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APPENDIX

Effects of VPA and VHA on the release of cortical amino acid neurotransmitters

Table 1 Total amount of aspartate within 180 min after injection

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	95.37	31.88	14.25
PEG400	5	86.05	29.88	13.36
VHA100	5	115.38	72.74	32.53
VHA200	5	69.11	27.46	12.28
VPA200	5	55.02	14.21	6.35
VPA400	5	56.90	35.51	15.88

Table 2. Total amount of glutamate within 180 min after injection

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	95.62	42.65	19.07
PEG400	5	94.24	25.79	11.53
VHA100	5	83.18	46.97	21.00
VHA200	5	63.57	8.67	3.87
VPA200	5	54.79	20.25	9.05
VPA400*	5	46.84	19.75	8.83

* $p < 0.05$ denote statistically significant difference from PEG400

Table 3. Total amount of glycine within 180 min after injection

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	108.93	39.11	17.49
PEG400	5	70.43	16.37	7.32
VHA100*	5	134.30	81.02	36.23
VHA200*	5	133.77	31.25	13.97
VPA200	5	78.27	19.11	8.55
VPA400	5	53.03	24.55	10.97

Table 4. Total amount of GABA within 180 min after injection

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	77.48	15.49	6.93
PEG400	5	64.36	28.33	12.67
VHA100	5	108.01	41.27	18.45
VHA200*	5	204.99	63.60	28.44
VPA200	5	82.21	23.89	10.68
VPA400	5	49.44	37.37	16.71

* p < 0.05 denote statistically significant difference from PEG400

Amount of aspartate at various times

Table 5. (20min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	120.77	35.25	15.76
PEG400	5	107.86	77.27	34.55
VHA100	5	129.35	154.35	69.02
VHA200	5	81.77	44.97	20.11
VPA200	5	58.64	17.49	7.82
VPA400	5	75.27	39.97	17.87

Table 6. (40min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	139.56	77.86	34.82
PEG400	5	67.65	42.35	18.94
VHA100	5	93.71	87.94	39.33
VHA200	5	67.23	42.46	18.9912.95
VPA200	5	61.39	28.96	7.91
VPA400	5	61.57	17.69	10.60

Table 7. (60min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	78.79	27.42	12.26
PEG400	5	82.07	38.93	17.41
VHA100	5	99.69	62.74	28.05
VHA200	5	61.67	25.44	11.37
VPA200	5	74.73	30.06	13.44
VPA400	5	46.67	47.65	21.31

Table 8. (80min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	90.11	45.89	20.52
PEG400	5	86.59	20.62	9.22
VHA100	5	156.86	91.98	41.13
VHA200	5	76.83	49.94	22.33
VPA200	5	59.03	10.84	4.84
VPA400	5	75.37	70.22	31.40

Table 9. (100min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	60.32	20.60	9.21
PEG400	5	86.82	31.95	14.29
VHA100	5	94.82	62.42	27.91
VHA200	5	63.52	38.21	17.09
VPA200	5	50.36	14.98	6.70
VPA400	5	57.68	74.95	33.52

Table 10. (120min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	112.08	83.55	37.36
PEG400	5	85.38	29.73	13.29
VHA100	5	129.10	138.40	61.89
VHA200	5	68.25	25.36	11.34
VPA200	5	46.47	26.71	11.94
VPA400	5	43.74	43.21	19.32

Table 11. (140min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	76.91	64.61	28.89
PEG400	5	91.31	33.76	15.09
VHA100	5	98.71	52.39	23.43
VHA200	5	71.10	53.40	23.88
VPA200	5	59.23	39.64	17.72
VPA400	5	43.65	38.93	17.41

Table 12. (160min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	114.08	75.07	33.57
PEG400	5	96.04	29.22	13.06
VHA100	5	127.79	85.21	38.10
VHA200	5	47.89	22.52	10.07
VPA200	5	40.26	23.99	10.72
VPA400	5	51.35	54.05	24.17

Table 13. (180min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	65.74	34.18	15.28
PEG400	5	70.75	32.22	14.41
VHA100	5	108.33	66.43	29.70
VHA200	5	83.72	56.99	25.48
VPA200	5	45.10	17.48	7.82
VPA400	5	56.83	49.86	22.29

Amount of glutamate of various times

Table 14. (20min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	105.16	64.40	28.80
PEG400	5	86.91	13.28	5.94
VHA100	5	113.05	64.17	28.69
VHA200	5	92.00	28.88	12.91
VPA200	5	67.94	36.18	16.18
VPA400	5	57.66	15.87	7.10

Table 15. (40min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	86.12	58.77	26.28
PEG400	5	81.07	28.41	12.70
VHA100	5	88.67	55.95	25.02
VHA200	5	80.22	31.58	14.12
VPA200	5	83.66	23.56	10.53
VPA400	5	74.08	24.62	11.01

Table 16. (60min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	65.26	44.68	19.98
PEG400	5	103.32	49.80	22.27
VHA100	5	82.38	50.30	22.49
VHA200	5	72.00	16.99	7.60
VPA200	5	76.94	62.35	27.88
VPA400	5	93.21	93.72	41.91

Table 17. (80min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	76.52	37.52	16.78
PEG400	5	102.58	47.39	21.19
VHA100	5	82.59	58.69	26.24
VHA200	5	7289	17.70	7.91
VPA200*	5	47.46	13.89	6.21
VPA400*	5	31.30	15.79	7.06

Table 18. (100min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	77.15	24.90	11.13
PEG400	5	89.67	38.06	17.02
VHA100	5	70.30	37.56	16.79
VHA200	5	59.60	35.45	15.85
VPA200	5	49.82	38.53	17.23
VPA400*	5	19.13	7.50	3.35

Table 19. (120min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	116.16	58.67	26.23
PEG400	5	81.30	17.31	7.74
VHA100	5	64.06	39.84	17.81
VHA200	5	53.33	12.39	5.54
VPA200	5	46.23	23.22	10.38
VPA400*	5	28.30	23.59	10.55

* $p < 0.05$ denote statistically significant difference from PEG400

Table 20. (140min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	108.39	61.12	27.33
PEG400	5	104.61	28.96	12.95
VHA100	5	76.41	37.03	16.56
VHA200*	5	46.34	11.04	4.93
VPA200*	5	44.69	51.80	23.16
VPA400*	5	33.91	20.88	9.34

Table 21. (160min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	111.64	91.16	40.78
PEG400	5	108.69	26.54	11.87
VHA100	5	100.71	78.51	35.11
VHA200	5	45.65	9.08	4.06
VPA200	5	37.93	18.29	8.18
VPA400	5	39.08	37.15	16.61

Table 22. (180min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	114.23	67.12	30.01
PEG400	5	90.02	42.06	18.81
VHA100	5	70.44	56.90	25.44
VHA200	5	50.11	22.99	10.28
VPA200	5	41.47	34.48	15.42
VPA400	5	44.91	35.44	15.85

* $p < 0.05$ denote statistically significant difference from PEG400

Amount of glycine at various times

Table 23. (20min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	141.28	79.50	35.55
PEG400	5	98.40	44.26	19.79
VHA100*	5	254.01	206.07	92.15
VHA200	5	135.47	14.05	6.28
VPA200	5	60.5	21.11	9.44
VPA400	5	50.59	109.16	12.15

Table 24. (40min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	132.27	44.70	19.99
PEG400	5	86.88	50.02	22.36
VHA100	5	141.42	102.44	45.81
VHA200	5	216.64	215.23	96.25
VPA200	5	81.13	43.42	19.42
VPA400	5	48.14	18.51	8.28

Table 25. (60min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	127.5	21.65	9.68
PEG400	5	66.57	18.25	8.16
VHA100	5	110.50	61.45	27.48
VHA200	5	95.27	27.02	12.08
VPA200	5	92.85	37.41	16.73
VPA400	5	65.24	43.93	19.65

* $p < 0.05$ denote statistically significant difference from PEG400

Table 26. (80min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	94.56	25.49	11.39
PEG400	5	73.56	26.64	11.91
VHA100	5	113.82	93.23	41.69
VHA200	5	105.24	17.92	8.01
VPA200	5	65.54	21.77	9.73
VPA400	5	89.54	72.54	32.44

Table 27. (100min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	88.17	43.74	19.56
PEG400	5	68.14	22.59	10.10
VHA100	5	141.61	110.95	49.62
VHA200	5	151.33	42.89	19.18
VPA200	5	110.55	126.80	56.70
VPA400	5	42.85	29.90	13.37

Table 28. (120min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	97.56	35.82	16.01
PEG400	5	57.37	18.29	8.18
VHA100*	5	159.04	125.28	56.02
VHA200	5	105.69	36.42	16.29
VPA200	5	66.78	21.95	9.81
VPA400	5	53.48	54.54	24.39

* p < 0.05 denote statistically significant difference from PEG400

Table 29. (140min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	84.42	53.97	24.13
PEG400	5	61.32	17.55	7.85
VHA100	5	109.95	84.35	37.72
VHA200	5	133.26	66.46	29.72
VPA200	5	81.39	28.20	12.61
VPA400	5	48.54	46.30	20.70

Table 30. (160min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	127.38	94.46	42.24
PEG400	5	64.19	29.45	13.17
VHA100	5	101.48	54.15	24.22
VHA200*	5	141.12	34.61	15.48
VPA200	5	71.57	27.81	12.44
VPA400	5	47.85	26.18	11.70

Table 31. (180min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	87.24	44.87	20.06
PEG400	5	57.45	11.50	5.14
VHA100	5	76.84	35.54	15.89
VHA200*	5	119.95	18.74	8.38
VPA200	5	73.08	48.08	21.50
VPA400	5	31.03	16.99	7.60

* $p < 0.05$ denote statistically significant difference from PEG400

Amount of GABA at various times

Table 32. (20min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	93.93	46.83	20.94
PEG400	5	76.37	49.70	22.22
VHA100	5	174.53	147.89	66.13
VHA200	5	136.09	71.15	31.82
VPA200	5	59.44	25.43	11.37
VPA400	5	51.64	35.94	16.07

Table 33. (40min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	98.26	51.98	23.24
PEG400	5	78.41	106.78	47.75
VHA100	5	101.01	96.81	43.29
VHA200*	5	251.06	204.88	91.62
VPA200	5	90.25	64.90	29.02
VPA400	5	52.72	32.28	14.43

Table 34. (60min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	86.46	49.23	22.02
PEG400	5	51.95	23.34	10.44
VHA100*	5	144.55	53.57	23.95
VHA200*	5	158.58	100.15	44.79
VPA200	5	65.80	28.50	12.74
VPA400	5	59.52	54.72	24.47

* p < 0.05 denote statistically significant difference from PEG400

Table 35. (80min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	78.28	27.89	12.47
PEG400	5	86.21	37.16	16.61
VHA100	5	105.55	84.79	37.92
VHA200*	5	161.53	54.50	24.37
VPA200	5	47.17	14.24	6.36
VPA400	5	48.23	50.30	22.49

Table 36. (100min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	49.80	22.46	10.04
PEG400	5	48.34	31.51	14.09
VHA100	5	104.12	73.00	32.65
VHA200*	5	270.50	164.48	73.56
VPA200	5	96.68	54.67	24.45
VPA400	5	59.03	56.58	25.30

Table 37. (120min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	72.48	15.43	6.90
PEG400	5	52.15	32.78	14.66
VHA100	5	98.62	45.18	20.20
VHA200*	5	195.73	100.77	45.06
VPA200	5	113.97	77.61	34.71
VPA400	5	45.03	45.75	20.46

* p < 0.05 denote statistically significant difference from PEG400

Table 38. (140min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	59.08	29.15	13.03
PEG400	5	57.34	24.67	11.03
VHA100	5	74.32	27.49	12.29
VHA200*	5	185.48	95.54	42.72
VPA200	5	95.58	67.31	30.10
VPA400	5	40.62	39.22	17.54

Table 39. (160min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	109.03	46.42	20.76
PEG400	5	69.32	45.42	20.31
VHA100	5	91.11	31.30	14.00
VHA200*	5	212.15	78.93	35.30
VPA200	5	97.18	29.40	13.14
VPA400	5	47.56	50.93	22.77

Table 40. (180min after injection)

Group	count	The Mean	Standard deviation	Standard Error of the Mean
NSS	5	59.04	24.15	10.80
PEG400	5	59.20	35.86	16.04
VHA100	5	78.31	34.33	15.35
VHA200*	5	273.76	204.77	91.57
VPA200	5	73.85	21.40	9.57
VPA400	5	40.61	29.48	13.18

* p < 0.05 denote statistically significant difference from PEG400



Curriculum vitae

Miss Aree Wanasuntronwong was born on 24th February 1977, in Bangkok, Thailand. She had graduated with Bachelor of Science (Physiotherapy), Mahidol University in 1999.