Supplemental Figure Legends

Figure 1. Short-term memory is specific for the seaweed used during training. A) To determine whether short-term LFI represented specific associative memory, animals were trained with laver seaweed and then tested for STM thirty minutes after training with either laver seaweed or an alternate seaweed kombu. Animals trained and tested with laver seaweed displayed robust STM with responses times during testing significantly lower than training times. In contrast, animals tested with the alternate seaweed exhibited no memory with responses comparable to training times (Animals trained and tested with laver n = 4, animals trained with laver and tested with kombu n = 4; ANOVA $F_{(3, 15)} = 24.44$, ANOVA $p < 0.001$; Bonferroni’s MCT $p < 0.001$ for laver-laver) B) Animals were trained with kombu seaweed and then tested with either kombu or laver thirty minutes after training. Training response times with kombu were similar to previously observed for laver seaweed. Animals trained and tested with kombu demonstrated significant STM, while animals tested with laver seaweed displayed no memory (Animals trained and tested with kombu n = 4, animals trained with kombu and tested with laver n = 5; ANOVA $F_{(3, 17)} = 14.73$, $p < 0.001$; Bonferroni’s MCT $p < 0.01$ for kombu-kombu). Short-term LFI memory represents specific associative memory for the seaweed used during training.

Figure 2. Injection of PKA and PKC inhibitors did not affect the responses of animals during training. Training response times for animals were pooled between experiments for which each inhibitor was injected 30 minutes before training. A) No significant differences were seen in the total response times during training for animals injected with vehicle, H89 or Rp-cAMPS (ANOVA $F_{(3, 76)} = 1.96$, $p = 0.13$). B) No significant differences were observed for the total length of time the seaweed was retained in the mouth during training for animals injected with vehicle, H89 or Rp-cAMPS (ANOVA $F_{(3, 76)} = 1.66$, $p = 0.18$). C) No significant differences were seen in the total response times during training for animals injected with vehicles, chelerythrine or Bis (ANOVA $F_{(3, 94)} = 0.92$, $p = 0.43$). D) No significant differences were
observed for the total length of time the seaweed was retained in the mouth during training for animals injected with vehicles, chelerythrine or Bis (ANOVA $F_{(3,94)} = 1.00, p = 0.40$).

**Figure 3. Prolonged PKA activity is necessary for long-term but not short-term memory as measured by total time the seaweed was retained in the mouth.** The time that the seaweed was retained in the mouth represents a second parameter measured during testing of animals. Data presented in this figure corresponds to the data presented in Figure 1 of the paper. A) Inhibition of PKA with 300nM H89 thirty minutes before training prevented LTM. Vehicle injected animals displayed significantly decreased response times (control n=14, H89 n=15; $F_{(3,57)} = 6.29, p < 0.01$). Means and SEM are plotted. B) Rp-cAMPS injected before training blocked LTM (control n=5, Rp-cAMPS n = 6; $F_{(3, 21)} = 4.451; p < 0.05$) C). Prolonged PKA is required for LTM. H89 injected 5 min after training inhibited LTM, while vehicle injected animals exhibited significant LTM (control n=9, H89 n= 8; $F_{(3,33)} = 5.070, p < 0.01$). D) H89 had no effect on STM formation as both control and drug-treated animals demonstrated significant STM (control n=14, H89 n=12; $F_{(3,51)} = 25.78, p < 0.001$). E) Injection of 10µM Rp-cAMPS did not block STM (control n=5, Rp-cAMPS n= 6; $F_{(3,21)} =14.39, p < 0.001$) Data analysis was performed using ANOVA followed by Bonferroni’s multiple comparison test (MCT). Asterisks denote significant differences with $p < 0.05$ for the testing versus training groups. White bars represent mean response times for vehicle treated animals, while grey bars signify mean response times for drug treated animals.

**Figure 4. PKC is required for the induction of LTM but not STM as measured by total time the seaweed was retained in the mouth.** Data presented in this figure corresponds to the data presented in Figure 2 of the paper. A) Inhibition of PKC before training with chelerythrine inhibited LTM. Vehicle injected animals exhibited robust memory with significantly decreased response times (control n=15, chelerythrine n=15; $F_{(3,59)} = 20.44; p < 0.001$). B) Bisindolylmaleimide I (control n=14, bis n =13; $F_{(3,53)} = 3.48; p < 0.01$) treatment before training also blocked LTM. C) Inhibition of PKC with chelerythrine after training had no effect on LTM (control n=9, chelerythrine n = 8; $F_{(3,33)} = 10.04, p < 0.001$). D) The PKC inhibitor chelerythrine
had no effect on STM formation as treated animals displayed robust STM comparable to controls (control n=13, chelerythrine n = 10; F(3,45) = 30.98, p < 0.001). E) Bisindolylmaleimide I failed to inhibit STM formation (control n= 7, bis n=8; F(3,29) =23.81; p < 0.001) Data analysis was performed using ANOVA followed by Bonferroni’s MCT. Asterisks denote significant differences with p < 0.05 for the testing versus training groups.

**Figure 5. PKA and PKC are not required for the recall of memory as assessed by total time the seaweed was retained in the mouth.** Data presented in this figure corresponds to the data presented in Figure 3 of the paper. A) Animals were injected with either vehicle (ASW), H89 or chelerythrine immediately after training and then tested for short-term memory 30 min later. Neither the inhibitor for PKA nor the inhibitor of PKC blocked the expression or retrieval of short-term memory with all groups exhibiting comparable significant STM (n=6 for each group; F(5,35) = 14.23; p < 0.001). B) Animals were trained and 24 hours later injected with either vehicle (ASW), H89 or chelerythrine 30 min prior to testing. Neither the inhibitor for PKA nor the inhibitor of PKC blocked the recall of long-term memory with all groups exhibiting comparable significant LTM (n = 9,8,9 respectively; F(5,51) = 26.49; p < 0.001). Data analysis was performed using ANOVA followed by Bonferroni’s MCT. Asterisks denote significant differences with p < 0.05 for the testing versus training groups.
Supplemental Figure 2

A. Che vehicle 10µM and vehicle 300nM
B. Bis vehicle 10µM and H89 Rp
C. Hv9 vehicle 300nM and vehicle 10µM
D. Bis Che vehicle 300nM and vehicle 10µM
PKA/PKC paper Supplemental Figure 5

A  STM  

![Bar graph showing STM time in minutes for different conditions.](image)

B  LTM  

![Bar graph showing LTM time in minutes for different conditions.](image)