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APPENDICES

APPENDIX A

GENERAL INFORMATION OF THE STUDY POPULATION

Table A-1 The Information of the study population

Sample Code[a]	Gender[b]	Age (years)	Weight (kg)	Height (cm)	Total BSA[c] (cm^2)	Exposed BSA	Attend School	Parental[d] Occupation	Household[e] Location	Indoor Pesticide use	OP pesticide[f] use in farm
T01	M	5	15	107	6,333	1,583	Yes	VF	I	No	CP
T02	F	5	15	110	6,333	1,583	Yes	VF	I	No	DC
T03	F	3	14	80	6,000	1,500	No	VF	I	No	DC, CP
T04	F	3	14	94	6,000	1,500	No	VF	I	No	DC
T05	M	2	12	95	5,333	1,333	No	VF	I	No	DC
T06	M	4	13	98	5,667	1,417	Yes	VF	I	No	DC
T07	F	4	14	100	6,000	1,500	Yes	VF	I	No	DC
T08	F	4	12	95	5,333	1,333	Yes	VF	I	No	DC, MP
T09	M	3	15	108	6,333	1,583	No	VF	I	No	DC, CP
T10	F	3	13	110	5,667	1,417	No	RP	N	Yes	none
T11	F	2	12	87	5,333	1,333	No	RP	N	Yes	none
T12	M	5	13	110	5,667	1,417	Yes	VF	I	Yes	DC
T13	M	3	14	98	6,000	1,500	No	VF	I	No	DC, PF
T14	M	5	15	100	6,333	1,583	Yes	VF	I	Yes	DC, PF
T15	M	5	15	110	6,333	1,583	Yes	VF	I	Yes	PF
T16	F	3	14	98	6,000	1,500	No	VF	I	Yes	PF
T17	M	4	16	102	6,667	1,667	Yes	VF	I	No	PF
T18	M	5	17	100	7,000	1,750	Yes	VF	I	Yes	PF, MP
T19	M	4	13	96	5,667	1,417	Yes	VF	I	No	DC, CP
T20	F	2	12	79	5,333	1,333	No	VF	I	No	DC, CP
T21	M	3	12	80	5,333	1,333	No	VF	I	Yes	DC, CP, PF
T22	F	4	13	100	5,667	1,417	Yes	VF	I	Yes	PF
T23	M	5	20	108	8,000	2,000	Yes	RP	N	No	none
T24	M	3	14	98	6,000	1,500	Yes	VF	I	No	PF
T25	M	2	13	90	5,667	1,417	No	VF	I	No	PF, MP
T26	F	3	14	95	6,000	1,500	No	VF	I	No	DC, PF
T27	M	4	14	100	6,000	1,500	Yes	VF	I	No	DC, PF
T28	M	4	15	105	6,333	1,583	Yes	VF	I	No	DC, CP
T29	F	3	15	98	6,333	1,583	No	VF	I	No	DC, MP
T30	F	4	13	100	5,667	1,417	Yes	RP	N	No	none
T31	M	4	20	100	8,000	2,000	Yes	RP	N	No	none

Sample Code	Gender	Age (years)	Weight (kg)	Height (cm)	BSA (cm^2)	Exposed BSA	Attend School	Parental Occupation	Household[e] Location	Indoor Pesticide use	OP pesticide[f] use in farm
T32	F	5	15	110	6,333	1,583	Yes	RP	N	No	none
T33	M	3	13	97	5,667	1,417	No	EM	N	No	none
T34	M	5	14	102	6,000	1,500	Yes	RP	N	Yes	none
T35	F	4	13	105	5,667	1,417	Yes	RP	N	Yes	none
T36	F	4	14	100	6,000	1,500	Yes	VF	I	No	DC, PF
T37	F	2	12	78	5,333	1,333	No	RP	N	Yes	none
R01	M	3	15	105	6,333	1,583	No	RP	O	Yes	none
R02	M	3	13	110	5,667	1,417	No	RP	O	Yes	none
R03	M	2	13	75	5,667	1,417	No	RP	O	Yes	none
R04	F	3	12	100	5,333	1,333	No	RP	O	No	none
R05	M	4	14	100	6,000	1,500	Yes	RP	O	No	none
R06	F	3	13	76	5,667	1,417	No	RP	O	No	none
R07	F	3	15	90	6,333	1,583	No	RP	O	No	none
R08	M	2	13	78	5,667	1,417	No	RP	O	No	none
R09	F	2	16	78	6,667	1,667	No	RP	O	Yes	none
R10	F	2	12	80	5,333	1,333	No	RP	O	No	none
R11	F	3	15	110	6,333	1,583	No	RP	O	No	none
R12	F	3	16	102	6,667	1,667	No	EM	O	No	none
R13	F	3	13	100	5,667	1,417	No	RP	O	No	none
R14	F	5	16	110	6,667	1,667	Yes	RP	O	No	none
R15	M	2	15	85	6,333	1,583	No	RP	O	No	none
R16	M	2	12	87	5,333	1,333	No	RP	O	No	none
R17	M	4	14	102	6,000	1,500	Yes	EM	O	No	none

Noted:

[a] T = farm children (target group), and R = reference group; [b] M = male, F = female; [c] BSA = (total) body surface area;

[d] VF = vegetable farmer, RP = rubber plantation worker, EM = employee

[e] I = inside farm area, N = nearby farm area, O = outside farm area

[f] CP = Chlorpyrifos; DC = dicrotophos; MP = Methyl parathion; PF = Profenofos; none = no application

Table A-2 Specific default values of body weight and body surface area for Thai children 2-5 years of age

	BW[a] (kg)		BSA[b] (m^2)	
Age	Male	Female	Male	Female
2 years	12.5	11.5	0.5500	0.5177
3 years	14.5	14.0	0.6177	0.6000
4 years	16.3	15.5	0.6777	0.6500
5 years	17.8	17.5	0.7277	0.7177
Average for age group	15.3	14.6	0.6425	0.6208
Average of male and female	15.0[a]		0.6317[b]	

[a] The mean of the 50th percentile values of body weight of male and female children (source: The standard growth curve for Thai children; Ministry of Public Health MOPH,1997)

[b] The mean of the 50th percentile values of total body surface area of male and female children based on a formula, BSA = (BW+4)/30 (Current, 1998)

Table A-3 Surface area of body part (m^2) for Thai children 2-5 years of age

Age	Total BSA[a]	Exposed SA[b]	Hands[c]	Feet[d]
2 years	0.5333	0.1333	0.0304	0.0384
3 years	0.6083	0.1521	0.0347	0.0438
4 years	0.6633	0.1658	0.0378	0.0478
5 years	0.7217	0.1804	0.0411	0.0520
Average for age group	0.6317	0.1579	0.0360	0.0455

[a] The mean of the 50th percentile values of total body surface area of male and female

[b] Recommended 25% of the total skin area is exposed to soil or dust (US EPA, 1992)

[c] Recommended 5.7% (the mean of percentage) of the total skin area is the surface areas of two hands for children 2-5 years of age (US EPA,1992)

[d] Recommended 7.2% of the total skin area is the surface areas of feet (US EPA,1992)

APPENDIX B

OPTIMAL CONDITIONS OF ORGANOPHOSPHATE MEASUREMENT

B-1. Instrumental Conditions

Instrument: Hewlett-Packard gas chromatography (HP6890) with a nitrogen phosphorus detector (GC-NPD)

Column : Capillary column, HP-5 (30 m x 0.32 mm id x 0.25 μm film thickness)

Oven : Initial temp: 70 °C Maximum temp: 290 °C

Initial time: 2.0 min Equilibration time: 3.0 min

Ramps :

#	Rate	Final temp	Final time
1	45.0	250.0	5.0
2	0.0 (Off)		

Post temp : 100 °C

Post time : 0.0 min

Run time : 11.00 min

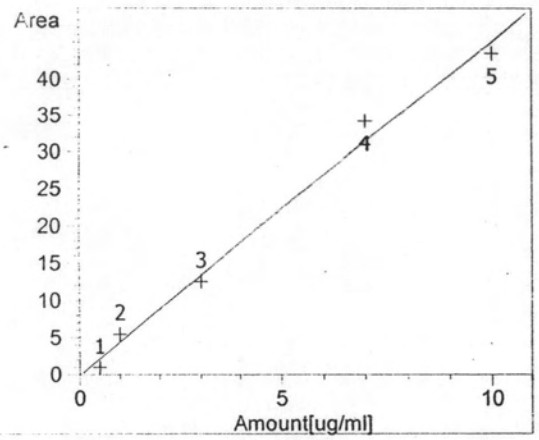
Back Inlet :

Mode :	Splitless
Initial temp :	250 °C
Pressure :	8.59 psi
Purge flow :	65.0 mL/min
Purge time :	0.75 min
Total flow :	70.3 mL/min
Gas saver :	Off
Gas type :	Helium

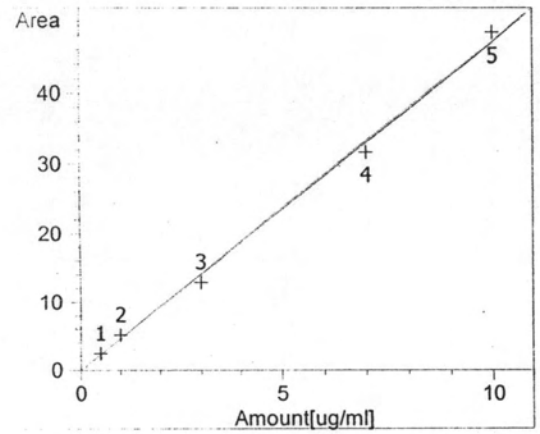
Back Detector :

Temperature :	290 °C
Hydrogen flow :	On
Air flow :	On
Makeup flow :	On
Makeup Gas Type :	Nitrogen
Adjust offset :	30.00
Electrometer :	On
Bead :	On
Equilibration time :	0.50

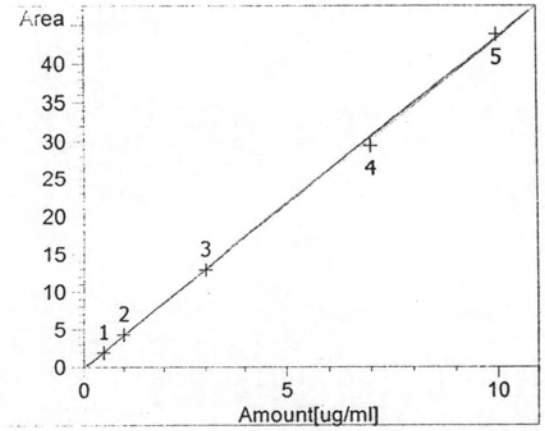
B-2. Calibration Curve for Target Organophosphate Pesticides



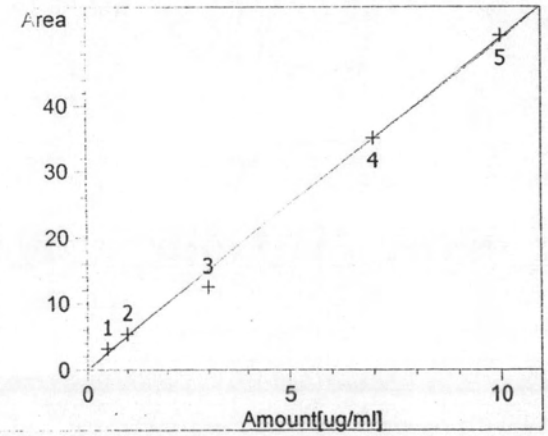
dicrotofos at exp. RT: 7.316
NPD1 A,
Correlation: 0.99796
Residual Std. Dev.: 1.81774
Formula: y = mx
m: 4.50598
x: Amount[ug/ml]
y: Area



chlorpyrifos at exp. RT: 8.048
NPD1 A,
Correlation: 0.99925
Residual Std. Dev.: 1.14858
Formula: y = mx
m: 4.71257
x: Amount[ug/ml]
y: Area



methyl parathion at exp. RT: 8.223
NPD1 A,
Correlation: 0.99981
Residual Std. Dev.: 0.53754
Formula: y = mx
m: 4.31879
x: Amount[ug/ml]
y: Area



profinofos at exp. RT: 9.496
NPD1 A,
Correlation: 0.99905
Residual Std. Dev.: 1.38189
Formula: y = mx
m: 5.01455
x: Amount[ug/ml]
y: Area

B-3. Chromatogram of Standard Solutions of OP Pesticides

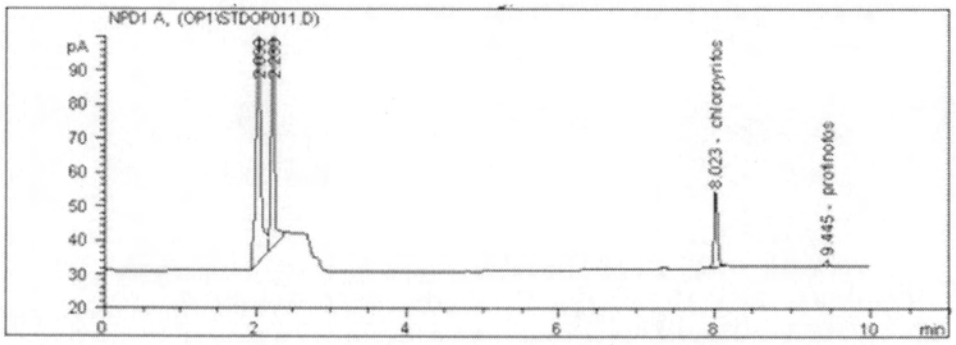


Figure B-1 Chromatograms of standard solution of chlorpyrifos

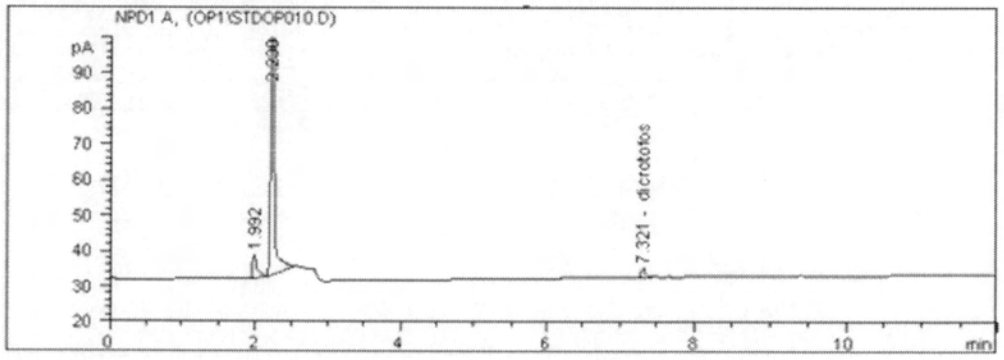


Figure B-2 Chromatograms of standard solution of dicrotophos

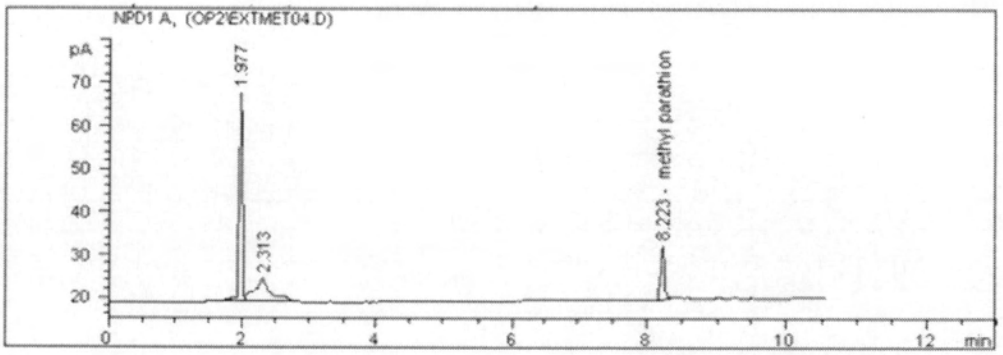


Figure B-3 Chromatograms of standard solution of methyl parathion

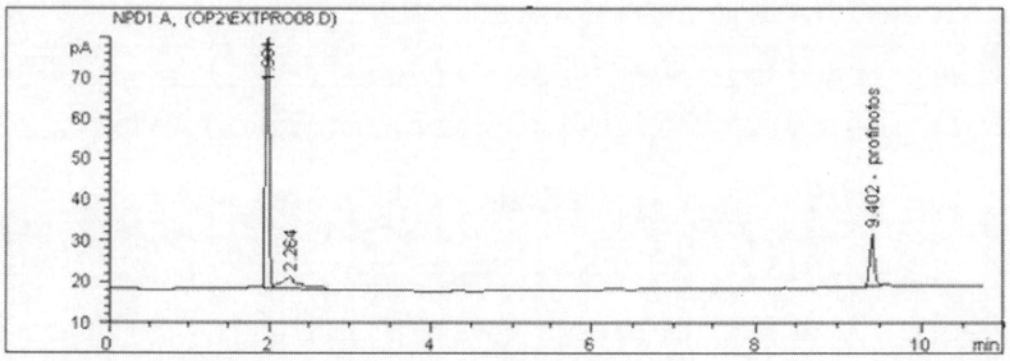


Figure B-4 Chromatograms of standard solution of profenofos

APPENDIX C

OPTIMAL CONDITIONS OF DIALKYLPHOSPHATE MEASUREMENT

C-1. Instrumental Conditions

Instrument : Hewlett-Packard gas chromatography (HP6890) with a flame photometric detector (GC-FPD)

Column : Capillary column, HP5 (30 m x 0.32 mm id x 0.25 μm film thickness)

Oven : Initial temp: 80 °C Maximum temp: 290 °C

Initial time: 2.0 min Equilibration time: 3.0 min

Ramps :

#	Rate	Final temp	Final time
1	17.0	210.0	1.0
2	0.0 (Off)		

Post temp : 80 °C

Post time : 0.0 min

Run time : 10.65 min

Back Inlet :

Mode : Splitless

Initial temp : 250 °C

Pressure : 26.23 psi

Purge flow : 35.0 mL/min

Purge time : 0.75 min

Total flow : 42.9 mL/min

Gas saver : Off

Gas type : Helium

Back Detector :

Temperature : 250 °C

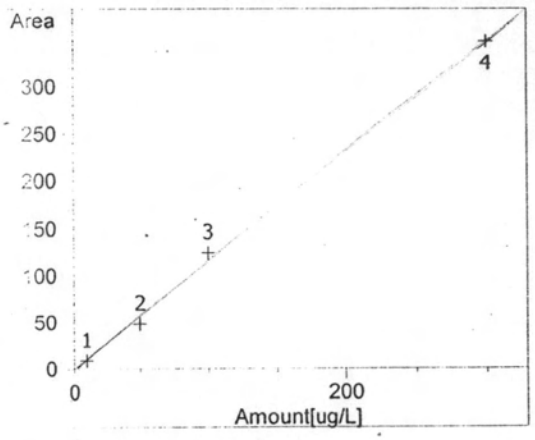
Hydrogen flow : 150 mL/min

Oxidizer Gas Type : Nitrogen

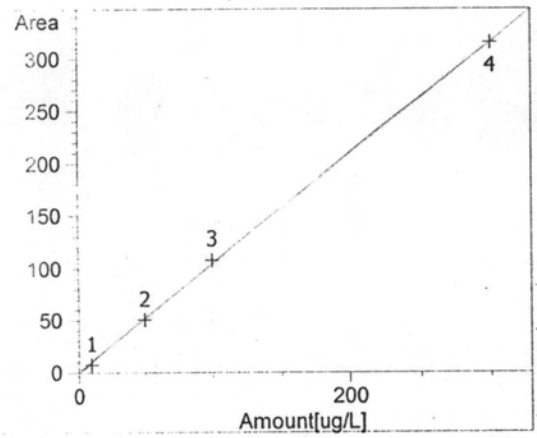
Flame : On

Lit offset : 2.00

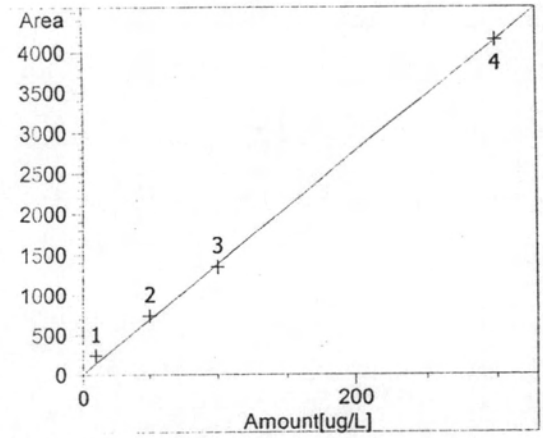
C-2. Calibration Curve for DAP Metabolites



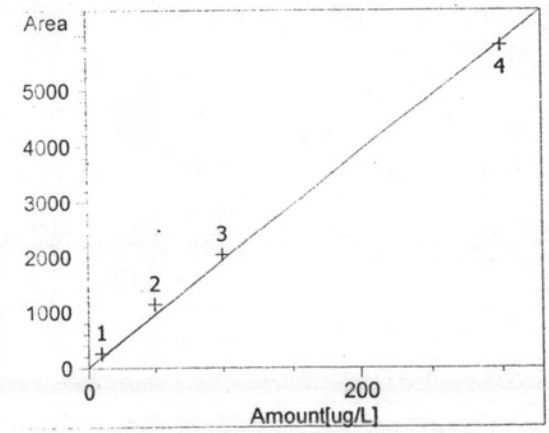
DMP at exp. RT: 7.139
FPD1 B,
Correlation: 0.99941
Residual Std. Dev.: 7.41821
Formula: y = mx
m: 1.16563
x: Amount[ug/L]
y: Area



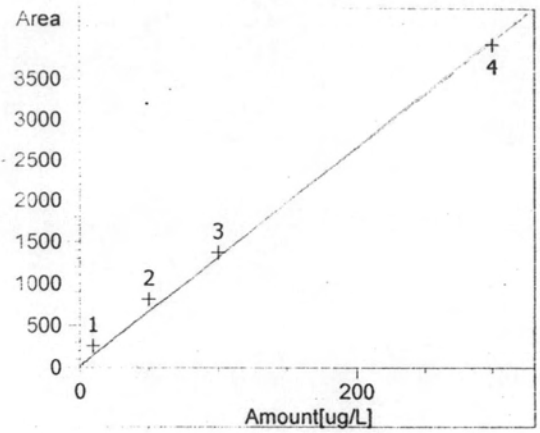
DEP at exp. RT: 7.964
FPD1 B,
Correlation: 0.99989
Residual Std. Dev.: 2.84786
Formula: y = mx
m: 1.05257
x: Amount[ug/L]
y: Area



DMTP at exp. RT: 8.308
FPD1 B,
Correlation: 0.99963
Residual Std. Dev.: 69.46123
Formula: y = mx
m: 13.83352
x: Amount[ug/L]
y: Area



DETP at exp. RT: 8.937
FPD1 B,
Correlation: 0.99952
Residual Std. Dev.: 112.39049
Formula: y = mx
m: 19.57797
x: Amount[ug/L]
y: Area




```
DEDTP at exp. RT: 9.334
FPD1 B,
Correlation:              0.99886
Residual Std. Dev.:   117.35994
Formula: y = mx
      m:      13.26173
      x: Amount[ug/L]
      y: Area
```

C-3. Chromatogram of DAP Metabolites in Urine

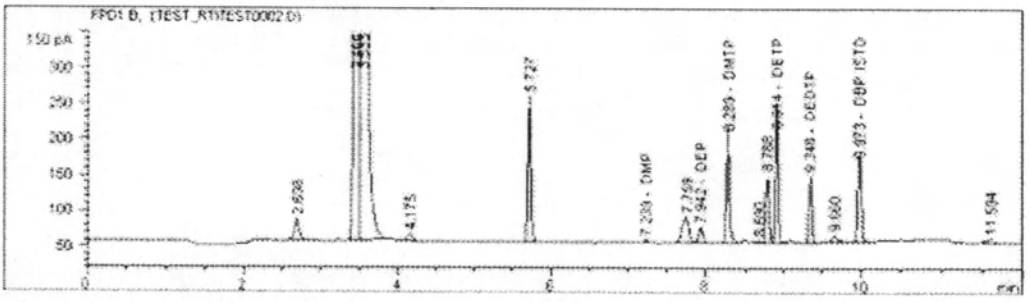


Figure C-1 Chromatograms of a blank urine sample spiked mixed five standard of DAP metabolites

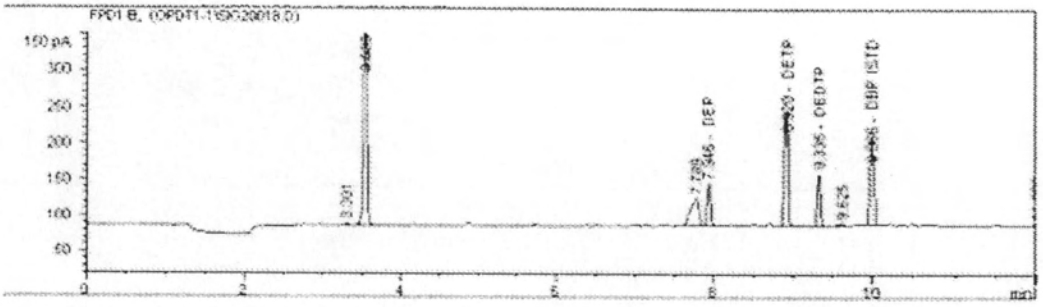


Figure C-2 Chromatograms of a non-occupationally exposed children's urine

APPENDIX D

BASELINE QUESTIONNAIRE AND CHILD ACTIVITY DIARY

Baseline Questionnaire

Pesticide Exposure for Preschool Children in Bang Rieng Agricultural Community, Songkhla

☐ Farm Children ☐ Reference Children

Part I General Information

Officer

1. Name (participant) _____
   Age_____ Relationship to child _____
2. Address_____ Village Number_____
3. What is your main job?
   ( ) 1. vegetable farmer ( ) 2. rubber plantation worker
   ( ) 3. sale ( ) 4. government official
   ( ) 5. others_____
4. How much is the average income of the family each month? _____
5. What's the highest level of your studies? _____
6. How many children in your family aged less than 6 years old? _____

	Name	Gender	Age	Weight/Height	living time
(a)	_____	_____	_____	___/___/___	____/____
(b)	_____	_____	_____	___/___/___	____/____
(c)	_____	_____	_____	___/___/___	____/____

7. How many family members work as vegetable farmer? ____ person (s)
8. Is your family of Bang Reing origin?
   ( ) 1. Yes (Next to #11) ( ) 2. No (next to #10)
9. Where is your family originally from? _____
10. How long has your family lived in the Bang Reing region? _____
    (days/ months/ years)
11. Where is your residence located?
    ( ) 1. Inside the farm area
    ( ) 2. Next to the farm area
    ( ) 3. Outside the farm area
12. What structure of your home?
    ( ) 1. Contemporary structure ( ) 2. Permanent structure

Officer

13. What type of floor does your home have?

( ) 1. Cement floor ( ) 2. Wood floor
( ) 3. Porcelain floor ( ) 4. Dirt floor

14. How frequently do you clean the house floor ?

( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never

15. If you choose 1-3, How is the floor cleaned?

( ) 1. Wet mop ( ) 2. Sweep ( ) 3. Others _____

16. Do you use household pesticides in your home?

( ) 1. Yes ( ) 2. No

If Yes then,

How frequently do you use pesticides in your home? _____ times/year

17-18 FOR ONLY FARM FAMILY

17. Please indicate the names of pesticide you've used in your farm in last 6 months?

Pesticide Name	Frequency
_____	_____
_____	_____
_____	_____

18. Where do you store the pesticides?

( ) 1. At home (inside) ( ) 2. Home's area (outside)
( ) 3. In a separate storage facility ( ) 4. Other_____

Part II Children Exposure Information

	Officer	
	Child1	Child2
1. How long does your child spend traveling outside the home in the day? _____ (min/hrs)		
2. How long does your child spend laying down or sitting on the house floor in the day? _____ (min/hrs)		
3. How many time does your child wash his/her hands in the day? _____ time		
4. How many time does your child take a shower or bath in the day? _____ time		
5. Where dose your child spend time for playing in the day? (you can select more than one choice) ( ) 1. floor indoor ( ) 2. outside at home ( ) 3. inside the farm ( ) 4. day care ( ) 5. others_____		
6. How frequently does your child put hands or fingers into mouth in the day? ( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never		
7. How frequently does your child place non-food items (such as toy) in his/her mouth? ( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never		
8. Does your child has soil or dirt from your yard/farm in contact with the skin in the day? ( ) 1. Yes ( ) 2. No		
9. How frequently does your child has an illness in the past sixth months? ( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never		
10. How frequently does your child play in the farm area in the past sixth months? ( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never		
11. Does your child pass the vegetable farm on the way to school? ( ) 1. Yes ( ) 2. No		
12-15 FOR ONLY FARM FAMILY		
12. How frequently do you take your child together with you while you are working in the farm? ( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never		

Child1	Child2

13. How frequently does your child play in the farm during pesticide spraying?
( ) 1. often ( ) 2. sometimes ( ) 3. almost never ( ) 4. never
How do you prevent your child away from the sprayed pesticide?

_____

14. Has your child ever directly come into contact with contaminated pesticide containers?
( ) 1. Yes ( ) 2. No
15. Do your contaminated clothes separate from family clothes?
( ) 1. Yes ( ) 2. No

Child Activity Diary

Time Period # 1 (Time Child Woke Up-Lunch Time)

1. Your child woke up at:___:___ (AM/PM)
2. Your child finished lunch at:___:___ (AM/PM)
3. How long did your child stay indoors during this period of time?
   _____ hours/minutes.
   How long did your child stay outdoors during this period of time?
   _____ hours/minutes.
4. Did your child do any of the following things during this period of time?
   - ☐ a. Put hand in the mouth (_____ times)
   - ☐ b. Put objects in the mouth (_____ times)
   - ☐ d. Play dirt or soil
   - ☐ e. Eat outside the house
   - ☐ f. Eat on the floor inside the house
   - ☐ g. Wash hands before eating
   - ☐ h. Walk barefeet inside the house
   - ☐ i. Walk barefeet outside at home
   - ☐ j. Walk barefeet in the farm
   - ☐ k. Take a bath
   - ☐ l. Go somewhere away from home

   If your child went somewhere away from home, please answer 4a & 4b

   4a. Where away from home?

   _____

   4b. Total time away from home _____hours_____minutes
5. Where did your child spend most time outdoors at home?

   _____

Child Activity Diary

Time Period # 2 (Lunch Time –Time Child Went To Sleep)

1. Your child went to sleep at:___:___ (AM/PM)
2. How long did your child stay indoors during this period of time?
   _____ hours/minutes.
   How long did your child stay outdoors during this period of time?
   _____ hours/minutes.
3. Did your child do any of the following things during this period of time?
   - ☐ a. Put hands in the mouth (_____ times)
   - ☐ b. Put objects in the mouth (_____ times)
   - ☐ d. Play dirt or soil
   - ☐ e. Eat outside the house
   - ☐ f. Eat on the floor inside the house
   - ☐ g. Wash hands before eating
   - ☐ h. Walk barefeet inside the house
   - ☐ i. Walk barefeet outside at home
   - ☐ j. Walk barefeet in the farm
   - ☐ k. Take a bath
   - ☐ l. Go somewhere away from home

If your child went somewhere away from home, please answer 4a & 4b

4 a. Where away from home? _____

4 b. Total time away from home _____hours/minutes

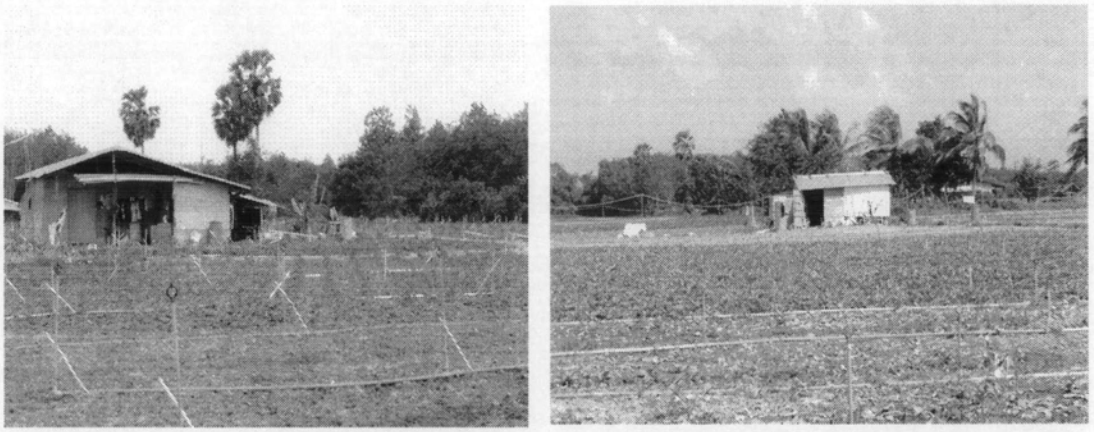
4. Where did your child spend most time outdoors at home?

_____

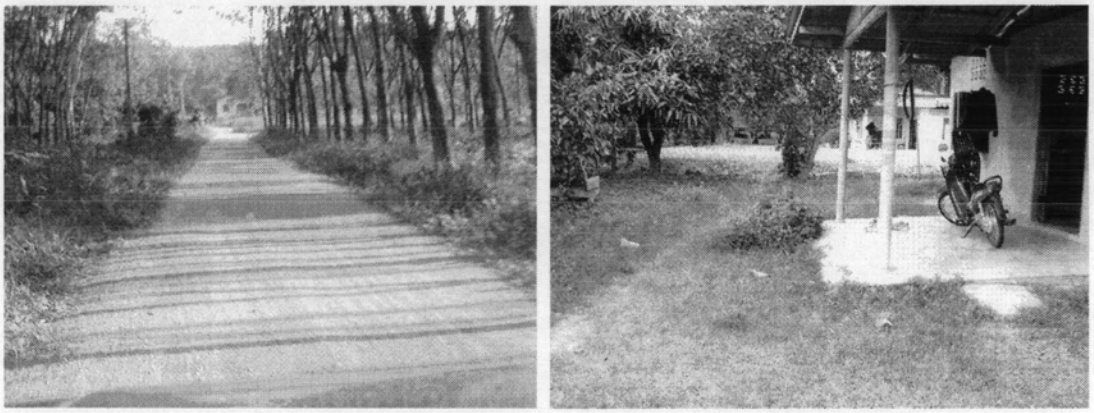
APPENDIX E

FIGURES OF FIELD STUDIES

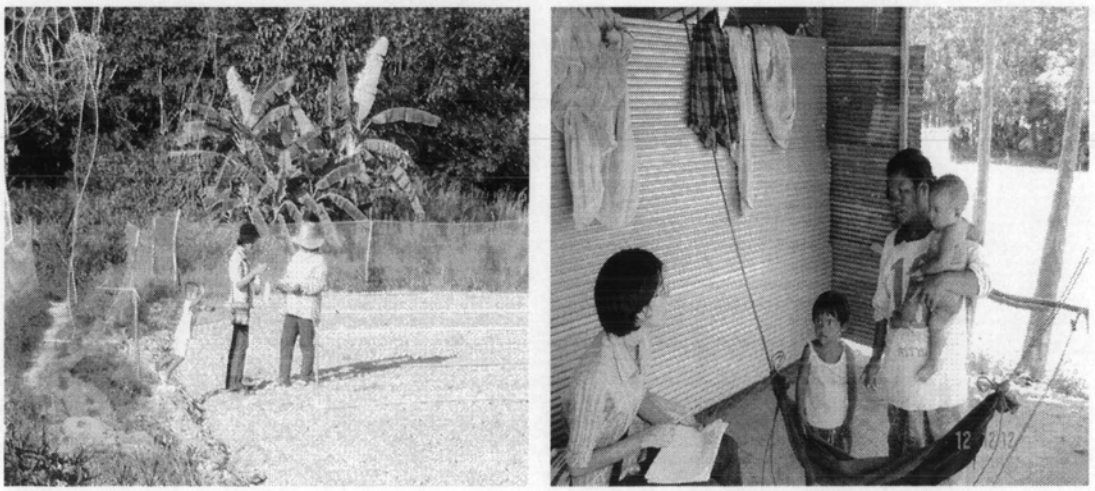
E-1 Study Site and Field Survey



(a) Bang Rieng Vegetable Farm Region



(b) Rubber Plantation Region (Reference)

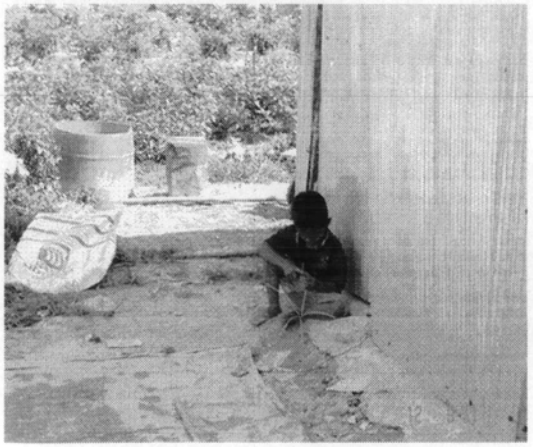


(c) Parental Interview and Signing a Consent Form

E-2 Children's Activities in the farm

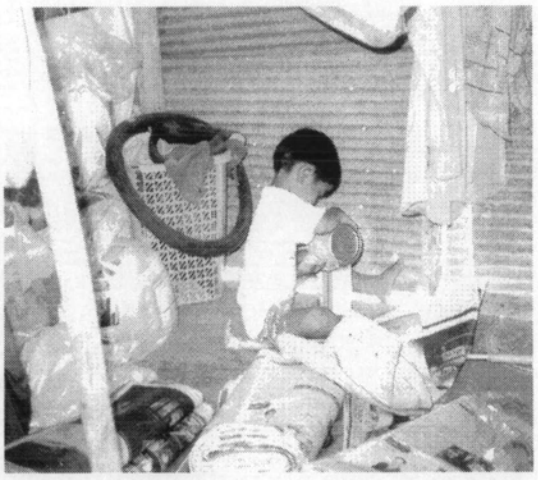
(a) Company with their parents into the field

(b) Walking and Playing in the field



(c) Contact with Outdoor Soil and Dirt

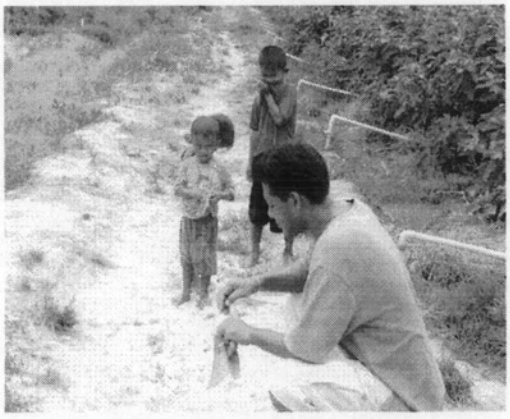
E-2 Children's Activities (Cont.)



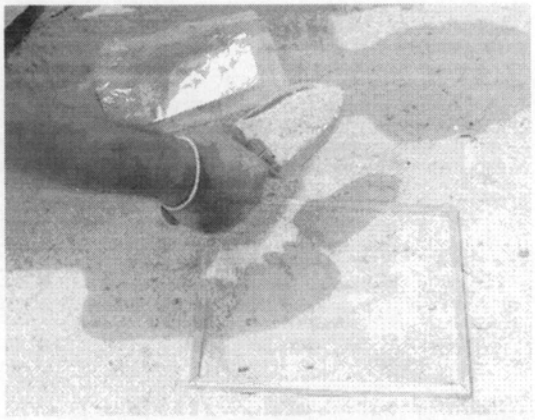
(d) Spend time indoors

(e) Hand-to-Mouth Behavior

E-3. Surface Soil Sample Collection

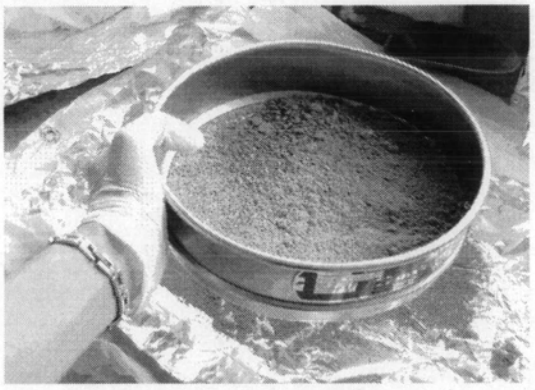


(a) Location for Soil Sampling
(the most children's playing area)



(b) Material and Sampling Strategy

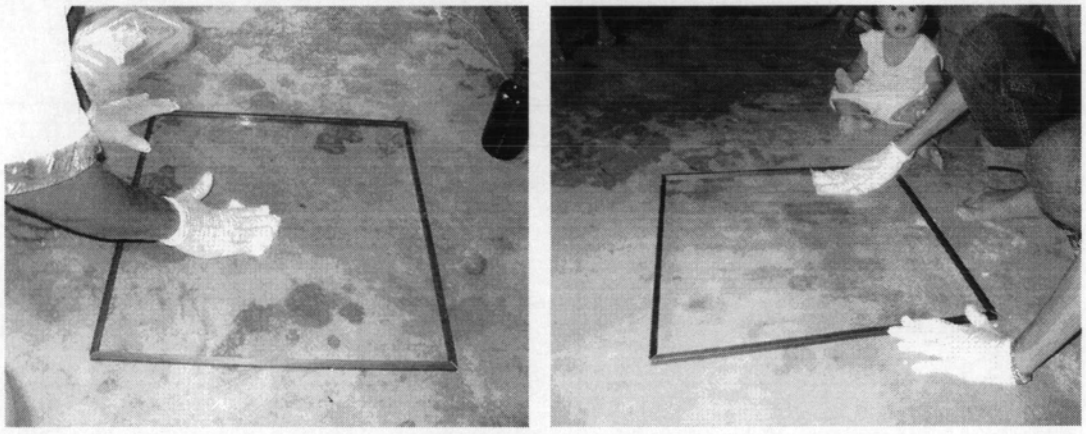
(c) Soil Samples



(d) Soil Sieving

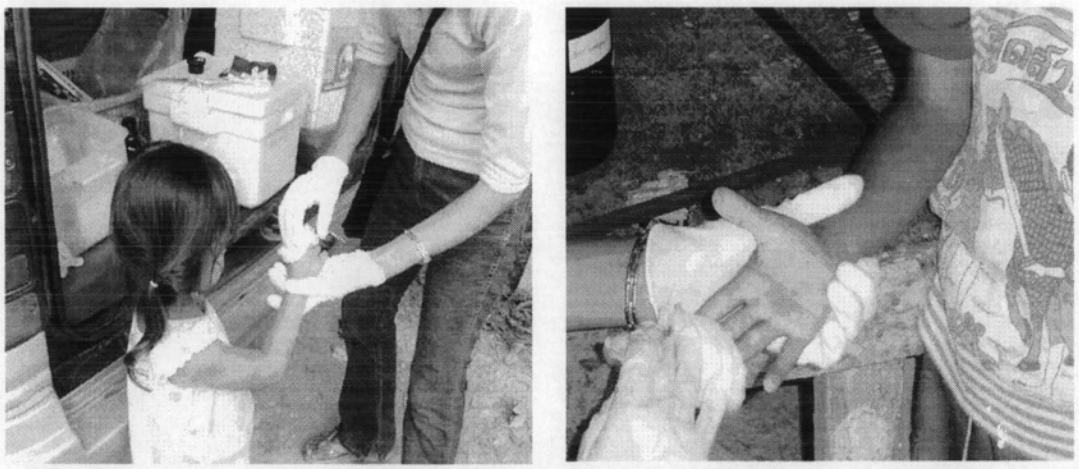
E-4. Surface Wipe Sample Collection

(a) Material and Reagent for Wipe Sampling

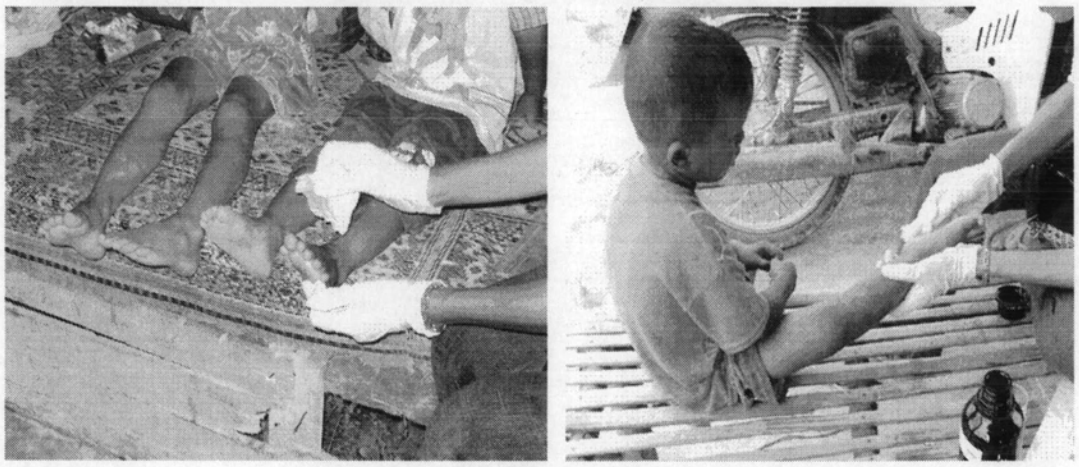


(b) Floordust Wipe Sampling

E-5. Dermal Wipe Sample Collection



(a) Hand Wipe Sampling



(b) Feet Wipe Sampling

BIOGRAPHY

Name:	Chidhathai Petchuay
Date of Birth:	July 2, 1971
Place of Birth:	Yala, Thailand
Education:	1989-1993, B.Sc. Public Health (Environmental Health), Mahidol University
	1993-1997, M.Sc. Environmental Science, Chulalongkorn University

Employment Record:

June 1997 – Present : Government Official (Lecturer), Faculty of Science, Ubonratchathani University, Ubonratchathani, Thailand