XIV. APPENDIX VI

SUMMARY OF ACTIVITIES OF THE STATE OF CALIFORNIA IN CONTROLLING USE OF PESTICIDES, 1974

Under the California regulations, [132] 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, methyl parathion is considered a Category 1 pesticide. This supervision includes preexposure baseline cholinesterase determinations and periodic biologic monitoring of erythrocyte and plasma cholinesterase 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 inhibition of plasma cholinesterase to 50% of the preexposure baseline or erythrocyte cholinesterase to 40% of the preexposure baseline. Both cholinesterase activities must return to within 20% of the preexposure baseline before the employee can resume exposure to organophosphates or carbamates. Whenever a cholinesterase test indicates an inhibition of 30% or more, a retest is required. Laboratories performing cholinesterase assays must be approved by the California State Department of Health.

Closed mixing and loading systems are required to prevent exposure, especially to concentrated solutions, caused by spills in the course of pouring. [132] Ground- and aerial-application tanks must have an external means for determining the internal liquid level, or the filler hose must have an automatic shutoff 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 previous training, employers must instruct employees 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. [132] 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." [132] To prevent the simple masking of symptoms, atropine may be taken by an employee only under direction of a physician.

Neither pilots of agricultural aircraft nor employees under the age of 18 are permitted to mix or load pesticides in Category 1 or 2 unless closed mixing or loading systems are used. [132] 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 handling pesticides in Category 1 or 2 who work for more than 30 hours in any 30-day period. [132] Contaminated equipment or work clothing may not be taken home by employees. In addition, minimum amounts of water are required at worksites, along with soap and towels, for routine or emergency washing.

Mixers, loaders, applicators, and flaggers handling Category 1 or 2 pesticides must be provided with clean outer clothing daily by the employer. Contaminated clothing must be immediately removed. [132] 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 cholinesterase testing intervals. [144] The table (XIV-1) immediately following was provided in a letter to physicians with the warning 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	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 cholinesterase tests by 1 week for this group.

Adapted from Kahn [144]

XV. APPENDIX VII

SUMMARY OF ACTIVITIES OF VARIOUS STATES OTHER THAN CALIFORNIA IN CONTROLLING USE OF PESTICIDES

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

In most of the administrative units, the responsible agency is some government department, most commonly the state agricultural department or its equivalent. Departments of environmental protection or of conservation are the designated agencies in several administrative units. Other state governmental entities (eg, Department of Natural Resources, Department of Health, State Chemist, or Director of Regulatory and Public Service Programs of Clemson University) appear occasionally as responsible authorities. Thirty-nine administrative units provide for pesticides

boards, councils, or committees. In most cases, these have advisory capacities only, but a few have been made responsible for controlling the use of pesticides and for licensing or certifying custom or private applicators of pesticides.

In 22 administrative units other than California, the governing statute gives to the designated agency the power to require reports of illness caused by accidental pesticide exposure. 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, the Virgin Islands, and Washington. This power generally has been available for only a short time in administrative units other than California; there it has existed since the passage in 1949 of the Injurious Materials Law. California has, therefore, a particularly extensive but not necessarily complete inventory of illnesses caused by 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 a license or certification requires full reporting of pesticide use during previous periods of licensure or certification. A number of the other administrative units do have a means for obtaining some information when required use or purchase permits for pesticides are obtained. Maine, New Hampshire, and Rhode Island use this mechanism as a check on the required reporting of pesticide uses.

XVI. TABLES AND FIGURES

TABLE XVI-1

PHYSICAL PROPERTIES OF METHYL PARATHION

Chemical name	0,0 dimethyl 0-p-nitrophenyl phosphorothioate [also: 0,0-dimethyl 0-(4-nitrophenyl) thiophosphate; or dimethyl p-nitrophenyl thionophosphate
Common name	Methyl parathion
Molecular weight	263.3
Volatility	1.40 mg/cu m at 20 C (pure)
Boiling point	Thermally unstable
Melting point	37 C (pure); 29 C (technical)
Crystallization temperature (80% in xylene, stabilized)	17 C (62.6 F)
Flashpoint (80% in xylene, tag open cup)	46 C (115 F)
Vapor pressure	0.000097 mmHg at 20 C
Autoignition temperature (80% in xylene)	120 C (248 F)
Odor	Garliclike (technical)
Color	Tan-to-brown (technical); white (pure)
Solubility	55-60 ppm in water at 25 C; slightly soluble in light petroleum and mineral oils; soluble in most other organic solvents; slightly soluble in lipids and fats
Specific gravity	1.358 at 20 C (pure); 1.22 at 20 C (technical)
Conversion factors (at 760 mmHg, 25 C)	1 ppm = 10.5 mg/cu m 1 mg/cu m = 0.095 ppm

Adapted from Monsanto Corporation, [8] National Agricultural Chemicals Association, [136] and Agency for International Development [169] publications

TABLE XVI-2

SYNONYMS, INCLUDING TRADE NAMES, FOR METHYL PARATHION

Azofos
Azophos
Bay 11405
Bayer E601
Dalf
O,O-Dimethyl-O-p-nitrofenylester kyseliny thiofos (Czech)
O,O-Dimetyhl-O-(4-nitro-fenyl)-monothiofosfaat (Dutch)
Dimethyl p-nitrophenyl monothiophosphate
O,O-Dimethyl-O-(4-nitro-phenyl)-monothiophosphat (German)
O,O-Dimethyl O-(p-nitrophenyl) phosphorothioate
O,O-Dimethyl-O-(4-nitrophenyl)phosphorothioate
O,O-Dimethyl O-(p-nitrophenyl)thionophosphate
O,O-Dimethyl-O-(p-nitrophenyl)-thionophosphat (German)
Dimethyl-p-nitrophenyl thionphosphate
Dimethyl p-nitrophenyl thiophosphate
O,O-Dimethyl O-p-nitrophenyl thiophosphate
Dimethyl parathion
E601
ENT 17,292
Folidol M
Folidol 80
8056HC
M-Parathion
Metacid 50
Metacide-50
Metacide
Metaphor
Metaphos
Methyl-E 605
Metylopartion (Polish)

TABLE XVI-2 (CONTINUED)

SYNONYMS, INCLUDING TRADE NAMES, FOR METHYL PARATHION

Methylthiophos
Metron
p-Nitrophenyldimethylthionophosphate
Nitrox
Nitrox 80
Parathion methyl
Parathion-Metile (Italian)
Partron M
Phenol, p-nitro-,O-ester with O,O-dimethylphosphorothioate
Thiophenit
Thiophosphate de O,O-dimethyle et de O-(4-introphenyle) (French)
Vafatox
Vofatox
Wofatox
Wofotox

Adapted from Encyclopaedia of Occupational Health and Safety, [142] Registry of Toxic Effects of Chemical Substances--1975 Edition, [170] and 1968 Evaluations of Some Pesticide Residues in Food [171]

TABLE XVI-3

OCCUPATIONS WITH POTENTIAL EXPOSURE TO METHYL PARATHION

Aerial application personnel	Flag persons
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
Drum reconditioning personnel	Refuse haulers
Dump personnel	Tractor tank loaders
Field checkers	Truck loaders
Fieldworkers (eg, exposed to residues on crops and foliage)	Warehouse personnel

Adapted from reference 12

TABLE XVI-4

SIGNS AND SYMPTOMS ASSOCIATED WITH PARATHION POISONING

Effector Organ	Signs and Symptoms
MUSCARINIC Manifestations	
(a) Gastrointestinal	Anorexia; nausea; vomiting; abdominal cramps; diarrhea; tenesmus; involuntary defecation; eructation; "heartburn"; substernal pressure
(b) Sweat glands	Increased sweating
(c) Salivary glands	Increased salivation
(d) Lacrimal (tear) glands	Increased lacrimation
(e) Cardiovascular system	Bradycardia; fall in blood pressure
(f) Bronchial tree	Tightness in chest; wheezing suggestive of bronchoconstriction; dyspnea; cough; increased bronchial secretion; pulmonary edema
(g) Pupils	Pinpoint (miosis) and nonreactive
(h) Ciliary body	Blurring of vision
(i) Bladder	Frequent or involuntary urination
NICOTINIC Manifestations	
(a) Striated muscle	Muscular twitching; fasciculation; cramps; weakness (including muscles of respiration)
(b) Sympathetic ganglia and adrenals	Pallor; tachycardia; elevation of blood pressure

TABLE XVI-4 (CONTINUED)

SIGNS AND SYMPTOMS ASSOCIATED WITH PARATHION POISONING

Effector Organ	Signs and Symptoms
CNS Manifestations	
	Uneasiness; restlessness; anxiety; tremulousness; tension; apathy; giddiness; withdrawal and depression; headache; sensation of "floating"; insomnia with excessive dreaming (nightmares); ataxia; slurred, slow speech with repetition; drowsiness; difficulty in concentrating; confusion; emotional lability; coma with absence of reflexes; Cheyne-Stokes respirations; convulsions; hyperpyrexia; depression of respiratory and circulatory centers (with dyspnea and fall in blood pressure)

Derived from references 6 and 78

TABLE XVI-5

EFFECTS OF METHYL PARATHION (MP) EXPOSURE ON HUMANS

Routes of Exposure	Subjects	Exposure Concentration and Duration	Effects	References
Dermal and respiratory	4 humans	(Unknown conc)	Death; marked microscopic changes in liver, kidneys, and brain; paranitrophenol in all tissues examined	17-19
"	3 humans	MP (unknown conc)	No deaths; chromosomal anomalies in 2.53% of metaphase lymphocytes in 14 of 15 patients; 0.5% anomalies in controls	30
	12 humans	Organophosphorus pesticides (unknown conc)		
	10 controls			
"	16 exposed farm workers	Organophosphorus pesticides including MP (unknown conc)	Peak-season chromosomal break frequency in metaphase lymphocytes 5 times greater than that of off-season	32
"	47 humans (winter) 35 humans (summer)	MP dust (unknown conc) 3 mon - 6 yr in formulating plant with poor work practices	Signs and symptoms independent of length of employment, "mild" at 18 winter exams, "severe" at 29 summer exams; CNS involvement, headache, dizziness, nausea, insomnia, fatigue, visual disturbances, nervousness, shooting pains in heart, loss of appetite, vomiting, stomach pains, numbness of extremities, fibrillar muscle twitching; summer plasma cholinesterase activities 30% or more below winter values in 21 of 29 symptomatic workers	16

TABLE XVI-5 (CONTINUED)

EFFECTS OF METHYL PARATHION (MP) EXPOSURE ON HUMANS

Routes of Exposure	Subjects	Exposure Concentration and Duration	Effects	References
Oral, dermal, and respiratory	4 men and 1 woman	MP (unknown conc)	Translocations or deletions in 9.80% of metaphase lymphocytes at 3-6 d after exposure, 26.00% at 30 d, 10.20% at 180 d	31
	26 humans	Organophosphorus pesticides (unknown conc)	For these plus above, translocations or deletions in 17.83% at 3-6 d, 22.00% at 30 d, 5.60% at 180 d	31
	15 controls (13 men, 2 women)		For controls, 3.33% deletions and no translocations	31
Oral	26 humans	1.84 - 200 g	Death in 2 hr-9 d; marked microscopic changes in liver, kidneys, and brain; paranitrophenol in all tissues examined	17-19
"	7 men at each dose level: 5 subjects, 2 controls	1 - 22 mg/d in corn oil x 30 d	Average erythrocyte or plasma cholinesterase activity not inhibited more than 20% below baseline	20-23, 26-28
"	7 men: 5 subjects, 2 controls	24 mg/d in corn oil x 30 d	More than 20% inhibition in 2 of 5 subjects (plasma, 24 and 23%; erythrocyte, 27 and 55%)	24

TABLE XVI-5 (CONTINUED)

EFFECTS OF METHYL PARATHION (MP) EXPOSURE ON HUMANS

Routes of Exposure	Subjects	Exposure Concentration and Duration	Effects	References
Oral	7 men: 5 subjects, 2 controls	26 mg/d in corn oil x 30 d	More than 20% inhibition in 2 of 5 subjects for erythrocyte cholinesterase only (25 and 37%); maximum mean inhibition, 18%	24
"	7 men: 5 subjects, 2 controls	28 mg/d in corn oil x 30 d	More than 20% inhibition in 3 of 5 subjects for erythrocyte cholinesterase; maximum mean inhibition, 19%	25
"	7 men: 5 subjects, 2 controls	30 mg/d in corn oil x 30 d	Maximum mean inhibition of erythrocyte cholinesterase activity, 37%	25

TABLE XVI-6

LD50S FOR MICE, RATS, AND GUINEA PIGS

Routes of Exposure	Animals	Number and Sex	Material	LD50 or LC50	References
Oral	Mice	- -	Methyl parathion, 84.7% isomerized	Greater than 200 mg/kg	41
"	"	- -	Methyl parathion, not isomerized	100-200 mg/kg	41
"	Mice 15 - 20 g	- -	Methyl parathion* in mucine	58 mg/kg	40
"	"	- -	Methyl parathion* in propylene glycol	18.5 mg/kg	40
"	Mice 13 - 18 g	- -	Methyl parathion in aqueous emulsion	17 mg/kg	38
"	Rats 170 - 190 g	- M	"	24.5 mg/kg	38
"	Rats 200 g or larger	60 F	Methyl parathion* in peanut oil	24 mg/kg	33
"	Rats 200 g	10 F	Methyl parathion* in propylene glycol	18 mg/kg	37
"	Rats 175 g or larger	68 M	Methyl parathion* in peanut oil	14 mg/kg	33
"	Rats 200 g	10 M	Methyl parathion* in propylene glycol	12 mg/kg	37
"	Guinea pigs 290 - 320 g	- M	Methyl parathion in aqueous emulsion	417 mg/kg	38
iv	Mice 13 - 18 g	- M, F	"	13 mg/kg	38
"	Mice 15 - 20 g	- -	Methyl parathion* in propylene glycol	2.3 mg/kg	40

TABLE XVI-6 (CONTINUED)

LD50S FOR MICE, RATS, AND GUINEA PIGS

Routes of Exposure	Animals	Number and Sex	Material	LD50 or LC50	References
iv	Rats 200 g	- F	Methyl parathion* in propylene glycol	14.5 mg/kg	37
"	"	- M	"	9 mg/kg	37
"	Rats 170 - 190 g	- M	Methyl parathion in aqueous emulsion	4.1 mg/kg	38
"	Guinea pigs 290 - 320 g	- M	"	50 mg/kg	38
ip	Mice 15 - 20 g	- -	Methyl parathion* in mucine	32.0 mg/kg	40
"	"	- -	Methyl parathion* in propylene glycol	8.6 mg/kg	40
"	Rats 200 - 300 g	24 M	Methyl parathion in ethanol (20%) and propylene glycol (80%)	5.8 mg/kg	39
"	Rats 50 - 60 g	58-	"	3.5 mg/kg	39
Sub-cutaneous	Mice 15 - 20 g	- -	Methyl parathion* in propylene glycol	18.0 mg/kg	40
Dermal (clipped fur)	Rats 200 g	- F	"	120 mg/kg	37
"	"	- M	"	110 mg/kg	37
"	Rats 200 g or larger	69 M	Methyl parathion in xylene (0.0016 ml/kg)	67 mg/kg	33
"	Rats 175 g or larger	50 F	"	67 mg/kg	33

TABLE XVI-6 (CONTINUED)

LD50S FOR MICE, RATS, AND GUINEA PIGS

Routes of Exposure	Animals	Number and Sex	Material	LD50 or LC50	References
Respiratory	Rats 200 g	- F	Methyl parathion* in propylene glycol	287 mg/cu m (1.38 mg/kg) for 1 hr	37
"	"	- M	"	257 mg/cu m (1.23 mg/kg) for 1 hr	37
"	Rats	- M	Methyl parathion*	0.2 mg/1 for 1 hr 0.12 mg/1 for 4 hr	35

*Technical grade

TABLE XVI-7

EFFECTS OF METHYL PARATHION EXPOSURE ON ANIMALS

Routes of Exposure	Animals	Number and Sex	Material	Exposure Concentration and Duration	Effects	References
Oral (in food)	Rats*, F0, F1, F2	10 M, 20 F (for each generation, including F1)	Methyl parathion, 99% pure	3 mg/kg/d x 27 wk	No consistent or dose-related effects on reproduction; reduced survival of F1 weanlings; fewer litters from F2 dams than from controls	68
"	"	"	"	1 mg/kg/d x 27 wk	No consistent or dose-related effects on reproduction; reduced survival of F3 weanlings	68
Oral	Rats 270 g	4 F	Methyl parathion, unspecified grade	11 mg/kg (3 mg in 0.4 ml ethanol)	Twitching in dams and fetuses after dose 1-3 d before expected parturition; methyl parathion in liver and placenta of dams killed 30 min postdose; methyl parathion and methyl paraoxon in fetal brain, liver, and muscle	72
Oral (in food)	Rabbits ca. 2 kg	7 M, 7 M, 7 M, 7 M	"	1.479 mg/kg/d, 0.519 mg/kg/d, 0.162 mg/kg/d, 0.036 mg/kg/d x 56 d (Immunization with sheep erythrocytes 28th d)	Slight suppression of cell-mediated immune responses; slight decrease in spleen weights	61
"	Dogs 6-10 kg	1 M, 1 F	Methyl parathion, technical grade	50 ppm/d x 90 d	Plasma and erythrocyte ChE inhibition	43
"	"	1 M, 1 F	"	20 ppm/d x 90 d	"	43
"	"	1 M, 1 F	"	5 ppm/d x 90 d	No appreciable plasma or erythrocyte ChE inhibition	43
iv	Rats	- M	Methyl parathion in aqueous emulsion	2.1 mg/kg	50% brain ChE inhibition	38
"	"	- M	"	1.8 mg/kg	50% plasma ChE inhibition	38
"	Guinea pigs	- M	"	28 mg/kg	50% brain ChE inhibition	38
"	"	- M	"	24 mg/kg	50% plasma ChE inhibition	38
"	Rabbits	- -	Methyl parathion	12.5 mg/kg	Death	48
im, iv	"	- -	"	15 mg/kg im every 15 d for 5 mo and then 12.5 mg/kg iv	Like those in rabbits given only 1 im dose before iv dose (see below) but shorter lasting and less marked	60
"	"	- -	"	15 mg/kg im and 7 d later 12.5 mg/kg iv	Slight bradycardia after im dose, neutralization of iv dose (lethal to other rabbits) by im doses, slight electrocardiographic alterations and ChE inhibition effects after iv dose	48

TABLE XVI-7 (CONTINUED)

EFFECTS OF METHYL PARATHION EXPOSURE ON ANIMALS

Routes of Exposure	Animals	Number and Sex	Material	Exposure Concentration and Duration	Effects	References
ip	Mice	14 F	Methyl parathion in sodium carboxymethyl cellulose (0 5%)	60 mg/kg d 10 of gestation	22.3% offspring dead, 13/112 cleft palates, low offspring body weights; variations in cervical rib formation and caudal vertebrae ossification	70
"	"	11 F	"	20 mg/kg d 10 of gestation	None	70
"	Rats	13 F	"	15 mg/kg on d 12 of gestation	Slight retardation of ossification of caudal vertebrae and lower body weights in offspring	70
"	"	10 F	"	10 mg/kg d 12 of gestation	No malformations in offspring	70
"	Rats 225 g	12 F	Methyl parathion (unspecified grade) in ethanol (20%) and propylene glycol (80%)	6.0 mg/kg or 4.0 mg/kg on d 9 or d 15 of gestation	Fetal brain ChE inhibition, reduced erythrocyte ChE activity, symptoms of ChE inhibition, and lower average weight gain in dams	71
"	Rats	10 F	Methyl parathion in sodium carboxymethyl cellulose (0.5%)	5 mg/kg d 12 of gestation	No malformations in offspring	70
"	"	5 F, 5 F, 5 F, 5 F, 5 F	Methyl parathion in distilled water	0 15 mg in 3 ml water at 8 hr, 12 hr, 16 hr, 20 hr, 24 hr before 131I ip injection	Inhibition of thyroid 131I uptake, maximum inhibition at 8 hr, less inhibition when more time between methyl parathion and 131I injections	62
Subcutaneous	Chickens, atropinized	- -	Methyl parathion, unspecified grade	200 mg/kg	Lowest lethal dose tested, leg flaccidity beginning in 24 hr and lasting 3-28 d	51
"	"	- -	"	64 mg/kg	Lowest effective test dose	51
"	"	- -	"	32 mg/kg	Highest no-effect test dose	51
Respiratory	Rats	15 -	Methyl parathion, unspecified grade, aerosolized	0 072 mg/cu m 3 mo	Marked changes in liver, spleen, heart, adrenal glands, and CNS	60
"	"	15 -	"	0.024 mg/cu m 3 mo	Less marked changes than at 0.072 mg/cu m	60
"	"	15 -	"	0.008 mg/cu m 3 mo	No specific morphologic changes	60

*Three-generation study. F0=original parents; F1, F2, and F3=1st, 2d, and 3d generation, respectively

TABLE XVI-8

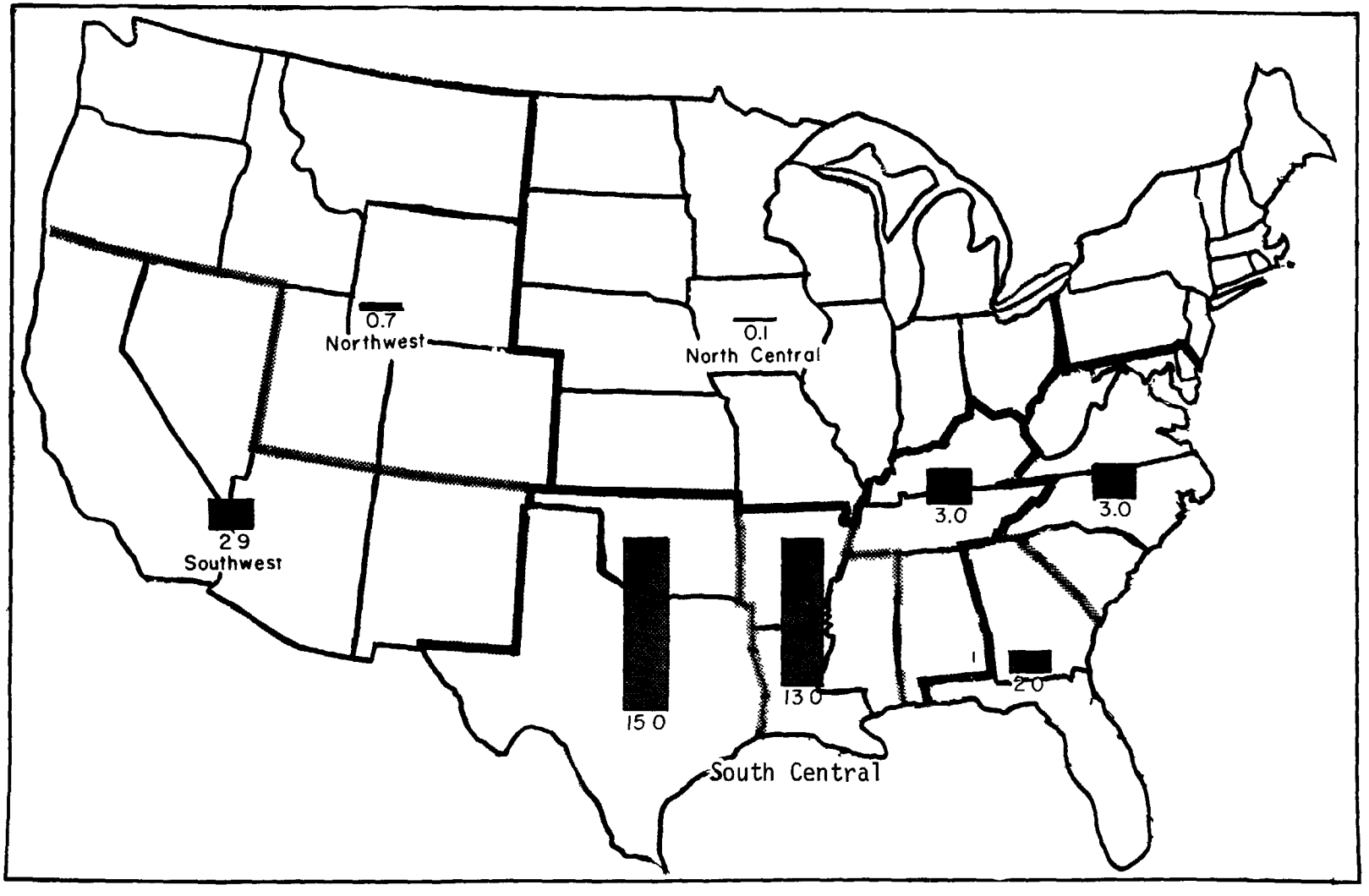
NORMAL VALUES FOR CIRCULATING CHOLINESTERASES
IN HEALTHY NONEXPOSED PERSONS*

Subjects	Erythrocyte Cholinesterase Activity (delta pH/hr)			Plasma Cholinesterase Activity (delta pH/hr)			Reference
	Range	Mean	SD	Range	Mean	SD	
400 men	0.58 -0.95	0.766	0.081	0.52 -1.39	0.953	0.187	112**
400 women	0.56 -0.94	0.750	0.082	0.38 -1.25	0.817	0.187	112**
255 men	0.554-1.252	0.861	0.091	0.408-1.652	0.912	0.112	93***
120 men and women	-	-	-	0.58 -1.37	0.94	0.16	113
20 men	-	-	-	-	0.95	0.24	114
20 women	-	-	-	-	0.78	0.12	114

*All analyses performed by method of Michel [29]
**Ranges, means, and standard deviations estimated from data extrapolated to age 40; highest 1% and lowest 1% values eliminated from ranges
***Analytic method modified for smaller blood samples

FIGURE XVI-1

GEOGRAPHIC DISTRIBUTION OF DOMESTIC METHYL PARATHION USE, 1972*

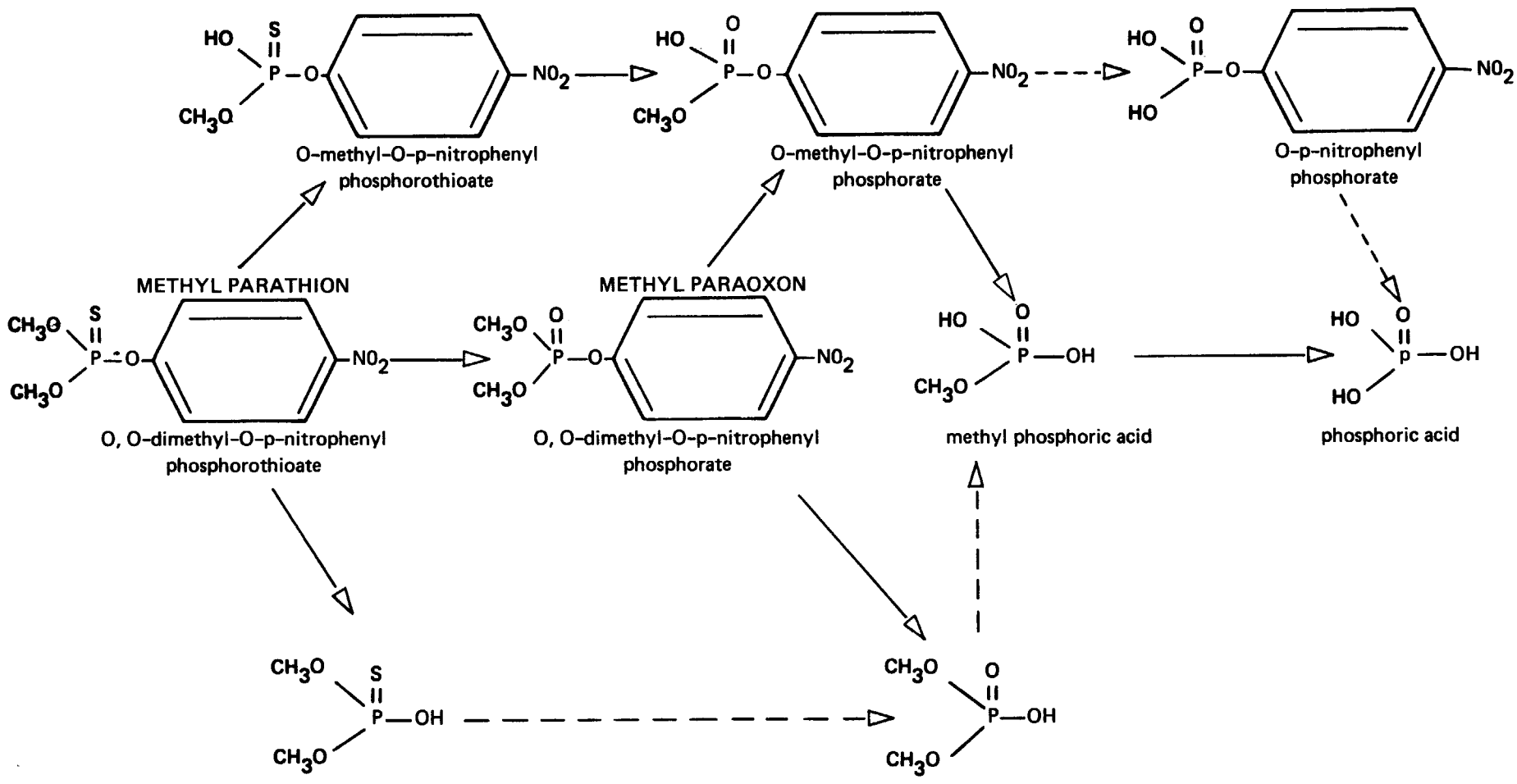


*Figures in millions of pounds of active ingredient

Adapted from US Environmental Protection Agency [11]

FIGURE XVI-2

METABOLISM OF METHYL PARATHION IN MICE*



* Dashed lines indicate hypothetical pathways

NOTE: Since only 32P-labeled metabolites were identified, paranitrophenol, a known degradation product of methyl parathion, does not appear in the figure.

Adapted from Hollingworth et al [74]

* U.S. GOVERNMENT PRINTING OFFICE: 1977—757-057/5752

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