Torque, Vendex	Fenbutatinoxide	Citrus
(Chlorinated Isophthalic Acid)	Bravo	Chlorothalonil	Celery, Cauliflower, Cabbage, Broccoli, Melons, Cucumbers, Peanuts, Onions, Tomatoes, Squash, Watermelons

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FUNGICIDES *Continued*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>
(Ethlenebisdi-thiocarbamate)	Dithane	Maneb
(Benzimidazole)	Mancozate Benlate	Mancozeb Benomyl
(Dimethyl Aniline)	Ridomil, Apron	Metalaxyl
(Chlorinated Hydrocarbon)	Terrclor	Pentachloronitr Benzene
(Diozadiazole)	Rovral	Iprodione
(Thiocarbamate)	Ro-Neet	Cycloate
(Bicarboximide)	Captan	Captan
(Chlorophenoxy)	Bayleton	Triadimefon
(Elemental Sulfur)	Dusting Sulfur	Sulfur
<u>WEST</u> (Chlorinated Isophthalic Acid)	Bravo	Chlorothalonil
(Ethlenebisdi-Thiocarbamate)	Dithane	Maneb
(Benzimidazole)	Manzate Topsin M	Mancozeb Thiophanate-Methyl Benomyl
(Pthalimide)	Captan	Captan
(Dimethyl Aniline)	Ridomil	Metalaxyl
(Organotin)	Triple Tin	Triphenyltin Hydroxide
(Chlorophenoxy)	Bayleton	Triadimefon
(Chlorinated Hydrocarbon)	Terraclor	Pentachloronitro benzene

Vary between hexachlorobenzenes, pentachlorobenzenes, diclolean, chloroneb, and thrian.

- 1) Wash
- 2) Lavage and induce vomiting necessary + syrup of ipecac
- 3) 3-8 gm q.i.d. of cholestyramine will accelerate elimination
- 4) Treat porphyria symptoms
- 5) Monitor liquids and cardiac functions

FUNGICIDES

<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
Manzate	Maneb Mancozeb	Peanuts, Watermelons
Bravo	Chlorothalonil	Melons, Peanuts, Watermelons
Benlate Captan	Benomyl Captan	Melons Peaches
Terrachlor Du-Ter Apl-Luster, Arbotect Bayleton	PCNB Triphenyltin Thiabendazole Triadimefon	Peanuts Pecans Sweet Potatoes Wheat
Dithane, Manzate	Mancozeb	Wheat, Squash, Watermelons
Bravo	Chlorothalonil	Squash, Watermelons, Peanuts
Captan Du-Ter	Captan Triphenyltin Hydroxide	Pecans Peaches
Dusting Sulfur Tilt Bayleton	Sulfur Propiconazole Triadimefon	Rice, Wheat Wheat
Torque, Vendex	Fenbutatinoxide Chlorothalonil	Citrus Celery, Cauliflower, Cabbage, Broccoli, Melons, Cucumbers, Peanuts, Onions, Tomatoes, Squash, Watermelons

FUNGICIDES Continued

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
(Ethylenebisdi-thiocarbamate)	Dithane	Maneb	Celery, Cauliflower, Cabbage, Broccoli, Watermelons, Lettuce, Cucumbers, Onions, Collards, Mustard Greens, Kale, Swiss Chard, Kohlrabi, Tomatoes, Turnips, Spinach, Celery, Melons
(Benzimidazole)	Mancozate Benlate	Mancozeb Benomyl	Squash Celery, Melons, Peaches, Watermelons
(Dimethyl Aniline)	Ridomil, Apron	Metalaxyl	Melons, Cucumbers, Onions, Sorghum, Squash, Spinach, Watermelons
(Chlorinated Hydrocarbon)	Terraclor	Pentachloronitro Benzene Iprodione Cycloate Captan Triadimefon	Peanuts Onions Spinach Peaches, Spinach Cucumbers, Squash, Melons Peaches
(Diozadiazole) (Thiocarbamate) (Bicarboximide) (Chlorophenoxy)	Rovral Ro-Neet Captan Bayleton		
(Elemental Sulfur)	Dusting Sulfur	Sulfur	
WEST (Chlorinated Isophthalic Acid)	Bravo	Chlorothalonil	Watermelons, Melons, Onions, Potatoes, Peanuts
(Ethylenebisdi-Thiocarbamate)	Dithane	Maneb	Watermelons, Onions, Potatoes, Peanuts
(Benzimidazole)	Manzate Topsin M Benlate	Mancozeb Thiophanate-Methyl Benomyl	Onions Peanuts Watermelons, Grapes
(Pthalimide) (Dimethyl Aniline) (Organotin)	Captan Ridomil Triple Tin	Captan Metalaxyl Triphenyltin Hydroxide Triadimefon	Grapes Grapes Melons
(Chlorophenoxy)	Bayleton		Sugar Beets Grapes, Melons, Sugar Beets
(Chlorinated Hydrocarbon)	Terraclor	Pentachloronitro-benzene	Peanuts

HERBICIDES

Toxicology	Weed killers by selective metabolic impairment unique to plant life. Careless handling in humans affects eyes, skin, mucous membrane.
Chemical Effects	Effects depend on adjuvants (stabilizers, penetrants, safeners, surfactants) or mixed with organophosphates excreted in urine.
Exposure	Occupational/accidental = contact, through eyes, skin, and mucous membranes; ingestion.
Symptoms/Signs	Skin lesions, scarring, conjunctivitis, keratitis, pyrexia, corneal opacities, hepatomegaly, porphyria, other serious CNS symptoms. Carbamate herbicides will show symptoms similar to the carbamate insecticides.
Laboratory	Generally not available to confirm human absorption; determine recent exposure from occupation.

NOTE: Some herbicides as chlorophenoxy do not have lab urine and blood procedures. However, they are useful for assessing the magnitude of the poisoning.

Treatment	<ol style="list-style-type: none"> 1) Wash, remove from contact, flush eyes and treat toxicosis. Carbamate herbicides treatment should follow the suggestions given for carbamate insecticides. General treatment guidelines for other herbicides follows: 2) Gastric lavage may be necessary 3) Support with IV solutions 4) Control body temperature with physical means 5) Pulmonary and cardiac monitoring may be necessary, may need to give oxygen continuously to reduce anoxia
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- 6) Anticonvulsive therapy :
- 7) For diquat/paraquat poi:
Bentonite and Fuller's E:
Note: Listen for bowel sound

HERBICIDES

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>
NORTHEAST		
(Dinitrotoluidine)	Surflan	Oryzalin
(Dinitrotoluidine)	Treflan	Tripluralin
(Dinitrotoluidine) (Chloro-S-Triazine) (Dipridyl)	Prowl Princep Gramozone	Pendimethalin Simazine Paraquat
(Isopropyl Amine Salt)	Roundup	Glyphosate
(Alkyl Cyclohexene) (Triazine)	Poast Aatrex Milograd	Sethoxydim Atrazine Propazine
(Acetamides) (Anilides)	Lasso Dual Bicep Enid	Alachlor Metolachlor Diphenamid
(Athalate)	Dachtal	Chlorthal Dimethyl
(Dichlorobenzoic Acid) (Chlorophenoxy)	Amiben 2,4-D Banvel	Chloramben 2,4-D Dicamba
(Sulfonamide) (Pyridazinone) (Chlorophenoxy) (Trichlorpicolinic Acid) (Benzoic Acid + Chlorophenoxy)	Glean Solicam Butyrac Grazon Weedmaster	Chlorsulfan Norflurazon 2,4-DB Picloram Dicamba + 2,4-D
SOUTHEAST		
(Chlorophenoxy)	2,4-D	2,4-D
(Sulfonylurea) (Dichlorobenzoic Acid)	Butyrac Glean Amiben	2,4-DB Chlorsulfon Chloramben

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Weed killers by selective metabolic impairment unique to plant life. Careless handling in humans affects eyes, skin, mucous membrane.

Effects depend on adjuvants (stabilizers, penetrants, safeners, surfactants) or mixed with organophosphates excreted in urine.

Occupational/accidental = contact, through eyes, skin, and mucous membranes; ingestion.

Skin lesions, scarring, conjunctivitis, keratitis, pyrexia, corneal opacities, hepatomegaly, porphyria, other serious CNS symptoms. Carbamate herbicides will show symptoms similar to the carbamate insecticides.

Generally not available to confirm human absorption; determine recent exposure from occupation.

Herbicides as chlorophenoxys do not have lab blood procedures. However, they are useful in measuring the magnitude of the poisoning.

1) Wash, remove from contact, flush eyes and treat toxicosis. Carbamate herbicides treatment should follow the suggestions given for carbamate insecticides. General treatment guidelines for other herbicides follows:

2) Gastric lavage may be necessary

3) Support with IV solutions

4) Control body temperature with physical means

5) Pulmonary and cardiac monitoring may be necessary, may need to give oxygen continuously to reduce anoxia

continued

- 6) Anticonvulsive therapy may be necessary
 - 7) For diquat/paraquat poisoning administer Bentonite and Fuller's Earth
- Note: Listen for bowel sounds; ileus may occur

HERBICIDES

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
NORTHEAST			
(Dinitrotoluidine)	Surflan	Oryzalin	Blueberries, Peaches
(Dinitrotoluidine)	Treflan	Tripluralin	Peanuts, Watermelons, Southern Peas
(Dinitrotoluidine) (Chloro-S-Triazine) (Dipridyl)	Prowl Princep Gramozone	Pendimethalin Simazine Paraquat	Peanuts Blueberries Blueberries, Cotton, Sweet Potatoes
(Isopropyl Amine Salt)	Roundup	Glyphosate	Sweet Potatoes, Blueberries, Peaches, Pecans
(Alkyl Cyclohexene Triazine)	Poast Aatrex Milograd	Sethoxydim Atrazine Propazine	Blueberries Corn, Sorghum Sorghum
(Acetamides) (Anilides)	Lasso Dual Bicep Enid	Alachlor Metolachlor Diphenamid	Corn, Peanuts Corn Sorghum, Sweet Potatoes
(Athalate)	Dachtal	Chlorthal Dimethyl	Southern Peas, Sweet Potatoes
(Dichlorobenzoic Acid) (Chlorophenoxy)	Amiben 2,4-D Banvel	Chloramben 2,4-D Dicamba	Sweet Potatoes Wheat, Coastal Bermuda Wheat, Coastal Bermuda
(Sulfonamide) (Pyridazinone) (Chlorophenoxy) (Trichlorpicolinic Acid)	Glean Solicam Butyrac Grazon	Chlorsulfan Norflurazon 2,4-DB Picloram	Wheat Blueberries Peanuts Coastal Bermuda
(Benzoic Acid + Chlorophenoxy)	Weedmaster	Dicamba + 2,4-D	Coastal Bermuda
SOUTHEAST			
(Chlorophenoxy)	2,4-D	2,4-D	Wheat, Coastal Bermuda
(Sulfonylurea) (Dichlorobenzoic Acid)	Butyrac Glean Amiben	2,4-DB Chlorsulfon Chloramben	Peanuts Wheat Squash

Continued next page

HERBICIDES *Continued*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
(Dinitrotoluidine)	Treflan	Trifluralin	Watermelons, Peanuts
	Surflan	Oryzalin	Peaches, Blueberries
(Chloro-S-Triazine)	Aatrex	Atrazine	Corn, Sorghum
	Milogard	Propazine	Sorghum
(Acetanilide)	Lasso	Alachlor	Corn, Sorghum
(Acetamide)	Dual	Metolachlor	Corn, Sorghum, Soybeans
	Stampede	Propanil	Rice
(Isopropyl Amine Salt)	Roundup	Glyphosate	Corn, Peaches, Pecans, Blueberries
(Thiadiazin)	Basagran	Bentazon	Rice, Soybeans
(Chloro-S-Triazine)	Princep	Simazine	Blueberries
(Diphridyl)	Gramoxone	Paraquat	Blueberries
(Thiocarbamate)	Bolero	Thiobencarb	Rice
(Pyridazinone)	Solicam	Norflurazon	Blueberries
(Alkyl Cyclohexene Derivative)	Poast	Sethoxydim	Blueberries
(Trichloropicolinic Acid)	Grazon	Picloram	Coastal Bermuda
(Benzoic Acid + Chlorophenoxy)	Weedmaster	Dicamba + 2,4-D	Coastal Bermuda
(Diphenylether)	Blazer	Acifluorfen	Soybeans
(Imidazolinone)	Scepter	Imazaquin	Soybeans
(Benzene Sulfonamide)	Prefar	Bensulide	Squash, Watermelons
SOUTH VALLEY (Triazine)	Aatrex	Atrazine	Corn, Sorghum, Sugarcane
	Trigard	Cyromazine	Celery, Peppers
	Milogard	Propazine	Sorghum
	Evik	Ametryn	Sugarcane
(Isopropyl Amine Salt)	Roundup	Glyphosate	Corn, Citrus, Peaches
(Acetanilide)	Lasso	Alachlor	Corn, Peanuts
(Dimethylurea)	Karmex	Diuron	Citrus, Sugarcane
(Uracil)	Hyvar	Bromacil	Citrus
(Dinitroaniline)	Treflan	Trifluralin	Cauliflower, Cotton, Turnips, Sugarcane, Grapes
(Chlorophenoxy)	Butyrac	2,4-DB	Peanuts
(Dinitrotoluidine)	Surflan	Oryzalin	Peaches
(Sulfonamide)	Betasan, Prefar	Bensulide	Lettuce
(Benzoic Acid)	Banvel Prefar	Dicamba	Sugarcane
WEST (Dinitroaniline)	Treflan	Trifluralin	Cotton, Watermelons, Grapes, Potatoes
		Oryzalin	Grapes

Continued next page

HERBICIDES *Continued*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>
(Cyclohexones)	Poast	Sethoxydim
(Dipyridyl)	Gramoxone	Paraquat
(Triazine)	Sencor	Metribuzin
(Diphenyl Ether)	Goal	Oxyflourfen
(Benzene Sulfonamid)	Prefar	Bensulide
(Benzonitrile)	Buctril	Bromoxynil
(Methyl Sulfonate)	Nortron	Ethofumesate
(Carbanilate Derivative)	Betanal	Phenmedipham
(Thiocarbamate)	Eptam, Genep	EPTC

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SOLID OR DISSOLVED ARSENICALS

Toxicology Metal and nonmetal phys reversible combination proteins and enzymes phosphates; causes injury to vessels, liver, kidney and

Chemical Effects Will depend on transformation mechanism (dilation)

Exposure Mucous membrane absorption.

Symptoms/Signs Acute: within 1 hour, gas and feces; mouth phary inflammation; burning abdominal vomiting; diarrhea. Respiratory disorders, cardiovascular anemia, leukopenia, thrombocytopenia, circulatory failure, death.

Chronic: Dermal signs more prominent hyperpigmentation; dermal edema of face, edema of loss of nails or hair; stomatitis peripheral neuropathy nephropathy; EKG abnormalities; cancer; lung cancer; rare

HERBICIDES *Continued*

<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
Trifluralin	Trifluralin	Watermelons, Peanuts
Oryzalin	Oryzalin	Peaches, Blueberries
Atrazine	Atrazine	Corn, Sorghum
Propazine	Propazine	Sorghum
Alachlor	Alachlor	Corn, Sorghum
Metolachlor	Metolachlor	Corn, Sorghum, Soybeans
Propanil	Propanil	Rice
Glyphosate	Glyphosate	Corn, Peaches, Pecans, Blueberries
Bentazon	Bentazon	Rice, Soybeans
Simazine	Simazine	Blueberries
Paraquat	Paraquat	Blueberries
Thiobencarb	Thiobencarb	Rice
Norflurazon	Norflurazon	Blueberries
Sethoxydim	Sethoxydim	Blueberries
Picloram	Picloram	Coastal Bermuda
Dicamba + 2,4-D	Dicamba + 2,4-D	Coastal Bermuda
Acifluorfen	Acifluorfen	Soybeans
Imazaquin	Imazaquin	Soybeans
Bensulide	Bensulide	Squash, Watermelons
Atrazine	Atrazine	Corn, Sorghum, Sugarcane
Cyromazine	Cyromazine	Celery, Peppers
Propazine	Propazine	Sorghum
Ametryn	Ametryn	Surgarcane
Glyphosate	Glyphosate	Corn, Citrus, Peaches
Alachlor	Alachlor	Corn, Peanuts
Diuron	Diuron	Citrus, Sugarcane
Bromacil	Bromacil	Citrus
Trifluralin	Trifluralin	Cauliflower, Cotton, Turnips, Sugarcane, Grapes
2,4-DB	2,4-DB	Peanuts
Oryzalin	Oryzalin	Peaches
Bensulide	Bensulide	Lettuce
Dicamba	Dicamba	Sugarcane
Trifluralin	Trifluralin	Cotton, Watermelons, Grapes, Potatoes
Oryzalin	Oryzalin	Grapes

HERBICIDES *Continued*

<u>Subcategories</u>	<u>BRAND</u>	<u>CHEMICAL</u>	<u>CROPS</u>
(Cyclohexones)	Poast	Sethoxydim	Sugar Beets
(Dipyridyl)	Gramoxone	Paraquat	Potatoes
(Triazine)	Sencor	Metribuzin	Potatoes
(Diphenyl Ether)	Goal	Oxyflourfen	Onions
(Benzene	Prefar	Bensulide	Onions
Sulfonamid)	Buctril	Bromoxynil	Seed Sorghum
(Benzonitrile)	Nortron	Ethofumesate	Sugar Beets
(Methyl Sulfonate)	Betanal	Phenmedipham	Sugar Beets
(Carbanilate	Eptam, Genep	EPTC	Alfalfa, Sugar Beets
Derivative)			
(Thiocarbamate)			

★ ★ ★

SOLID OR DISSOLVED ARSENICALS

Toxicology	Metal and nonmetal physical properties; has reversible combination effect on tissue proteins and enzymes; competes with phosphates; causes injury to nerve cells, blood vessels, liver, kidney and other tissues.
Chemical Effects	Will depend on its biochemical transformation mechanisms: (vascular dilation)
Exposure	Mucous membrane absorption, dermal, ingestion.
Symptoms/Signs	Acute: within 1 hour, garlic odor in breath and feces; mouth pharynx, and esophagus inflammation; burning abdominal pain; thirst; vomiting; diarrhea. Renal injury, CNS disorders, cardiovascular and liver damage, anemia, leukopenia, thrombocytopenia, circulatory failure, death.
Chronic:	Dermal signs more prominent; hyperkeratosis; hyperpigmentation; dermatitis; subcutaneous edema of face, edema of eyelids and ankles; loss of nails or hair; stomatitis; weight loss; peripheral neuropathy; liver injury; nephropathy; EKG anomalies; anemia; skin cancer; lung cancer; rarely encephalopathy.

Laboratory	24 hour urinary measurement; GUTZEIT Test REINSOIT Test
Treatment	1) Wash skin and hair with copious amount of soap and water. 2) Gastric lavage and intubation may be necessary 3) Hydrate with IV fluid if necessary and maintain urine flow 4) Cardiac monitoring is important 5) Dimercaprol (Bal) then at 3 mg/kg 1/4 hrs over 3-10 days to 3 mg/kg 1/12 hrs and then after GI tract is reasonably free of arsenic, oral administration of D-Penicillamine should probably replace Bal therapy in persons not allergic to penicillin.

ARSENICALS

INORGANIC

Arsenic Acid
Sodium Arsenite
Copper Arsenites
Calcium Arsenites
Zinc Arsenates

ORGANIC

Cacodylic Acid
Methane Arsenic Acid
Monosodium Methane Arsonate
Monoammonium Methane Arsonate
Calcium Acidmethane Arsonate

ARSENICALS are sometimes used in combination with other pesticides because of their binding effect. They are mostly used as defoliants, herbicides and insecticides in the form of powders or waste solutions. Commonly they are used in cotton, potatoes, tomatoes, as wood preservatives and as ant killers.

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24 hour urinary measurement;

GUTZEIT Test

REINSOIT Test

- 1) Wash skin and hair with copious amount of soap and water.
- 2) Gastric lavage and intubation may be necessary
- 3) Hydrate with IV fluid if necessary and maintain urine flow
- 4) Cardiac monitoring is important
- 5) Dimercaprol (Bal) then at 3 mg/kg 1/4 hrs over 3-10 days to 3 mg/kg 1/12 hrs and then after GI tract is reasonably free of arsenic, oral administration of D-Penicillamine should probably replace Bal therapy in persons not allergic to penicillin.

ARSENICALS

ORGANIC

Cacodylic Acid

Methane Arsenic Acid

Monosodium Methane Arsonate

Monoammonium Methane Arsonate

Calcium Acidmethane Arsonate

are sometimes used in combination with other
se of their binding effect. They are mostly used
rbicides and insecticides in the form of powders
ns. Commonly they are used in cotton, potatoes,
od preservatives and as ant killers.

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