

## Supplemental Digital Content 1

### Neural Correlates of Wakefulness, Sleep, and General Anesthesia: An Experimental Study in Rat

**Abbreviated title:** Wakefulness and Unconsciousness

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**Funding:** This work was supported by a grant from the National Institutes of Health (Bethesda, MD, USA), to G.A.M (NIH RO1 GM098578) and funding from the Department of Anesthesiology, University of Michigan Medical School, Ann Arbor.

**Table 1:** ACh levels (pmoles/22  $\mu$ L) in PFC before, during, and after propofol- and sevoflurane-induced unconsciousness

Wake	<b>Propofol</b>	Recovery wake	F statistic p value	Wake	<b>Sevoflurane</b>	Recovery wake	F statistic p value
0.9 $\pm$ 0.16 (0.52-1.3)	0.086 $\pm$ 0.006 (0.071-0.10)	0.71 $\pm$ 0.11 (0.43-0.99)	F(2,6)=22 *p=0.0003	1.0 $\pm$ 0.18 (0.66-1.4)	0.15 $\pm$ 0.035 (0.077-0.23)	1.3 $\pm$ 0.23 (0.77-1.8)	F(2,11)=19 *p<0.0001

Data are shown as mean  $\pm$  standard error of the mean and 95% confidence interval in parenthesis. Asterisk indicates significant difference. ACh: acetylcholine, PFC: prefrontal cortex.

**Table 2:** Corticocortical coherence before, during, and after propofol- and sevoflurane-induced unconsciousness

Frequency band (Hz)	Wake	<b>Propofol</b>	Recovery wake	F statistic p value	Wake	<b>Sevoflurane</b>	Recovery wake	F statistic p value
<b>δ</b> (0.5 - 4)	0.79 ± 0.030 (0.72-0.86)	0.67 ± 0.026 (0.60-0.73)	0.74 ± 0.027 (0.67-0.80)	F(2,7)=10 *p=0.004	0.80 ± 0.014 (0.77-0.83)	0.67 ± 0.028 (0.61-0.73)	0.74 ± 0.015 (0.71-0.77)	F(2,10)=13 *p=0.001
<b>θ</b> (4 - 10)	0.74 ± 0.015 (0.71-0.78)	0.52 ± 0.027 (0.46-0.59)	0.67 ± 0.024 (0.62-0.73)	F(2,7)=32 *p<0.0001	0.74 ± 0.016 (0.71-0.78)	0.60 ± 0.024 (0.55-0.65)	0.69 ± 0.022 (0.65-0.74)	F(2,10)=12 *p=0.0005
<b>α</b> (10 - 15)	0.62 ± 0.015 (0.59-0.66)	0.37 ± 0.031 (0.29-0.44)	0.58 ± 0.015 (0.54-0.62)	F(2,7)=47 *p<0.0001	0.63 ± 0.022 (0.58-0.68)	0.51 ± 0.024 (0.46-0.56)	0.60 ± 0.023 (0.55-0.65)	F(2,10)=9.8 *p=0.001
<b>β</b> (15 - 25)	0.54 ± 0.014 (0.51-0.57)	0.33 ± 0.024 (0.28-0.39)	0.50 ± 0.017 (0.46-0.54)	F(2,7)=42 *p<0.0001	0.53 ± 0.016 (0.49-0.56)	0.44 ± 0.019 (0.40-0.49)	0.52 ± 0.019 (0.48-0.56)	F(2,10)=15 *p=0.0001
<b>low γ</b> (25 - 55)	0.46 ± 0.015 (0.42-0.49)	0.31 ± 0.016 (0.27-0.35)	0.44 ± 0.016 (0.40-0.48)	F(2,7)=57 *p<0.0001	0.43 ± 0.014 (0.40-0.46)	0.33 ± 0.013 (0.30-0.36)	0.43 ± 0.018 (0.39-0.47)	F(2,10)=68 *p<0.0001
<b>medium γ</b> (85 - 125)	0.61 ± 0.023 (0.56-0.66)	0.32 ± 0.014 (0.29-0.35)	0.60 ± 0.038 (0.51-0.70)	F(2,7)=40 *p<0.0001	0.59 ± 0.018 (0.55-0.63)	0.38 ± 0.020 (0.33-0.42)	0.58 ± 0.037 (0.50-0.66)	F(2,10)=33 *p<0.0001
<b>high γ</b> (125 - 155)	0.64 ± 0.026 (0.58-0.70)	0.38 ± 0.026 (0.32-0.44)	0.65 ± 0.035 (0.56-0.73)	F(2,7)=28 *p=0.0001	0.65 ± 0.017 (0.62-0.69)	0.43 ± 0.029 (0.37-0.49)	0.63 ± 0.034 (0.56-0.71)	F(2,10)=35 *p<0.0001

Data are shown as mean ± standard error of the mean and 95% confidence interval in parenthesis. Asterisk indicates significant difference.

**Table 3:** Frontal-parietal directed connectivity before, during, and after propofol- and sevoflurane-induced unconsciousness

Frequency band (Hz)	Frontal-to-parietal				Parietal-to-frontal			
	Wake	Propofol	Recovery wake	F statistic p value	Wake	Propofol	Recovery wake	F statistic p value
<b>θ</b> (4 - 10)	0.037 ± 0.001 (0.035-0.040)	0.027 ± 0.003 (0.020-0.033)	0.045 ± 0.003 (0.038-0.052)	F(2,7)=21 *p<0.0001	0.060 ± 0.005 (0.047-0.072)	0.032 ± 0.004 (0.023-0.041)	0.060 ± 0.005 (0.049-0.071)	F(2,7)=13 *p=0.004
<b>low γ</b> (25 - 55 )	0.029 ± 0.002 (0.025-0.033)	0.020 ± 0.001 (0.017-0.023)	0.028 ± 0.003 (0.02-0.035)	F(2,7)=6.2 *p=0.03	0.025 ± 0.002 (0.020-0.030)	0.019 ± 0.001 (0.017-0.022)	0.025 ± 0.004 (0.017-0.034)	F(2,7)=2.3 p=0.2
<b>medium γ</b> (85 - 125)	0.041 ± 0.002 (0.036-0.046)	0.019 ± 0.002 (0.014-0.023)	0.042 ± 0.004 (0.034-0.05)	F(2,7)=23 *p=0.0005	0.040 ± 0.002 (0.035-0.046)	0.019 ± 0.002 (0.014-0.024)	0.041 ± 0.004 (0.032-0.050)	F(2,7)=15 *p<0.002
<b>high γ</b> (125 - 155)	0.055 ± 0.003 (0.048-0.062)	0.028 ± 0.004 (0.019-0.036)	0.053 ± 0.003 (0.047-0.060)	F(2,7)=28 *p<0.0001	0.053 ± 0.002 (0.047-0.058)	0.027 ± 0.003 (0.018-0.035)	0.053 ± 0.003 (0.046-0.059)	F(2,7)=28 *p=0.0003
Frequency band (Hz)	Wake	Sevoflurane	Recovery wake	F statistic p value	Wake	Sevoflurane	Recovery wake	F statistic p value
<b>θ</b> (4 - 10)	0.037 ± 0.002 (0.032-0.041)	0.036 ± 0.003 (0.029-0.043)	0.044 ± 0.003 (0.038-0.050)	F(2,10)=5.1 *p=0.02	0.057 ± 0.003 (0.051-0.063)	0.039 ± 0.003 (0.033-0.046)	0.061 ± 0.004 (0.052-0.069)	F(2,10)=21 *p<0.0001
<b>low γ</b> (25 - 55 )	0.025 ± 0.002 (0.021-0.028)	0.021 ± 0.002 (0.017-0.024)	0.024 ± 0.002 (0.021-0.028)	F(2,10)=10 *p=0.002	0.022 ± 0.002 (0.018-0.025)	0.021 ± 0.001 (0.018-0.024)	0.022 ± 0.002 (0.018-0.025)	F(2,10)=1.1 p=0.4
<b>medium γ</b> (85 - 125)	0.038 ± 0.002 (0.034-0.043)	0.026 ± 0.001 (0.023-0.029)	0.038 ± 0.004 (0.031-0.046)	F(2,10)=14 *p=0.0009	0.038 ± 0.002 (0.033-0.043)	0.024 ± 0.001 (0.022-0.026)	0.038 ± 0.004 (0.029-0.047)	F(2,10)=13 *p=0.001
<b>high γ</b> (125 - 155)	0.055 ± 0.002 (0.051-0.059)	0.036 ± 0.002 (0.032-0.040)	0.054 ± 0.003 (0.047-0.061)	F(2,10)=31 *p<0.0001	0.053 ± 0.002 (0.049-0.057)	0.035 ± 0.002 (0.031-0.039)	0.052 ± 0.003 (0.045-0.059)	F(2,10)=31 *p<0.0001

Data are shown as mean ± standard error of the mean and 95% confidence interval in parenthesis. Asterisk indicates significant difference.

**Table 4:** Corticocortical coherence during sleep-wake states

Frequency band (Hz)	Wake	Slow wave sleep	Rapid eye movement sleep	F statistic p value
<b><math>\delta</math></b> (0.5 – 4)	0.84 $\pm$ 0.001 (0.82-0.86)	0.66 $\pm$ 0.01 (0.63-0.69)	0.64 $\pm$ 0.02 (0.60-0.68)	F(2,6)=262 *p<0.0001
<b><math>\theta</math></b> (4 – 10)	0.72 $\pm$ 0.02 (0.68-0.76)	0.57 $\pm$ 0.007 (0.55-0.58)	0.70 $\pm$ 0.007 (0.68-0.71)	F(2,6)=95 *p<0.0001
<b><math>\alpha</math></b> (10 - 15 )	0.59 $\pm$ 0.02 (0.55-0.63)	0.51 $\pm$ 0.008 (0.49-0.53)	0.58 $\pm$ 0.007 (0.56-0.59)	F(2,6)=22 *p=0.002
<b><math>\beta</math></b> (15 – 25)	0.51 $\pm$ 0.01 (0.48-0.55)	0.48 $\pm$ 0.008 (0.46-0.50)	0.45 $\pm$ 0.007 (0.43-0.47)	F(2,6)=20 *p=0.003
<b>low <math>\gamma</math></b> (25 - 55 )	0.48 $\pm$ 0.01 (0.45-0.50)	0.45 $\pm$ 0.005 (0.44-0.46)	0.39 $\pm$ 0.007 (0.37-0.40)	F(2,6)=40 *p<0.0001
<b>medium <math>\gamma</math></b> (85 - 125)	0.62 $\pm$ 0.02 (0.58-0.66)	0.43 $\pm$ 0.01 (0.39-0.46)	0.36 $\pm$ 0.01 (0.33-0.39)	F(2,6)=119 *p<0.0001
<b>high <math>\gamma</math></b> (125 - 155)	0.66 $\pm$ 0.02 (0.61-0.71)	0.43 $\pm$ 0.01 (0.39-0.46)	0.39 $\pm$ 0.02 (0.35-0.43)	F(2,6)=136 *p<0.0001

Data are shown as mean  $\pm$  standard error of the mean and 95% confidence

interval in parenthesis. Asterisk indicates significant difference.

**Table 5:** Frontal-parietal directed connectivity during sleep-wake states

Frequency band (Hz)	Frontal-to-parietal				Parietal-to-frontal			
	Wake	Slow wave sleep	Rapid eye movement sleep	F statistic p value	Wake	Slow wave sleep	Rapid eye movement sleep	F statistic p value
<b><math>\theta</math></b> (4 - 10)	0.047 ± 0.002 (0.043-0.052)	0.027 ± 0.001 (0.024-0.030)	0.12 ± 0.013 (0.091-0.16)	F(2,6)=45 *p=0.0004	0.066 ± 0.003 (0.058-0.074)	0.031 ± 0.001 (0.028-0.033)	0.13 ± 0.013 (0.096-0.16)	F(2,6)=43 *p=0.0003
<b>low <math>\gamma</math></b> (25 - 55)	0.026 ± 0.003 (0.020-0.032)	0.021 ± 0.001 (0.017-0.024)	0.015 ± 0.0002 (0.014-0.015)	F(2,6)=13 *p=0.0038	0.022 ± 0.002 (0.018-0.026)	0.017 ± 0.0007 (0.015-0.018)	0.015 ± 0.0002 (0.014-0.015)	F(2,6)=15 *p=0.004
<b>medium <math>\gamma</math></b> (85 - 125)	0.033 ± 0.002 (0.028-0.038)	0.024 ± 0.001 (0.021-0.027)	0.019 ± 0.0007 (0.018-0.021)	F(2,6)=40 *p=0.0002	0.033 ± 0.002 (0.028-0.039)	0.022 ± 0.001 (0.019-0.025)	0.018 ± 0.0005 (0.017-0.019)	F(2,6)=49 *p=0.0001
<b>high <math>\gamma</math></b> (125 - 155)	0.041 ± 0.002 (0.035-0.047)	0.028 ± 0.001 (0.026-0.030)	0.025 ± 0.001 (0.022-0.028)	F(2,6)=56 *p<0.0001	0.042 ± 0.002 (0.037-0.048)	0.027 ± 0.001 (0.024-0.029)	0.024 ± 0.001 (0.022-0.027)	F(2,6)=81 *p<0.0001

Data are shown as mean ± standard error of the mean and 95% confidence interval in parenthesis. Asterisk indicates significant difference.