CLAIMS

1. Use of a nucleic acid that suppresses NEK6 gene expression as an active ingredient in the manufacture of a medicament for inhibiting phosphorylation of SAD2/3 protein.

2. Use of a a nucleic acid that suppresses NEK6 gene expression as an active ingredient in the manufacture of a medicament for the treatment of fibrosis.

3. A double-strand nucleic acid molecule selected from the group consisting of the following (a), (b), (c), (d), and (e):

(a) a double-strand nucleic acid molecule comprising a 19- to 30-nt guide strand (antisense strand) comprising a sequence shown in SEQ ID NO: 1 at 5' end and a 19- to 30-nt passenger strand (sense strand) comprising a sequence shown in SEQ ID NO: 6 at 3' end,

(b) a double-strand nucleic acid molecule comprising a 19- to 30-nt guide strand (antisense strand) comprising a sequence shown in SEQ ID NO: 2 at 5' end and a 19- to 30-nt passenger strand (sense strand) comprising a sequence shown in SEQ ID NO: 7 at 3' end,

(c) a double-strand nucleic acid molecule comprising a 19- to 30-nt guide strand (antisense strand) comprising a sequence shown in SEQ ID NO: 3 at 5' end and a 19- to 30-nt passenger strand (sense strand) comprising a sequence shown in SEQ ID NO: 8 at 3' end,

(d) a double-strand nucleic acid molecule comprising a 19- to 30-nt guide strand (antisense strand) comprising a sequence shown in

SEQ ID NO: 4 at 5' end and a 19- to 30-nt passenger strand (sense strand) comprising a sequence shown in SEQ ID NO: 9 at 3' end, and

(e) a double-strand nucleic acid molecule comprising a 19- to 30-nt guide strand (antisense strand) comprising a sequence shown in SEQ ID NO: 5 at 5' end and a 19- to 30-nt passenger strand (sense strand) comprising a sequence shown in SEQ ID NO: 10 at 3' end.

4. The double-strand nucleic acid molecule according to claim 3, wherein 1 to 11 ribonucleotide residues and/or deoxyribonucleotide residues are further added to the 3' end of the guide strand (antisense strand) and/or the passenger strand (sense strand) to form an overhanging end.

5. A single-strand nucleic acid molecule forming a hairpin RNA structure, wherein the 3' end of the passenger strand (sense strand) and the 5' end of the guide strand (antisense strand) set forth in claim 3 or 4 are linked to each other via a linker sequence of a nucleotide residue and/or a linker of a non-nucleotide structure, or the 3' end of the guide strand (antisense strand) and the 5' end of the passenger strand (sense strand) set forth in claim 3 or 4 are linked to each other via a linker sequence of a nucleotide residue and/or a linker of a non-nucleotide structure.

6. A single-strand nucleic acid molecule of the following (A) or (B), comprising a sequence suppressing NEK6 gene expression selected from SEQ ID NOs: 1 to 5:

(A) the nucleic acid molecule comprising or consisting only of a region (X), a linker region (Lx), and a region (Xc),

wherein the region (Xc), the linker region (Lx), and the region (X) are disposed in this order from 5' side to 3' side,

wherein the region (Xc) is complementary to the region (X),

wherein the linker region (Lx) has a non-nucleotide structure comprising at least one of a pyrrolidine skeleton and a piperidine skeleton, and

wherein the region (X) comprises the sequence suppressing expression;

(B) the nucleic acid molecule comprising a region (Xc), a linker region (Lx), a region (X), a region (Y), a linker region (Ly), and a region (Yc) in this order from the 5' side to the 3' side,

wherein the region (X) and the region (Y) are linked and form an inner region (Z),

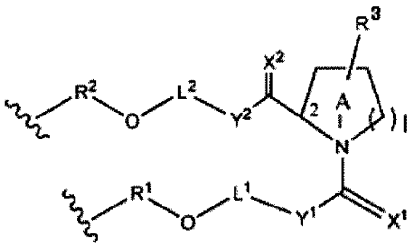
wherein the region (Xc) is complementary to the region (X),

wherein the region (Yc) is complementary to the region (Y), and

wherein the linker region (Lx) and/or the linker region (Ly) have a non-nucleotide structure comprising at least one of a pyrrolidine skeleton and a piperidine skeleton, and

wherein the inner region (Z) comprises the sequence suppressing expression .

7. The single-strand nucleic acid molecule according to claim 6, wherein the linker region (Lx) and/or (Ly) are represented as the following formula (I):



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wherein

X^1 and X^2 are each independently H_2, O, S, or NH;

Y^1 and Y^2 are each independently a single bond, CH_2, NH, O, or S;

R^3 is a hydrogen atom or a substituent bound to C-3, C-4, C-5, or C-6 on ring A;

L^1 is an alkylene chain having n number of carbon atoms, wherein each of hydrogen atoms on the alkylene carbon atom may or may not be substituted with OH, OR^a, NH_2, NHR^a, NR^aR^b, SH, or SR^a, or

L^1 is a polyether chain in which one or more carbon atoms in the alkylene chain are replaced with one or more oxygen atoms,

with the proviso that if Y^1 is NH, O, or S, then an atom in L^1 bound to Y^1 is carbon, an atom in L^1 bound to OR^1 is carbon, and oxygen atoms are not adjacent to each other;

L^2 is an alkylene chain having m number of carbon atoms, wherein each of hydrogen atoms on the alkylene carbon atom may or may not be substituted with OH, OR^c, NH_2, NHR^c, NR^cR^d, SH, or SR^c, or

L^2 is a polyether chain in which one or more carbon atoms in the alkylene chain are replaced with one or more oxygen atoms,

with the proviso that if Y^2 is NH, O, or S, then an atom in L^2 bound to Y^2 is carbon, an atom in L^2 bound to OR^2 is carbon, and oxygen atoms are not adjacent to each other;

R^a, R^b, R^c, and R^d are each independently a substituent or a protecting group;

l is 1 or 2;

m is an integer ranging from 0 to 30;

n is an integer ranging from 0 to 30;

one carbon atom on the ring A other than C-2 may be replaced with nitrogen, oxygen, or sulfur,

the ring A may comprise a carbon-carbon double bond or a carbon-nitrogen double bond therein,

the region (Xc) and the region (X) are each bound to the linker region (Lx) via $-OR^1-$ or OR^2-,

the region (Yc) and the region (Y) are each bound to the linker region (Ly) via $-OR^1-$ or OR^2-, respectively,

wherein R^1 and R^2 may or may not be present, and if present, R^1 and R^2 are each independently a nucleotide residue or the structure (I).

8. The single-strand nucleic acid molecule according to claim 6 or 7, wherein X or Z comprises a sequence selected from the group consisting of SEQ ID NOs: 11 to 25.

9. A nucleic acid that suppresses NEK6 gene expression as an active ingredient for use as a phosphorylation inhibitor of SMAD2/3 protein.

10. A nucleic acid that suppresses NEK6 gene expression as an active ingredient, for use in treating fibrosis.