

CLAIMS

1. A single stranded antisense oligonucleotide 20 nucleotides in length that suppresses the expression of a PIKFYVE, wherein the antisense oligonucleotide comprises a nucleobase sequence that comprises the nucleobase sequences set forth in SEQ ID NO: 20.
2. The antisense oligonucleotide of claim 1, wherein at least one internucleoside linkage is a modified internucleoside linkage.
3. The antisense oligonucleotide of any one of claims 1 to 2, wherein at least one modified internucleoside linkage is a phosphorothioate internucleoside linkage.
4. The antisense oligonucleotide of any one of claims 1 to 3, wherein at least one internucleoside linkage is a phosphodiester internucleoside linkage.
5. The antisense oligonucleotide of claim 4, wherein at least one internucleoside linkage is a phosphorothioate linkage and at least one internucleoside linkage is a phosphodiester linkage.
6. The antisense oligonucleotide of any one of claims 1 to 5, wherein at least one nucleoside comprises a modified nucleobase.
7. The antisense oligonucleotide of any one of claims 1 to 6, wherein at least one nucleoside of the antisense oligonucleotide comprises a modified sugar moiety.
8. The antisense oligonucleotide of claim 7, wherein the modified sugar moiety comprises a 2'-O-methoxyethyl group.
9. The antisense oligonucleotide of any one of claims 1 to 8, wherein the antisense oligonucleotide is a gapmer.
10. The antisense oligonucleotide of claim 9, wherein the antisense oligonucleotide comprises:

a gap segment consisting of 10 to 12 linked deoxynucleosides;
a 5' wing segment consisting of 4 to 5 linked nucleosides; and
a 3' wing segment consisting of 4 to 5 linked nucleosides,
wherein the gap segment is positioned between the 5' wing segment and the 3' wing segment and wherein a nucleoside of each wing segment comprises a modified sugar moiety.

11. The antisense oligonucleotide of claim 10, wherein each nucleoside of each wing segment comprises a modified sugar moiety.

12. The antisense oligonucleotide of claim 11, wherein the modified sugar moiety comprises a 2'-O-methoxyethyl group.

13. A pharmaceutical composition comprising the antisense oligonucleotide of any one of claims 1 to 12, and a pharmaceutically acceptable carrier, diluent and/or excipient.

14. A single stranded antisense oligonucleotide of 20 nucleotides in length that suppresses the expression of a PIKFYVE, wherein the antisense oligonucleotide has a nucleobase sequence that comprises the sequence set forth in SEQ ID NO: 20, wherein the first 3-5 nucleosides at the 5' end ("5' wing segment") comprise modified sugars, the last 3-5 nucleosides at the 3' end ("3' wing segment") comprise modified sugars, and the remaining nucleosides comprise a gap segment.

15. The antisense oligonucleotide of claim 14, wherein the modified sugars comprise 2'-OMe, 2'-MOE, LNA, or any combination thereof.

16. The antisense oligonucleotide of any one of claims 14 to 15, wherein the backbone linkages of the 5' wing segment, the 3' wing segment, and the gap segment comprise a mixture of phosphorothioate and phosphodiester linkages.

17. The antisense oligonucleotide of any one of claims 14 to 16, which comprises the sequence set forth in SEQ ID NO: 520.

18. A single stranded antisense oligonucleotide of 20 nucleotides in length that suppresses the expression of a PIKFYVE, wherein the antisense oligonucleotide comprises the sequence set forth in SEQ ID NO: 520, wherein the backbone linkage of the antisense oligonucleotide comprises a mixture of phosphorothioate and phosphodiester linkages.

19. The antisense oligonucleotide of any one of claims 14 to 18, wherein the first, sixth, seventh, eighth, ninth, tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, eighteenth, and nineteenth linkages are phosphorothioate linkages, and the second, third, fourth, fifth, sixteenth, and seventeenth linkages are phosphodiester linkages.

20. The antisense oligonucleotide of any one of claims 14 to 19, wherein at least one nucleoside comprises a modified nucleobase.

21. A pharmaceutical composition comprising the antisense oligonucleotide of any one of claims 14 to 20, and a pharmaceutically acceptable carrier, diluent and/or excipient.