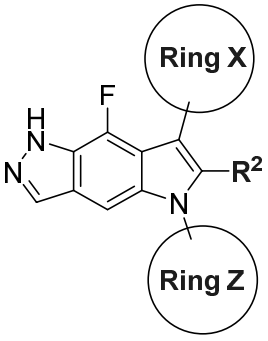
WHAT IS CLAIMED IS:

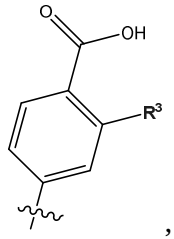
1. A compound of Formula I:



(I),

a tautomer thereof, a deuterated derivative of the compound or tautomer, or a pharmaceutically acceptable salt of the compound, tautomer, or deuterated derivative, wherein:

Ring X is selected from:



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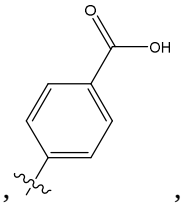

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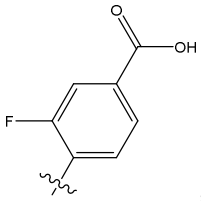

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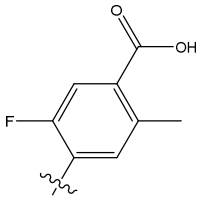

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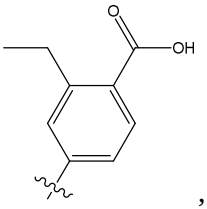

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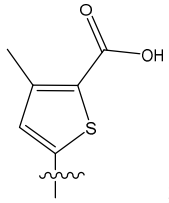
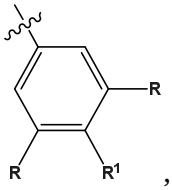


and ;

Ring Z is selected from:



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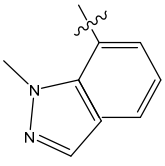

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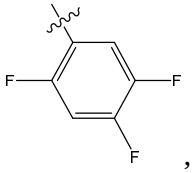
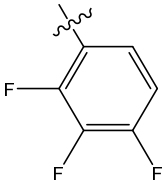


, and

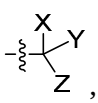


;

each **R** is independently selected from F, H, Cl, -CH_3, -OCH_3, and -OCD_3;

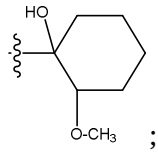
R^1 is H or F;

R^2 is selected from:

- 

, wherein

- one of **X**, **Y**, and **Z** is -OH;
- one of **X**, **Y**, and **Z** is chosen from -CH_2CH_3 and cyclopropyl; and
- one of **X**, **Y**, and **Z** is chosen from -CH_2OCH_3, -$CH_2CH_2OCH_3$, -$CH_2OCH_2CH_3$, -CH_2O-cyclopropyl, and -CH_2O-isopropyl;

- 

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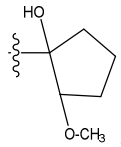
- 

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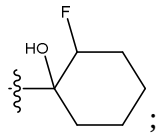
- 

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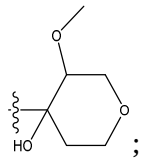
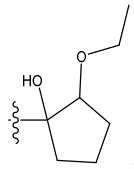
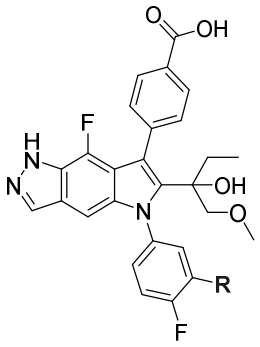
- 

; and
- 

; and

R^3 is chosen from H and -CH_3.

2. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 1, wherein the compound of Formula I is selected from compounds of Formula Ia:

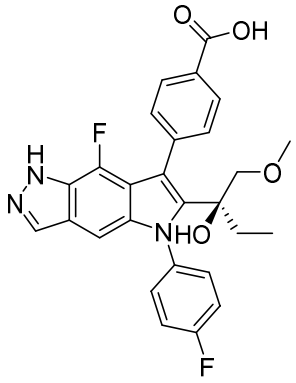
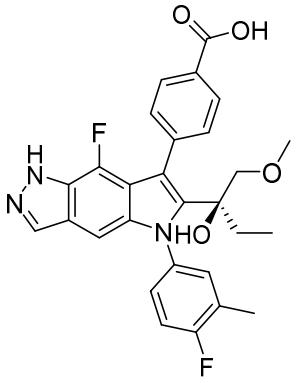
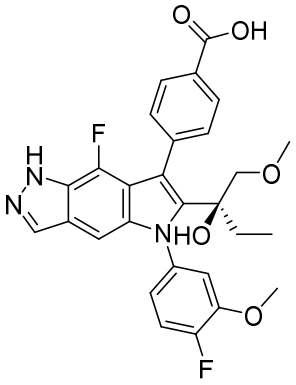
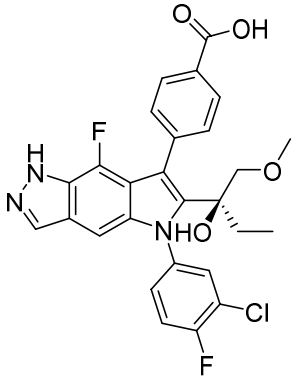
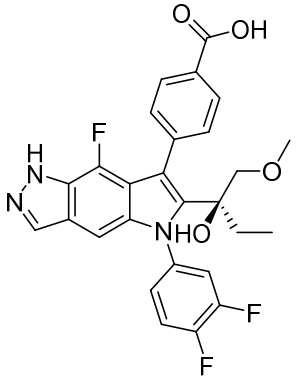


(Ia),

tautomers thereof, deuterated derivatives of those compounds or tautomers, and

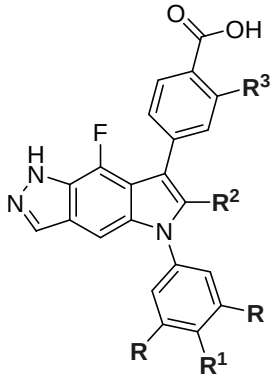
pharmaceutically acceptable salts of the foregoing compounds, tautomers, and deuterated derivatives, wherein **R** is selected from F, H, Cl, -CH_3, and -OCH_3.

3. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 2, wherein the compound of Formula Ia is selected from:

Compound 1	Compound 2	Compound 3
		
Compound 4	**Compound 5**	
		

tautomers of those compounds, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives.

4. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 1, wherein the compound of Formula I is selected from compounds of Formula Ib:



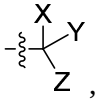
(Ib),

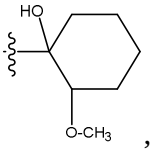
tautomers thereof, deuterated derivatives of those compounds or tautomers, and pharmaceutically acceptable salts of the foregoing compounds, tautomers, and deuterated derivatives, wherein:

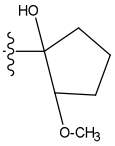
each **R** is independently selected from F, H, Cl, -CH_3, -OCH_3, and -OCD_3;

R^1 is H or F;

R^2 is selected from

- 

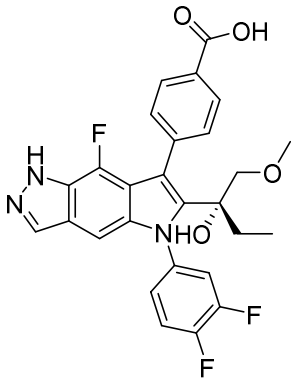
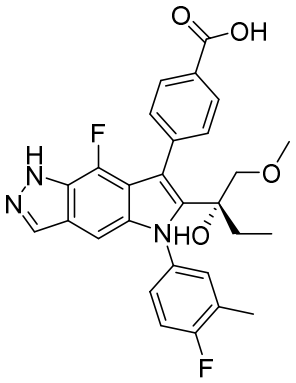
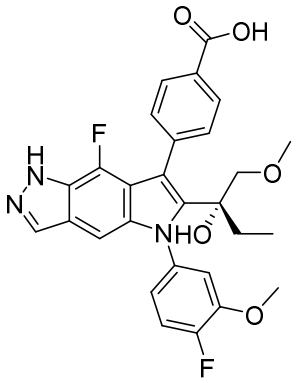
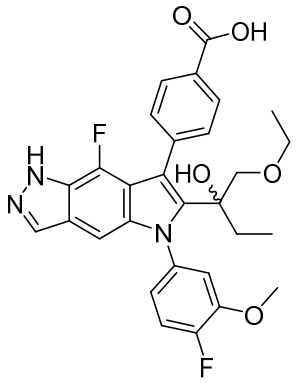
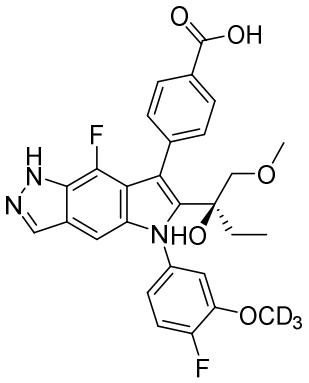
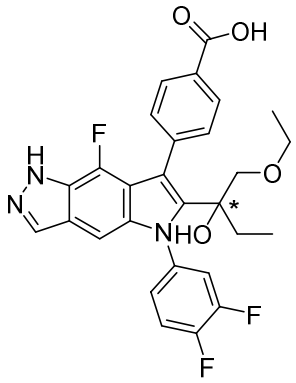
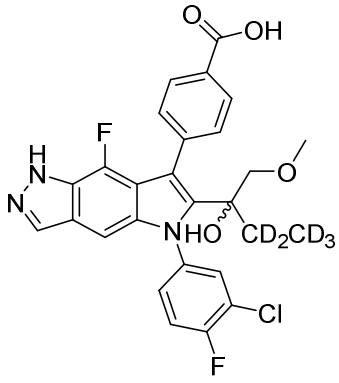
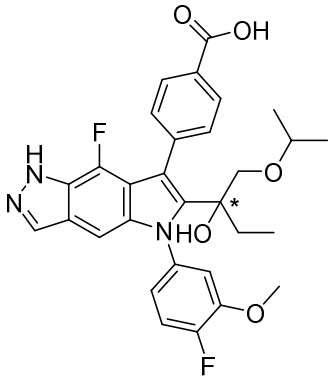
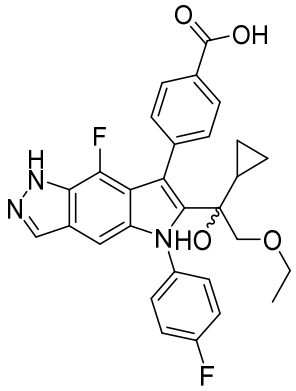
, wherein
  - one of **X**, **Y**, and **Z** is -OH;
  - one of **X**, **Y**, and **Z** is chosen from -CH_2CH_3 and cyclopropyl; and
  - one of **X**, **Y**, and **Z** is chosen from -CH_2OCH_3, -$CH_2CH_2OCH_3$, -$CH_2OCH_2CH_3$, -CH_2O-cyclopropyl, and -CH_2O-isopropyl; and
- 

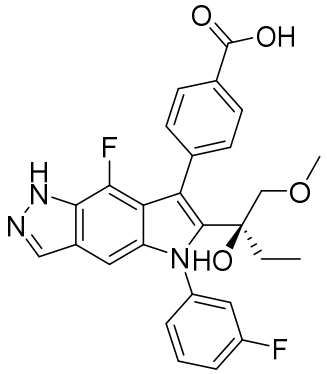
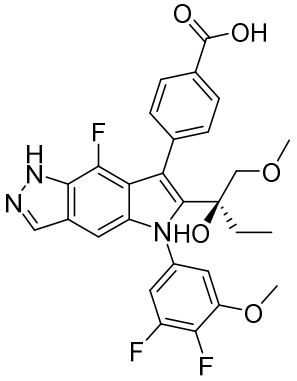
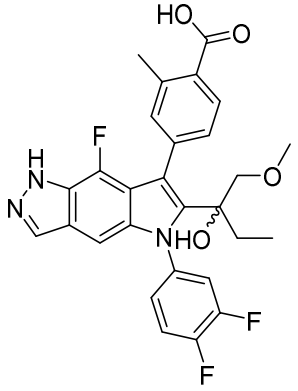
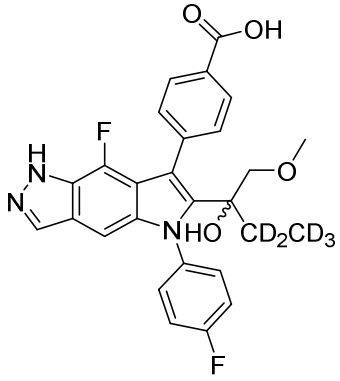
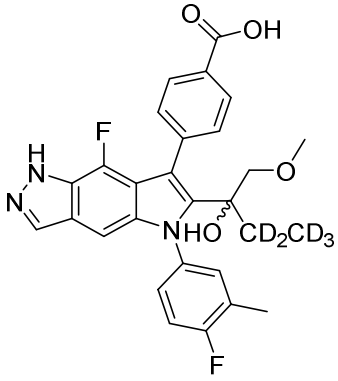
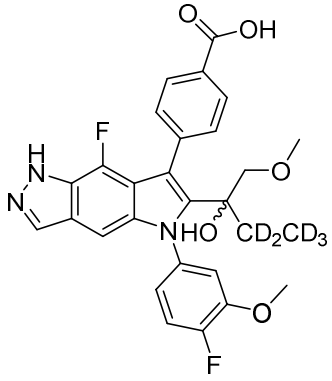
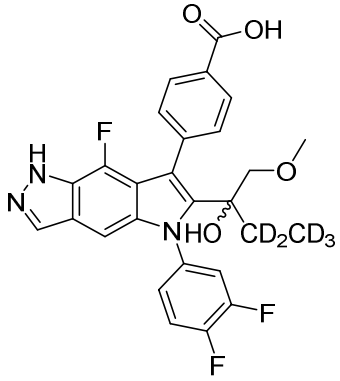
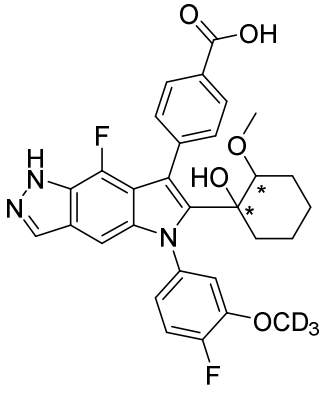
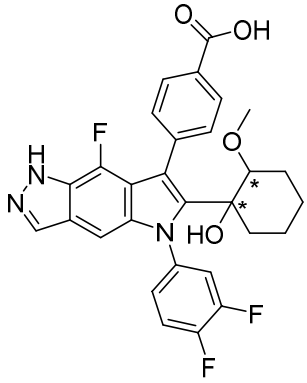
, and
- 

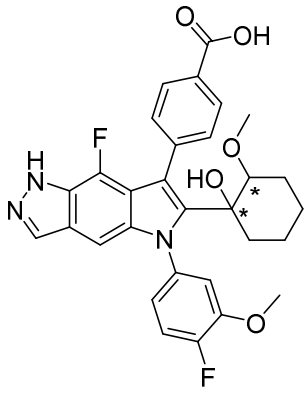
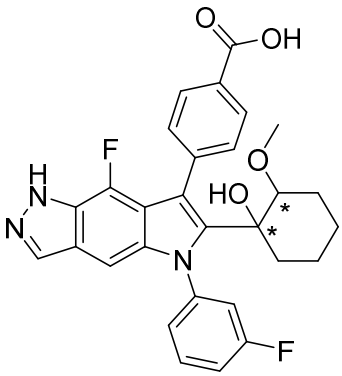
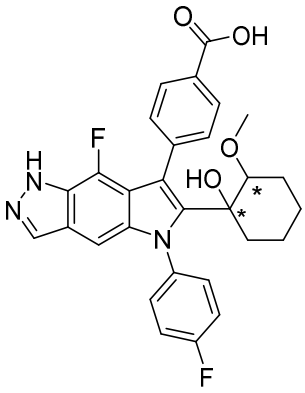
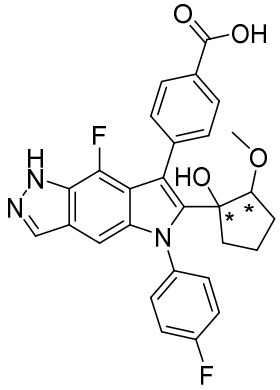
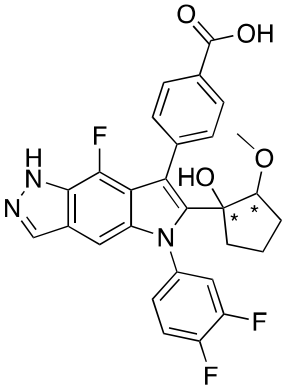
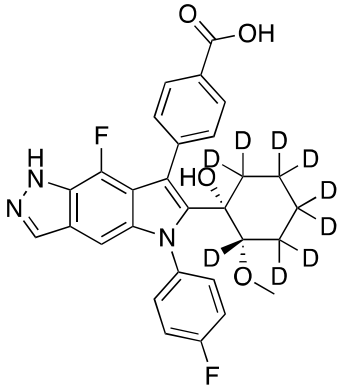
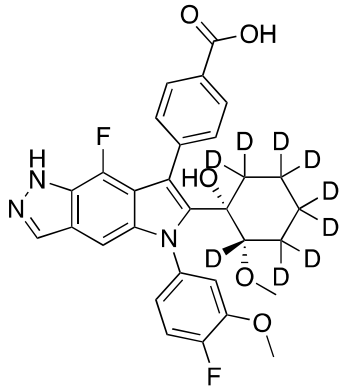
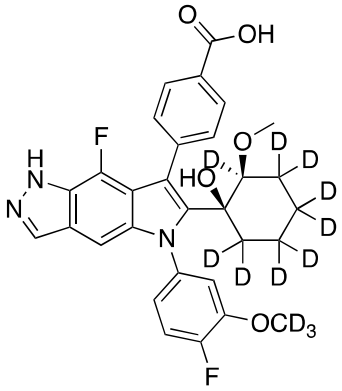
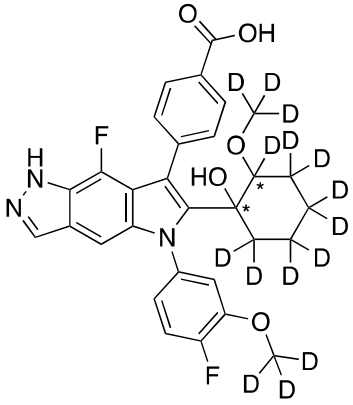
; and

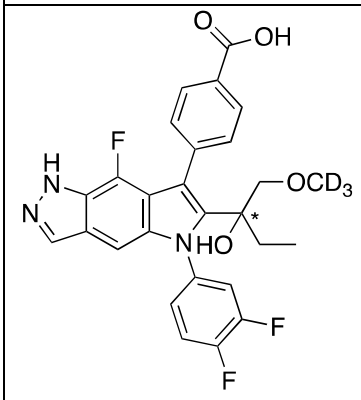
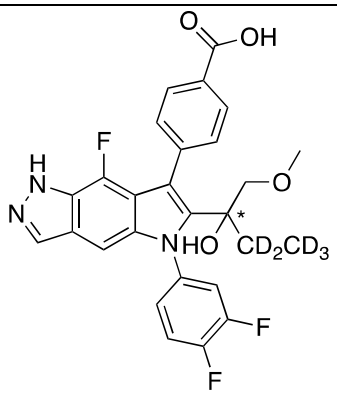
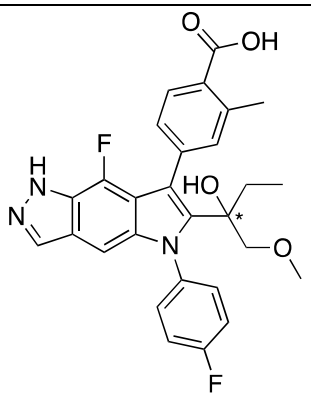
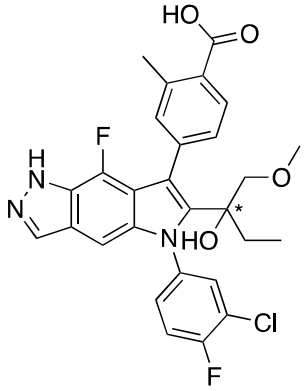
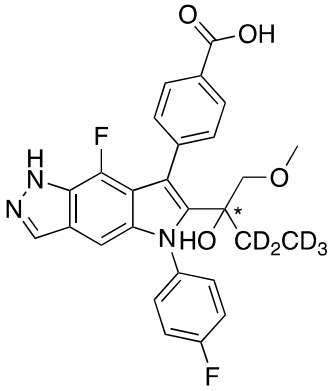
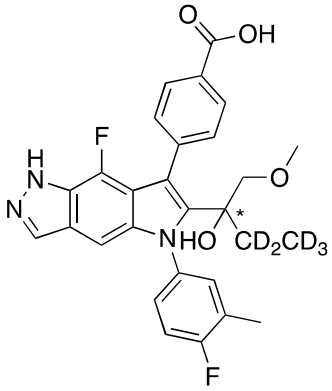
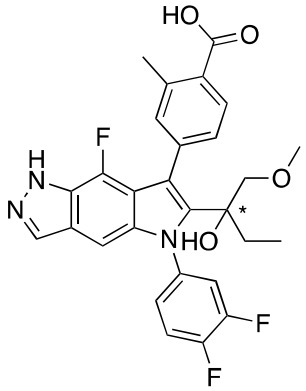
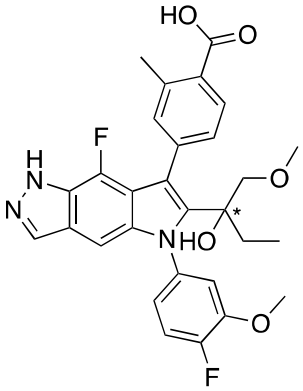
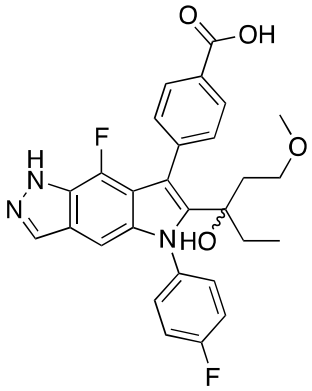
R^3 is chosen from H and -CH_3.

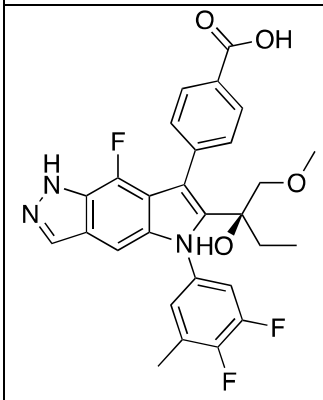
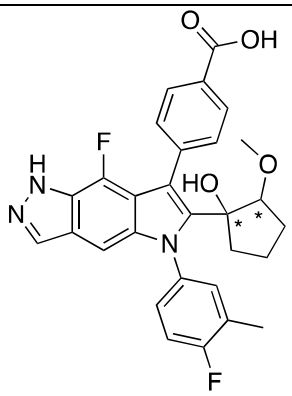
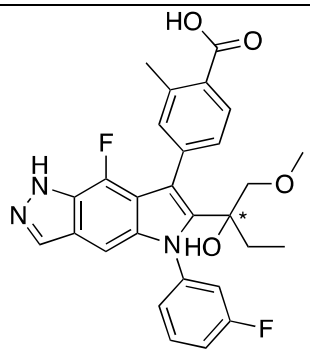
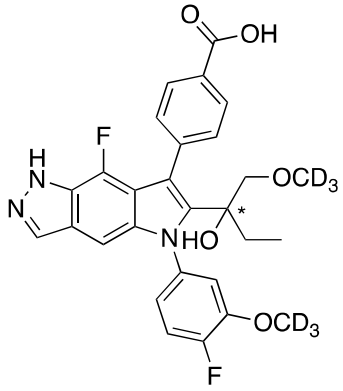
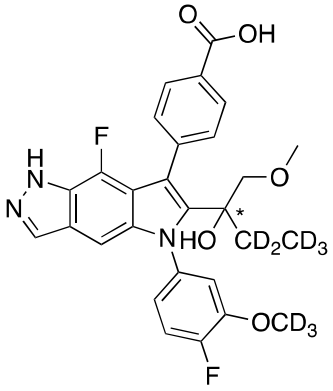
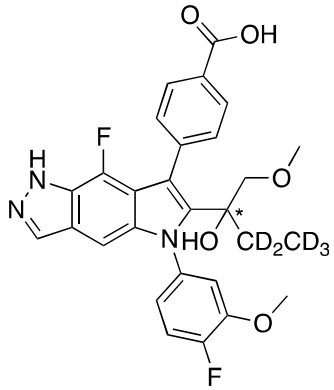
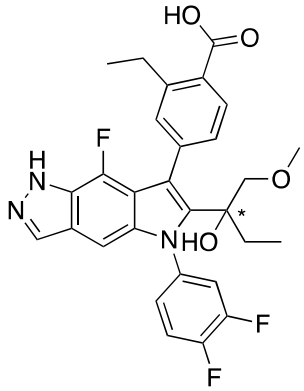
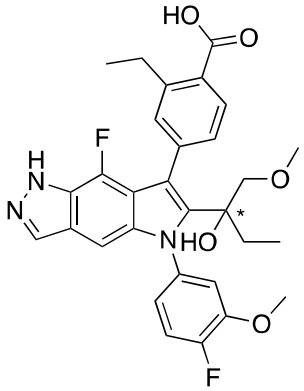
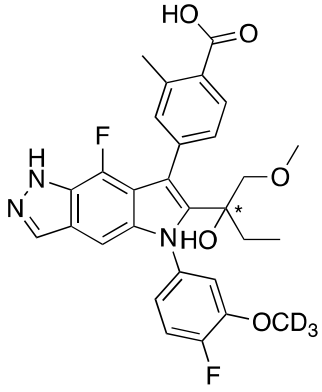
5. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 4, wherein the compound of Formula Ib is selected from:

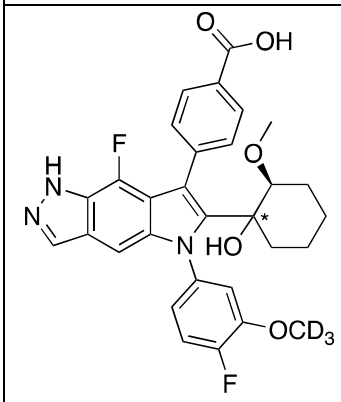
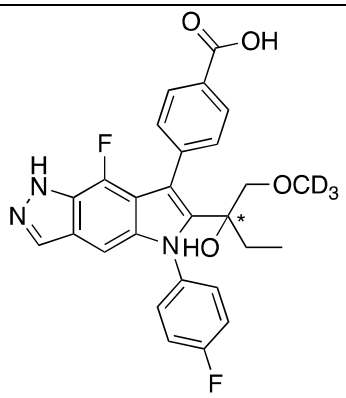
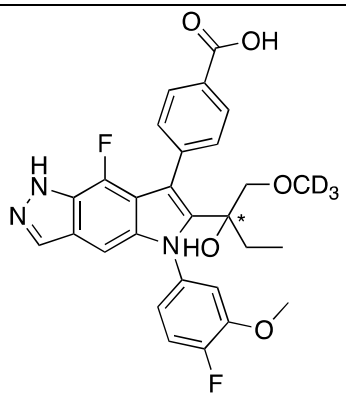
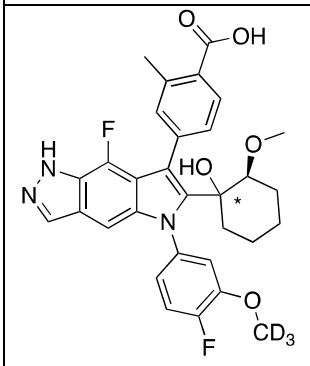
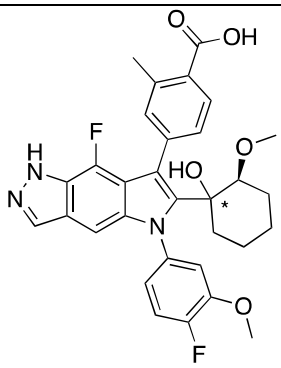
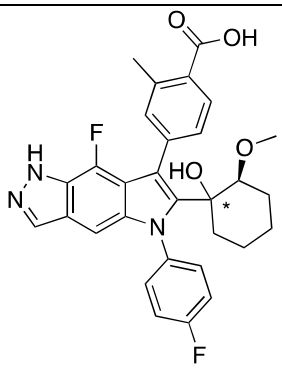
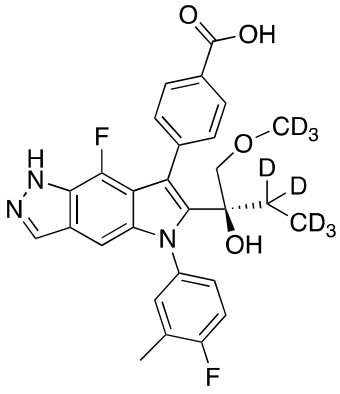
Compound 6	Compound 7	Compound 8
		
Compound 9	Compound 10	Compound 11
		
Compound 12	Compound 13	Compound 14
		

Compound 15	Compound 16	Compound 17
		
Compound 18	Compound 19	Compound 20
		
Compound 21	Compound 22	Compound 23
		

Compound 24	Compound 25	Compound 26
		
Compound 27	Compound 28	Compound 29
		
Compound 30	Compound 31	Compound 32
		

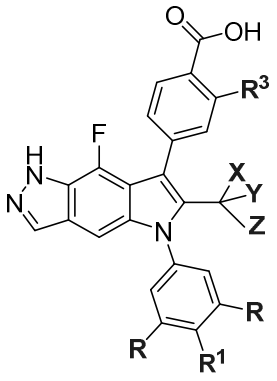
Compound 33	Compound 34	Compound 35
		
Compound 36	Compound 37	Compound 38
		
Compound 39	Compound 40	Compound 41
		

Compound 42	Compound 43	Compound 44
		
Compound 45	Compound 46	Compound 47
		
Compound 48	Compound 49	Compound 50
		

Compound 51	Compound 52	Compound 53
		
Compound 54	**Compound 55**	**Compound 56**
		
Compound 57		
		

tautomers of those compounds, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives.

6. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 4, wherein the compound of Formula Ib is selected from compounds of Formula Ib-i:


(Ib-i),

tautomers thereof, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives, wherein:

each **R** is independently selected from F, H, Cl, $-CH_3$, $-OCH_3$, and $-OCD_3$;

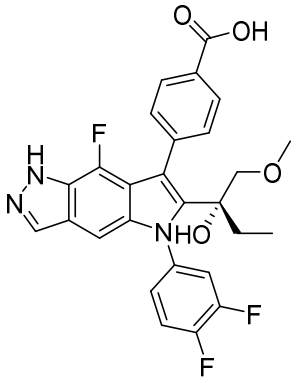
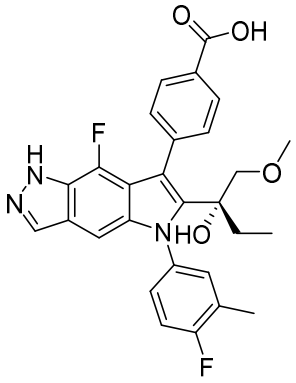
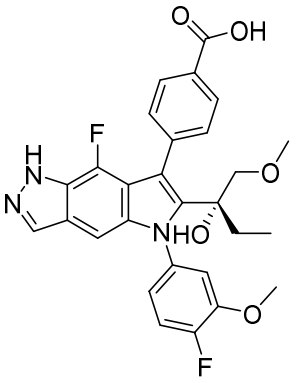
$\mathbf{R^1}$ is H or F;

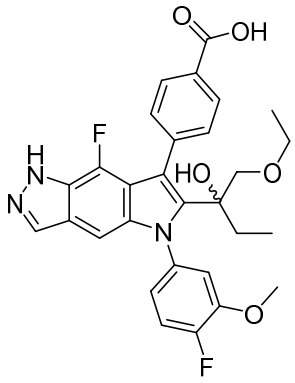
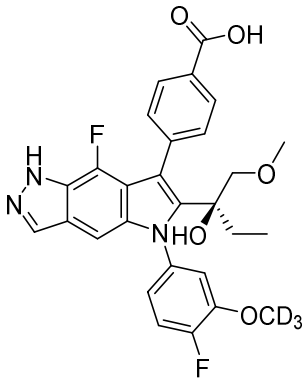
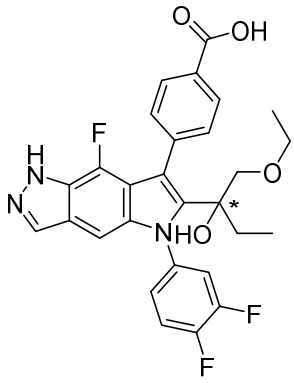
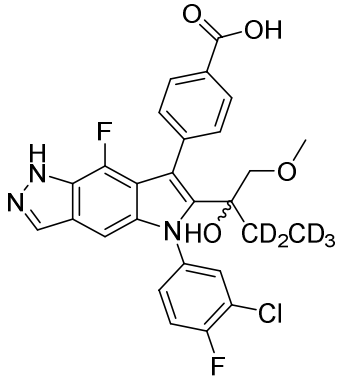
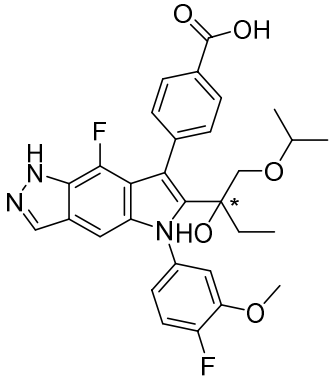
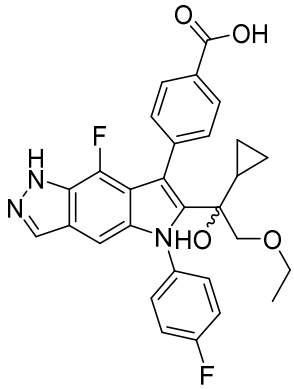
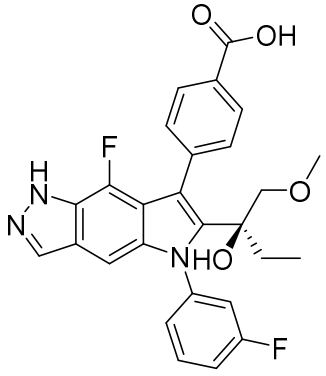
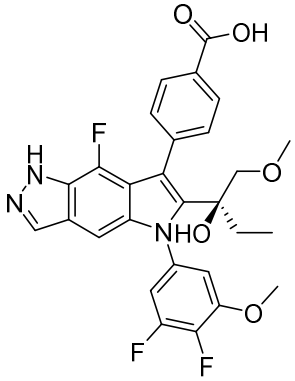
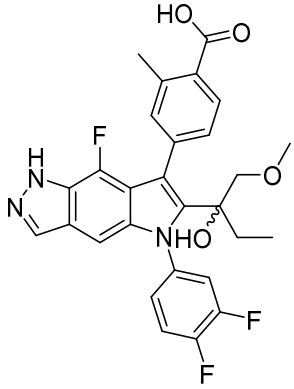
X, **Y**, and **Z** are defined as follows:

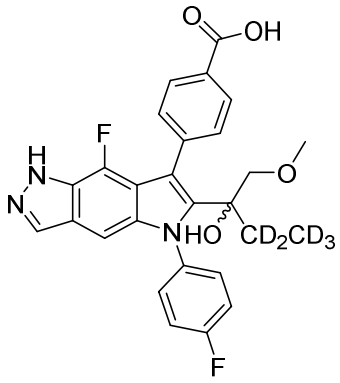
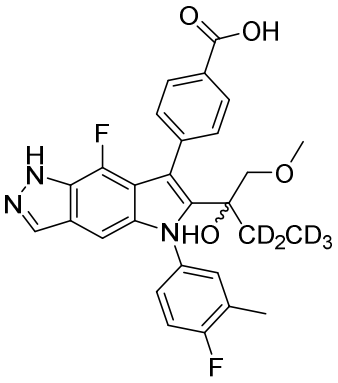
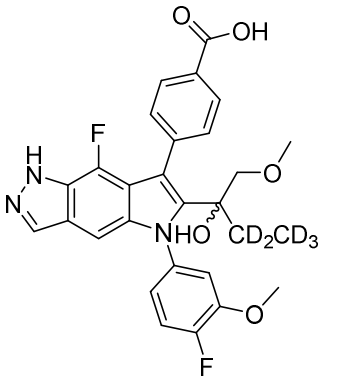
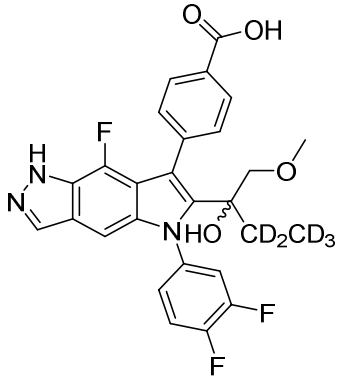
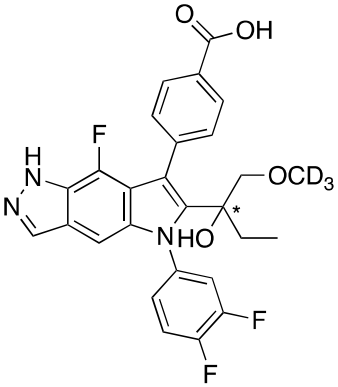
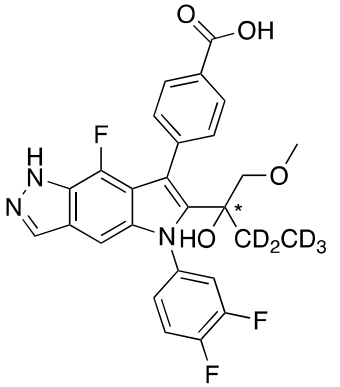
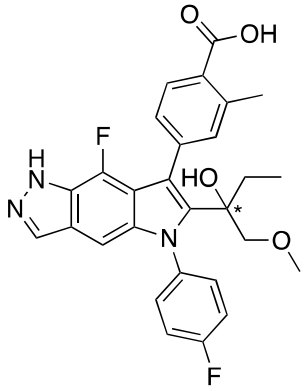
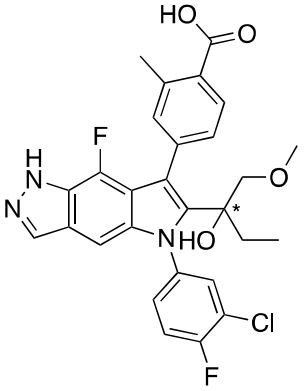
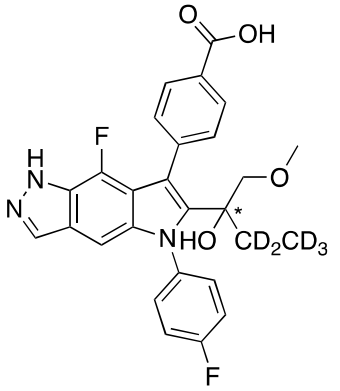
- one of **X**, **Y**, and **Z** is -OH;
- one of **X**, **Y**, and **Z** is chosen from $-CH_2CH_3$ and cyclopropyl; and
- one of **X**, **Y**, and **Z** is chosen from $-CH_2OCH_3$, $-CH_2CH_2OCH_3$, $-CH_2OCH_2CH_3$, $-CH_2O$-cyclopropyl, and $-CH_2O$-isopropyl; and

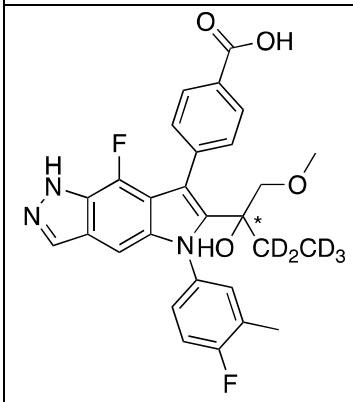
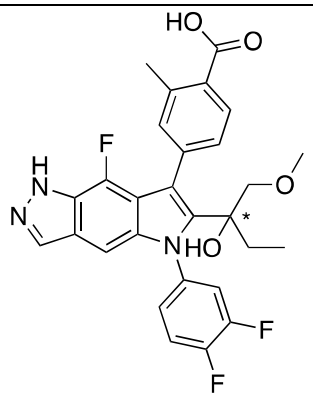
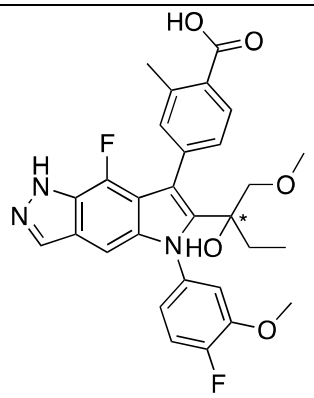
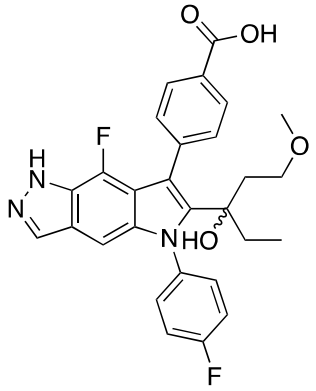
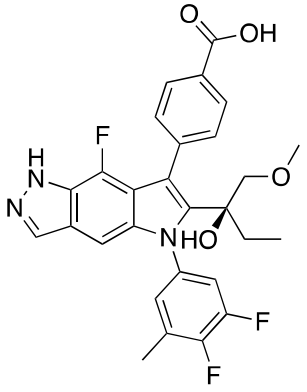
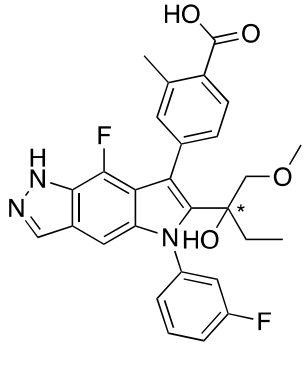
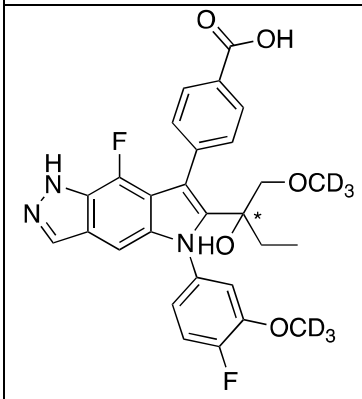
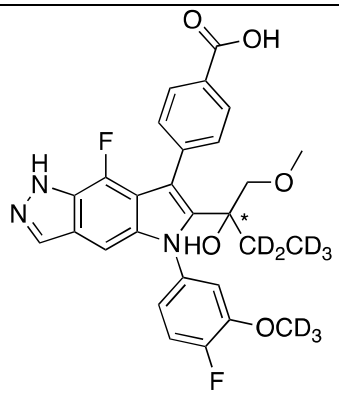
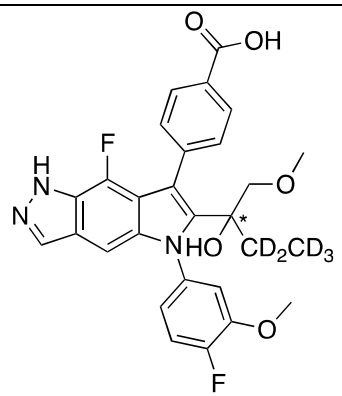
$\mathbf{R^3}$ is chosen from H and $-CH_3$.

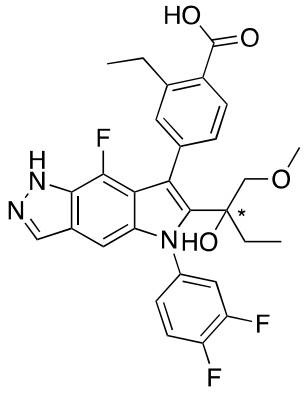
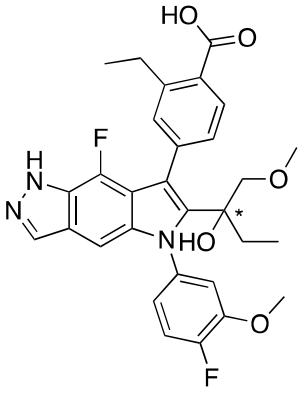
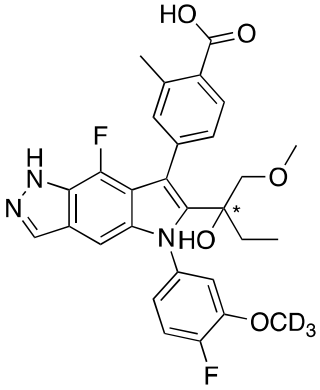
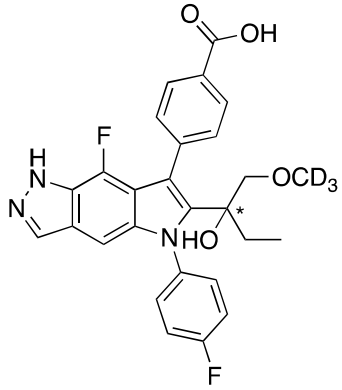
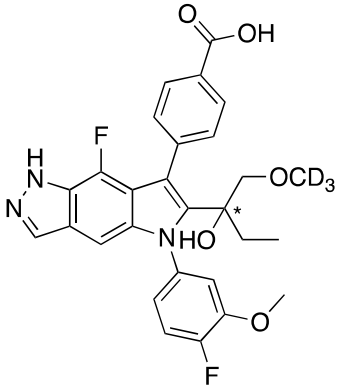
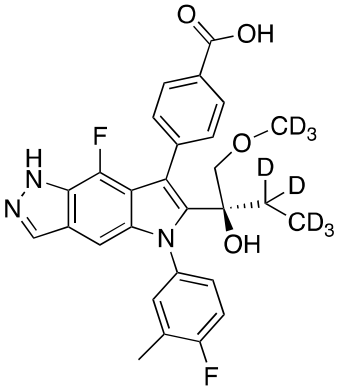
7. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 6, wherein the compound of Formula Ib-i is selected from:

Compound 6	Compound 7	Compound 8
		
Compound 9	Compound 10	Compound 11

		
Compound 12	Compound 13	Compound 14
		
Compound 15	Compound 16	Compound 17
		

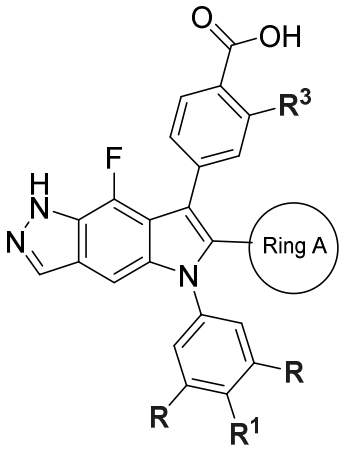
Compound 18	Compound 19	Compound 20
		
Compound 21	Compound 33	Compound 34
		
Compound 35	Compound 36	Compound 37
		

Compound 38	Compound 39	Compound 40
		
Compound 41	Compound 42	Compound 44
		
Compound 45	Compound 46	Compound 47
		

Compound 48	Compound 49	Compound 50
		
Compound 52	Compound 53	Compound 57
		

tautomers thereof, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives.

8. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 4, wherein the compound of Formula Ib is selected from compounds of Formula Ib-ii:



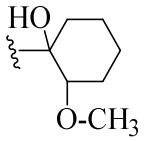
(Ib-ii),

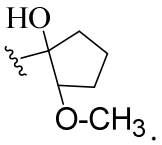
tautomers thereof, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives, wherein:

each **R** is independently selected from F, H, Cl, -CH_3, -OCH_3, and -OCD_3;

R^1 is H or F;

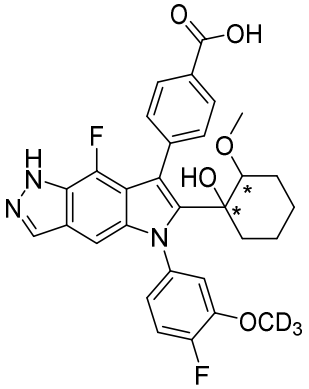
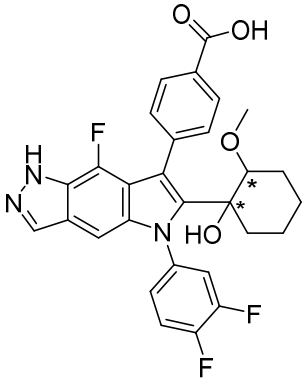
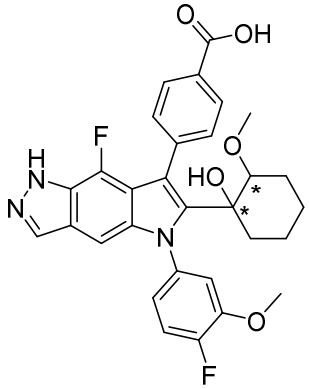
R^3 is chosen from H and -CH_3; and

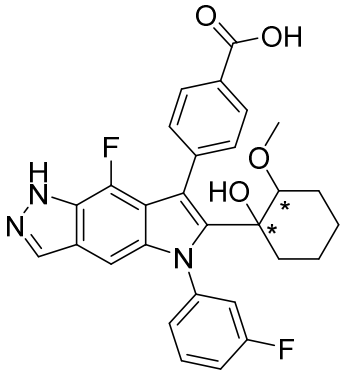
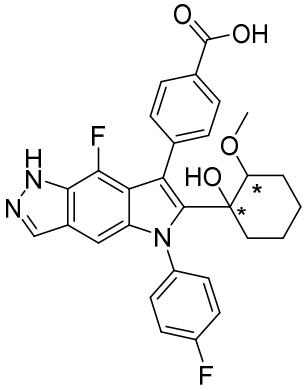
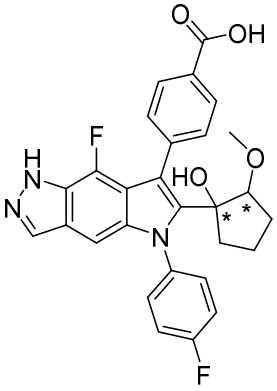
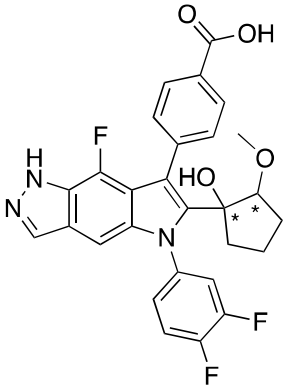
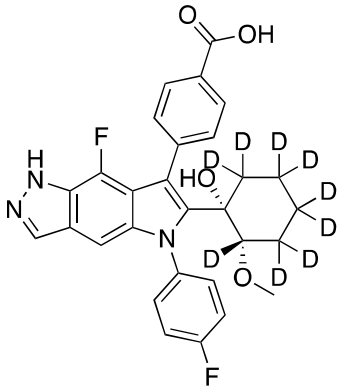
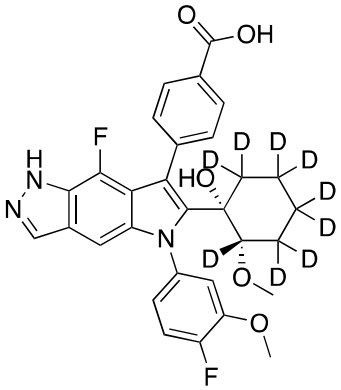
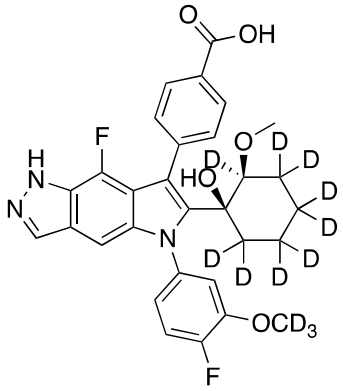
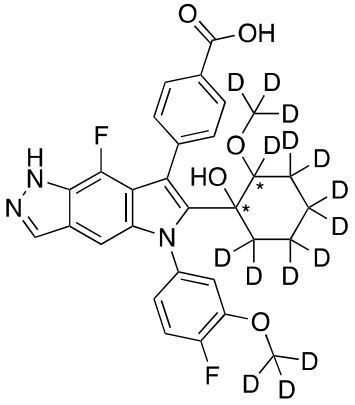
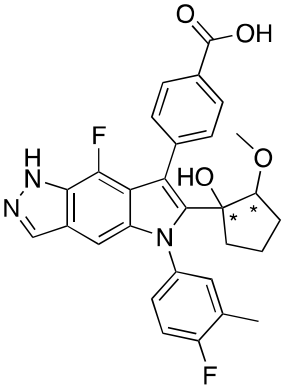
Ring A is selected from 

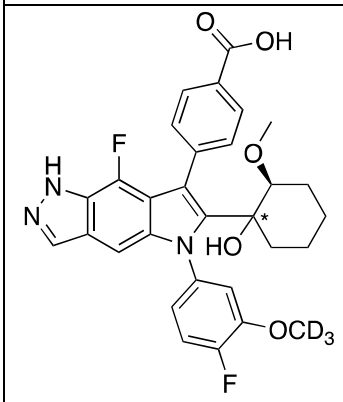
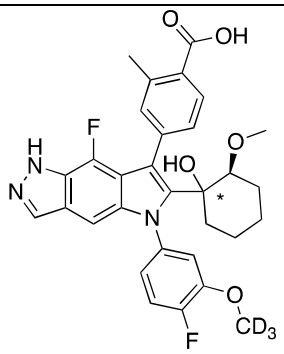
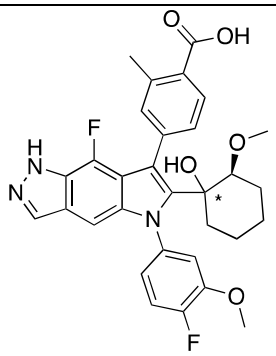
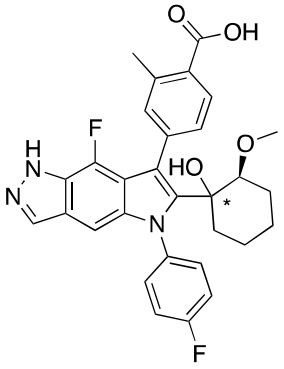
and 

.

9. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 8, wherein the compound of Formula Ib-ii is selected from:

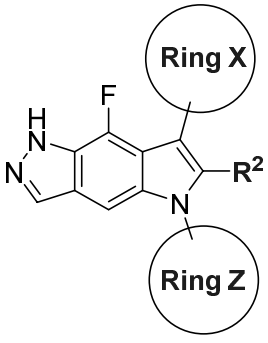
Compound 22	Compound 23	Compound 24
		

Compound 25	Compound 26	Compound 27
		
Compound 28	Compound 29	Compound 30
		
Compound 31	Compound 32	Compound 43
		

Compound 51	Compound 54	Compound 55
		
Compound 56		
		

tautomers thereof, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives.

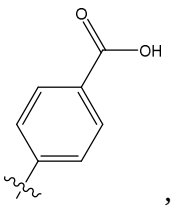
10. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 1, wherein the compound of Formula I is selected from compounds of Formula Ic:

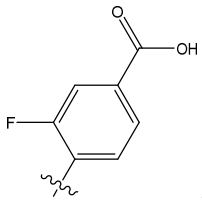


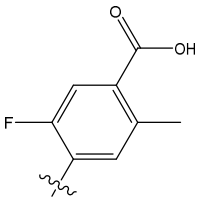
(Ic),

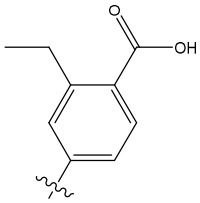
tautomers thereof, deuterated derivatives of those compounds or tautomers, and pharmaceutically acceptable salts of the foregoing compounds, tautomers, and deuterated derivatives, wherein:

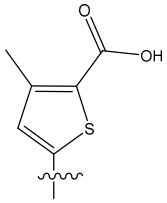
Ring X is selected from:



, 

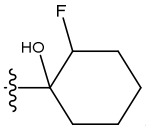
, 

, 

, and 

;

R^2 is selected from:

- 

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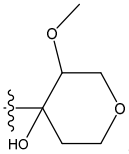
- 

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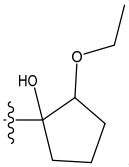
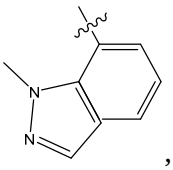
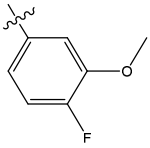
- 

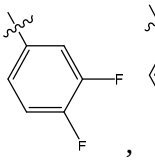
, and
- 

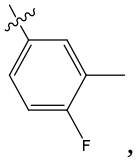
, wherein
  - one of **X**, **Y**, and **Z** is -OH;
  - one of **X**, **Y**, and **Z** is -CH_2CH_3; and
  - one of **X**, **Y**, and **Z** is chosen from -CH_2OCH_3, and -$CH_2OCH_2CH_3$; and

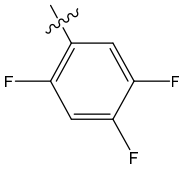
Ring Z is selected from:

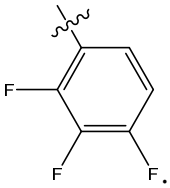


, 

, 

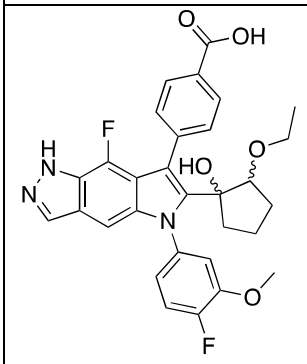
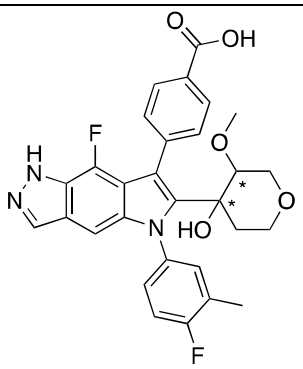
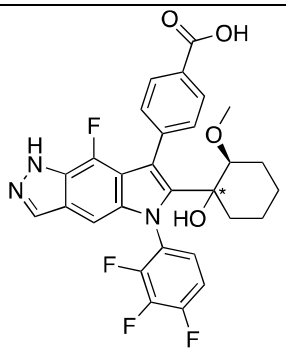
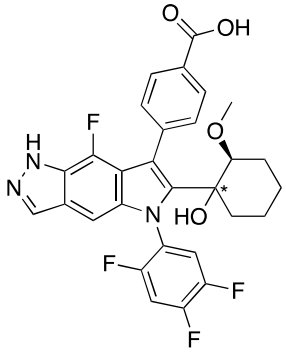
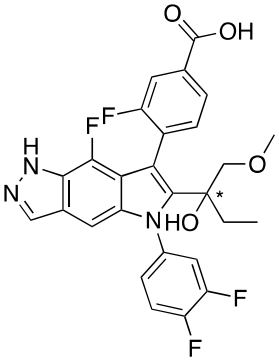
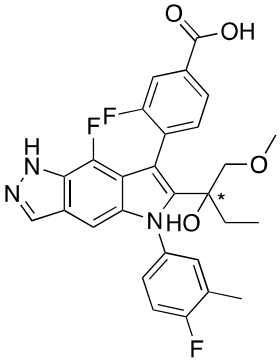
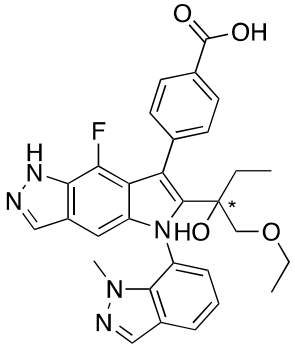
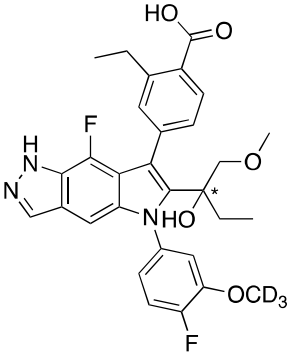
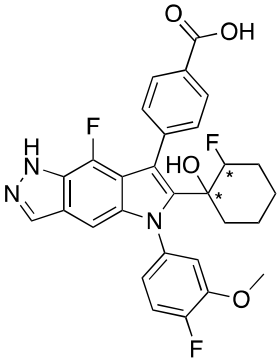
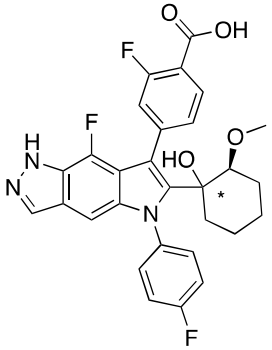
, 

, 

, and 

.

11. The compound, tautomer, deuterated derivative, or pharmaceutically acceptable salt according to claim 10, wherein the compounds of Formula Ic are selected from:

Compound 58	Compound 59	Compound 60
		
Compound 61	Compound 62	Compound 63
		
Compound 64	Compound 65	Compound 66
		
Compound 67		
		

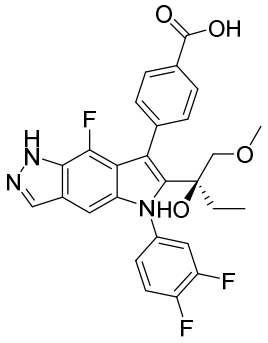
tautomers of those compounds, deuterated derivatives of those compounds and tautomers, and pharmaceutically acceptable salts of those compounds, tautomers, and deuterated derivatives.

12. A pharmaceutical composition comprising the compound, tautomer, deuterated derivative or pharmaceutically acceptable salt according to any one of claims 1 to 11, and a pharmaceutically acceptable carrier.

13. The compound, tautomer, deuterated derivative or pharmaceutically acceptable salt according to any one of claims 1 to 11, or the pharmaceutical composition according to claim 12, for use in the treatment of alpha-1 antitrypsin deficiency (AATD).

14. The compound, tautomer, deuterated derivative or pharmaceutically acceptable salt according to any one of claims 1 to 11, or the pharmaceutical composition according to claim 12, for use in the manufacture of a medicament for the treatment of alpha-1 antitrypsin deficiency (AATD).

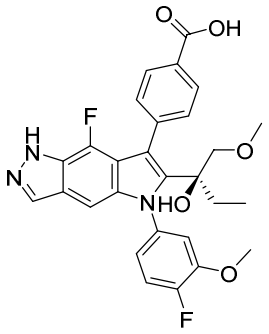
15. A substantially crystalline form of Compound 5



(Compound 5)

selected from Compound 5 free form Monohydrate Form A, Compound 5 free form Form A, Compound 5 free form Form B, Compound 5 free form NPA Solvate Form A, Compound 5 free form EtOH Solvate Form A, Compound 5 free form MeOH Solvate Hydrate Form A, Compound 5 free form DCM Solvate Form A, and Compound 5 free form EtOAc Heptane Solvate Form A.

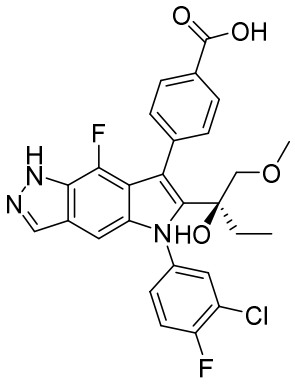
16. A substantially crystalline form of Compound 3



(Compound 3)

selected from Compound 3 free form Form A, Compound 3 free form Form B, Compound 3 free form Hydrate Form A, Compound 3 free form Hydrate Form B, Compound 3 free form Hydrate Form C, and Compound 3 free form MTBE Solvate Form A.

17. A substantially crystalline form of Compound 4



(Compound 4)

selected from Compound 4 free form Form A, Compound 4 free form Form B, Compound 4 free form Form C, Compound 4 free form Form D, Compound 4 free form Hydrate Form A, Compound 4 free form Hydrate Form B, and Compound 4 free form Hydrate Form C.

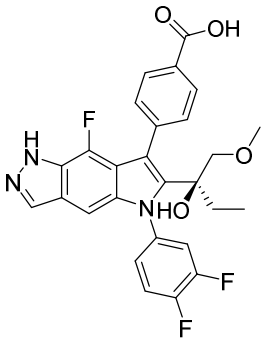
18. A pharmaceutical composition comprising the substantially crystalline form according to any one of claims 15-17, and a pharmaceutically acceptable carrier.

19. The substantially crystalline form of Compound 5 according to claim 15, the substantially crystalline form of Compound 3 according to claim 16, the substantially crystalline form of Compound 4 according to claim 17, or the pharmaceutical composition according to claim 18, for use in the treatment of alpha-1 antitrypsin deficiency (AATD).

20. Use of the substantially crystalline form of Compound 5 according to claim 15, the substantially crystalline form of Compound 3 according to claim 16, the substantially

crystalline form of Compound 4 according to claim 17, or the pharmaceutical composition according to claim 18, in the manufacture of a medicament for the treatment of alpha-1 antitrypsin deficiency (AATD).

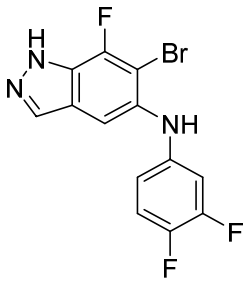
21. A process for preparing (*S*)-4-(5-(3,4-Difluorophenyl)-8-fluoro-6-(2-hydroxy-1-methoxybutan-2-yl)-1,5-dihydropyrrolo[2,3-*f*]indazol-7-yl)benzoic acid (Compound 5)



(Compound 5),

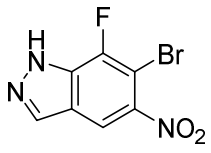
wherein the process comprises the steps of

(a) preparing intermediate S14



S14

by reductive coupling of



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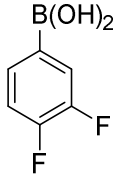
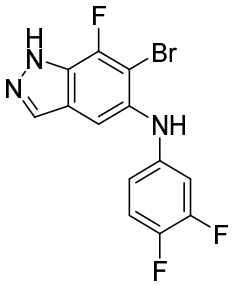


; and

(b) reacting intermediate S14 with reagent N6



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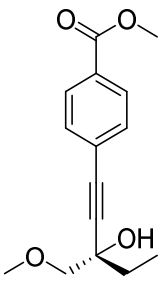
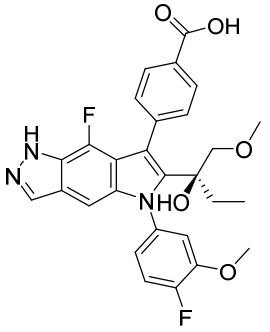


via Larock annulation to provide Compound 5.

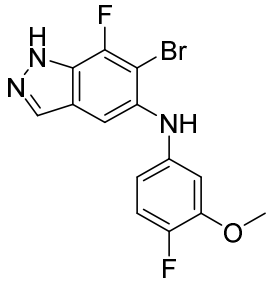
22. A process for preparing Compound 3



(Compound 3),

comprising the steps of

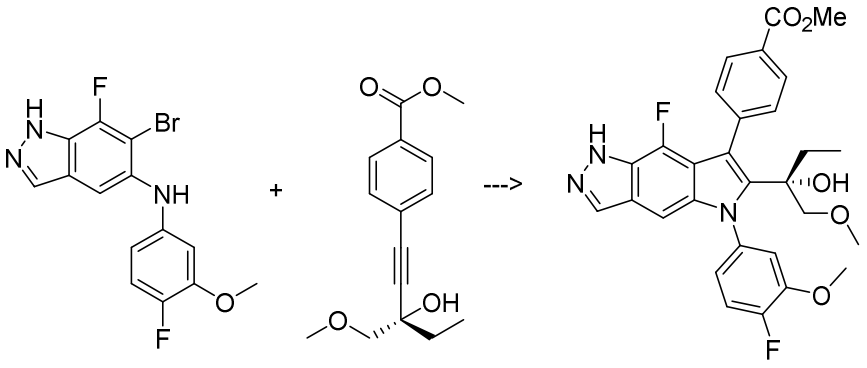
(a) reacting 6-bromo-7-fluoro-5-iodo-1*H*-indazole and 4-fluoro-3-methoxyaniline via Buchwald coupling to produce intermediate S1



S1

;

(b) reacting intermediate S1 with reagent via Larock annulation to produce (methyl (S)-4-(8-fluoro-5-(4-fluoro-3-methoxyphenyl)-6-(2-hydroxy-1-methoxybutan-2-yl)-1,5-dihydropyrrolo[2,3-f]indazol-7-yl)benzoate:



S1

; and

(c) subjecting (methyl (S)-4-(8-fluoro-5-(4-fluoro-3-methoxyphenyl)-6-(2-hydroxy-1-methoxybutan-2-yl)-1,5-dihydropyrrolo[2,3-f]indazol-7-yl)benzoate to ester hydrolysis to produce Compound 3.