

Table S1. Statistical analysis and sex comparisons

Figure	Group	N_total	Male mice	Female mice	Mean_total	Mean_males	Mean_females	P values	F and DF	Statistical notes
1C	PDE4D3-Cat	15 mice	12 males	3 females	50.8 g at Week 4	52.6 g	43.4 g	p < 0.0001	DF = 22	Two-tailed, unpaired t-test using Week 4 data
	mCherry	9 mice	6 males	3 females	26.6 g at Week 4	30.1 g	19.6 g			
1D	Lean mCherry	7 mice	5 males	2 females	22.7 g	24.1 g	19.1 g	Lean: p < 0.0001 Fat: p < 0.0001	F = 116.3 DF = 3	Two-tailed, unpaired one-way ANOVA with sidak post hoc test between PDE4D3-Cat and mCherry
	Lean PDE4D3-Cat	6 mice	3 males	3 females	29.5 g	29.9 g	29.1 g			
	Fat mCherry	7 mice	5 males	2 females	6.3 g	6.7 g	5.1 g			
	Fat PDE4D3-Cat	6 mice	3 males	3 females	18.1 g	17.1 g	18.9 g			
1E	mCherry Week 1	8 mice	5 males	3 females	3.96 g	4.07 g	3.84 g	Week 1: p = 0.0006 Week 2: p < 0.0001 Week 3: p < 0.0001 Week 4: p = 0.0021	F = 14.2 DF = 7	Two-tailed, unpaired one-way ANOVA with sidak post hoc test between PDE4D3-Cat and mCherry
	PDE4D3-Cat Week 1	6 mice	3 males	3 females	5.79 g	6.01 g	5.42 g			
	mCherry Week 2	8 mice	5 males	3 females	4.08 g	4.2 g	3.96 g			
	PDE4D3-Cat Week 2	6 mice	3 males	3 females	6.56 g	6.72 g	6.29 g			
1F	mCherry Week 3	8 mice	5 males	3 females	3.95 g	4.24 g	3.66 g	p = 0.02	DF = 11	Two-tailed, unpaired t-test using 24 hr data
	PDE4D3-Cat Week 3	6 mice	3 males	3 females	6.54 g	6.98 g	5.8 g			
	mCherry Week 4	8 mice	5 males	3 females	4.24 g	4.11 g	4.36 g			
	PDE4D3-Cat Week 4	6 mice	3 males	3 females	5.88 g	5.71 g	6.18 g			
1G	PDE4D3-Cat	6 mice	3 males	3 females	9.72 kCal at 24 hrs	10.11 kCal	9.31 kCal	p = 0.002	DF = 11	Two-tailed, unpaired t-test using 24 hr data
	mCherry	7 mice	5 males	2 females	4.36 kCal at 24 hrs	4.76 kCal	3.36 kCal			
1H	PDE4D3-Cat	6 mice	3 males	3 females	24.35 kCal at 24 hrs	24.89 kCal	23.81 kCal	p < 0.0001	DF = 11	Two-tailed, unpaired t-test using 24 hr data
	mCherry	7 mice	5 males	2 females	15.59 kCal at 24 hrs	16.29 kCal	13.82 kCal			
1I	PDE4D3-Cat	6 mice	3 males	3 females	14.63 kCal at 24 hrs	14.77 kCal	14.48 kCal	p < 0.0001 from the no-correlation null hypothesis	NA	Pearson correlation
	mCherry	7 mice	5 males	2 females	11.23 kCal at 24 hrs	11.53 kCal	10.46 kCal			
1J	PDE4D3-Cat	6 mice	3 males	3 females	549 cells	585 cells	513 cells	p = 0.843	DF = 11	Two-tailed, unpaired t-test
	mCherry	7 mice	5 males	2 females	568 cells	565 cells	574 cells			
2C	Example session	-	-	-	-	-	-	NA	NA	
2D	All sessions	3407 trials	2 males	2 females	-	-	-	NA	NA	
2E	Fasted state	1571 trials	-	-	-	-	-	NA	NA	
	Fed state	1836 trials	2 males	2 females	-	-	-			
2F	Combined no-stim.	3176 trials	-	-	-	-	-	NA	NA	
	Fasted state	1571 trials	2 males	2 females	-	-	-			
2H	Fed state	1836 trials	-	-	-	-	-	NA	NA	
	Fasted state	1571 trials	2 males	2 females	-	-	-			
2I	Fed state	211 hits	2 males	2 females	-	-	-	NA	NA	
	Fed state	304 hits	-	-	-	-	-			
2J	Fasted state	10 FOVs	2 males	2 females	0.07	-	-	p = 0.0005	DF = 9	Two-tailed, paired t-test.
	Fed state	10 FOVs	-	-	0.12	-	-			
2K	Fasted state	10 FOVs	2 males	2 females	0.17	-	-	p < 0.0001	DF = 9	Two-tailed, paired t-test.
	Fed state	10 FOVs	-	-	1	-	-			
2M	ACSF	931 trials	1 male	1 female	-	-	-	NA	NA	
	SHU9119	1757 trials	-	-	-	-	-	NA	NA	
2N	ACSF	130 hits	1 male	1 female	-	-	-	NA	NA	
	SHU9119	88 hits	-	-	-	-	-	NA	NA	
3C	Example session	-	-	-	-	-	-	NA	NA	
3D	All sessions	2283 trials	2 males	2 females	-	-	-	NA	NA	
3E	Fasted state	1190 trials	-	-	-	-	-	NA	NA	
	Fed state	1093 trials	2 males	2 females	-	-	-			
3F	Combined no-stim.	1928 trials	-	-	-	-	-	NA	NA	
	Fasted state	1190 trials	2 males	2 females	-	-	-			
3G	Fed state	1093 trials	-	-	-	-	-	NA	NA	
	Fasted state	355 hits	2 males	2 females	-	-	-			
3H	Fed state	262 hits	-	-	-	-	-	p < 0.0001	DF = 12	Two-tailed, paired t-test.
	Fasted state	13 FOVs	2 males	2 females	-0.165	-	-			
3I	Fed state	13 FOVs	-	-	-0.113	-	-	p < 0.0001	DF = 12	Two-tailed, paired t-test.
	Fasted state	13 FOVs	2 males	2 females	1.064	-	-			
3J	Fed state	13 FOVs	-	-	0.327	-	-	NA	NA	
	ACSF	680 trials	1 male	1 female	-	-	-			
3K	BIBP3226 + CGP71683	909 trials	-	-	-	-	-	NA	NA	
	ACSF	144 hits	1 male	1 female	-	-	-			
4B	BIBP3226 + CGP71683	55 hits	-	-	-	-	-	NA	NA	
	NPY wash on	10 slices	1 male	3 females	-	-	-			
4C	2s stim.	18864 trials	-	-	-	-	-	NA	NA	
	4s stim.	16439 trials	4 males	3 females	-	-	-			
	8s stim.	19969 trials	-	-	-	-	-			
	16s stim.	17379 trials	-	-	-	-	-			
4D	2s stim.	18864 trials	-	-	0.14	-	-	NA	NA	
	4s stim.	16439 trials	4 males	3 females	0.169	-	-			
	8s stim.	19969 trials	-	-	0.187	-	-			
	16s stim.	17379 trials	-	-	0.207	-	-			
4E	2s stim.	18864 trials	-	-	-	-	-	NA	NA	
	4s stim.	16439 trials	4 males	3 females	-	-	-			
	8s stim.	19969 trials	-	-	-	-	-			
	16s stim.	17379 trials	-	-	-	-	-			
4F	2s stim.	2632 hits	-	-	-	-	-	NA	NA	
	4s stim.	2782 hits	4 males	3 females	-	-	-			
	8s stim.	3736 hits	-	-	-	-	-			
	16s stim.	3595 hits	-	-	-	-	-			
4H	Fasted state	6048 trials	-	-	-	-	-	NA	NA	
	Fed state	8053 trials	2 males	2 females	-	-	-			
	Combined no-stim.	9371 trials	-	-	-	-	-			
	Fasted state	280 hits	-	-	-	-	-			
4I	Fed state	255 hits	2 males	2 females	-	-	-	NA	NA	
	Combined misses	13566 misses	-	-	-	-	-			
	Fasted hits	146 hits	-	-	-	-	-			
	Fasted misses	2233 misses	-	-	-	-	-			
4J	Fasted trials	2379 trials	2 males	2 females	-	-	-	NA	NA	Hits/misses from classification of paired soma trials.
	Fed hits	191 hits	-	-	-	-	-			
	Fed misses	2947 misses	-	-	-	-	-			
	Fed trials	3138 trials	-	-	-	-	-			
4K	Fasted state	4356 trials	-	-	-	-	-	NA	NA	
	Fed state	4998 trials	2 males	2 females	-	-	-			
	Combined no-stim.	5122 trials	-	-	-	-	-			
	Fasted state	455 hits	-	-	-	-	-			
4L	Fed state	592 hits	2 males	2 females	-	-	-	NA	NA	
	Combined misses	8307 misses	-	-	-	-	-			
	Fasted hits	188 hits	-	-	-	-	-			
	Fasted misses	1162 misses	-	-	-	-	-			
4M	Fasted trials	1350 trials	2 males	2 females	-	-	-	NA	NA	Hits/misses from classification of paired soma trials.
	Fed hits	271 hits	-	-	-	-	-			
	Fed misses	1092 misses	-	-	-	-	-			
	Fed trials	1363 trials	-	-	-	-	-			
4N	npvLight	72651 trials	4 males	3 females	-	-	-	NA	NA	
	AgRP stim. (soma)	2283 trials	-	-	-	-	-			
	POMC stim. (soma)	3407 trials	2 males	2 females	-	-	-			
	Saline	114 hits	-	-	-	-	-			
5C left	MTII	95 hits	2 males	1 female	-	-	-	NA	NA	
	Saline	6 FOVs	-	-	-	-	-			
5C middle	MTII	6 FOVs	2 males	1 female	-0.166	-	-	p = 0.0013	DF = 5	Two-tailed, paired t-test.
	Saline	6 FOVs	-	-	-0.092	-	-			
5C right	MTII	6 FOVs	2 males	1 female	1.28	-	-	p = 0.0007	DF = 5	Two-tailed, paired t-test.
	Saline	6 FOVs	-	-	0.76	-	-			
5E left	ACSF	97 hits	1 male	1 female	-	-	-	NA	NA	
	αMSH	92 hits	-	-	-	-	-			
5E middle	ACSF	6 FOVs	1 male	1 female	-0.158	-	-	p = 0.0005	DF = 5	Two-tailed, paired t-test.
	αMSH	6 FOVs	-	-	-0.035	-	-			
5E right	ACSF	6 FOVs	1 male	1 female	1.06	-	-	p = 0.0004	DF = 5	Two-tailed, paired t-test.
	αMSH	6 FOVs	-	-	0.18	-	-			

Figure	Group	N_total	Male mice	Female mice	Mean_total	Mean_males	Mean_females	P values	F and DF	Statistical notes
5G left	ACSF	235 hits	1 male	1 female	-	-	-	NA	NA	
	NPY	173 hits	-	-	-	-	-			
5G middle	ACSF	6 FOVs	1 male	1 female	0.103	-	-	p = 0.026	DF = 5	Two-tailed, paired t-test.
	NPY	6 FOVs	-	-	0.047	-	-			
5G right	ACSF	6 FOVs	1 male	1 female	0.87	-	-	p = 0.0005	DF = 5	Two-tailed, paired t-test.
	NPY	6 FOVs	-	-	0.15	-	-			
6B	Fasted state	6 mice	3 males	3 females	-	-	-	NA	NA	
	Fed state	6 mice	-	-	-	-	-			
6C	Fasted state	11 FOVs	3 males	3 females	-	-	-	NA	NA	
	Fed state	7 FOVs	-	-	-	-	-			
6D	Fasted state	561 trials	3 males	3 females	-	-	-	NA	NA	
	Fed state	646 trials	-	-	-	-	-			
6E	Fasted state	1542 trials	3 males	3 females	-	-	-	NA	NA	
	Fed state	1759 trials	-	-	-	-	-			
6F	Fasted state (hits)	359 hits	3 males	3 females	-	-	-	NA	NA	
	Fasted state (misses)	1744 misses	-	-	-	-	-			
	Fasted state (trials)	2103 trials	-	-	-	-	-			
	Fasted state (hits)	290 hits	-	-	-	-	-			
6G	Fasted state (misses)	2115 misses	3 males	3 females	-	-	-	NA	NA	
	Fasted state (trials)	2405 trials	-	-	-	-	-			
	Saline + No opto. (A)	17 mice	9 males	8 females	0.77 g at 3 hrs	0.9 g	0.63 g	p < 0.0001 (A - B)		
	CNO only (B)	17 mice	9 males	8 females	0.4 g at 3 hrs	0.42 g	0.38 g	p = 0.0004 (A - C)		
6H	Opto. Only (C)	11 mice	6 males	5 females	0.42 g at 3 hrs	0.45 g	0.39 g	p < 0.0001 (A - D)	F = 22.4	Two-tailed, unpaired one-way ANOVA with sidak post hoc
	Saline + Opto. (D)	17 mice	9 males	8 females	0.18 g at 3 hrs	0.21 g	0.16 g	p = 0.998 (B - C)	DF = 3	test between pairs of data points at 3 hrs
								p = 0.018 (B - D)		
								p = 0.032 (C - D)		
6I	No light	8 mice	4 males	4 females	-	-	-	NA	NA	
	Light	8 mice	-	-	-	-	-			
6K	Control session	8 mice	4 males	4 females	1.72 licks/s at the end	1.88 licks/s	1.56 licks/s	p < 0.0001	DF = 7	Two-tailed, paired t-test with data after 10 min wait (10 trials)
	Expt. Session	8 mice	-	-	0.29 licks/s at the end	0.33 licks/s	0.25 licks/s			
6L left	Control session	8 mice	4 males	4 females	2.46 licks/s	2.67 licks/s	2.24 licks/s	p = 0.0037 (control - no stim.)	F = 19.3	Two-tailed, unpaired one-way ANOVA with sidak post hoc
	Expt. (no stim.)	8 mice	-	-	1.41 licks/s	1.71 licks/s	1.10 licks/s	p = 0.0065 (control - stim.)	DF = 2	test
	Expt. (stim.)	8 mice	-	-	1.28 licks/s	1.38 licks/s	1.18 licks/s	p = 0.646 (no stim. - stim.)		
6L right	Control session	8 mice	4 males	4 females	3.03 licks/s	3.23 licks/s	2.84 licks/s	p = 0.0002 (control - no stim.)	F = 53.3	Two-tailed, unpaired one-way ANOVA with sidak post hoc
	Expt. (no stim.)	8 mice	-	-	2.18 licks/s	2.49 licks/s	1.85 licks/s	p < 0.0001 (control - stim.)	DF = 2	test
	Expt. (stim.)	8 mice	-	-	2.02 licks/s	2.38 licks/s	1.65 licks/s	p = 0.389 (no stim. - stim.)		
6M	Expt. Session	8 mice	4 males	4 females	-	-	-	NA	NA	
	RCaMP1a (no stim.)	8 mice	4 males	4 females	-	-	-			
7A	RCaMP1a (biPAC stim.)	8 mice	4 males	4 females	-	-	-	NA	NA	
	GCaMP6s (PDE4D3-Cat)	8 mice	4 males	4 females	-	-	-			
7B	RCaMP1a (no stim.)	8 mice	4 males	4 females	-	-	-	NA	NA	
	RCaMP1a (biPAC stim.)	8 mice	4 males	4 females	-	-	-			
	GCaMP6s (PDE4D3-Cat)	8 mice	4 males	4 females	-	-	-			
7C	Example cell	-	-	-	-	-	-	NA	NA	
7D	All cells	16 cells	3 mice	-	-	-	-	NA	NA	
7H	mCherry	19 cells	4 mice	-	3.33 Hz	-	-	p < 0.0001	DF = 40	Two-tailed, unpaired t-test
	PDE4D3-Cat	23 cells	4 mice	-	0.28 Hz	-	-			
7I	mCherry	7 cells	4 mice	-	6.93 Hz	-	-	p = 0.0001	DF = 11	Two-tailed, unpaired t-test
	PDE4D3-Cat	6 cells	4 mice	-	1.69 Hz	-	-			
7J	mCherry	7 cells	4 mice	-	24.2 pA	-	-	p = 0.0116	DF = 11	Two-tailed, unpaired t-test
	PDE4D3-Cat	6 cells	4 mice	-	15.2 pA	-	-			
S1A	PDE4D3-Cat	15 mice	12 males	3 females	178% at Week 4	177%	182%	p < 0.0001	DF = 22	Two-tailed, unpaired t-test using Week 4 data
	mCherry	9 mice	6 males	3 females	104% at Week 4	107%	98%			
S1B	Lean mCherry	7 mice	5 males	2 females	0.76	0.76	0.76	Lean: p < 0.0001	F = 264	Two-tailed, unpaired one-way ANOVA with sidak post hoc
	Lean PDE4D3-Cat	6 mice	3 males	3 females	0.6	0.61	0.59	Fat: p < 0.0001	DF = 3	test between PDE4D3-Cat and mCherry
	Fat mCherry	7 mice	5 males	2 females	0.2	0.21	0.2			
	Fat PDE4D3-Cat	6 mice	3 males	3 females	0.37	0.35	0.39			
S1C	PDE4D3-Cat	8 mice	5 males	3 females	1.03 cm at Week 4	1.3 cm	0.86 cm	p = 0.0325	DF = 13	Two-tailed, unpaired t-test using Week 4 data
	mCherry	7 mice	5 males	2 females	0.7 cm at Week 4	0.78 cm	0.5 cm			
S1D	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1E	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1F	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1G	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1H	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1I	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1J	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	NA	NA	NA
	mCherry	7 mice	5 males	2 females	-	-	-			
S1K	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	p = 0.0006 from the no-correlation null hypothesis	NA	Pearson correlation
	mCherry	7 mice	5 males	2 females	-	-	-			
S1L	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	p < 0.0001 from the no-correlation null hypothesis	NA	Pearson correlation
	mCherry	7 mice	5 males	2 females	-	-	-			
S1M	PDE4D3-Cat	6 mice	3 males	3 females	-	-	-	p = 0.0062 from the no-correlation null hypothesis	NA	Pearson correlation
	mCherry	7 mice	5 males	2 females	-	-	-			
S2A	Fasted state	1571 trials	2 males	2 females	0.134	-	-	p < 0.0001 (fasted - no stim.)	NA	Two-tailed mean comparison of bootstrapped hit rates, with Bonferroni correction.
	Fed state	1836 trials	-	-	0.166	-	-	p < 0.0001 (fed - no stim.)		
	Combined no-stim.	3176 trials	-	-	0.003	-	-	p = 0.22 (fasted - fed)		
S2B	Fasted state	211 hits	2 males	2 females	-	-	-	NA	NA	
	Fed state	304 hits	-	-	-	-	-			
S2E	ACSF	3 mice	1 male	2 females	-	-	-	NA	NA	
S2F	αMSH	3 mice	1 male	2 females	-	-	-	NA	NA	
S2G	ACSF	11 FOVs	1 male	2 females	3 ps	-	-	p = 0.654 (ACSF)	F = 10.4	Two-tailed, paired one-way ANOVA with sidak post hoc test
	αMSH	11 FOVs	-	-	17 ps	-	-	p = 0.002 (αMSH)	DF = 3	between -3-0 min and 9-12 min means.
S2H	ACSF	931 trials	1 male	1 female	-	-	-	p < 0.0001	NA	Two-tailed mean comparison of bootstrapped hit rates.
	SHU9119	1757 trials	-	-	-	-	-			
S2I	ACSF	130 hits	1 male	1 female	-	-	-	NA	NA	
	SHU9119	88 hits	-	-	-	-	-			
S2J	ACSF	6 FOVs	1 male	1 female	0.113	-	-	p = 0.002	DF = 5	Two-tailed, paired t-test.
	SHU9119	6 FOVs	-	-	0.067	-	-			
S2K	ACSF	6 FOVs	1 male	1 female	0.98	-	-	p = 0.977	DF = 5	Two-tailed, paired t-test.
	SHU9119	6 FOVs	-	-	0.99	-	-			
S3A	Fasted state	1190 trials	2 males	2 females	0.298	-	-	p < 0.0001 (fasted - no stim.)	NA	Two-tailed mean comparison of bootstrapped hit rates, with Bonferroni correction.
	Fed state	1093 trials	-	-	0.24	-	-	p < 0.0001 (fed - no stim.)		
	Combined no-stim.	1928 trials	-	-	0	-	-	p = 0.17 (fasted - fed)		
S3B	Fasted state	355 hits	2 males	2 females	-	-	-	NA	NA	
	Fed state	262 hits	-	-	-	-	-			
S3E	ACSF	3 mice	1 male	2 females	-	-	-	NA	NA	
S3F	ACSF	11 FOVs	1 male	2 females	5 ps	-	-	p = 0.351 (ACSF)	F = 24.7	Two-tailed, paired one-way ANOVA with sidak post hoc test
	αMSH	11 FOVs	-	-	-27.5 ps	-	-	p = 0.0002 (αMSH)	DF = 3	between -3-0 min and 9-12 min means.
S3G	ACSF	680 trials	1 male	1 female	0.212	-	-	NA	NA	Two-tailed mean comparison of bootstrapped hit rates.
	BIBP+CGP	909 trials	-	-	0.056	-	-			
S3H	ACSF	144 hits	1 male	1 female	-	-	-	NA	NA	
	BIBP+CGP	55 hits	-	-	-	-	-			
S3I	ACSF	6 FOVs	1 male	1 female	-0.116	-	-	p = 0.0085	DF = 5	Two-tailed, paired t-test.
	BIBP+CGP	6 FOVs	-	-	0.032	-	-			
S3J	ACSF	6 FOVs	1 male	1 female	0.98	-	-	p = 0.571	DF = 5	Two-tailed, paired t-test.
	BIBP+CGP	6 FOVs	-	-	0.99	-	-			

Figure	Group	N_total	Male mice	Female mice	Mean_total	Mean_males	Mean_females	P values	F and DF	Statistical notes
S4B	2s stim.	18864 trials	4 males	3 females	-	-	-	NA	NA	
S4C	4s stim.	16439 trials	4 males	3 females	-	-	-	NA	NA	
S4D	8s stim.	19969 trials	4 males	3 females	-	-	-	NA	NA	
S4E	16s stim.	17379 trials	4 males	3 females	-	-	-	NA	NA	
	2s stim.	18864 trials	-	-	-	-	-	-	-	
S4F	4s stim.	16439 trials	4 males	3 females	-	-	-	NA	NA	
	8s stim.	19969 trials	-	-	-	-	-	-	-	
	16s stim.	17379 trials	-	-	-	-	-	-	-	
S4G	Example session	-	-	-	-	-	-	NA	NA	
	AgRP stim. (neurite)	13 FOVs	2 males	2 females	0.00005	-	-	-	-	
	AgRP stim. (soma)	13 FOVs	-	-	0.00022	-	-	-	-	
S4H	POMC stim. (neurite)	10 FOVs	2 males	2 females	0.00013	-	-	p = 0.011 (POMC) p < 0.0001 (AgRP)	DF = 3 F = 15.82	Two-tailed, unpaired one-way ANOVA with sidak post hoc test between soma and neurites
	POMC stim. (soma)	10 FOVs	-	-	0.00021	-	-	-	-	
S4K	AgRP stim. (neurite)	14101 trials	2 males	2 females	-	-	-	NA	NA	
	POMC stim. (neurite)	9354 trials	2 males	2 females	-	-	-	-	-	
	Fasted state (neurite)	6048 trials	-	-	-	-	-	-	-	
S4L	Fed state (neurite)	8053 trials	2 males	2 females	-	-	-	NA	NA	Two-tailed mean comparison of bootstrapped data. From 2 males and 2 females
	Fasted state (soma)	1190 trials	-	-	-	-	-	-	-	
	Fed state (soma)	1093 trials	-	-	-	-	-	-	-	
	Fasted state (neurite)	4356 trials	-	-	-	-	-	-	-	
S4M	Fed state (neurite)	4998 trials	2 males	2 females	-	-	-	NA	NA	Two-tailed mean comparison of bootstrapped data. From 2 males and 2 females
	Fasted state (soma)	1190 trials	-	-	-	-	-	-	-	
	Fed state (soma)	1093 trials	-	-	-	-	-	-	-	
S5A	Fasted state	9 mice	5 males	4 females	-	-	-	NA	NA	
	Fed state	9 mice	5 males	4 females	-	-	-	-	-	
S5B	Fasted state	9 mice	5 males	4 females	-	-	-	NA	NA	
	Fed state	9 mice	5 males	4 females	-	-	-	-	-	
	Fasted state	4 slices	2 male	2 female	-	-	-	NA	NA	
S5C	Fed state	4 slices	-	-	-	-	-	-	-	
	Fasted state	8 slices	3 males	3 females	-	-	-	NA	NA	
	Fed state	8 slices	-	-	-	-	-	-	-	
S5D	Saline	6 FOVs	2 males	1 female	-1.8 ps	-	-	p = 0.903 (Saline)	F = 13.5	Two-tailed, paired one-way ANOVA with sidak post hoc test
	MTII	6 FOVs	-	-	23.8 ps	-	-	p = 0.01 (MTII)	DF = 3	between -3-0 min and 9-12 min means.
S5E	Saline	517 trials	2 males	1 females	-	-	-	NA	NA	
	MTII	473 trials	-	-	-	-	-	-	-	
S5F left	ACSF	391 trials	1 male	1 female	-	-	-	NA	NA	
	αMSH	417 trials	-	-	-	-	-	-	-	
S5F right	ACSF	391 trials	1 male	1 female	-	-	-	p = 0.891	NA	Two-tailed mean comparison of bootstrapped hit rates.
	αMSH	417 trials	-	-	-	-	-	-	-	
S5G	ACSF	97 hits	1 male	1 female	-	-	-	NA	NA	
	αMSH	92 hits	-	-	-	-	-	-	-	
S5H left	ACSF	1667 trials	1 male	1 female	-	-	-	NA	NA	
	NPY	1311 trials	-	-	-	-	-	-	-	
S5H right	ACSF	1667 trials	1 male	1 female	-	-	-	p = 0.937	NA	Two-tailed mean comparison of bootstrapped hit rates.
	NPY	1311 trials	-	-	-	-	-	-	-	
S5I	ACSF	235 hits	1 male	1 female	-	-	-	NA	NA	
	NPY	173 hits	-	-	-	-	-	-	-	
S5J	Fasted state	87hit-hits	2 males	2 females	-	-	-	NA	NA	
	Fed state	57 hit-hits	-	-	-	-	-	-	-	
	Fasted state (1st)	13 FOVs	-	-	0.069	-	-	-	-	
S5K	Fasted state (2nd)	13 FOVs	2 males	2 females	0.11	-	-	p < 0.0001 (Fasted) p = 0.0003 (Fed)	F = 41.85 DF = 3	Two-tailed, paired one-way ANOVA with sidak post hoc test between 1st and 2nd hits.
	Fed state (1st)	13 FOVs	-	-	0.096	-	-	-	-	
	Fed state (2nd)	13 FOVs	-	-	0.13	-	-	-	-	
	Fasted state (1st)	13 FOVs	-	-	0.25	-	-	-	-	
S5L	Fasted state (2nd)	13 FOVs	2 males	2 females	0.78	-	-	p < 0.0001 (Fasted) p < 0.0001 (Fed)	F = 92.93 DF = 3	Two-tailed, paired one-way ANOVA with sidak post hoc test between 1st and 2nd hits.
	Fed state (1st)	13 FOVs	-	-	0.81	-	-	-	-	
	Fed state (2nd)	13 FOVs	-	-	1.27	-	-	-	-	
S5M	Fasted state	24 hit-hits	2 males	2 females	-	-	-	NA	NA	
	Fed state	39 hit-hits	-	-	-	-	-	-	-	
	Fasted state (1st)	10 FOVs	-	-	0.069	-	-	-	-	
S5N	Fasted state (2nd)	10 FOVs	2 males	2 females	0.11	-	-	p = 0.04 (Fasted) p = 0.449 (Fed)	F = 4.65 DF = 3	Two-tailed, paired one-way ANOVA with sidak post hoc test between 1st and 2nd hits.
	Fed state (1st)	10 FOVs	-	-	0.096	-	-	-	-	
	Fed state (2nd)	10 FOVs	-	-	0.13	-	-	-	-	
	Fasted state (1st)	10 FOVs	-	-	0.25	-	-	-	-	
S5O	Fasted state (2nd)	10 FOVs	2 males	2 females	0.78	-	-	p = 0.0009 (Fasted) p = 0.012 (Fed)	F = 18.87 DF = 3	Two-tailed, paired one-way ANOVA with sidak post hoc test between 1st and 2nd hits.
	Fed state (1st)	10 FOVs	-	-	0.81	-	-	-	-	
	Fed state (2nd)	10 FOVs	-	-	1.27	-	-	-	-	
	Fasted state (hits)	74 hits	-	-	-	-	-	-	-	
	Fasted state (misses)	93 misses	-	-	-	-	-	-	-	
S5P	Fasted state (trials)	167 trials	2 males	2 females	-	-	-	NA	NA	
	Fed state (hits)	46 hits	-	-	-	-	-	-	-	
	Fed state (misses)	66 misses	-	-	-	-	-	-	-	
	Fed state (trials)	112 trials	-	-	-	-	-	-	-	
	Fasted state (hits)	43 hits	-	-	-	-	-	-	-	
	Fasted state (misses)	54 misses	-	-	-	-	-	-	-	
S5Q	Fasted state (trials)	97 trials	2 males	2 females	-	-	-	NA	NA	
	Fed state (hits)	67 hits	-	-	-	-	-	-	-	
	Fed state (misses)	72 misses	-	-	-	-	-	-	-	
	Fed state (trials)	139 trials	-	-	-	-	-	-	-	
S6A	Ghrelin	8 FOVs	2 males	1 female	-	-	-	p = 0.281 (Saline)	F = 14.4	Two-tailed, paired one-way ANOVA with sidak post hoc test
S6B	ACSF	8 FOVs	2 males	1 female	3.1 ps	-	-	p = 0.011 (Ghrelin)	DF = 3	between -2-0 min and 6-8 min means.
	Ghrelin	8 FOVs	-	-	-23.7 ps	-	-	-	-	
S6C	Fasted state	11 FOVs	3 males	3 females	-	-	-	NA	NA	
	Fed state	7 FOVs	-	-	-	-	-	-	-	
S6D	Fasted state	561 trials	3 males	3 females	-	-	-	NA	NA	
S6E	Fed state	646 trials	-	-	-	-	-	NA	NA	
S6F	Example session	-	-	-	-	-	-	NA	NA	
S6G	Control session	8 mice	4 males	4 females	1.63 licks/s at the end	1.81 licks/s	1.44 licks/s	p = 0.0002	DF = 7	Two-tailed, paired t-test with data after 10 min wait (10 trials)
	Expt. Session	8 mice	-	-	0.32 licks/s at the end	0.29 licks/s	0.35 licks/s	-	-	
S6H	Control session	8 mice	4 males	4 females	0.44	0.49	0.39	p = 0.0007	DF = 7	Two-tailed, paired t-test with data after 10 min wait (10 trials)
	Expt. Session	8 mice	-	-	0.085	0.064	0.106	-	-	
	Control session	8 mice	-	-	0.62	0.65	0.6	p = 0.0016 (control - no stim.) p = 0.0013 (control - stim.) p = 0.568 (no stim. - stim.)	F = 33.9 DF = 2	Two-tailed, unpaired one-way ANOVA with sidak post hoc test
S6I	Expt. (no stim.)	8 mice	4 males	4 females	0.43	0.48	0.38	-	-	
	Expt. (stim.)	8 mice	-	-	0.42	0.47	0.38	-	-	
S6J left	Expt. Session	8 mice	4 males	4 females	-	-	-	NA	NA	
S6J right	Expt. Session	8 mice	4 males	4 females	-	-	-	NA	NA	
S7A	Example session	-	-	-	-	-	-	NA	NA	
S7B	Example session	-	-	-	-	-	-	NA	NA	
S7D	GCaMP6s - Fed	8 mice	4 males	4 females	-	-	-	NA	NA	
S7E	RCaMP1a - Fed	8 mice	4 males	4 females	-	-	-	NA	NA	
S7F	RCaMP1a - Fasted	8 mice	4 males	4 females	-	-	-	NA	NA	
S7G	All cells	16 cells	3 mice	-	-	-	-	NA	NA	
S7H	All cells	471 cells	2 males	-	-	-	-	NA	NA	
S7I	With calcium	35 cells	4 mice	-	-	-	-	NA	NA	
	Without calcium	7 cells	2 mice	-	-	-	-	-	-	
S7J	No light	5 slices	1 male	1 female	-	-	-	NA	NA	
	Light	5 slices	-	-	-	-	-	-	-	
S7K	No light	4 slices	1 male	1 female	-	-	-	NA	NA	
	Light	4 slices	-	-	-	-	-	-	-	
S7L	No light	3 slices	1 male	1 female	-	-	-	NA	NA	
	Light	3 slices	-	-	-	-	-	-	-	
	Light + PDE4D3-Cat	3 slices	-	-	-	-	-	-	-	
S7M	mCherry	7 cells	4 mice	-	1.80 Hz	-	-	p = 0.0038	DF = 30	Two-tailed, unpaired t-test
	PDE4D3-Cat	6 cells	4 mice	-	0.03 Hz	-	-	-	-	