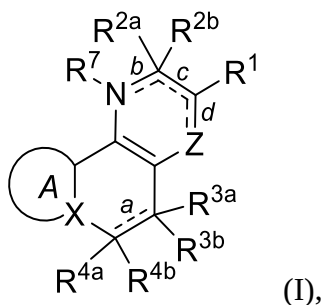


CLAIMS

1. A compound of formula (I), or a salt, solvate, geometric isomer, stereoisomer, tautomer and any mixtures thereof:



R^1 is selected from the group consisting of ~~H; halogen; OR^8 ; $C(R^9)(R^9)C(=O)OR^8$; -
 $C(=O)R^8$; $-C(=O)OR^8$; $-C(=O)NH-OR^8$; $-C(=O)NHNHR^8$; $-C(=O)NHNHC(=O)R^8$; -
 $C(=O)NHS(=O)_2R^8$; $-CH_2C(=O)OR^8$; $-CN$; $-NH_2$; $-N(R^8)C(=O)H$; $-N(R^8)C(=O)R^{10}$; -
 $N(R^8)C(=O)OR^{10}$; $-N(R^8)C(=O)NHR^8$; $-NR^9S(=O)_2R^{10}$; $-P(=O)(OR^8)_2$; $-B(OR^8)_2$; 2,5-dioxo-
pyrrolidin-1-yl; 2H-tetrazol-5-yl; 3-hydroxy-isoxazol-5-yl; 1,4-dihydro-5-oxo-5H-tetrazol-1-yl;
pyridin-2-yl optionally substituted with C_1 - C_6 -alkyl; pyrimidin-2-yl optionally substituted with
 C_1 - C_6 -alkyl; (pyridin-2-yl)methyl; (pyrimidin-2-yl)methyl; (pyrimidin-2-yl)amino; bis-
(pyrimidin-2-yl)amino; 5- R^8 -1,3,4-thiadiazol-2-yl; 5-thioxo-4,5-dihydro-1H-1,2,4-triazol-3-yl;
1H-1,2,4-triazol-5-yl; 1,3,4-oxadiazol-2-yl; 1,2,4-oxadiazol-5-yl; and 3- R^{10} -1,2,4-oxadiazol-5-yl;~~

R^{2a} , R^{2b} , R^7 , bond b , bond c , bond d , and Z are selected such that:

- (i) Z is selected from the group consisting of ~~NCR^{12}~~ and ~~$CR^{12}N$~~ ;

R^{2a} and R^{2b} combine to form $=O$;

bond b is a single bond; bond c is a single bond; bond d is a double bond; and

R^7 is selected from the group consisting of H, optionally substituted C_1 - C_6 alkyl, and optionally substituted C_3 - C_8 cycloalkyl; or

- ~~(ii) Z is selected from the group consisting of N and CR^{12} ;~~

~~R^{2a} is selected from the group consisting of H, halogen, and optionally substituted C_1 - C_6 -alkoxy;~~

~~R^{2b} is null;~~

~~bond b is a double bond; bond c is a single bond; bond d is a double bond; and~~

~~R^7 is null; or~~

~~(iii)~~(ii) Z is C(=O);

R^{2a} is selected from the group consisting of H, halogen, and optionally substituted C₁-C₆ alkoxy;

R^{2b} is null;

bond *b* is a single bond; bond *c* is a double bond; bond *d* is a single bond; and

R⁷ is selected from the group consisting of H, optionally substituted C₁-C₆ alkyl, and optionally substituted C₃-C₈ cycloalkyl;

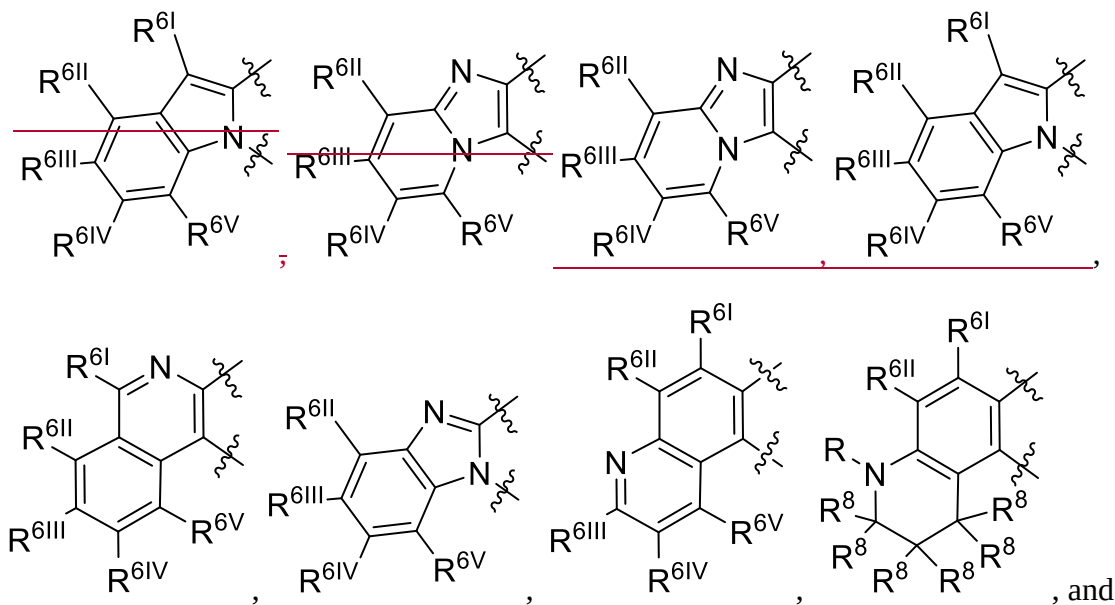
R^{3a}, R^{3b}, R^{4a}, and R^{4b} are each independently selected from the group consisting of H, alkyl-substituted oxetanyl, optionally substituted C₁-C₆ alkyl, and optionally substituted C₃-C₈ cycloalkyl;

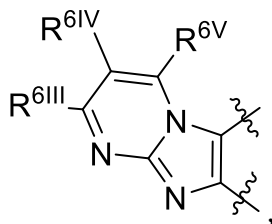
or one pair selected from the group consisting of R^{3a} / R^{3b}, R^{4a} / R^{4b}, and R^{3a} / R^{4a} combine to form a divalent group selected from the group consisting of C₁-C₆ alkanediyl, -(CH₂)_nO(CH₂)_n-, -(CH₂)_nNR⁹(CH₂)_n-, -(CH₂)_nS(CH₂)_n-, -(CH₂)_nS(=O)(CH₂)_n-, and -(CH₂)_nS(=O)₂(CH₂)_n-, wherein each occurrence of *n* is independently selected from the group consisting of 1 and 2 and wherein each divalent group is optionally substituted with at least one C₁-C₆ alkyl or halogen;

bond *a* is single; ~~or bond *a* is double and R^{3b} and R^{4b} are both null;~~

X is C or N₂ and

ring A is selected from the group consisting of:





R^{6I} , R^{6II} , R^{6III} , R^{6IV} , and R^{6V} are independently selected from the group consisting of H, OR, halogen, -CN, optionally substituted C_1 - C_6 alkyl, optionally substituted C_1 - C_6 alkenyl, optionally substituted C_3 - C_8 cycloalkyl, optionally substituted ~~heteroaryl~~heteroaryl, optionally substituted heterocyclyl, ~~OR, C_1 - C_6 haloalkoxy~~, -N(R)(R), -NO₂, -S(=O)₂N(R)(R), acyl, and C_1 - C_6 alkoxy carbonyl,

each occurrence of R is independently selected from the group consisting of H, optionally substituted C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, R'-substituted C_1 - C_6 alkyl, C_1 - C_6 hydroxyalkyl, optionally substituted ~~(C_1 - C_6 alkoxy)- C_1 - C_6 alkyl, optionally substituted~~ C_3 - C_8 cycloalkyl, and optionally substituted C_1 - C_6 acyl,

each occurrence of R' is selected from the group consisting of -NH₂, -NH(C_1 - C_6 alkyl), -N(C_1 - C_6 alkyl)(C_1 - C_6 alkyl), -NHC(=O)O^tBu, -N(C_1 - C_6 alkyl)C(=O)O^tBu, and a 5- or 6-membered heterocyclic group, which is optionally N-linked;

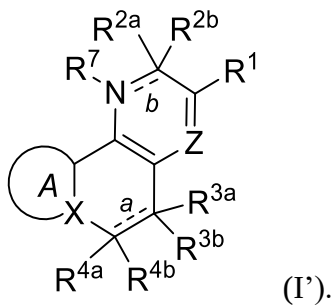
each occurrence of R⁸ is independently selected from the group consisting of H, optionally substituted C_1 - C_6 alkyl, and optionally substituted C_3 - C_8 cycloalkyl;

~~each occurrence of~~ R⁹ is ~~independently~~ selected from the group consisting of H and C_1 - C_6 alkyl ~~(e.g., methyl or ethyl);~~

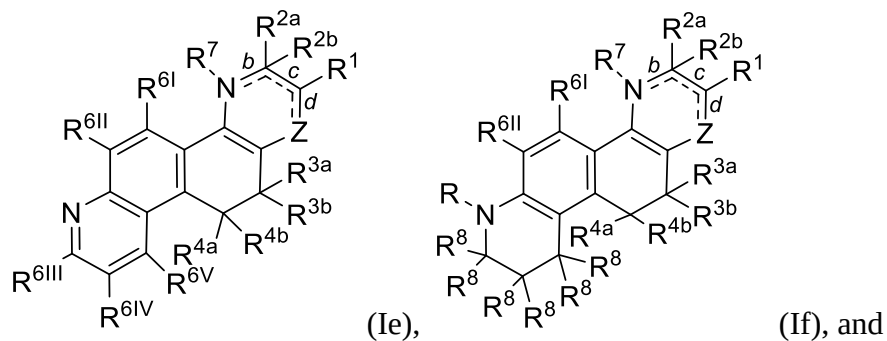
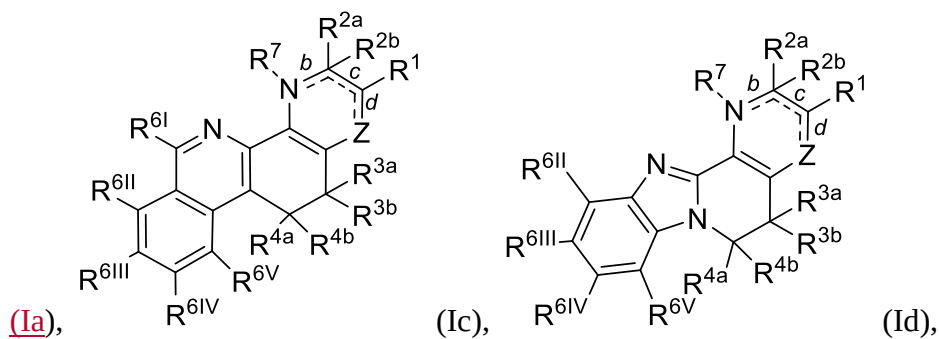
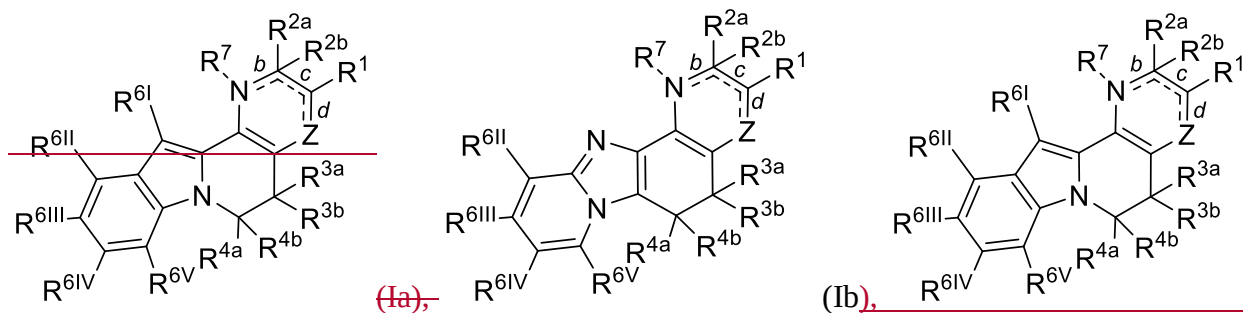
~~each occurrence of~~ R¹⁰ ~~is independently selected from the group consisting of optionally substituted~~ C_1 - C_6 alkyl; ~~and optionally substituted phenyl; and,~~

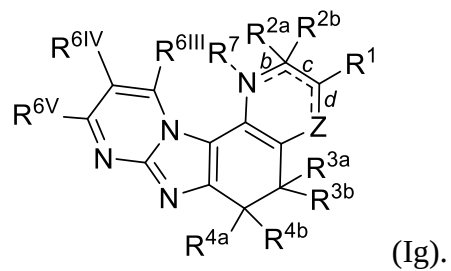
R¹² is selected from the group consisting of H, OH, halogen, C_1 - C_6 alkoxy, optionally substituted C_1 - C_6 alkyl, and optionally substituted C_3 - C_8 cycloalkyl.

2. The compound of claim 1, which is a compound of formula (I'):

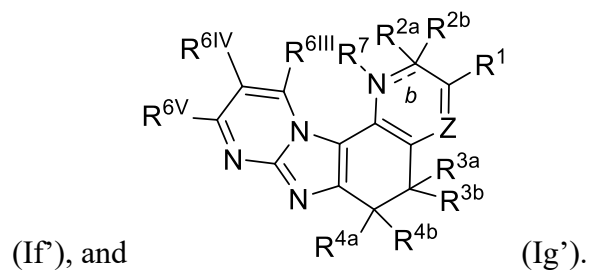
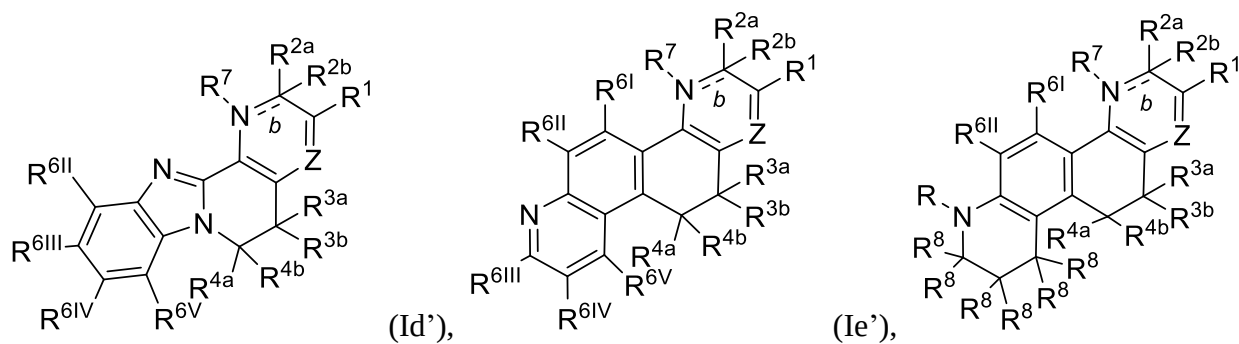
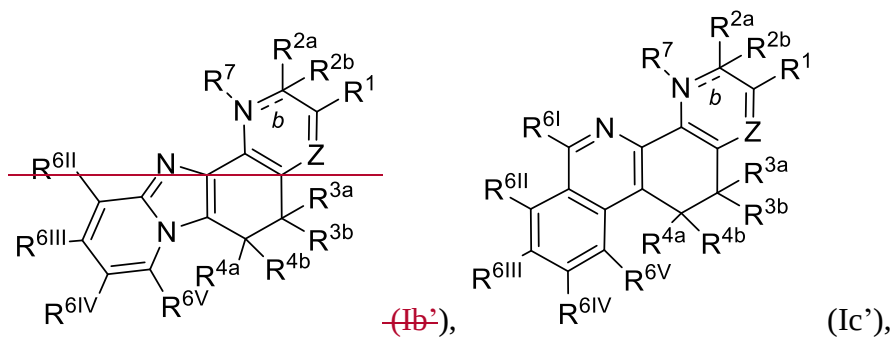
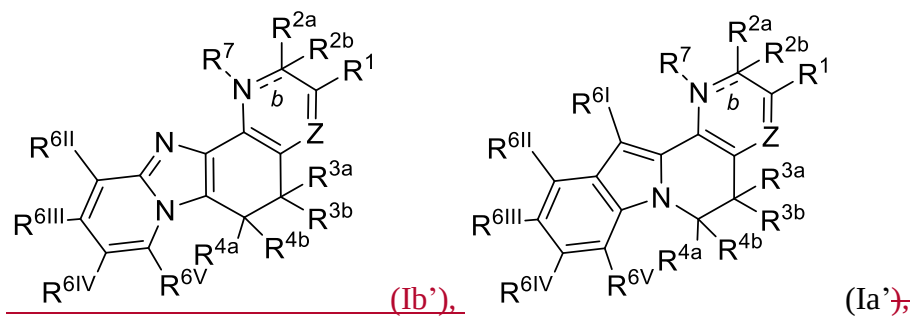


3. The compound of claim 1, which is selected from the group consisting of:





4. The compound of claim 1, which is selected from the group consisting of:



5. The compound of claim 1, wherein at least one of R^{3a} or R^{3b} is independently selected from the group consisting of optionally substituted C₁-C₆ alkyl and optionally substituted C₃-C₈ cycloalkyl.

6. The compound of claim 1, wherein each occurrence of alkyl, alkenyl, cycloalkyl, or acyl is independently optionally substituted with at least one substituent selected from the group consisting of C₁-C₆ alkyl, halogen, -OR'', phenyl, and -N(R'')(R''), wherein each occurrence of R'' is independently H, C₁-C₆ alkyl, or C₃-C₈ cycloalkyl.

7. The compound of claim 1, wherein each occurrence of ~~aryl or~~ heteroaryl is independently optionally substituted with at least one substituent selected from the group consisting of C₁-C₆ alkyl, C₁-C₆ haloalkyl, C₁-C₆ haloalkoxy, halogen, -CN, -OR'', -N(R'')(R''), -NO₂, -S(=O)₂N(R'')(R''), acyl, and C₁-C₆ alkoxycarbonyl, wherein each occurrence of R'' is independently H, C₁-C₆ alkyl or C₃-C₈ cycloalkyl.

8. The compound of claim 1, wherein each occurrence of ~~aryl or~~ heteroaryl is independently optionally substituted with at least one substituent selected from the group consisting of C₁-C₆ alkyl, C₁-C₆ haloalkyl, C₁-C₆ haloalkoxy, halogen, -CN, -OR'', -N(R'')(R''), and C₁-C₆ alkoxycarbonyl, wherein each occurrence of R'' is independently H, C₁-C₆ alkyl or C₃-C₈ cycloalkyl.

9. The compound of claim 1, wherein at least one applies: R^{3a} is H and R^{3b} is ~~isopropyl~~tert-butyl; R^{3a} is H and R^{3b} is ~~tert-butyl~~isopropyl; R^{3a} is methyl and R^{3b} is isopropyl; R^{3a} is methyl and R^{3b} is tert-butyl; R^{3a} is methyl and R^{3b} is methyl; R^{3a} is methyl and R^{3b} is ethyl; and R^{3a} is ethyl and R^{3b} is ethyl.

10. The compound of claim 1, wherein R^{3a} and R^{3b} are not H.

11. The compound of claim 1, which is selected from the group consisting of:
5-(tert-butyl)-11-(difluoromethoxy)-4-hydroxy-2-oxo-1,2,5,6-tetrahydroindolo[1,2-

h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-4-hydroxy-11-methoxy-2-oxo-1,2,5,6-tetrahydroindolo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-11-ethoxy-4-hydroxy-2-oxo-1,2,5,6-tetrahydroindolo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-4-hydroxy-11-(2-methoxyethoxy)-2-oxo-1,2,5,6-tetrahydroindolo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-11-(difluoromethoxy)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-7-hydroxy-9-oxo-1,2,3,4,5,6,9,10-octahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

5-(tert-butyl)-11-(difluoromethoxy)-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

11-(difluoromethoxy)-5-isopropyl-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

5-(tert-butyl)-11-methoxy-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

5-isopropyl-11-methoxy-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

5-(tert-butyl)-10,11-dimethoxy-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

11-(difluoromethoxy)-6-isopropyl-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

5-(tert-butyl)-10,11-dimethoxy-1-methyl-2-oxo-1,2,5,6-tetrahydropyrido[2',1':2,3]imidazo[4,5-h]quinoline-3-carboxylic acid;

5-(tert-butyl)-4-hydroxy-11-methoxy-2-oxo-1,2,5,6-tetrahydrobenzo[4,5]imidazo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-11-(difluoromethoxy)-4-hydroxy-2-oxo-1,2,5,6-tetrahydrobenzo[4,5]imidazo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-11-(difluoromethoxy)-2-oxo-1,2,5,6-tetrahydrobenzo[4,5]imidazo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

5-(tert-butyl)-11-methoxy-2-oxo-1,2,5,6-tetrahydrobenzo[4,5]imidazo[1,2-h][1,7]naphthyridine-3-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-7-hydroxy-9-oxo-5,6,9,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-1-(3-methoxypropyl)-9-oxo-1,2,3,4,5,6,9,10-octahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

1-acetyl-6-(tert-butyl)-12-(difluoromethoxy)-9-oxo-1,2,3,4,5,6,9,10-octahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-1-methyl-9-oxo-1,2,3,4,5,6,9,10-octahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-Butyl)-12-(difluoromethoxy)-1-ethyl-9-oxo-1,2,3,4,5,6,9,10-octahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-butyl)-12-methoxy-9-oxo-5,6,9,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-9-oxo-5,6,9,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-10-methyl-9-oxo-5,6,9,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid;

12-(tert-butyl)-6-methoxy-3-oxo-3,4,11,12-tetrahydrobenzo[c][1,10]phenanthroline-2-carboxylic acid;

12-(tert-butyl)-6-methoxy-4-methyl-3-oxo-3,4,11,12-tetrahydrobenzo[c][1,10]phenanthroline-2-carboxylic acid;

12-(tert-butyl)-6-chloro-4-methyl-3-oxo-3,4,11,12-tetrahydrobenzo[c][1,10]phenanthroline-2-carboxylic acid;

6-(tert-butyl)-12-(difluoromethoxy)-9-methoxy-10-methyl-7-oxo-5,6,7,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid; and

6-(tert-butyl)-12-(difluoromethoxy)-9-methoxy-7-oxo-5,6,7,10-tetrahydroquinolino[7,8-f]quinoline-8-carboxylic acid.

12. A pharmaceutical composition comprising at least one compound of claim 1 and a pharmaceutically acceptable carrier.

13. The pharmaceutical composition of claim 12, further comprising at least one additional agent useful for treating hepatitis virus infection, wherein the hepatitis virus is at least one selected from the group consisting of hepatitis B virus (HBV) and hepatitis D virus (HDV).

14. The pharmaceutical composition of claim 13, wherein the at least one additional agent comprises at least one selected from the group consisting of reverse transcriptase inhibitors, capsid inhibitors, cccDNA formation inhibitors, RNA destabilizers, oligomeric nucleotides targeted against the HBV genome, immunostimulators, and GalNAc-siRNA conjugates targeted against an HBV gene transcript.

15. The pharmaceutical composition of claim 14, wherein the oligomeric nucleotide comprises one or more siRNAs.

16. The pharmaceutical composition of claim 13, wherein the hepatitis virus is ~~at least one selected from the group consisting of~~ hepatitis B virus (HBV) ~~and hepatitis D virus (HDV).~~

17. Use of a therapeutically effective amount of at least one compound of claim 1 or at least one pharmaceutical composition of claim 12 in the manufacture of a medicament for the treatment or prevention of a hepatitis B virus (HBV) infection in a subject.

~~18.—The use of claim 17, wherein the subject is infected with hepatitis B virus (HBV).~~

~~19.18. The use of claim 17, wherein the subject is further~~ infected with hepatitis D virus (HDV).

~~20.—The use of claim 17, wherein the subject is infected with HBV and HDV.~~

~~21.19.~~ Use of a therapeutically effective amount of at least one compound of claim 1 or at least one pharmaceutical composition of claim 12 in the manufacture of a medicament for reducing or minimizing levels of at least one selected from the group consisting of hepatitis B virus surface antigen (HBsAg), hepatitis B e-antigen (HBeAg), hepatitis B core protein, and pregenomic (pg) RNA, in a HBV-infected subject.

~~22.20.~~ The use of claim 17 or ~~2419~~, wherein the at least one compound is to be administered to the subject in a pharmaceutically acceptable composition.

~~23.21.~~ The use of claim 17 or ~~2419~~, wherein the subject is to be further administered at least one additional agent useful for treating the hepatitis virus infection.

~~24.22.~~ The use of claim ~~2321~~, wherein the at least one additional agent comprises at least one selected from the group consisting of reverse transcriptase inhibitors, capsid inhibitors, cccDNA formation inhibitors, RNA destabilizers, oligomeric nucleotides targeted against the HBV genome, immunostimulators, and GalNAc-siRNA conjugates targeted against an HBV gene transcript.

~~25.23.~~ The use of claim ~~2422~~, wherein the oligomeric nucleotide comprises one or more siRNAs.

~~26.24.~~ The use of claim ~~2321~~, wherein the subject is to be co-administered (i) the at least one compound or at least one composition and (ii) the at least one additional agent.

~~27.25.~~ The use of claim ~~2321~~, wherein (i) the at least one compound or at least one composition and (ii) the at least one additional agent are coformulated.

~~28.26.~~ The use of claim 17 or ~~2419~~, wherein the subject is further infected with HDV.

~~29.27.~~ The use of claim 17 or ~~2419~~, wherein the subject is a mammal.

~~30.—~~ The use of claim ~~2927~~, wherein the mammal is a human.

~~31.28.~~