LENNTIVIRAL VECTORS:

Duke University Viral Vector Core plasmids: Control optogenetic and other constructs (no MTA required, unless specified otherwise). Publications should acknowledge the donor of the reagent and the Viral Vector Core at Duke University.

Reporter constructs & cassettes for cloning

1. pLV-empty cassette with polylinker
2. pLV-CMV-eGFP
3. pLV-CMV-mCherry
4. pLV-CMV- with a polylinker for fusion protein-eGFP
5. pLV-CMV-eGFP-polylinker for cloning IRES, cleavage peptides, or miR/shRNA
6. pLV-CMV-GFP-IRES-PURO
7. pLV-CMV-GFP-Puro
8. pLV-CMV-IRES-eGFP with a polylinker for cloning cleavage peptides, or miR/shRNA
9. pLV-CMV-IRES-Luc with a polylinker for cloning cleavage peptides, or miR/shRNA
10. pLV-hUbC-EGFP (Addgene 14883)

Naïve/control constructs for shRNA

11. pLV-U6-shRNA-negative control WPRE- Puro
12. pLV-U6-shRNA-negative control WRE- eGFP
13. pLV-CMV-eGFP-miR flank-shRNA-Luc-flank-miR- EM7-blast
14. pLV-CMV-tGFP-IRES-Puro-shRNA negative control- miR flank-shRNA negative control-flank-miR
15. pLV-mPGK-tGFP-IRES-Puro-shRNA negative control- miR flank-shRNA negative control-flank-miR
16. pLV-CMV-IRES-eGFP- with a polylinker for cloning cleavage peptides, or miR/shRNA
17. pLV-CMV-IRES-Luc- with a polylinker for cloning cleavage peptides, or miR/shRNA

Inducible systems

18. pLV-CMV rtTA3-Blast (Addgene #26429)
19. pLV –CMV-TetR Blast (Addgene #17492)
20. pInducer20 (Tet-inducible; Addgene #44012)
21. pLV-CMV-CRE (Addgene #12238)
22. pLV-CMV-SV40-nls-CRE (Addgene #12265)

Optogenetic constructs

**Dr. Karl Deisseroth’s lab constructs**

For first time order of these vectors you will have to fill an MTA form with Dr. Deisseroth. To obtain MTA, please please contact Dr. Karl Deisseroth and Charu Ramakrishnan. Please upload a copy of your MTA when placing your online order.

Contact email of Charu Ramakrishnan: charur@stanford.edu

Contact email of Dr. Karl Deisseroth: deissero@stanford.edu

23. pLenti-CaMKIIa-eArch 3.0-eYFP
24. pLenti-CaMKIIa-eArchT 3.0-eYFP
25. pLenti-CaMKIIa-eMac 3.0-eYFP
26. pLenti-CaMKIIa-C1V1 (E122T)-TS-eYFP
27. pLenti-CaMKIIa-C1V1 (E162T)-TS-eYFP
28. pLenti-CaMKIIa-C1V1 (E122T/E162T)-TS-eYFP
29. pLenti-CaMKIIa-hChR2 (C128S/D156A)-eYFP
30. pLenti-CaMKIIa-hChR2(T159C)-eYFP-WPRE
31. pLenti-CaMKIIa-hChR2(E123T/T159C)-eYFP-WPRE
32. pLenti-EF1a-hChR2-eYFP-WPRE (a.k.a. pLECYT)
33. pLenti-EF1a-hChR2(H134R)-eYFP-WPRE (a.k.a. pLECYT)
34. pLenti-CaMKIIa-hChR2-mCherry-WPRE
35. pLenti-CaMKIIa-hChR2-eYFP-WPRE
36. pLenti-CaMKIIa-hChR2(H134R)-eYFP-WPRE
37. pLenti-Synapsin-hChR2(H134R)-eYFP-WPRE
38. pLenti-CaMKIIa-eNpHR 3.0-eYFP
39. pLenti-hSyn-eNpHR3.0-eYFP

**Optical Excitation: Volvox Channelrhodopsin-1 (VChR1)**

40. Available in a standard mammalian expression vector and lentivirus vectors
41. pcDNA3.1/VChR1-eYFP
42. pcDNA3.1/VChR1-mCherry
43. pLenti-CaMKIIa-VChR1-eYFP-WPRE
44. pLenti-CaMKIIa-VChR1-mCherry-WPRE
For more info see:

A gene-fusion strategy for stoichiometric and co-localized expression of light-gated membrane proteins.

Color-tuned channelrhodopsins for multiwavelength ontogenetic.

Maps of the constructs are available here
http://web.stanford.edu/group/dlab/optogenetics/sequence_info.html

*The VChR1 gene is codon-optimized for mammalian expression.

Optical Inhibition: Halorhodopsin (NpHR), Third-generation Optogenetic Inhibition
Arch 3.0 ArchT 3.0, and Mac 3.0
For more info see: Amygdala circuitry mediating reversible and bidirectional control of anxiety.

Second (2.0) and Third (3.0) generations of NpHR are available. eNpHR2.0 may be superior in some cell types, including photoreceptors, see: Genetic reactivation of cone photoreceptors restores visual responses in retinitis pigmentosa.

45. pLenti- hSyn- eNpHR 3.0- eYFP
46. pLenti-CaMKIIa-eNpHR2.0-eYFP
47. pLenti- CaMKIIa- eArchT3.0- eYFP
48. pLenti- CaMKIIa- eArch3.0- eYFP
49. pLenti- CaMKIIa- eMac3.0- eYFP

Optical Excitation: Channelrhodopsin-2 (ChR2)
For more info see:
Channelrhodopsin-2 and optical control of excitable cells.
Circuit-breakers: optical technologies for probing neural signals and systems.
50. pLenti-CaMKIIa-hChR2-eYFP-WPRE (a.k.a. pLECYT)
51. pLenti-EF1a-hChR2-eYFP-WPRE (a.k.a. pLECYT)
52. pLenti-EF1a-hChR2(H134R)-eYFP-WPRE (a.k.a. pLECYT)
53. pLenti-CaMKIIa-hChR2-mCherry-WPRE
54. pLenti-CaMKIIa-hChR2-eYFP-WPRE
55. pLenti-Hcrt-hChR2(H134R)-eYFP
56. pLenti-Synapsin-hChR2(H134R)-eYFP-WPRE
57. pLenti-mThy1-hChR2(H134R)-eYFP
58. pLenti-hThy1-hChR2(H134R)-eYFP

**Bi-stable excitation: Step Function Opsins (SFOs)**

Three point-mutants of humanized ChR2 convert a brief pulse of light into a stable step in membrane potential. The lentiviral vectors were created by site-directed mutagenesis of the C128 position in ChR2. All three mutants are activated by blue (470nm) light. Photocurrents generated by ChR2 (C128A) and ChR2 (C128S) can be effectively terminated by a pulse of green (542nm) light. For more info see: [Bi-stable neural state switches](#).

59. pLenti-CaMKIIa-hChR2(C128A)-eYFP
60. pLenti-CaMKIIa-hChR2(C128S)-eYFP
61. pLenti-CaMKIIa-hChR2(C128T)-eYFP

**Ultrafast Optogenetic Control**

For more info see: [Ultrafast optogenetic control](#).

62. pLenti-CaMKIIa-hChR2(E123T-H134R)-eYFP
63. pLenti-CaMKIIa-hChR2(T159C)-eYFP-WPRE
64. pLenti-CaMKIIa-hChR2(E123T/T159C)-eYFP

**Stabilized Step Function Opsins SSFO**

Newly developed ChR2 variants which act to stabilize the conducting state of the channel to deactivate with a time constant of nearly 30 minutes following a brief pulse of activating blue light. They can be deactivated by yellow light (590nm). The stabilized open state of the channel
allows for both lower power activation, meaning in some circumstances the light delivery system need not penetrate the brain, as well as for behavior in the absence of a tethered laser or other light delivery system.

65. pLenti-CaMKIIa-hChR2 (C128S/D156A)-eYFP

Red-Shifted Optical Excitation: C1V1 variants C1V1
For more info see: Two-photon optogenetics of dendritic spines and neural circuits. Simultaneous cellular-resolution optical perturbation and imaging of place cell firing fields.

66. pLenti-CaMKIIa-C1V1-eYFP
67. pLenti-CaMKIIa-C1V1-TS-eYFP
68. pLenti-CaMKIIa-C1V1 (E122T)-TS-eYFP
69. pLenti-CaMKIIa-C1V1 (E162T)-TS-eYFP
70. pLenti-CaMKIIa-C1V1 (E122T/E162T)-TS-eYFP

Dr. Edward Boyden lab constructs

All LV constructs obtained from Addgene: No MTA required unless used for commercial purposes

Neural Silencers/Activators
For more info see: Millisecond-timescale, genetically targeted optical control of neural activity. Prosthetic systems for therapeutic optical activation and silencing of genetically-targeted neurons.

A gene-fusion strategy for stoichiometric and co-localized expression of light-gated membrane.

71. pLenti-CaMKIIa-ChR2-GFP
72. pLenti-CaMKIIa - codon-optimized halorhodopsin-GFP
73. pLenti-CaMKIIa - Arch-GFP
Dr. Adam Cohen lab constructs

All LV constructs obtained from Addgene: No MTA required unless used for commercial purposes

Archaerhodopsin-based voltage indicators; Channelrhodopsin actuator

For more info see: All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins.

81. pLenti-DRH296: FCK-Optopatch2
82. pLenti-DRH229: FCK-QuasAr1-mO2
83. pLenti-DRH334: FCK-QuasAr2-mO2
84. pLenti-DRH313: FCK-CheRiff-eGFP
85. pLenti-DRH335: FCK-Optopatch1
86. pLenti-Arch(D95H)-eGFP
87. pLenti-FCK-QuasAr2-Citrine
88. pLenti-FCK-QuasAr2-mRuby2 eFRET
89. pLenti-FCK-QuasAr2-mOrange2 Efret
90. Lenti-MOS010: pLX304-CheRiff-GFP