Monoamine Release During Unihemispheric Sleep and Unihemispheric Waking in the Fur Seal

Running Title: Neurochemistry of Unihemispheric Sleep

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SUPPLEMENTAL MATERIAL

Table S1

Location/ transmitter, parameter	BSWS	USWS Left hemisphere	USWS Right hemisphere
Cortex, HI			
AI	-0.06± 0.03	+0.64± 0.02	-0.56±0.05
SWA L vs R, t-test (t, P)	t_8=0.313, P=0.762	T_6=3.937, P= 0.015	T_6=2.674, P=0.037
Cortex, NE			
AI	-0.04±0.10	+0.51±0.19	-0.52±0.16
SWA L vs R, t-test (t, P)	t_8=1.402, P=0.669	T_8=4.210, P=0.003	T_8=4.688, P=0.002
Hypothalamus, 5HT[a]			
AI	+0.07±0.03	+0.44±0.05	-//-
SWA L vs R, t-test (t, P)	t_{31}=0.162, P=0.872	t_8=4.587, P=0.002	
Thalamus, 5HT[b]			
AI	+0.06±0.12	+0.51±0.05	-0.65±0.04
SWA L vs R, t-test (t, P)	t_{30}=0.088, P = 0.930	t_{14} = 3.652, P=0.003	t_{14}=6.803, P<0.001
Thalamus, 5HT[c]			
AI	-//-	+0.70±0.03	-0.70±0.09
SWA L vs R, t-test (t, P)		t_6=2.400, P=0.045	t_{12}=7.887, P<0.001
Caudate nucleus, 5HT			
AI	+0.01±0.03	+0.51±0.03	-0.50±0.04
SWA L vs R, t-test (t, P)	t_{36}=-0.932, P = 0.362	t_{22}=4.966, P<0.001	t_{20}=4.134, P<0.001

Table S1. Characteristics of episodes of bilateral symmetrical slow wave sleep (BSWS) and unihemispheric sleep (USWS) used to measure release of histamine (HI), norepinephrine (NE) and serotonin (5HT) in cortical and subcortical locations in fur seals.

The table includes mean asymmetry indexes (AI, see Materials and Methods) and results of comparison of EEG slow wave activity (SWA, power in the range 1.2-4.0 Hz) between left (L) and right (R) hemispheres (SWA L vs R) during episodes of BSWS and USWS (t-test, P and t values and degrees of freedom). The localizations of the probes are shown in Figure 2.

[a] During the 2 epochs of right USWS, SWA in the right hemisphere was twice that in the left hemisphere. No samples collected during right USWS for this location. [b] Left and right thalamic probes 1 (l-Th1 and r-Th1). [c] Left thalamic probe 2 (l-Th2). No BSWS samples were collected for this location.

Figure S1

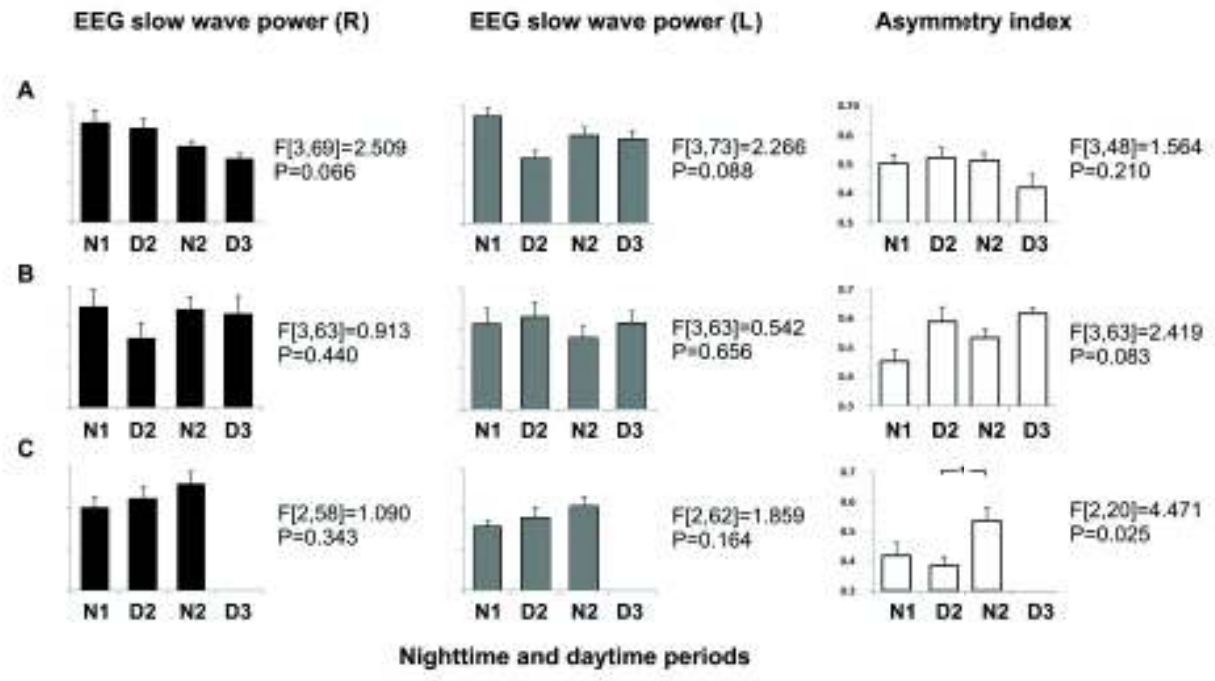

Figure S1. Parameters of sleep in fur seals during microdialysis experiments. (**A**), (**B**) and (**C**) Three different experiments in different seals which lasted 46, 49 and 40h, respectively. EEG slow wave power (SWA, power in the range 1.2-4.0 Hz) was calculated separately for the right and left hemisphere (**A,B**, - R and L, respectively) and averaged for 10-min epochs (duration of one microdialysis sample collection). The power is expressed in relative units (proportional to mkv^2). The average absolute asymmetry index (AI) was calculated for the 10-min epochs scored as left or right unihemispheric slow wave sleep (USWS) based on the following criteria: right USWS - AI <-0.3, left USWS - AI>+0.3 (see Materials and Methods). That is the absolute AI is a measure of expression of EEG asymmetry (right and left USWS). All values are presented for 12-h nighttime (2000-0800, N1 and N2) and daytime (0800-2000, D2 and D3) periods. N1 started on the day of experiment after a short (usually about 1-h) isoflurane anesthesia (see Materials and Methods) undertaken to facilitate probe insertions (finished at 1200-1300), a 4-h

stabilization period (finished at 1600-1700) and feeding the seals (between 1800 and 1830). In two seals (**A,B**) the data presented for N1,D2,N2 and D3 periods and in one seals (**C**) for N1,D2 and N2. The results of ANOVA tests (effect of the 12-h period) are shown on the diagrams. * P <0.05 for Tukey's post hoc comparison tests. As revealed by ANOVA a brief isoflurane anesthesia on the day of experiment did not cause any significant effect on parameters of SWS and EEG asymmetry in fur seals (comparison the first and second post anesthesia nights). Additional test also revealed a significant difference between the AI during the nighttime and daytime USWS in only one **(C)** out of 3 randomly selected experiments. This data suggest that expression of EEG asymmetry during SWS in fur seals is comparable during the daytime and nighttime periods.

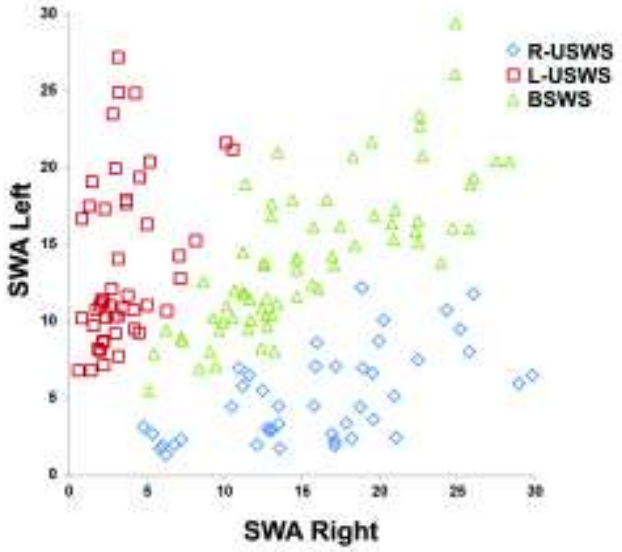

Figure S2. Slow wave activity (SWA, EEG power in the range of 0.8-4.0 Hz) in the left and right hemispheres during bilateral and unihemispheric slow wave sleep in the fur seal. BSWS – bilateral slow wave sleep, L-USWS – left unihemispheric slow wave sleep and R-USWS – right unihemispheric slow wave sleep. Right – right SWA, Left – left SWA. Positions of the markers correspond to average SWA values in the left and right hemispheres during BSWS, L-USWS and R-USWS. These 10-min epochs were used to analyze correlation between SWA in the two cortical hemispheres and cortical monoamine (HI,NE and $5HT^{11}$) release shown in Figure 8 (a total of 138 epochs in 10 experiments in 10 fur seals). During USWS when SWA progressed in the sleeping hemisphere, SWA also slowly progressed in the waking hemisphere.