

[0013a] In one aspect, the present disclosure provides a nucleic acid cassette comprising a PV neuron sensitive regulatory element of less than 2.5 kb comprising SEQ ID NO: 1, SEQ ID NO: 8 or SEQ ID NO: 30 operably linked to a heterologous transgene.

[0013b] In one aspect, the present disclosure provides a nucleic acid cassette comprising a regulatory element of less than 2.5 kb comprising a sequence with at least 95% sequence identity to SEQ ID NO: 1, SEQ ID NO: 8, or SEQ ID NO: 30 operably linked to a heterologous transgene, wherein the regulatory element results in selective expression in parvalbumin (PV) neurons in the CNS over one or more non-PV cells in the CNS.

CLAIMS

WHAT IS CLAIMED IS:

1. A nucleic acid cassette comprising a PV neuron selective regulatory element of less than 2.5 kb comprising SEQ ID NO: 1, SEQ ID NO: 8, or SEQ ID NO: 30 operably linked to a heterologous transgene.
2. The nucleic acid cassette of claim 1, wherein the transgene comprises a nucleic acid sequence encoding a DNA binding protein.
3. The nucleic acid cassette of claim 2, wherein the DNA binding protein is a transcriptional modulator of an endogenous gene.
4. The nucleic acid cassette of claim 2, wherein the DNA binding protein comprises a zinc finger.
5. The nucleic acid cassette of claim 2, wherein the DNA binding protein is a nuclease-deactivated zinc finger protein.
6. The nucleic acid cassette of claim 2, wherein the DNA binding protein is linked to a transcriptional activator domain.
7. The nucleic acid cassette of claim 2, wherein the DNA binding protein is linked to a transcriptional repressor domain.
8. The nucleic acid cassette of claim 2, wherein the DNA binding protein is a transcriptional activator that modulates an endogenous SCN1A gene.
9. The nucleic acid cassette of claim 1, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
10. The nucleic acid cassette of claim 9, wherein the AAV vector is AAV9 or scAAV9.
11. The nucleic acid cassette of claim 8, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
12. The nucleic acid cassette of claim 11, wherein the AAV vector is AAV9 or scAAV9.
13. The nucleic acid cassette of claim 1, wherein the regulatory element comprises SEQ ID NO: 31 or SEQ ID NO: 32.
14. The nucleic acid cassette of claim 13, wherein the heterologous transgene comprises a nucleic acid sequence encoding a DNA binding protein.
15. The nucleic acid cassette of claim 14, wherein the DNA binding protein is a transcriptional activator that modulates an endogenous SCN1A gene.
16. The nucleic acid cassette of claim 13, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
17. The nucleic acid cassette of claim 16, wherein the AAV vector is AAV9 or scAAV9.

18. The nucleic acid cassette of claim 15, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
19. The nucleic acid cassette of claim 18, wherein the AAV vector is AAV9.
20. The nucleic acid cassette of claim 18, wherein the AAV vector is scAAV9.
21. A nucleic acid cassette comprising a regulatory element of less than 2.5 kb comprising a sequence with at least 95% sequence identity to SEQ ID NO: 1, SEQ ID NO: 8, or SEQ ID NO: 30 operably linked to a heterologous transgene, wherein the regulatory element results in selective expression in parvalbumin (PV) neurons in the CNS over one or more non-PV cells in the CNS.
22. The nucleic acid cassette of claim 21, wherein the heterologous transgene comprises a nucleic acid sequence encoding a DNA binding protein.
23. The nucleic acid cassette of claim 22, wherein the DNA binding protein is a transcriptional modulator of an endogenous gene.
24. The nucleic acid cassette of claim 22, wherein the DNA binding protein comprises a zinc finger.
25. The nucleic acid cassette of claim 22, wherein the DNA binding protein is linked to a transcriptional activator domain.
26. The nucleic acid cassette of claim 22, wherein the DNA binding protein is a transcriptional activator that modulates an endogenous SCN1A gene.
27. The nucleic acid cassette of claim 21, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
28. The nucleic acid cassette of claim 27, wherein the AAV vector is AAV9 or scAAV9.
29. The nucleic acid cassette of claim 21, wherein the regulatory element comprises a sequence with at least 95% sequence identity to SEQ ID NO: 31 or SEQ ID NO: 32.
30. The nucleic acid cassette of claim 29, wherein the heterologous transgene comprises a nucleic acid sequence encoding a DNA binding protein.
31. The nucleic acid cassette of claim 30, wherein the DNA binding protein is a transcriptional activator that modulates an endogenous SCN1A gene.
32. The nucleic acid cassette of claim 29, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
33. The nucleic acid cassette of claim 32, wherein the AAV vector is AAV9 or scAAV9.
34. The nucleic acid cassette of claim 31, wherein the nucleic acid cassette is an adeno-associated virus (AAV) vector.
35. The nucleic acid cassette of claim 34, wherein the AAV vector is AAV9 or scAAV9.