XIII. APPENDIX V

MATERIAL SAFETY DATA SHEET

The following items of information which are applicable to a specific product or material shall be provided in the appropriate block of the Material Safety Data Sheet (MSDS).

The product designation is inserted in the block in the upper left corner of the first page to facilitate filing and retrieval. Print in upper case letters as large as possible. It should be printed to read upright with the sheet turned sideways. The product designation is that name or code designation which appears on the label, or by which the product is sold or known by employees. The relative numerical hazard ratings and key statements are those determined by the rules in Chapter V, Part B, of the NIOSH publication, *An Identification System for Occupationally Hazardous Materials*. The company identification may be printed in the upper right corner if desired.

(a) Section I. Product Identification

The manufacturer's name, address, and regular and emergency telephone numbers (including area code) are inserted in the appropriate blocks of Section I. The company listed should be a source of detailed backup information on the hazards of the material(s) covered by the MSDS. The listing of suppliers or wholesale distributors is discouraged. The trade name should be the product designation or common name associated with the material. The synonyms are those commonly used for the product, especially formal chemical nomenclature. Every known chemical designation or competitor's trade name need not be listed.

(b) Section II. Hazardous Ingredients

The "materials" listed in Section II shall be those substances which are part of the hazardous product covered by the MSDS and individually meet any of the criteria defining a hazardous material. Thus, one component of a multicomponent product might be listed because of its toxicity, another component because of its flammability, while a third component could be included both for its toxicity and its reactivity. Note that a MSDS for a single component product must have the name of the material repeated in this section to avoid giving the impression that there are no hazardous ingredients.

Chemical substances should be listed according to their complete name derived from a recognized system of nomenclature. Where possible, avoid using common names and general class names, such as "aromatic amine," "safety solvent," or "aliphatic hydrocarbon," when the specific name is known.

The "%" may be the approximate percentage by weight or volume (indicate basis) which each hazardous ingredient of the mixture bears to the whole mixture. This may be indicated as a range or maximum amount, ie, "10-40% vol" or "10% max wt" to avoid disclosure of trade secrets.

Toxic hazard data shall be stated in terms of concentration, mode of exposure or test, and animal used, eg, "100 ppm LC50-inhalation-rat," "25 mg/kg LD50-skin-rabbit," "75 ppm LC man," or "permissible exposure from 29 CFR 1910.1000," or, if not available, from other sources of publications, such as the American Conference of Governmental Industrial Hygienists or the American National Standards Institute Inc. Flammable or reactive data could be flashpoint, shock sensitivity, or other brief data indicating nature of the hazard.

(c) Section III. Physical Data

The data in Section III should be for the total mixture and should include the boiling point and melting point in degrees Fahrenheit (Celsius in parentheses); vapor pressure, in conventional millimeters of mercury (mmHg); vapor density of gas or vapor relative to the density of air (air=1); solubility in water, in parts/hundred parts of water by weight; specific gravity (water=1); percent volatiles (indicated whether by weight or volume) at 70 degrees Fahrenheit (21.1 degrees Celsius); evaporation rate for liquids or sublimable solids, relative to the evaporation rate of butyl acetate; and appearance and odor. These data are useful for the control of toxic substances. Boiling point, vapor density, percent volatiles, vapor pressure, and evaporation rate are useful for designing proper ventilation equipment. This information is also useful for design and deployment of adequate fire and spill containment equipment. The appearance and odor may facilitate identification of substances stored in improperly marked containers, or when spilled.

(d) Section IV. Fire and Explosion Data

Section IV should contain complete fire and explosion data for the product, including flashpoint

and autoignition temperature in degrees Fahrenheit (Celsius in parentheses); flammable limits, in percent by volume in air; suitable extinguishing media or materials; special firefighting procedures; and unusual fire and explosion hazard information. If the product presents no fire hazard, insert "NO FIRE HAZARD" on the line labeled "Extinguishing Media."

(e) Section V. Health Hazard Information

The "Health Hazard Data" should be a combined estimate of the hazard of the total product. This can be expressed as a TWA concentration, as a permissible exposure, or by some other indication of an acceptable standard. Other data are acceptable, such as lowest LD50, if multiple components are involved.

Under "Routes of Exposure," comments in each category should reflect the potential hazard from absorption by the route in question. Comments should indicate the severity of the effect and the basis for the statement, if possible. The basis might be animal studies, analogy with similar products, or human experiences. Comments such as "yes" or "possible" are not helpful. Typical comments might be:

> Skin Contact—single short contact, no adverse effects likely; prolonged or repeated contact, local sweating and muscular fibrillation.
>
> Eye Contact—constriction of iris; poor vision in dim light; scleral injection.

"Emergency and First Aid Procedures" should be written in lay language and should primarily represent first-aid treatment that could be provided by paramedical personnel or individuals trained in first aid.

Information in the "Notes to Physician" section should include any special medical information which would be of assistance to an attending physician including required or recommended preplacement and periodic medical examinations, diagnostic procedures, and medical management of overexposed workers.

(f) Section VI. Reactivity Data

The comments in Section VI relate to safe storage and handling of hazardous, unstable substances. It is particularly important to highlight instability or incompatibility to common substances or circumstances such as water, direct sunlight, steel or copper piping, acids, alkalies, etc. "Hazardous Decomposition Products" shall include those products released under fire conditions. It must also include dangerous products produced by aging, such as peroxides in the case of some ethers. Where applicable, shelf life should also be indicated.

(g) Section VII. Spill or Leak Procedures

Detailed procedures for cleanup and disposal should be listed with emphasis on precautions to be taken to protect workers assigned to cleanup detail. Specific neutralizing chemicals or procedures should be described in detail. Disposal methods should be explicit including proper labeling of containers holding residues and ultimate disposal methods such as "sanitary landfill," or "incineration". Warnings such as "comply with local, state, and federal antipollution ordinances" are proper but not sufficient. Specific procedures shall be identified.

(h) Section VIII. Special Protection Information

Section VIII requires specific information. Statements such as "Yes," "No," or "If necessary" are not informative. Ventilation requirements should be specific as to type and preferred methods. Respirators shall be specified as to type and NIOSH or US Bureau of Mines approval class, ie, "Supplied air," "Organic vapor canister," "Suitable for dusts not more toxic than lead," etc. Protective equipment must be specified as to type and materials of construction.

(i) Section IX. Special Precautions

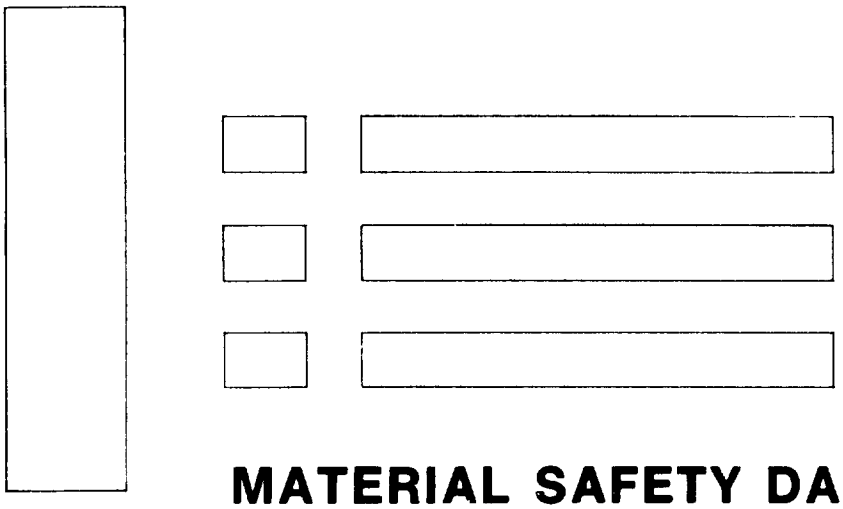
"Precautionary Statements" shall consist of the label statements selected for use on the container or placard. Additional information on any aspect of safety or health not covered in other sections should be inserted in Section IX. The lower block can contain references to published guides or in-house procedures for handling and storage. Department of Transportation markings and classifications and other freight, handling, or storage requirements and environmental controls can be noted.

(j) Signature and Filing

Finally, the name and address of the responsible person who completed the MSDS and the date of completion are entered. This will facilitate correction of errors and identify a source of additional information.

The MSDS shall be filed in a location readily accessible to workers potentially exposed to the hazardous material. The MSDS can be used as a training aid and basis for discussion during safety meetings and training of new employees. It should assist management by directing attention to the need for specific control engineering, work prac-

tices, and protective measures to ensure safe handling and use of the material. It will aid the safety and health staff in planning a safe and healthful work environment and suggesting appropriate emergency procedures and sources of help in the event of harmful exposure of employees.



MATERIAL SAFETY DATA SHEET

I PRODUCT IDENTIFICATION	
MANUFACTURER'S NAME	REGULAR TELEPHONE NO. EMERGENCY †ELEPHONE NO.
ADDRESS	
TRADE NAME	
SYNONYMS	

II HAZARDOUS INGREDIENTS		
MATERIAL OR COMPONENT	%	HAZARD DATA

III PHYSICAL DATA			
BOILING POINT 760 MM HG		MELTING POINT	
SPECIFIC GRAVITY (H_2O=1)		VAPOR PRESSURE	
VAPOR DENSITY (AIR=1)		SOLUBILITY IN H_2O, % BY WT	
% VOLATILES BY VOL		EVAPORATION RATE (BUTYL ACETATE 1)	
APPEARANCE AND ODOR			

IV FIRE AND EXPLOSION DATA

FLASH POINT (TEST METHOD)		AUTOIGNITION TEMPERATURE	

FLAMMABLE LIMITS IN AIR, % BY VOL.	LOWER		UPPER	

EXTINGUISHING MEDIA	
SPECIAL FIRE FIGHTING PROCEDURES	
UNUSUAL FIRE AND EXPLOSION HAZARD	

V HEALTH HAZARD INFORMATION

HEALTH HAZARD DATA

ROUTES OF EXPOSURE

INHALATION

SKIN CONTACT

SKIN ABSORPTION

EYE CONTACT

INGESTION

EFFECTS OF OVEREXPOSURE

ACUTE OVEREXPOSURE

CHRONIC OVEREXPOSURE

EMERGENCY AND FIRST AID PROCEDURES

EYES

SKIN

INHALATION

INGESTION

NOTES TO PHYSICIAN

VI REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY

INCOMPATIBILITY

HAZARDOUS DECOMPOSITION PRODUCTS

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

NEUTRALIZING CHEMICALS

WASTE DISPOSAL METHOD

VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY (SPECIFY IN DETAIL)

EYE

GLOVES

OTHER CLOTHING AND EQUIPMENT

IX SPECIAL PRECAUTIONS

PRECAUTIONARY
STATEMENTS

OTHER HANDLING AND
STORAGE REQUIREMENTS

PREPARED BY

ADDRESS

DATE

XIV. APPENDIX VI

SUMMARY OF PERTINENT CALIFORNIA STATE PESTICIDE REGULATIONS, 1974

Under the California regulations,[202] employers must arrange medical supervision for all workers who mix, load, apply, or flag Category 1 (highly toxic) pesticides for more than 30 hours in any 30-day period. According to these regulations, parathion is considered a Category 1 pesticide. This supervision includes preexposure baseline ChE determinations and periodic biologic monitoring of RBC and plasma ChE activities. It also includes authority for the physician to instruct the employer to remove an employee from all occupational exposure to organophosphates and carbamates should monitoring reveal depression of plasma ChE to 50% of the preexposure baseline or RBC ChE to 40% of the preexposure baseline. Both ChE activities must return to within 20% of the preexposure baseline before the employee can resume exposure to organophosphates or carbamates. Whenever a ChE test indicates a depression of 30% or more, a retest is required. Laboratories performing ChE assays must be approved by the California State Department of Health.

Closed mixing and loading systems are required[202] to prevent exposure to concentrates caused by spills in the course of pouring. Ground and aerial application tanks must have an external means for determining the internal liquid level, or the filler hose must have an automatic shut-off device to prevent overfilling. Such transfer hoses must be equipped with a device to prevent dripping from the outlet end after filling. In addition, no unshielded flexible hoses carrying liquid pesticide may pass through the driver's compartment of an application vehicle.

If employees have not received training previously, employers must instruct employees[202] on the safe handling of pesticides used, including personal protective equipment, common poisoning symptoms, the necessity for eating and smoking rules, availability of emergency medical treatment, and the rationale for biologic monitoring. Close supervision is required during training.

Employers must make prior arrangements for emergency medical services and must take an employee to a physician immediately "when the employer has reasonable grounds to suspect a pesticide illness or when an exposure to a pesticide has occurred that might reasonably be expected to lead to an illness."[202] To prevent the simple masking of symptoms, atropine may not be taken by an employee except under direction of a physician.

Neither pilots of agricultural aircraft nor employees under the age of 18[202] are permitted to mix or load pesticides in Category 1 or 2 unless closed mixing or loading systems are used. Persons handling pesticides in Category 1 are not allowed to work alone. Radio, telephone, or personal contact at least once every 2 hours during the day or every hour at night may be substituted for the presence of a second person. Operators of ground vehicles who are able to see each other's application vehicles or operating lights are not considered to be working alone. Pilots and either mixer-loaders or flaggers are not considered alone when working as a team.

Changing areas equipped with towels, soap, and sufficient water are required for mixers, loaders, applicators, and flaggers[202] handling pesticides in Category 1 or 2 who work for more than 30 hours in any 30-day period. Contaminated equipment or work clothing may not be taken home by employees. In addition, minimum amounts of water are required at work sites, along with soap and towels, for routine or emergency washing.

Mixers, loaders, applicators, and flaggers handling Category 1 or 2 pesticides[202] must be provided daily by the employer with clean outer clothing. Contaminated clothing must be immediately removed. Mixing and loading sites must have at least one change of clean outer clothing. The employer is required to provide respiratory and other personal protective equipment, to clean it as necessary, and to provide new respirator filter pads and cartridges according to the manufacturer's instructions. Employees who service or repair mixing, loading, or application equipment must be informed of the hazards associated with exposure to residues and must be provided with suitable protective equipment and clothing by their employer.

Subsequent to the issuance of the above regulations in 1974, the California State Department of Health sought to guide physicians providing medical supervision in the selection of blood ChE test-

ing intervals.[203] The table (XIV-1) was provided in a letter to physicians with the caveat that immediate testing was indicated in the event of accidental exposure from splashes, spills, or other mishaps. Only workers exposed to Category 1 or 2 pesticides for 30 hours or more in a 30-day period were covered.

TABLE XIV-1

RECOMMENDED FREQUENCY OF CHOLINESTERASE TESTING IN NUMBER OF WEEKS BETWEEN ROUTINE TESTS, CALIFORNIA STATE DEPARTMENT OF HEALTH, MAY 1975

Work Activity	Days of Exposure/Week	
	2 Days or Less	3 Days or More
Mixer-Loader*	2	1
Ground applicator	4	2
Agricultural pilot	4	3
Flagger	4	2

*When closed mixing and loading systems are used exclusively, increase the interval between ChE tests by 1 week for this group. Adapted from Kahn [203].

XV. APPENDIX VII

SUMMARY OF PERTINENT STATE (EXCLUDING CALIFORNIA) PESTICIDE REGULATIONS

Of the 53 administrative units within the United States and its possessions, all except Guam have at least one law relating to the control of pesticides. The laws of Nebraska and American Samoa are quite general, without specific provisions in the law. In all other administrative units except Michigan, the law or laws give to the responsible governmental authority powers to regulate storage, transportation, and disposal of pesticides, to restrict the uses of pesticides, and to hold disciplinary hearings on alleged infractions of regulations on the use of pesticides. In 35 of the 53 administrative units, the responsible authority is given the power to license dealers in pesticides. In 49 administrative units, the responsible authority licenses or certifies custom applicators of pesticides; in 35, the responsible authority also certifies private users of pesticides for the use of restricted-use pesticides.

In most of the administrative units, the responsible authority is a governmental department, most commonly the Department of Agriculture or its equivalent. Departments of Environmental Protection or Conservation are designated as the responsible authorities in several administrative units. Other governmental entities (Department of Natural Resources, Department of Health, State Clinics, and Director of Regulatory and Public Service Programs of Clemson University) appear occasionally as responsible authorities. Thirty-nine administrative units provide for Pesticide Boards, Councils, or Committees. In most cases, these administrative units have advisory capacities only, but in a few administrative units they are made the responsible governmental authorities to control the use of pesticides and to license or certify custom or private applicators of pesticides.

In 22 administrative units other than California, the law gives to the responsible authority the power to require reports of illness due to accidental exposure to pesticides. These administrative units are: Alaska, Arkansas, Colorado, Florida, Hawaii, Indiana, Iowa, Louisiana, Missouri, Nevada, New Mexico, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Vermont, Virginia, Virgin Islands, and Washington. This power generally has been available for only a short time in the administrative units other than California, where it has existed since the passage of the Injurious Materials Law in 1949. California has, therefore, a particularly extensive, but not necessarily complete, inventory of illnesses due to pesticides.

In general, the various administrative units have no statutory authority to require information on the use of pesticides. In Maine, New Hampshire, and Rhode Island, however, the law provides that renewal of licenses or certifications requires full reporting of pesticide usage during the previous period of licensing or certification. A number of the other administrative units do have a means for obtaining approximations of such information through requiring use or purchase permits for pesticides. Maine, New Hampshire, and Rhode Island have this mechanism as a check on the required reporting of use of pesticides.

XVI. TABLES

TABLE XVI-1

PHYSICAL PROPERTIES OF TECHNICAL GRADE PARATHION

Chemical names	Phosphorothiotic acid, 0,0-diethyl 0-(P-nitrophenyl) ester, 0,0-diethyl 0-p-nitrophenyl phosphorothioate, 0,0-diethyl 0-(4-nitrophenyl) thiophosphate, diethyl p-nitrophenyl thionophosphate
Common names	Parathion or ethyl parathion
Form and color	Liquid, straw-yellow or amber
Odor	Pungent, garlic-like
Molecular weight	291.3
Molecular formula	C10H14N05PS
Boiling point	375 C at 760 mmHg
Melting point (freezing point)	6.1 C
Vapor pressure	0.003 mmHg at 24 C
Specific gravity	1.27 at 25 C
Viscosity	15.30 cp at 25 C
Solubility	Parathion is miscible with acetone, alcohol, benzene, CCl4, CHCl3, ethyl acetate, o-dichloro-benzene, toluene, xylene. Parathion is slightly soluble in kerosene, petroleum ether, other paraffinic solvents. Parathion is relatively insoluble (very slightly soluble) in water — 24 (n) g/ml at 25 C.
Conversion factors (25 C; 760 mg Hg)	1 ppm = 11.9 mg/cu m 1 mg/cu m = 0.084 ppm

Adapted from [3, 54, 56, 198].

TABLE XVI-2

SYNONYMS, INCLUDING TRADE NAMES, FOR PARATHION

AAT	Niran
AATP	Nitrostigmine
Alkron	Niuif-100
Alleron	Nourithion
American Cyanamid 3422	Oleofos 20
Bladan F	Oleoparathion
Corothion	Orthophos
Corthione	PAC
Danthion	Paramar 50
Diethylparathion	Paraphos
DNTP	Parathion-ethyl
E605	Parawet
Ecatox	Pestos Plus
Ekatox	Pethion
Ent 15,108	Phoskil
Ethyl parathion	Phosphemol
Etilon	Phosphenol
Folidol	Phosphostigmine
Fosferno	RB
Fosfex	Rhodiatox
Fosfive	SNP
Fosova	Stabilized ethyl parathion
Fostern	Sulphos
Genithion	T-47
Kolphos	Tiofos
Kypthion	Thiophos
Lirothion	Thiophos 3422
Metacide	Tox 47
Murfos	Vapophos

Adapted from the *Registry of Toxic Effects of Chemical Substances* [204].

TABLE XVI-3

OCCUPATIONS WITH POTENTIAL EXPOSURE TO PARATHION

Aerial application personnel	Flaggers
Area cleanup crews	Ground applicator vehicle drivers
Bagging machine operators	Janitorial personnel
Basic manufacturing employees	Laundry workers
Haulers of Laundry	Maintenance personnel
Drum fillers	Mixer and blender operators (formulators, "swampers")
Drum reconditioning personnel	Refuse haulers
Dump personnel	Tractor tank loaders
Field checkers	Truck loaders
Field workers (exposed to "residues" on fruits, vegetables, foliage, etc.)	Warehouse personnel

TABLE XVI-4

PULMONARY VENTILATION RATES FOR VARIOUS WORK LEVELS

Metabolic Level	Minute Volume (liters)
Sleep	6.0
Rest	9.3
Light work	19.7
Medium work	29.2
Medium heavy work	40
Heavy work	59.5
Maximum work	132.0

Derived from [199].

TABLE XVI-5

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE INHIBITION IN DOGS FOLLOWING 4-HOUR INHALATION EXPOSURES TO PARATHION

Parathion Concentration (mg/cu m*)	Ct (mg min/ cu m)	Toxic Signs	Cholinesterase, % of normal (avg of 4 dogs)			Mortality (24-hour)
			Time	RBC	Plasma	
37.1*	8912		4 hours	73	20	0/4
			24 hours	45	8	
			48 hours	78	16	
			7 days	65	38	
			14 days	85	76	
8.93	2143	Lacrimation occurred in 1 of 4 dogs	4 hours	64	14	0/4
			24 hours	42	7	
			48 hours	37	7	
			7 days	27	21	
			14 days	37	32	
3.42	821.0		4 hours	71	23	0/4
			24 hours	44	13	
			48 hours	39	4	
			7 days	19	9	
			14 days	24	30	
0.145	34.8		4 hours	70	40	0/4
			24 hours	56	20	
			48 hours	57	17	
			7 days	57	28	
			14 days	60	37	
0.015	3.672		4 hours	62	18	0/4
			24 hours	49	14	
			48 hours	44	15	
			7 days	72	35	
			14 days	58	75	

* Average of 2 chamber samples collected at 1 and 2 hours.

TABLE XVI-6

PROBIT ANALYSIS OF ERYTHROCYTE (RBC) CHOLINESTERASE INHIBITION IN RATS FOLLOWING 4-HOUR INHALATION EXPOSURES TO PARATHION

Parathion Dose (mg/cu m)	Percent RBC Cholinesterase Inhibition (34 rats)	Bliss Statistical Analysis			
		Cholinesterase Inhibition, %	Dose (mg/cu m)	95% Confidence Limits Lower	Upper
0.04	7	16	0.38	0.17	0.83
0.21	8	50	5.43	4.20	7.03
0.24	28	84	78.20	26.43	231.34
0.83	17				
0.91	8				
1.21	11				
2.17	30				
2.27	60		Probit Y = 4.369 + .859 Log ×		
12.8	58				
19.1	69				
26.1	85				
31.4	80				
35.0	68				

Blood sampled 24 hours postexposure.

TABLE XVI-7

PROBIT ANALYSIS OF PLASMA CHOLINESTERASE INHIBITION IN RATS FOLLOWING 4-HOUR INHALATION EXPOSURES TO PARATHION

Parathion Dose (mg/cu m)	Percent Plasma Cholinesterase Inhibition (34 rats)	Bliss Statistical Analysis			
		Cholinesterase Inhibition, %	Dose (mg/cu m)	95% Confidence Limits Lower	Upper
0.04	0	16	0.51	0.51	1.18
0.21	0	50	7.28	5.24	10.12
0.24	24	84	103.85	27.23	396.05
0.83	37				
0.91	12				
1.21	0				
2.17	28				
2.27	58		Probit Y = 4.257 + .862 Log ×		
12.8	69				
19.1	52				
26.1	58				
31.4	77				
35.0	74				

Blood sampled 24 hours postexposture.

TABLE XVI-8

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY IN RATS EXPOSED BY INHALATION TO PARATHION AEROSOLS FOR 4 HOURS

Parathion Concentration* (mg/cu m)	Percent Cholinesterase Activity from Start of Exposure									
	4 Hours		24 Hours		48 Hours		168 Hours		336 Hours	
	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma
0.04	84	100	93	100	91	100	91	100	83	100
0.21	67	81	92	100	100	100	98	100	70	100
0.24	100	80	73	76	86	80	100	76	74	67
0.83	66	63	83	63	66	76	74	90	85	69
0.91	100	88	92	88	81	68	88	81	77	74
1.21	100	100	89	100	79	100	80	100	95	100
2.17	84	65	70	72	69	69	74	74	78	71
2.27	56	52	40	42	72	68	78	81	53	50
12.8	66	48	42	31	46	44	60	73	61	67
19.1	43	47	31	48	18	59	49	60	78	78
26.1	24	33	15	42	42	38	46	64	58	58
31.4	42	40	20	23	19	27	57	67	74	63
35.0	44	24	32	26	27	28	49	61	60	77

* 34 rats exposed/concentration level.

TABLE XVI-9

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY IN MALE RATS EXPOSED BY INHALATION TO PARATHION AEROSOLS FOR 7 HOURS/DAY, 5 DAYS/WEEK, FOR 6 WEEKS

Parathion Concentration (mg/cu m)	Percent Cholinesterase Activity from Start of Exposure											
	1st Week		2nd Week		3rd Week		4th Week		5th Week		6th Week	
	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma
0.01	88	96	93	100	—	—	69	97	70	77	97	99
0.10	57	99	60	66	—	—	65	79	67	92	Exposure terminated	
0.74	58	68	50	67	24	23	33	21	16	34	26	40
	Percent Cholinesterase Activity — Postexposure Period											
0.01	82	97	84	127	—	—	94	99	—	—	119	141
0.10	61	116	76	133	82	119	—	—	81	113	—	—
0.74	44	113	—	—	65	100	—	—	—	—	88	117

TABLE XVI-10

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY IN MALE DOGS EXPOSED BY INHALATION TO PARATHION AEROSOLS FOR 7 HOURS/DAY, 5 DAYS/WEEK, FOR 6 WEEKS

Parathion Concentration (mg/cu m)	Percent Cholinesterase Activity from Start of Exposure													
	Day 1		1st Week		2nd Week		3rd Week		4th Week		5th Week		6th Week	
	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma
0.001	101	88	135	88	129	96	106	95	—	—	135	102	135	91
0.01	124	113	106	92	79	70	86	72	—	—	97	72	101	58
0.20	89	46	75	41	54	26	74	35	—	—	57	53	41	36
	Percent Cholinesterase Activity — Postexposure Period													
0.001	—	—	95	99	95	79	—	—	86	97	90	131	98	103
0.01	—	—	98	91	104	91	—	—	—	—	—	—	—	—
0.20	—	—	77	72	61	94	—	—	86	115	84	134	79	112

TABLE XVI-11

RAT 24-HOUR LD50 FOLLOWING ORAL ADMINISTRATION OF PARATHION IN CORN OIL

Parathion Dose (mg/kg)	Percent Mortality (10 rats/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Mortality	Dose (mg/kg)	Lower Limit	Upper Limit
10.0	100	16	5.72	5.01	6.53
7.9	80	50	6.85	6.18	7.60
6.3	20	84	8.21	7.17	9.40
5.0	10				
4.0	0				

TABLE XVI-12

DOG 24-HOUR LD50 FOLLOWING ORAL ADMINISTRATION OF PARATHION IN CORN OIL

Parathion Dose (mg/kg)	Percent Mortality (4 dogs/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Mortality	Dose (mg/kg)	Lower Limit	Upper Limit
20.0	100	16	4.42	1.29	15.07
15.8	75	50	8.27	4.79	14.29
10.0	50	84	15.50	6.61	36.34
6.3	50				
2.5	0				

TABLE XVI-13

RAT ACUTE ERYTHROCYTE (RBC) ChE50 FOLLOWING ORAL ADMINISTRATION OF PARATHION

Parathion Dose (mg/kg)	Percent RBC Cholinesterase Inhibition (10 rats/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Inhibition	Dose (mg/kg)	Lower Limit	Upper Limit
0.18	8	16	0.410	0.318	0.527
0.35	13	50	2.579	2.117	3.141
0.70	27	84	16.236	11.716	22.499
1.40	32				
2.80	52				
5.60	70				
7.00	69				

TABLE XVI-14

RAT ACUTE PLASMA ChE50 FOLLOWING ORAL ADMINISTRATION OF PARATHION

Parathion Dose (mg/kg)	Percent Plasma Cholinesterase Inhibition (10 rats/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Inhibition	Dose (mg/kg)	Lower Limit	Upper Limit
0.18	0	16	0.622	0.416	0.930
0.35	9	50	2.546	2.123	3.054
0.70	23	84	10.424	5.813	18.692
1.40	45				
2.80	34				
5.60	78				
7.00	75				

TABLE XVI-15

DOG ACUTE ERYTHROCYTE (RBC) ChE50 FOLLOWING ORAL ADMINISTRATION OF PARATHION

Parathion Dose (mg/kg)	Percent RBC Cholinesterase Inhibition (4 dogs/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Inhibition	Dose (mg/kg)	Lower Limit	Upper Limit
10.0	73	16	0.114	0.032	0.412
2.50	64	50	1.497	1.060	2.115
1.26	50	84	19.619	6.620	58.141
0.50	29				

TABLE XVI-16

DOG ACUTE PLASMA ChE50 FOLLOWING ORAL ADMINISTRATION OF PARATHION

Parathion Dose (mg/kg)	Percent Plasma Cholinesterase Inhibition (4 dogs/dose)	Bliss Statistical Analysis (95% Confidence Limits)			
		Percent Inhibition	Dose (mg/kg)	Lower Limit	Upper Limit
10.0	65	16	0.020	0.000	0.893
2.50	59	50	1.670	0.942	2.960
1.26	40	84	141.422	4.061	4,294.465
0.50	42				

TABLE XVI-17

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY IN MALE RATS DOSED ORALLY WITH PARATHION 5 DAYS/WEEK FOR 6 WEEKS

Daily Dose (mg/kg)	Percent Cholinesterase Activity from Start of Exposure											
	1st Week		2nd Week		3rd Week		4th Week		5th Week		6th Week	
	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma
0.05	85	98	95	127	—	—	119	133	—	—	115	156
0.10	87	106	79	20	—	—	78	94	—	—	81	115
0.25	74	103	—	—	66	106	44	115	57	54	46	52
	Percent Cholinesterase Activity — Postexposure Period											
0.05	85	96	—	—	—	—	—	—	—	—	—	—
0.10	119	109	141	117	—	—	72	103	—	—	—	—
0.25	44	76	69	101	—	—	68	106	—	—	159	119

TABLE XVI-18

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY IN MALE DOGS DOSED ORALLY WITH PARATHION 5 DAYS/WEEK FOR 6 WEEKS

Daily Dose (mg/kg)	Percent Cholinesterase Activity from Start of Exposure											
	1st Week		2nd Week		3rd Week		4th Week		5th Week		6th Week	
	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma	RBC	Plasma
0.05	82	44	105	68	—	—	101	87	—	—	83	54
0.10	73	24	86	32	—	—	81	44	—	—	80	61
0.50	74	22	65	37	—	—	51	80	—	—	42	15
	Percent Cholinesterase Activity — Postexposure Period											
0.05	70	74	95	92	—	—	101	99	—	—	—	—
0.10	77	165	90	94	—	—	91	90	—	—	—	—
0.50	50	70	49	90	—	—	68	93	—	—	67	74

TABLE XVI-19

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY RECOVERY IN MALE RATS FOLLOWING A SINGLE ORAL DOSE (2.8 mg/kg) OF PARATHION

Time (Postexposure) Hours	Percent Residual Cholinesterase Activity	
	RBC	Plasma
4	44	35
24	45	49
48	56	52
72	51	85
168	60	70
336	67	89

TABLE XVI-20

ERYTHROCYTE (RBC) AND PLASMA CHOLINESTERASE ACTIVITY RECOVERY IN MALE DOGS FOLLOWING A SINGLE ORAL DOSE (2.5 mg/kg) OF PARATHION

Time (Postexposure) Hours	Percent Residual Cholinesterase Activity	
	RBC	Plasma
24	36	41
264	53	78
360	58	85
696	67	117
864	89	112

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