

Appendix I

Calculation of Thin Mercury Film (TMF) Thickness on Glassy Carbon Electrode (Metrohm, 6.1204.1204)

Disk diameter : 2.0 ± 0.1 mm

$$\begin{aligned} \text{Area disk} &= \pi r^2 = 3.1416 \text{ mm}^2 && (10 \text{ mm} = 1 \text{ cm.}) \\ &= 0.031416 \text{ cm}^2 \end{aligned}$$

Average deposition current = 1.0×10^{-4} A

Deposition time = 300 s

Amount of coulombs applied = 1.0×10^{-4} A * 300 s = 0.03 C

Calculated Amount of Mercury (Hg) deposited = $0.03 \text{ C} \div (9.6485 \times 10^4 \text{ C/mole} \div 2)$

since: 1 Faraday = $9.6485 \times 10^4 \text{ C/mole}$

and 2 equivalents/mole Hg

$$\begin{aligned} &= 1.55 \times 10^{-7} \text{ mole} \\ &= 1.55 \times 10^{-7} \text{ mole} * 10^6 \mu\text{mole/mole} \\ &= 0.155 \mu\text{mole} * 200.59 \mu\text{g}/\mu\text{mole} \\ &= 31.09 \mu\text{g} \end{aligned}$$

$$\begin{aligned} \text{Volume of Hg deposited} &= 3.109 \times 10^{-5} \text{ g} / 13.54 \text{ g/cm}^3 && (\rho_{\text{Hg}, 25^\circ \text{C}} = 13.54 \text{ g/cm}^3) \\ &= 2.3 \times 10^{-6} \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{TMF Thickness} &= 2.3 \times 10^{-6} \text{ cm}^3 / 0.031416 \text{ cm}^2 \\ &= 7.3 \times 10^{-5} \text{ cm} \\ &= 7.3 \times 10^{-7} \text{ m} \\ &= 0.73 \mu\text{m} \end{aligned}$$

Appendix II

Sample Calculation for Method Detection Limit

X_i	Y_i	Y^{\wedge}_i	$ Y_i - Y^{\wedge}_i $	$(Y_i - Y^{\wedge}_i)^2$
0	0.4204	0.3618	5.86×10^{-2}	3.4×10^{-3}
2	0.8502	0.8407	9.5×10^{-3}	0.1×10^{-3}
6	1.754	1.798	4.4×10^{-2}	1.9×10^{-3}
10	2.681	2.756	7.5×10^{-2}	5.6×10^{-3}
14	3.696	3.714	1.79×10^{-2}	0.3×10^{-3}
18	4.741	4.672	6.94×10^{-2}	4.8×10^{-3}

where : X_i = amount of Pb added ($\mu\text{g/l}$)

Y_i = current signal (μA)

From linear regression of X_i and Y_i values:

$$r = 0.9994$$

$$A = 0.3618 \Rightarrow Y_B$$

$$b = 0.2394$$

$$\Rightarrow y = 0.2394 (x) + 0.3618 \quad \text{Equation 1}$$

$$S_{y/x} = \{ \sum (Y_i - Y^{\wedge}_i)^2 / n - 2 \}^{1/2} = S_B$$

$$S_{y/x} = \{ 0.0161 / (6 - 2) \}^{1/2}$$

$$= 0.0634$$

$$\text{Limit of Detection : } Y - Y_B = 3S_B$$

$$Y = 3(0.0634) + 0.3618$$

$$Y = 0.5522 \Rightarrow x = 0.794 \mu\text{g/l} = 0.08 \mu\text{g/dl} \quad \text{from Equation 1}$$

Appendix III

Odds Ratio Calculation

Odds ratios were calculated using the Epi Info 6.0 system. Comparison of two potential risk factors with respect to their influence on the occurrence of PbB levels $\geq 10 \mu\text{g/dl}$ makes use of a 2 x 2 table such as the following:

		PbMask100		
Count		PbB $\geq 10 \mu\text{g/dl}$	PbB $< 10 \mu\text{g/dl}$	Row Total
Type of Mask				
1		37 (A)	11 (C)	48 (66.7 %)
2		16 (B)	8 (D)	24 (33.3 %)
Column Total		53 (73.6 %)	19 (26.4 %)	72 (100 %)

The odds of exposure among the "diseased" (A/C) is divided by the odds of the exposure among the "non-diseased" (B/D) to form the odds ratio, AD/BC. For the above example;

$$\text{OR} = \text{AD/BC} = \frac{37 \times 8}{16 \times 11} = \frac{296}{176} = 1.68$$

Note:

Mask 1 refers to the use of cotton masks

Mask 2 refers to the use of filter masks

Appendix IV

Number of Registered Motor Vehicles in Chiang Mai City (1984 - 1996)

Year	4-wheeled Motor Vehicles (cars, pick-ups, trucks, vans, minibuses)	Motorcycles	Total
1984	23,960	112,479	136,439
1985	27,023	101,468	128,491
1988	48,291	207,300	255,591
1989	52,085	237,765	289,850
1990	63,823	236,486	300,309
1995	119,830	328,969	448,799
1996	132,775	365,309	498,084

Appendix V

Use of Lead as Gasoline Additive in Thailand

Year	Trend in reductions of Pb additive in gasoline
1984	Pb content in regular gasoline reduced from 0.84 g/l to 0.45 g/l
1989	Pb content in gasoline reduced from 0.45 g/l to 0.40 g/l
1991	Unleaded gasoline first introduced into the market
1992	Pb in regular and premium gasoline further reduced from 0.40 g/l to 0.15 g/l
1996	Total use of unleaded gasoline imposed nationwide

Appendix VI

----- ONEWAY -----

Variable PbB
By Variable MTRAF96 (refers to # hours on road/day)

Analysis of Variance

Source	D. F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
B e t w e e n	2	9477.0357	4738.5179	2.3106	.1055

Groups

Within Groups	84	172265.3091	2050.7775
Total	86	181742.3448	

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct	Conf Int	for Mean
Grp 0	20	79.0500	41.4722	9.2735	59.6404	TO	98.4596
Grp 1	12	106.7500	51.9827	15.0061	73.7218	TO	139.7782
Grp 2	55	75.8727	45.1052	6.0820	63.6791	TO	88.0664
Total	87	80.8621	45.9705	4.9286	71.0644	TO	90.6597

GROUP	MINIMUM	MAXIMUM
Grp 0	17.0000	178.0000
Grp 1	35.0000	169.0000
Grp 2	11.0000	219.0000
TOTAL	11.0000	219.0000

Levene Test for Homogeneity of Variances

Statistic	df1	df2	2-tail Sig.
1.2936	2	84	.280

----- ONEWAY -----

Variable PbB
By Variable MTRAF96 (refers to # hours on road/day)

Multiple Range Tests: LSD test with significance level .05

The difference between two means is significant if

$$\text{MEAN (J) - MEAN (I)} \geq 32.0217 * \text{RANGE} * \text{SQRT} (1/N(I) + 1/N (J))$$

with the following value(s) for RANGE: 2.81

(*) Indicates significant differences which are shown in the following triangle

Mean	MTRAF96			
75.8727	Grp 2			
79.0500	Grp 0			
106.7500	Grp 1	*		

Appendix VII

----- ONEWAY -----

Variable PbB

By Variable MTRAF96 (refers to # hours on road/day)

Analysis of Variance

Source	D. F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	1	9391.7603	9391.7603	4.3734	.0404
Within Groups	65	139586.3591	2147.4824		
Total	66	148978.1194			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct	Conf Int	for Mean
Grp 1	12	106.7500	51.9827	15.0061	73.7218	TO	139.7782
Grp 2	55	75.8727	45.1052	6.0820	63.6791	TO	88.0664
Total	67	81.4030	47.5105	5.8043	69.8143	TO	92.9917

GROUP	MINIMUM	MAXIMUM
Grp 1	35.0000	169.0000
Grp 2	11.0000	219.0000
TOTAL	11.0000	219.0000

Levene Test for Homogeneity of Variances

Statistic	df1	df2	2-tail Sig.
1.9664	1	65	.166

Note:

Grp 1 ⇒ 1-2 hour(s) traffic work/day

Grp 2 ⇒ ≥3 hours traffic work/day

Appendix VIII

-----ONEWAY-----

By Variable PbB
Variable MASKC

Analysis of Variance

Source	D. F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	1	11091.3781	11091.3781	5.2285	.0255
Within Groups	65	137886.7413	2121.3345		
Total	66	148978.1194			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct	Conf Int	for Mean
Grp 1	43	71.7907	39.6836	6.0517	59.5779	TO	84.0035
Grp 2	24	98.6250	55.8514	11.4006	75.0410	TO	122.2090
Total	67	81.4030	47.5105	5.8043	69.8143	TO	92.9917

GROUP	MINIMUM	MAXIMUM
Grp 1	11.0000	169.0000
Grp 2	13.0000	219.0000
TOTAL	11.0000	219.0000

Levene Test for Homogeneity of Variances

Statistic	df1	df2	2-tail Sig.
3.5007	1	65	.066

Note:

Grp 1 refers to policemen who use filter masks

Grp 2 refers to policemen who use cotton masks

CURRICULUM VITAE

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